

FACTORS INFLUENCING CROPPING- PATTERNS ON INDIVIDUAL HOLDINGS

(JALGAON DISTRICT, MAHARASHTRA STATE)

PART I

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**A THESIS SUBMITTED
TO THE
UNIVERSITY OF POONA
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY**

1968

PREFACE

The subject of crop-pattern can be studied both at individual and aggregate level. In fact, it should be studied on both the levels by a two pronged approach. In India, however, the subject has been studied more on the macro-level, neglecting the micro side of it. Many of the studies of crop-pattern, therefore, are lop-sided and have yielded conflicting results--some putting forth that the Indian farmer is highly responsive to price, while the others revealing just the opposite. The role of price as a factor, can be better examined at the micro-level by studying how it affects the individual cultivator's cropping decisions. In the present study, therefore, I have made a modest attempt to analyse in detail the problem of cropping pattern at the micro-level to bring out the basic factors which influence the cropping decisions of individual cultivators.

The entire study was carried out under the guidance of Professor D. R. Gadgil, Ex-Director, Gokhale Institute of Politics and Economics, Poona, and at present Deputy Chairman, Planning Commission, Government of India, New Delhi. To work under him was, indeed, a privilege. The present study has benefited much from his exacting standard and critical comments. I have no words to express adequately my debt to him for his valuable and inspiring guidance.

The major part of this study was completed between

June 1965 and September 1967, when Professor V.M. Dandekar, Director, Gokhale Institute of Politics and Economics, Poona, kindly allowed me to concentrate on the work of my thesis. I am very much grateful to him for this and such other facilities extended to me, without which the work would not have been completed.

I am also grateful to Shri D. P. Apte, Registrar, Gokhale Institute of Politics and Economics, Poona, who gave me all the facilities in the Institute to complete the study earlier. I have also to thank my colleagues and friends in the Institute, who helped me in many ways.

I have to thank the village officials and the sample cultivators in the four villages, for the hospitality extended to me during my stay in their villages and for the patience shown in supplying all the information required by me.

Finally, I am also thankful to Shri V. N. Inamdar, who typed the thesis neatly and accurately and Shri K. K. Herwadkar who helped me in drawing the graphs and the maps.

G. R. Mulla

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ABBREVIATIONS USED FOR CROPS AND CROP-ROTATIONS

<u>Crops</u>	<u>Abbreviations</u>	<u>Crops</u>	<u>Abbreviations</u>
Bajara	B	Groundnut	G
Banana ('Junar')	JB	Jowar	J
Banana ('Nawati')	NB	Maize	M
Chillies	Ch	Paddy	P
Cotton	C	Wheat	W

Crop-rotations

Two-year rotations

Cotton-Jowar	C-J
Cotton-Wheat	C-W
Groundnut-Cotton	G-C
Groundnut-Jowar	G-J
Jowar-Bajara	J-B
Jowar-Wheat	J-W

Three-year rotations

Cotton-Cotton-Jowar	C-C-J
Cotton-Cotton-Wheat	C-C-W
Groundnut-Cotton-Bajara	G-C-B
Groundnut-Cotton-Jowar	G-C-J
Groundnut-Jowar-Cotton	G-J-C
'Nawati' banana-'Junar' banana-Cotton	NB-JB-C
'Nawati' banana-'Junar' banana-Groundnut	NB-JB-G
'Nawati' banana-'Junar' banana-Jowar	NB-JB-J
'Nawati' banana-'Junar' banana-Maize	NB-JB-M
'Nawati' banana-'Junar' banana-Wheat	NB-JB-W
Wheat-Cotton-Jowar	W-C-J

AbbreviationsFour-year rotations

Cotton-Cotton-Cotton-Jowar	C-C-C-J
Cotton-Cotton-Jowar-Wheat	C-C-J-W
'Nawati' banana-'Junar' banana-Cotton-Cotton	NB-JB-C-C
'Nawati' banana-'Junar' banana-Cotton-Groundnut	NB-JB-C-G
'Nawati' banana-'Junar' banana-Cotton-Jowar	NB-JB-C-J
'Nawati' banana-'Junar' banana-Cotton-Wheat	NB-JB-C-W
'Nawati' banana-'Junar' banana-Jowar-Cotton	NB-JB-J-C
'Nawati' banana-'Junar' banana-Maize-Bajara	NB-JB-M-B
'Nawati' banana-'Junar' banana-Maize-Cotton	NB-JB-M-C
'Nawati' banana-'Junar' banana-Wheat-Jowar	NB-JB-W-J

CHAPTER I

INTRODUCTION

✓ In a study of cropping-pattern, concentration on aggregate data, their averages and movements, tends to disguise the fact that these phenomena are the result of a synthesis of crop decisions, taken by individual cultivators. An appreciation of the results on the aggregate level, therefore, would be better facilitated, against the background of a detailed study of the economic behaviour of the individual cultivator. It is in this field of the economics of crop-pattern determination of the individual cultivator, that this study is set in. It attempts to analyse the crop-pattern of individual cultivator - how he works under the constraints, physical, social, personal and other types.

1.1. Crop-pattern : Individual and Aggregate

In India, the typical agricultural producer is, a peasant family, operating with a small fragmented land-holding. In almost all the States, the cultivator operates, chiefly with the help of family labour. Each conducts his activity of cultivation separately and is an independent unit of entrepreneurship. Given the technical and physical factors which influence and condition the cropping, each cultivator tries to adjust his crop-pattern in such a way that he gets maximum returns. Each is required to take his own crop decisions and has to allot his land to different crops in a judicious manner so that it maximises the income for the farm as a whole.

The individual crop-pattern, therefore, may differ from cultivator to cultivator, depending on the conditions and the circumstances under which he works. Such crop-patterns of different individual cultivators, are, however, added up and these make the aggregate crop-pattern of a village, taluka, district and region etc.

The subject of crop-pattern, thus, can be studied both at individual and aggregate level. In fact it should be studied on both the levels by a two pronged approach. In India, however, this has not happened. The subject has been studied more on the macro-level, neglecting the micro side of it. This may be because of the lack of data about individual cultivators and the difficulties in collecting such data. Many of the studies of crop-pattern, therefore, are lop-sided and have yielded conflicting results. Some discover that there is a high degree of response to prices; while others point out, just the opposite, that there is a negligible supply response. Raj Krishna, Dharma Narain and others hold the former view and have observed that prices have a powerful influence on the acreage - particularly of the cash-crops. Madan, Neale and Olson, on the other hand, have contributed to the opposite view and contend that there is negligible or negative supply response for agricultural output in under-developed countries. The preconceived notions of both the schools are substantiated with empirical data and proved with different statistical tests. A brief review of such studies may be useful to provide a background for the present work.

1.2. Macro-studies of Crop-pattern

In his study, Raj Krishna¹ finds that in Punjab, all the major crops, except jowar, have positive price elasticities in the short as well as long-run. Jowar seems to be the only crop which has a negative response to relative price movements. He points out that the short-run price elasticities of the different crops vary "from as low a figure as 0.1 in the case of wheat and bajara, to the medium magnitudes 0.2 to 0.4 in the case of maize, sugarcane and rice, up to 0.6 and 0.7 in the case of cotton."² The corresponding long-run elasticities range from 0.15 to 1.6. It is significant that the long-run elasticity of cotton acreage exceeds unity."

Dharm Narain³ also has arrived at similar conclusions, though not through any econometric exercises. He points out that "the Indian farmer is significantly responsive to price." He, however, maintains that there is a striking difference of behaviour between cash and food-grain crops. He points out that "similarity between the behaviour of areas under cash-crops and the prices of these crops is, in most of the

1 Raj Krishna, "Farm Supply Response in India-Pakistan : A Case Study of the Punjab Region," Economic Journal, Vol. LXXII, September 1963, p. 486.

2 Some unpublished estimates by N. Rath, Gokhale Institute of Politics and Economics, Poona, for jowar and cotton in pre-war Madhya Pradesh give even lower elasticity estimates than those for the Punjab.

3 Dharm Narain, The Impact of Price Movements on Areas under Selected Crops in India, 1900-1939, Cambridge University Press, 1965, p. 158.

cases, so striking that price emerges as a decisive consideration with the farmer in the areas he sows to these crops."

In the case of the foodgrain crops, however, the influence of non-price factors is more powerful.

Gupta and Majid¹ present a different point of view. They do not find any direct association between variations in prices of paddy and sugarcane and the respective acreage sown to them in district Deoria of Uttar Pradesh during the period 1949-50 to 1961-62. The study reveals that during the period, an increase in the prices of paddy is associated with a decline in its acreage in more number of years. In the case of sugarcane, the area had continuously increased in most of the years, though the guaranteed price remained unchanged. They, therefore, conclude, that "not much meaningful association exists between the prices of paddy and sugarcane on the one hand and the acreage under these crops, on the other." They, however, find that there is some association between changes in relative prices of sugarcane and paddy and their relative acreage from year to year. They conclude that "an important consideration that is likely to weigh with the producer, while planning for the allocation of acreage, is the relative monetary return per acre from different crops. This consideration may not be entirely independent of price variations, but may sometimes play an even more decisive role than relative prices."

1 Gupta, S.C., and Majid, A., Producers' Response to Changes in Prices and Marketing Policies, Asia Publishing House, Bombay, 1965, pp. 13-21.

Hanumantha Rao¹ appears to hold the same view. He states that while making a choice between different crops, a farmer is guided more by the differences in the net income per acre at margin from the crops concerned after meeting the variable costs. He finds that there is a remarkable correspondence between the net income per acre from different crops and the area under them. Crops which are more profitable invariably account for larger proportion of area, the area under the low-yielding crops being negligible.

Madan² takes an altogether different view. He feels that the relationship between prices and production is a complex one and not all sectors of agriculture or classes of agriculturists have the same production response to a given price change. According to him, a broad distinction has to be made between the reactions of a large farmer engaged in farming as a business and the small scale subsistence farmer with whom farming is largely a way of life. He finds that "the large farmer is induced to increase his inputs and expand his output when prices rise and vice versa with a fall in prices. In regard to the small family farmers, on the other hand, not only is no such direct correlation observable, but the observed

1 Hanumantha Rao, C.H., Agricultural Production Function, Costs and Returns in India, Asia Publishing House, Bombay, 1965, p. 72.

2 Madan, B. K., "Presidential Address," Proceedings of the Eighteenth Conference of the Indian Society of Agricultural Economics, Indian Journal of Agricultural Economics, Vol. XIII, No. 1, January-March, 1958, p. 16.

experience of agriculture over a long period shows an inverse elasticity of supply with changes in prices."

Neale¹ holds a similar view and puts it in strong terms when he says that "a programme of price supports is unnecessary to keep the farmers producing." To him the supply of agricultural produce seems to depend very much on what the peasant finds himself with after deducting the needs of family from his harvest. "If this excess or surplus is large, it will go to the market, whatever the price; and if it is small, it will not increase even with higher prices, because he (farmer) will first take care of his own family's immediate consumption requirements." Neale had attempted a number of correlations between acreages planted to the major crops and prices in the Punjab in the years 1939-53. He found significant correlations only for barley and maize, which are regarded as the least commercial crops. In Uttar Pradesh also he could not find any correlation between the prices and the acreages during the period 1919 to 1939.

Olson² is also of the same view. He clearly states that, "it is a misconception to believe that the price response of Indian cultivators is very low; on the contrary there is convincing evidence that there is a negative supply response by way of income effect."

1 Neale, W. C., "Economic Accounting and Family Farming in India," Economic Development and Cultural Change, Vol. 7, No. 3, 1958-59, p. 298.

2 Olson, R. O., "Discussion: Impact and Implications of Foreign Surplus Disposal on Underdeveloped Economies," Journal of Farm Economics, Vol. 42, No. 5, December 1960, pp. 1043-44.

Mathur and Ezekiel¹ subscribe to similar view and argue out that "prices and marketable supply tend to move in opposite direction." Dandekar,² however, has neatly refuted the arguments of Mathur and Ezekiel, with the help of Mathur's own data from the Farm Management Study in Akola and Amraoti; and goes further to say that "it is a sheer myth that farmers or farmers in underdeveloped countries respond very differently to normal economic stimuli."

All this controversy³ over the supply response to price changes has resulted because of much concentration on the macro-studies based on the aggregative data. In all these studies, there appears to be a tendency to rely too much on the correlation coefficient between time-series of the area under crop and prices to determine the causes of the crop-pattern adopted by the cultivator. Though these studies are

1 Mathur, P.N., and Ezekiel, H., "Marketable Surplus of Food and Price Fluctuations in a Developing Economy," Kyklos, Vol. 14, 1961, p. 397.

2 Dandekar, V.M., "Prices, Production and Marketed Surplus of Foodgrains," Indian Journal of Agricultural Economics, Vol. XIX, No.3 and 4, July-December 1964, pp. 186-195.

3 See contributions by several participants in the Conference Issue of Indian Journal of Agricultural Economics, Vol. IX, No.1, March 1954; and Vol. XX, No.1, January-March, 1965.

Also see: (1) Jakhade, V.M., and Mujumdar, N.A., "Response of Agricultural Producers to Prices - The case of jute and Rice in India," Indian Journal of Agricultural Economics, Vol. XIX, Nos.3 and 4, July-December, 1964.

(2) Sethi, J.D., "Some Analytical and Quantitative Aspects of Agricultural Supply and Substitution Functions: India," Indian Journal of Agricultural Economics, Vol. XXI, No. 2, April-June, 1966.

important, they are not definitive as there can be lots of other factors which contribute to the observed high correlations. For example, cyclical fluctuations in acreage generated through, say, weather preconditions and/or various rotation practices may have a very high correlation with lagged prices which may themselves be a result of the area in previous cycle etc. Therefore, to get at the definite factors determining the crop-pattern, we must study the problem at micro-level.

The macro-studies, though advantageous in some respects, do not reveal the whole truth about crop-pattern. To the extent that the aggregate is only a sum total of individual actions, the factors explaining aggregate crop-pattern may necessarily have their roots in individual decisions. But the converse may not be necessarily true. The factors influencing crop decisions of an individual cultivator, may not appear on aggregate plane. Many of these get lost in aggregation and are never seen on aggregate level. ✓ There are many such factors - food, fodder and cash needs of the individual cultivator, soil composition of his land-holding, his resources like manure, irrigation, bullock and human labour etc. These factors work on individual level and have a decisive influence on the crop-pattern. The influence of such factors has to be revealed only through micro-studies, as it cannot be seen on the macro-level. When we say that these other factors have an influence on the crop-pattern of the individual cultivator, we do not imply that big and long-term price changes have no

effect on cropping pattern but only that the cultivator is required to operate under very many constraints. And to be able to appreciate the role that the price changes play, we must make detailed study at the grass roots, rather than relying on some aggregative data and possibly spurious correlations.

In the present study, therefore, we make an attempt to analyse in detail the problem of crop-pattern on the micro-level and bring out the factors influencing crop decisions of individual cultivators.

1.3. Need for Micro-studies

The need for such detailed studies at the micro-level is more felt in recent years. Thus, in the First Five Year Plan,¹ it is clearly stated that, "It is difficult to forecast the effect of the agricultural programme on the crop-pattern with any degree of precision. This is due to the fact that the decision of the cultivator to raise a crop is based on factors like prices, weather conditions, availability of capital resources, and supplies which vary from season to season. Even areas under rice and wheat may be diverted to crops like sugarcane, fruits, and vegetables when irrigation is provided. Improvement in transport facilities, growth of urban areas, changes in food habits also at times affect the acreage under different crops. The influence that each of these

¹ First Five Year Plan, Government of India, Planning Commission, New Delhi, 1952, pp. 213-214.

factors exercise has to be studied in detail, so that some basis for making estimates might become available."

Gadgil¹ states it more explicitly in his technical address delivered in 1960, when he remarks that "... I was more amused than impressed when I learnt of the setting of a group at the Centre for a study of land use in the country. For, I know, having often to deal with the data, how scanty they are for any useful study at that level. We have yet to make even a beginning with proper research relating to the restraints, limitations and motivations that fashion the decisions regarding the crop-pattern of individual cultivators. A lot of this effort will be in the nature of case studies and you will no doubt have to handle and make do with the data which the purists among you would shudder to touch. But after all improvisation is the very soul of planning in an underdeveloped country."

The urgency and the importance of such studies have been realised by the Indian Council of Agricultural Research also which, later on, evolved a scheme for these studies in different regions of the country. In one of the notes² of the Council, it is clearly stated that, "There is very inadequate

1 Gadgil, D.R., "Planning for Agricultural Development in India," Planning and Economic Policy in India, Gokhale Institute of Politics and Economics, Poona, 1965, p. 233.

2 An unpublished note, "Enquiry into Factors Influencing Cropping Patterns on Individual Holding," Agricultural Economics Committee of the Indian Council of Agricultural Research, 1957.

knowledge at present about the basis of the decisions, which determine the pattern of land utilization on individual holdings and through them the ultimate composition of our agricultural production. Even though the subsistence nature of farming on a very large majority of our holdings introduces considerable rigidity into our cropping pattern, a number of crops still compete with each other on a fairly large proportion of our cultivated area. It would be worthwhile initiating a study to find out precisely, what factors influence the farmers in the choice of crops for such areas."

1.4. Micro-studies

The Council initiated the enquiries into the factors influencing crop-pattern on individual holdings at different Agro-Economic Centres in the country. Two reports of such enquiries at the Madras¹ and Ludhiana² Centres are available. Except these two, there is no other micro-study available on the subject. In both these reports, we find that there is too much reliance on the correlation coefficients between the areas under the crops and the factors. The data, though available at individual level, have been summed up and analysed on aggregate level by applying different statistical

1 Meenakshi Malya, Factors Influencing Cropping Pattern in South Arcot and North Arcot Districts, Agricultural Economics Research Centre, University of Madras, Madras, 1962 (mimeographed).

2 Kahlon, A.S., and Sharma, A.S., A Study into Factors Influencing Cropping Patterns on Individual Holdings in the Punjab, Punjab Agricultural University, Ludhiana (Punjab), 1963 (mimeographed).

tests to find out the significance or otherwise of different factors influencing the individual cultivator's crop-pattern. Thus, in the Report from the Madras Centre, we find that the multiple correlation coefficient computed for each of the villages to see the influence of the so-called "need restraints" (food, fodder and cash needs) are non-significant at 5 per cent probability level. From this, it is concluded that "these so-called 'need restraints' in fact do not operate - do not explain fully - or even to a significant partial extent, the variations in the proportion of area under food crops. The percentage variations explained by these variables range from 2 in Agrokottam to 24 in Sathugad." At another place, the influence of urbanization is tested by X^2 test, and it is pointed out that "the X^2 test shows very high significance at 1 per cent probability level. Thus, urbanization is seen to have definitely influenced the cropping pattern towards a more commercialised pattern of field crops." Even the influence of topography has been tested to point out that "the test of association between topography and cropping pattern is significant at 5% level." More or less similar is the case in the other Report of the Ludhiana Centre.

Thus, in both the studies, the various factors influencing the crop-pattern are considered independent of one another and the influence of each one is separately seen on the aggregate cropping pattern of the sample cultivators. In reality, however, the case is widely different. The various factors affecting the crop-pattern of an individual

cultivator, cannot be so separated. They are very much mixed together and have a composite effect on the crop-pattern.

1.5. The Present Micro-study

The present study differs from the above two, in its very approach. In the present study a case study approach has been followed in order to study in detail the individual cultivator - the man behind the crop decisions, who is altogether missed in the macro-studies and also in the micro-studies of the above type. Here the cultivator as a whole is studied with a view to find out as to how he takes a composite view of all the factors and decides upon his cropping. No factor taken independent of others can explain fully the cropping of any individual cultivator.

The ultimate aim of the cultivator is to get stable maximum income over years from his farm. He tries to achieve this not only through adequate utilization of the available resources, but also through proper conservation of them - particularly the land. He never aims at the highest production and profits for a year or for a short-term. He always prefers, on the other hand, to plan his long-run cropping programme in such a way that he can secure the maximum income and also keep his land at a profitable level of production over years. The goal of stable maximum income over years is the same for all the cultivators, but different cultivators achieve it differently, adapting to different conditions and circumstances under which each of them works. In order to

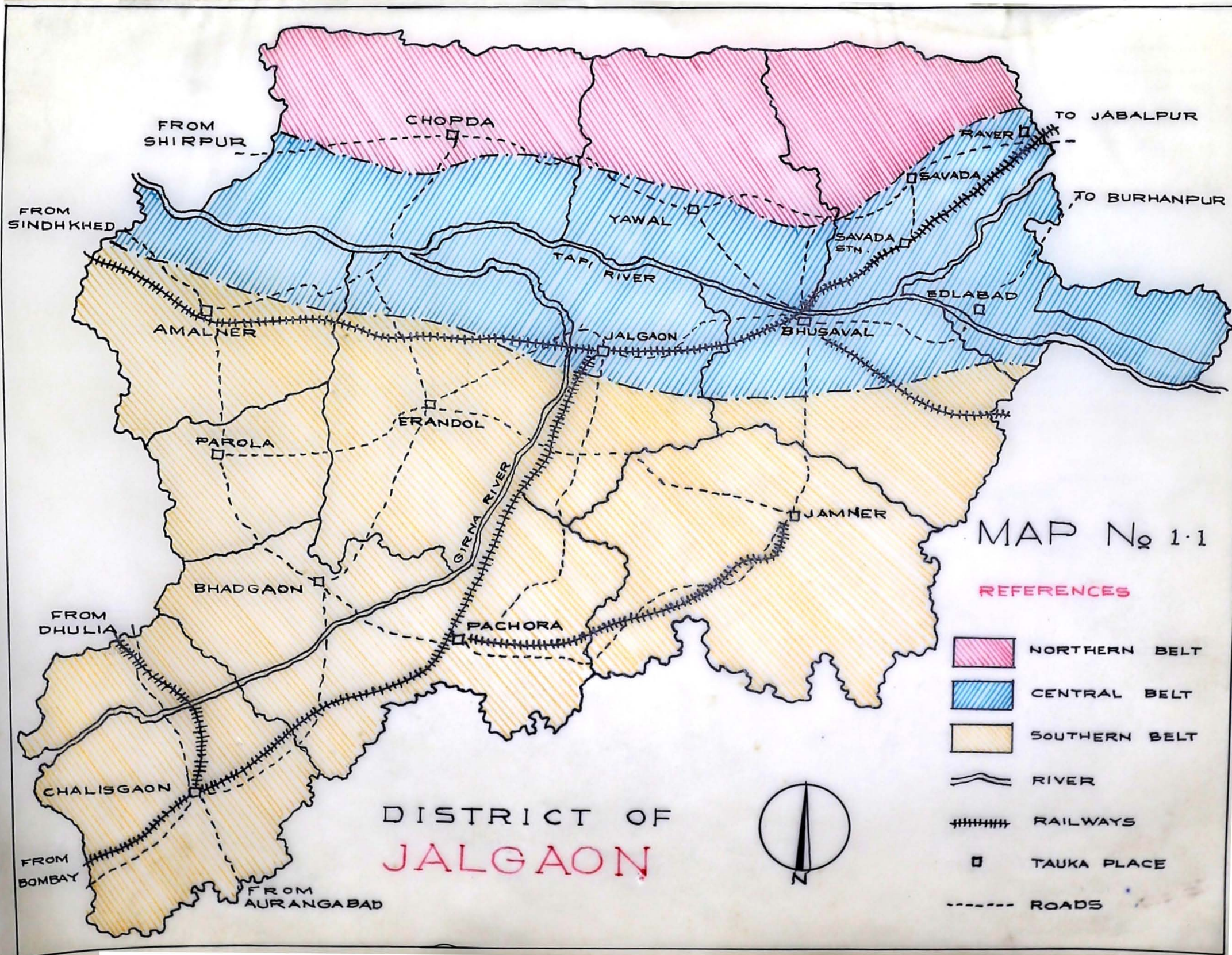
understand fully their crop decisions, a study in detail of the conditions and circumstances of each cultivator and how he adapts himself to these is necessary. One has to see how rigid are the restraints and limitations under which he works, and to what extent he can be flexible within the given frame. All these details have to be collected on individual level through case studies only. And hence a case study approach has been followed in the present study.

1.6. Region Selected for the Study

For the present study, cultivators from the four villages - Khirode-Pr.Yawal,¹ Vivare-Budruk,¹ Waghode-Budruk¹ and Rozode - in taluka Raver of Jalgaon district, Maharashtra State, were selected. In the following, a description of the region is given in brief.

The district of Jalgaon is to the extreme east of the Maharashtra State. From east to west, parallel to the Tapi river, the whole area of the district can be well marked in three belts - northern, central and southern. (See Map No.1.1.) The northern belt is a mountain land of the Satpuda hills. In this belt, we find dark brown soil, two to six feet deep, well drained and well supplied with organic matter. In the central belt, there is the rich Tapi Valley, where cultivation of different crops is widely spread. The whole area of this belt is of black alluvial clay, highly retentive of

¹ Hereinafter Khirode Pr.Yawal is referred to as Khirode; Vivare-Budruk as Vivare; and Waghode-Budruk as Waghode.



FROM SHIRPUR

CHOPDA

TO JABALPUR

RAVER

TO BURHANPUR

FROM SINDHKHED

YAWAL

SAVADA

SAVADA STN.

TAPI RIVER

EDLABAD

AMALNER

JALGAON

BHUSAVAL

ERANDOL

PAROLA

JAMNER

GIRNA RIVER

BHADGAON

PACHORA

FROM DHULIA

MAP No 1-1

REFERENCES

- NORTHERN BELT
- CENTRAL BELT
- SOUTHERN BELT
- RIVER
- RAILWAYS
- TAUKA PLACE
- ROADS

DISTRICT OF
JALGAON



FROM BOMBAY

FROM AURANGABAD

CHALISGAON

moisture and rich in its fertility. The southern belt is much similar to the northern one, though in some of its parts, it is drained by the Girna, Purna and Bori rivers. The soil available in this belt is of medium-black type.

The district receives its rainfall mainly from the south-west monsoon, which commences by the middle of June and continues upto the end of October. The winter precipitation from the north-east monsoon is comparatively very little and unreliable. The average annual rainfall in the district is 740.66 mms. of which about 87 per cent is received from the south-west monsoon, and the rest (13 per cent only), from the north-east. This clearly brings out the fact that the district belongs to the kharif tract. Some crops are grown in the rabi season too, but not as extensively as in the kharif season.

The important crops grown in the district are jowar, bajara and wheat among the food-crops; and cotton and groundnut among the cash-crops. Banana has been recently added to the list of important cash-crops of the areas where irrigation facility is available. Broadly speaking, jowar, wheat and cotton are the major crops in the central belt; and jowar, bajara and groundnut, in the northern and the southern belts of the district. Banana is predominantly grown, only in Raver and Yawal talukas of the district.

1.7. Villages Selected for the Study

All the four villages selected for the present study are from the taluka Raver and are situated in the central belt

of the district. The selection of the villages is purposive,¹ having some bearing on the crop-acreages in them. Two dry villages - Khirode and Vivare; and two irrigated villages - Waghode and Rozode, were purposely selected. In Khirode and Vivare, as irrigation is not commonly available, the cultivation of the dry crops is predominant. In Waghode and Rozode, however, irrigation from farm wells is available and hence there is extensive cultivation of the irrigated crop - banana. Among the two dry villages, we have purposely selected one (Khirode) where the cultivation of groundnut is overwhelming; and the other (Vivare) where cotton claims the largest area. In the case of the irrigated villages also, we have purposely selected one (Rozode) where the area under banana is proportionately high (41 per cent of the total cropped area); and the other (Waghode) where the proportion of such area is comparatively low.

The selected villages are distinctly different from one another, from their locational point of view. Of the two dry villages, one (Vivare) is a road-side village, situated along the side of the Yawal-Raver road; while the other (Khirode) is in the interior. Similar is the case of the two irrigated

1 Some of these villages were surveyed by the author in 1956-57 for the study of 'Economic Change in Rural Areas' in the Agro-Economic Research Unit, located at the Gokhale Institute of Politics and Economics, Poona, by the Ministry of Food and Agriculture. The resurvey of the same villages was taken up in 1962-63 and the study of crop-pattern was to go along with that. It was, therefore, convenient and advantageous, because of the developed contacts, to choose the same villages for the present study.

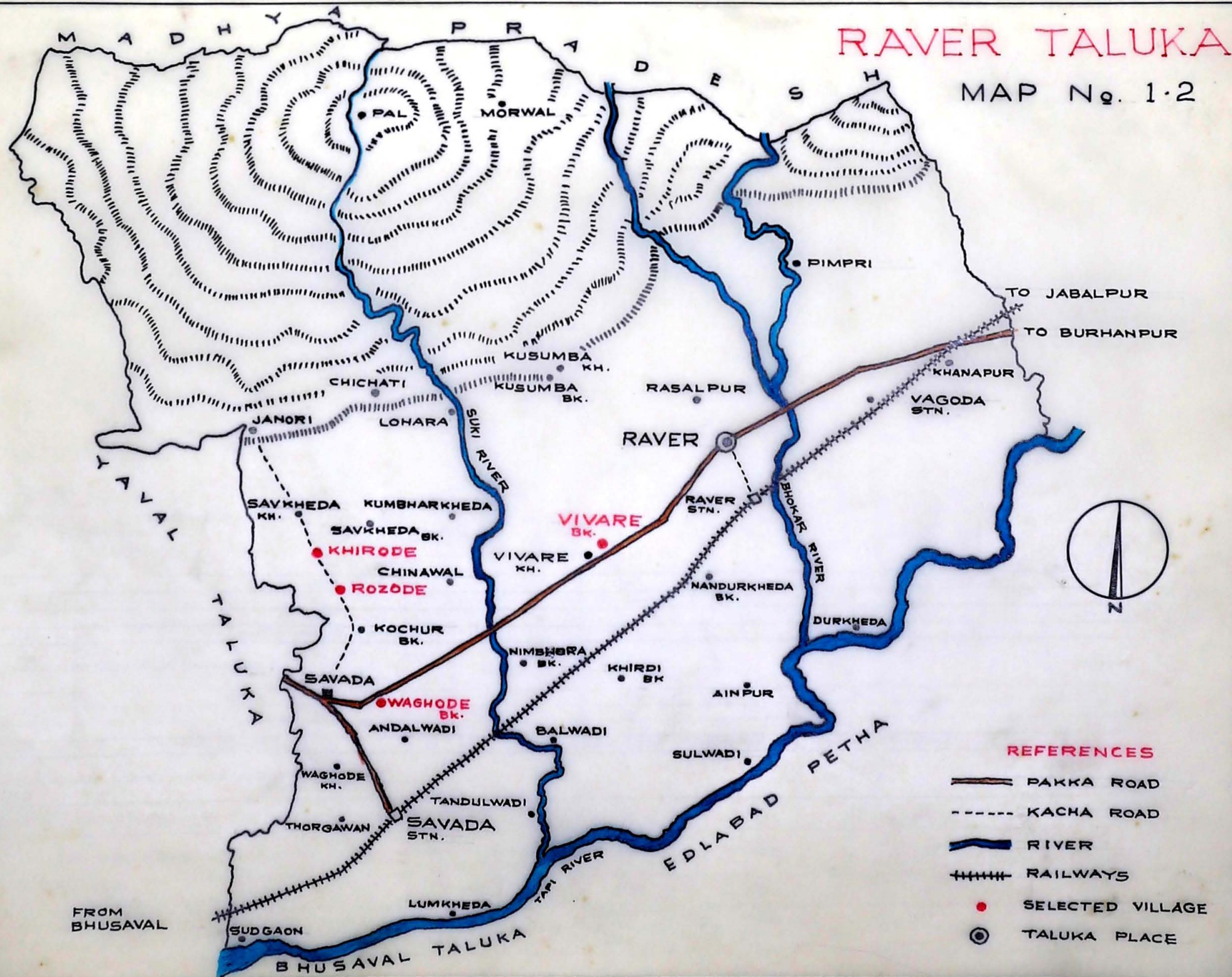
villages. Of the two, Waghode is along the same Yawal-Raver road; and Rozode, is in the interior. (See Map No. 1.2.) Waghode is about six miles north-east of the Savada railway station on the Bombay-Delhi main route of the Central Railway. It is situated at a distance of about two and half miles to the east from the Savada town proper. Vivare is still farther about three miles from Waghode to its east. The metalled road - Yawal-Raver - connects these two villages with the Savada town on the western side and Raver on the eastern. Rozode is at a distance of three miles from Savada town to its north. A kuccha road passing through fields and streams connects the two. The same road leads to Khirode, which is situated further north at a distance of about one mile from Rozode. Khirode is nearer the Satpuda hills, the land cultivated by the villagers extending upto the foots of the Satpuda hills. The kuccha road connecting these two villages with Savada and thereon with the other important market places remains almost inaccessible for vehicles in the rainy season.

1.8. Land in the Selected Villages

In Khirode, as it is situated at the foots of the Satpuda hills, the land is of inferior type. It is continuously subjected to erosion, and is cut by streams and brooks. It is stony, reddish or yellowish-red in colour, and very shallow. The texture of the soil is not good, and hence it has comparatively very low retentivity. The southern part of the area, however, where the ground attains somewhat plain level, the soil is deposited and the land there, is comparatively

RAVER TALUKA

MAP No. 1-2



more fertile. On the whole, however, a major portion of the land available in this village is of light soil. The land in the other dry village (Vivare) is of deep-black soil, very rich in fertility, and it presents a contrasting picture with the land in Khirode. The land in this village is very fine in texture and hence highly retentive. In the two irrigated villages, the land is of medium-black soil, having better texture and hence better retentivity. Between the two villages, the land in Waghode is reported to be more fertile than the land in Rozode.

1.9. Rainfall in the Selected Villages

The data regarding rainfall received in the selected villages are not available as there is no rain gauge station in any of these. One has to rely for this purpose on the rainfall figures collected at the taluka place - Raver - which, however, is not far off from these villages. The average monthly rainfall received at this centre in the last ten years is presented in Table 1.1. It can be seen from

Table 1.1 : Average Rainfall for Ten Year Period - 1952 to 1962 - Received at Raver

Month	Rainy days	Rainfall in mms.
January	0.5	6.10
February	-	-
March	0.5	3.05
April	0.1	0.51
May	0.8	14.48
June	7.3	136.14
July	11.7	192.53
August	10.8	179.58
September	9.3	151.64
October	2.8	61.47
November	0.6	22.61
December	0.2	1.27
Total	44.6	769.38

the table that the average annual rainfall for the last ten years is 769.38 mms. More than three-fourths of this total rainfall is received from the south-west monsoon.

1.10. Irrigation in the Selected Villages

Farm wells constituted the only source of irrigation in both the irrigated villages. In this part of the region, there are no rivers, nor any perennial tank utilized for irrigation purposes. Sub-soil water, however, is available in plenty and hence wells are commonly used for irrigation. It is reported that at 30 to 40 feet deep, sub-soil water is available in plenty. Another important point to be noted is that in this region, no hard rock is to be encountered even at a depth of 60 to 80 feet. Only the clayey soil, locally known as 'mān' is found below, even upto 80 feet depth. The work of sinking well, therefore, is comparatively easier, and less expensive. It is reported that in Waghode and Rozode, almost in every survey number of land, a well is sunk for irrigation purposes. The total number of serviceable wells in 1962-63, was 254 at Waghode, and 193 at Rozode. In Khirode and Vivare, sub-soil water is not available at such a depth. It is very deep, at the level of 100 feet or beyond. In these villages, therefore, the number of wells sunk for irrigation purposes is very small. In 1962-63, it was 15 at Khirode and 26 at Vivare.

In the two irrigated villages, the pumping sets operated on oil-engines are largely used to lift water from wells. The total number of such pumping sets in 1962-63,

was 215 at Waghode and 179 at Rozode.

1.11. Land Utilization in the Selected Villages

The details about the land utilization in the selected villages are given in Table 1.2. It may be seen from the table that most of the area of land available in these villages is cultivable. In Table 1.3, are given the details of the cultivable area in each village for the year 1962-63. The table points out that more than 90 per cent of the cultivable area in each village was cultivated in this year. The area under double cropping was considerably low in all the villages, even in the two irrigated villages. The irrigable area in the two irrigated villages was as high as 1,029 and 944 acres or 42.10 and 66.33 per cent of the total cultivable area in Waghode and Rozode respectively.

In Table 1.4, is presented the cropping pattern¹ in each village for the year of enquiry - 1962-63. It may be seen from the table that among the food crops, jowar was the major one, claiming fairly large area in the dry as well the irrigated villages. Among the cash-crops, groundnut was dominant in Khirode, having nearly 40 per cent of the total cropped land under it. Cotton commanded a similar position in Vivare, claiming more than 40 per cent of the total cropped area. Banana was the major cash-crop in the two irrigated villages. The area put to it was about 33 per cent

1 The botanical names of all the crops grown in the four villages are given in Appendix I.

Table 1.2 : Land Utilization in the Four Villages for the Year 1962-63

Land use	Khirode		Vivare		Waghode		Rozode	
	Area in acres	Percentage to total	Area in acres	Percentage to total	Area in acres	Percentage to total	Area in acres	Percentage to total
Cultivable area	2,865.03	88.16	3,733.05	94.21	2,443.60	93.09	1,423.80	91.88
Uncultivable area	148.65	4.57	38.10	0.96	56.88	2.17	75.63	4.88
Residential area	27.88	0.86	31.80	0.80	24.20	0.92	25.93	1.67
Area under roads	54.33	1.67	74.45	1.88	83.55	3.18	20.90	1.35
'Khalwadi' area	2.18	0.07	-	-	9.23	0.35	-	-
Grazing land	29.13	0.90	26.75	0.68	-	-	3.43	0.22
Other non-agricultural uses	1.25	0.04	6.13	0.15	7.65	0.29	-	-
Forest area	121.30	3.73	-	-	-	-	-	-
Area under railway track	-	-	52.43	1.32	-	-	-	-
Total area	3,249.75	100.00	3,962.71	100.00	2,625.11	100.00	1,549.69	100.00

Source : Village Records, Village Form I (1962-63)

Table 1.3 : The Cultivable, Irrigable and Net-sown Area in the Four Villages for the Year 1962-63

	Khirode	Vivare	Waghode	Rozode
Total cultivable area in acres	2,865.03	3,733.05	2,443.60	1,423.80
Total irrigable area in acres	79.18	375.53	1,028.75	944.43
Proportion of irrigable to the total cultivable area	2.76	10.06	42.10	66.33
Net area sown in acres	2,681.77	3,653.76	2,224.09	1,352.04
Proportion of net area sown to the total cultivable area	93.60	97.87	91.02	94.96
Gross cropped area in acres	2,691.10	3,715.16	2,287.29	1,407.79
Area sown more than once	9.33	61.38	63.20	55.75
Proportion of area sown more than once to the gross cropped area	0.35	1.65	2.76	3.96

Source : Village Records.- Village Forms I and XIII (1962-63)

Table 1.4 : The Cropping-pattern in the Four Villages for the Year 1962-63

Crop	Khirode		Vivare		Waghode		Rozode	
	Area in acres	Percentage to total	Area in acres	Percentage to total	Area in acres	Percentage to total	Area in acres	Percentage to total
Jowar	447.95	16.65	543.33	14.62	334.60	14.63	147.98	10.51
Groundnut	1,056.05	39.26	210.60	5.67	104.88	4.59	137.09	9.74
Cotton	754.78	28.05	1,496.83	40.30	636.18	27.82	213.25	15.15
'Nawati'-Banana	18.78	0.70	151.30	4.07	403.75	17.65	304.53	21.63
'Junar'-Banana	30.78	1.14	122.63	3.30	352.78	15.42	281.75	20.01
Wheat	21.20	0.79	390.43	10.51	18.70	0.81	74.93	5.32
Gram	0.50	-	449.00	12.09	10.68	0.47	-	-
Maize	1.48	0.05	0.40	-	-	-	7.83	0.56
Paddy	6.58	0.24	11.63	0.31	26.35	1.15	25.65	1.82
Bajara	49.48	1.84	6.65	0.18	-	-	6.65	0.47
Other millets and pulses	291.36	10.83	295.26	7.95	282.15	12.34	192.86	13.70
Vegetables	9.95	0.37	5.65	0.15	14.50	0.64	12.37	0.88
Sugar-cane	-	-	-	-	7.18	0.31	-	-
Oranges	2.08	0.08	23.70	0.64	90.33	3.95	2.90	0.21
Other fruits	0.13	-	7.75	0.21	5.03	0.22	-	-
Others	-	-	-	-	0.18	-	-	-
Total	2,691.10	100.00	3,715.16	100.00	2,287.29	100.00	1,407.79	100.00

Source: Village Records- Village Form XIII (1962-63)

of the total cropped land in Waghode and about 42 per cent in Rozode. The areas put under other cash-crops like cotton and groundnut were comparatively low in both these villages.

1.12. Selection of Cultivators

The first step in drawing a sample of the cultivators was preparation of an exhaustive list of all the cultivators in each village. In order to prepare such a list of cultivators, a preliminary census enumeration of all the households, had to be carried out. The information sought in this brief enquiry was on such points as occupations followed, land-holding - irrigated and dry, size of family, and live-stock. On the basis of these particulars, the cultivator families were separated into two groups: (1) those growing dry crops exclusively; and (2) those growing irrigated crops. In the dry villages, the sample was drawn from the list of the cultivators who cultivated dry crops exclusively; and in the irrigated villages, it was drawn from those cultivators who took irrigated crops. This means, the cultivators growing irrigated crops in the dry villages and those, growing dry crops alone in the irrigated villages were not considered. The total number of cultivators growing dry crops exclusively was 356 in Khirode and 304 in Vivare. The cultivators growing irrigated crops in these dry villages was very small. In the irrigated villages, the total number of cultivating families taking irrigated crops was 192 in Waghode and 170 in Rozode. The number of cultivators growing dry crops exclusively was comparatively large, forming about 30 per

cent of the total number of cultivators in these villages.

It was felt that a sample of about 30 cultivators in each of the four villages would be adequate for this type of intensive study. Therefore, 30 cultivators were selected at random from the list of the cultivators growing dry crops alone in the dry villages and from the list of cultivators growing irrigated crops in the irrigated villages. For the purpose of selection the cultivators were arranged in a descending order of the area under cultivation. In Khirode, every 12th cultivating family and in Vivare every 10th cultivating family from the list was chosen for the study. In the case of both the irrigated villages, every 6th cultivating family from the list was selected. Thus, 30 cultivating families each in Khirode, Vivare and Rozode were selected. In Waghode, however, the total number of the selected families came to 32. Thus, in all 122 cultivating families were selected for the study.

The relevant details about each of the selected cultivators are given in the case studies presented in Part II.

1.13. Collection of Data

The investigation of the study was conducted during May 1962 to October 1963. No assistance was taken for investigational work. The period covered under the study was of four years - from 1960-61 to 1963-64. The data were collected through individual case studies and also through two types of schedules: (1) General Family Schedule, and (2) Plot-wise Schedule. In the individual case studies, details

about each cultivator were collected to study his crop-decisions taken in each of the four years. In the General Family Schedule, the information about the general aspects about each cultivating family, such as family size, earners and non-earners in the family, occupations followed by the earners, details about the land owned and the land leased-in and/or leased-out; livestock owned and the agricultural implements etc. was sought. The Plot-wise Schedule was filled in for all the plots of the selected cultivators. In this schedule, the input and output data of the different crops grown by the selected cultivators in 1962-63, were collected. The points covered in the case studies and the two schedules used are given in Appendix II.

1.14. Plan of the Study

The study is divided into two parts: the first part , presents the analysis of the data collected in the case studies; and the second, the case studies themselves.

In the first part, we present the analysis of the data in nine chapters. The first chapter introduces the subject, points out the need for the present type of study and gives the essential background information about the region and the villages selected for the study. The second chapter deals with the major crops grown in the selected villages, giving in brief the cultivation practices followed in the villages and the relative profitability of different crops. The third chapter presents the aggregate crop-pattern of the sample cultivators to point out the influence

of the crop-rotations on the area variations of different crops. The fourth chapter gives agronomic details about the major crop-rotations practised in the selected villages. The fifth chapter propounds and elaborates the acceptance of crop-rotations by different cultivators. The deviations from the accepted crop-rotations, caused by the rotation-plans themselves and by the external factors are explained in the sixth and seventh chapters. The eighth chapter brings out the influence of crop-rotations and deviations on the aggregate areas of different crops and shows that a large proportion of the area variations are due to the accepted rotations. The last chapter concludes that in the short-run the influence of prices do not appear to be very powerful and that in the short-period the cultivators are more bound by the accepted rotation-plans.

In the second part, the individual case studies of the sample cultivators in the dry and the irrigated villages are presented in brief.

CHAPTER II

THE CROPS : CULTIVATION PRACTICES, COSTS, AND RETURNS

As seen earlier, jowar, cotton and groundnut are the three major dry crops grown in the dry as well as the irrigated villages. In the irrigated villages, besides these three crops, banana is extensively grown as an irrigated crop. In this chapter, it is proposed to discuss in detail the cultivation and the returns received from them; so as to have an idea about their relative profitability.

2.1. Cultivation Practices

Cultivation practices may be roughly divided into two parts: (1) tillage in preparation for a crop; and (2) tillage during the life of a crop. The tillage practices followed in preparation for a crop are more or less the same for all the major crops grown in these villages. The tillage during the life of a crop, however, differs from crop to crop. The inter-cultivation of jowar is not the same as that of banana or of banana as that of cotton. The requirements of each crop are different and so its tillage. We, therefore, first describe the pre-sowing operation in a general form, common for all the major crops and then go to individual crops to give in detail their cultivation practices.

2.1.1. Preparatory Tillage

The main objectives of the preparatory tillage are:

(1) to break up the soil and bring it into suitable physical

condition; (2) to maintain the surface sufficiently open to permit penetration of water; (3) to remove roots, stubble and weeds which use the stored water; and (4) to reserve an adequate supply of moisture to germinate the seed and support the growth of the resulting plants. These objectives are achieved through various operations like ploughing, harrowing, spreading manure and cleaning of the land. Some details of each of these operations are given in the following.

Ploughing :- In preparatory tillage ploughing is an important operation. It is the primary tillage. It is done to break up the soil and to improve its physical condition. Through ploughing the soil is turned over, the under layers exposed to aeration and sunshine. It also brings about more intimate mixture of the different parts of the tilled soil and thus helps in improving the physical condition of the soil.

Ploughing is undertaken soon after the harvesting of the previous crop. At this time the land still remains moist and can be ploughed more easily. As the land dries up, the clods become very hard and difficult to break through. Ploughing is, therefore, done in December and January or in February and March, if the preceding crops happen to be of rabi season.

For ploughing, iron ploughs are largely used in all the four villages. It is generally done four to six inches deep, with three to four pairs of bullocks. The practice of exchange of bullocks and human labour is not in vogue in any of the villages.

In Khirode, as its land is of inferior type, the cultivators are required to plough every year for every crop. It is reported that in this village, without ploughing no crop can be successfully grown. The conditions in the other villages are quite different. In Vivare, the land being deep-black, is ploughed once in three to four years. In the two irrigated villages, the land is ploughed largely for the banana crop as it requires loose and friable land. In the areas where only dry crops are taken, the land is ploughed once in three or four years as in the case of Vivare.

Harrowing and Cleaning :- Ploughing leaves the land cloddy, loose and uneven. To bring such land to a good tilth, it is harrowed several times. Harrowing serves many purposes. It crushes clods, levels the field, destroys germinating weeds, compacts the sub-soil and leaves the surface soil loose and friable. Unploughed land is also harrowed thrice or four times to bring it to a good tilth. Harrowing is generally carried out in April and May. The first harrowing is carried out after receiving one or two showers in the summer season so that the clods in a ploughed land are broken and the operation of harrowing goes comparatively easier.

Two or three days after the first turn of harrowing, the uprooted stubbles, weeds etc. are collected and the land is cleaned. The stubbles of jowar and cotton are collected and taken home as fuel. In the case of other crops, these are collected and burnt in the field itself.

After this cleaning, the land is harrowed for second

time. The second turn of harrowing is carried across the first one. It is so done to clear the land from the roots, stubbles and shrubs missed at the first turn of harrowing.

The second turn of harrowing is also followed by the operation of cleaning. But this time the work being not heavy, hired labourers are generally not employed. The cultivators themselves undertake the work.

Once the land is cleaned of weeds and shrubs etc. the work of spreading manure is undertaken. After spreading manure, the land is harrowed once again to mix manure with the soil. The land is thus harrowed at least three times. Some cultivators harrow their land even for more number of times, particularly when the monsoon rains are delayed.

Manuring :- The preparatory tillage includes manuring of the land also. Manure is of value in soil improvement because of its content of fertilizer materials, of humus and of certain organic constituents. By the supply of humus, it improves the tilth or physical character of the soil as well as the water holding capacity, aeration and temperature relations and it has a favourable effect on the biological activities of lower organisms that work over the stock of plant nutrients in the soil. The practice of applying farm-yard manure as basal dressing to different crops, particularly the cash-crops is followed in all the four villages.

Manure is transported to fields in the month of March and April, either by bullock-carts or by motor trucks. The former is largely used in the dry villages, while the latter,

in the irrigated villages. The big cultivators in the irrigated villages who are required to carry large quantities of manure for banana crop, prefer motor trucks. In a motor truck, five to six cart-loads of manure can be transported.

In the irrigated villages, banana is heavily manured. In the dry villages and in the dry areas of the irrigated villages, cotton is manured. The crops like jowar and groundnut are not given manure as it adversely affects their yield. It is reported that due to manuring more of vegetative growth takes place, and results in lower yield in the case of these crops. In these villages, because of heavy manuring of banana, there is acute shortage of farmyard manure. The local supply falls short to a considerable extent and the cultivators are required to bring manure from the far off villages where mostly dry crops are grown and the local demand is not so high.

After the third or fourth turn of harrowing, usually given at the end of May or in early June, the land is supposed to be ready to receive seeds of different crops taken in the kharif season. Generally by the middle of June the monsoon rains start and the cultivators take to sowing after receiving adequate moisture in the soil. The tillage practices followed during the life of a crop are described in the section below, separately for each crop.

2.1.2. Tillage During the Life of a Crop

Jowar :- Jowar holds a prominent place in the agriculture of these villages as it is the staple food and also the most important fodder crop to the cultivators. It is

grown by almost all cultivators, big as well as small, to meet their family consumption needs. Jowar, a hardier plant, is capable of growing on a variety of soils. Its cultivation, however, is more concentrated on the heavy and medium-black soils. The important factor to be noted about jowar is that it is capable of regulating its transpiration. It can suspend its growth and reduce transpiration during periods of stress and can resume growth upon the return of favourable conditions, confronting to water supply that may be available.¹ Jowar is therefore valued much as a drought resistant crop.

Jowar is a heavy feeder on the soil nutrients and leaves some residual effects known as 'sorghum injury' on the soil. It has been found that sorghum roots contain high proportion of sugar and when this is liberated into soil after the crop is harvested, it stimulates growth of certain micro-organisms which compete with the succeeding crop for nitrogen and probably for other elements.² The mal-effects, however, are only temporary and can be overcome by the application of nitrogenous fertilizers.³

Of the different varieties of kharif jowar locally known as 'Godgarwa', 'Niwwa', 'Chandal', 'Satpani', and

1 Mathews, O.R., "Special Dry Farming Problems," Soil and Men, U.S.D.A. Year Book, 1938, p. 689.

2 Hughes, H.D., and Hension, E.R., Crop Production - Principles and Practices, The Macmillan Company, New York, 1957, p. 111.

3 Diamond Jubilee Commemoration Volume, The Grains and Oil-seeds Merchants' Association, Bombay, 1960, p. 101.

'Aispuri', the last one is commonly grown in these villages. The stalks of this variety grow up to 6 to 7 feet high, are soft and hence readily eaten by cattle. Its grains are of medium size, of yellowish colour and flattened in shape. Its flour is white and sweet but not much sticky.

Sowing :- In the villages surveyed, jowar is sown at the end of June or in the early July i.e. in the period of 'Mrug' to 'Aradra' constellations.¹ Most of the cultivators sow it in the period of 'Aradra' constellation, as the sowing of cotton and groundnut is carried out earlier. It is reported that jowar can be sown as late as the end of 'Punarvasu' constellation i.e. the end of July. It is sown comparatively late so that its flowering does not occur in the period of 'Hasta' and 'Chitra' constellations, when the heavy rains are likely to wash it away and thereby affect the crop adversely. Sowing is usually done with a seed drill commonly known as 'teefan'.

Jowar is always taken as a mixed crop, other subsidiary crops like udid, mug, chavali, and mataki etc. sown along with it in the same field. The seed requirement of jowar is 3 to 4 seers² per acre. The seed requirement of the other crops grown along with the jowar, vary in different types of mixtures.

1 Approximate period of the different constellations pertaining to rainy season are given in Appendix III.

2 Quantities are expressed in seers and maunds instead of kilos and quintals, because the cultivators found it convenient to report in seers and maunds as they were not yet conversant with the metric system introduced in this region in 1960.

The following are the different mixtures reported in these villages. The first type of mixture is most commonⁱⁿ the four villages.

Mixture No.1

Jowar 3 to 4 seers per acre

Udid 1.5 to 2 " " "

Mixture No.2

Jowar 3 to 4 seers per acre

Udid 1 to 1.5 " " "

Mug 1 to 1.5 " " "

Mixture No. 3

Jowar 3 to 4 seers per acre

Mataki 1 to 1.5 " " "

Chavali 1 to 1.5 " " "

Mug 1 to 1.5 " " "

Interculturing :- When the plants are one month old the operations of interculturing are undertaken. The first turn of hoeing is generally carried out in the month of August. Hoeing is done to clear the land between two rows of the growing crop, to loosen the surface soil, to cover the roots of plants with earth, and also to wipe out cracks in the field.

Hoeing is followed by weeding which is generally done by female labourers, to clear off the weeds from the rows of the crop and loosen the surface soil around the base of the plants. The operation of weeding is also generally repeated three to four times depending on the weather conditions.

Harvesting :- Jowar ripens within five to six months from its sowing. In these villages, therefore, the crop is harvested in the months of November and December. The harvested

crop is carried to the village threshing yard locally known as 'Khalwadi' or to other convenient places near the village. The threshing floor is first prepared and smeared with cow-dung. When it is completely dried, the ear-heads are thickly spread over it and a pair of bullocks with a cart, are driven round on it to tread the grain. For winnowing two methods, one of the natural wind and the other of artificial wind, are followed. Of these two methods, the first one is more common as it is comparatively cheaper. The persons engaged for winnowing the grains are generally the relatives or friends, to whom wages are not paid. However, a general practice of giving a tea-party to these people is followed by all the cultivators.

Cotton :- In these villages Virnar variety of cotton, belonging to the arboreum group, is cultivated. It is a cross between Jarila from the Vidarbha tract and NR 5 from the Khandesh region.¹ This variety was released for cultivation in 1949. Under the Cotton Control Act passed by the Government of Maharashtra, cultivation of this variety of cotton alone was allowed in the whole Khandesh region.² It is reported that Virnar is superior to Jarila in yield and as well as in its ginning percentage. As it matures late, it can withstand the adverse seasonal conditions.

Cotton plant is very sensitive to the vagaries of

1 Sethi, B.L. et al, Cotton in India - A Monograph, Vol. I, Indian Central Cotton Committee, Bombay, 1960, p. 309.

2 Khandesh region includes two districts - Jalgaon and Dhulia.

weather. Continuous rains or a long spell of dry weather adversely affects the process of seed germination or the vegetative development of the crop. Heavy rains, continuous high winds or excessive drought at flowering and fruiting time may cause heavy shedding of buds and young bolls, thereby ruining the crop. A frost in the early stages of the plant also proves much harmful. Untimely rains and a heavy humid weather during the later stages of the crop, spoils the produce, lowers its spinning properties or promotes the attack of pests and diseases. The success or failure of cotton crop is thus intimately related with the prevailing weather conditions.¹

Cotton needs a soil with good moisture holding capacity with good drainage and aeration, as it cannot stand excessive moisture and water logging. Cotton is an exhausting crop. It has been estimated that an average rainfed cotton crop takes away from the soil about 177 lbs. of nitrogen, 40 lbs. of phosphoric acid and 190 lbs. of potash per acre.² Cotton is therefore either manured or taken after the heavily manured crop like banana, or after the leguminous crop like groundnut. It is pointed out that the application of organic manure before sowing and of chemical fertilizers as a top dressing at the time of plant growth gives the best results.

Sowing :- Cotton is sown largely during the period 'Mrug' constellation. If the rains are not sufficient during

1 Sethi, B.L. et al, op. cit., p. 40.

2 Dastur, R.H. et al, Cotton in India - A Monograph, Vol. II, Indian Central Cotton Committee, Bombay, 1960, p.135.

'Mrug', it is sown in 'Aradra' but not later. The cultivators in these villages have a firm belief that the cotton crop sown in 'Mrug', yields the best. It is pointed out that the cotton sown after 'Aradra' does not yield better as its flowering occurs in the period of 'Hasta' and 'Chitra' constellations. The heavy rains during this period wash away flowers and young bolls, and thereby damage the crop to a large extent. Cotton is, therefore, generally not sown after 'Aradra' i.e. after the middle of July. The experiments conducted in different States for determining the optimum date of sowing cotton have revealed that early sowing of the crop usually increases the yield and sowing later than normal season reduces it.¹

In these villages, two methods of sowing cotton are in vogue. One method is the dibbling of seed by hand and the other, of sowing in suitably spaced rows with seed drill. Of the two, latter is more in practice as dibbling results in higher cost of labour. Secondly, when a large area is to be sown the less expeditious method of dibbling does not serve the purpose. The cotton crop, therefore, is largely sown by seed drill. With the help of seed drill, about five acres of cotton can be sown in a day.

In these villages cotton is largely taken as a mixed crop along with jowar and tur. The jowar seeds are generally mixed with cotton seeds and both are sown together in the same rows. Tur, on the other hand, is sown separately. One row of

1 Ibid, p. 109.

tur is sown after every twelve rows of cotton. Only when cotton is grown by dibbling method, it is taken as the only crop. When dibbling is done, the cotton seeds required per acre are about twelve pounds. When the seed-drill is used for sowing, cotton is taken as mixed crop and the seed requirement per acre is 8 to 9 seers of cotton seeds, 1.0 to 1.5 seers of tur and 0.5 to 1.0 seer of jowar.

Interculturing :- Cotton is very sensitive to competition from weeds and suffers greatly if the weeds are allowed to grow.¹ The cultivators, therefore, try to keep as far as possible the fields clean by carrying out the operations like hoeing and weeding. The first turn of hoeing is generally applied in August, when the plants are about one month old and when rains become lighter. For hoeing, the bullock hoe is worked between rows of the line-sown crop. Three to four turns of hoeing, at an interval of a fortnight, are applied to this crop.

Hoeing is followed by hand-weeding. Hand-weeding is carried out to destroy weeds grown in rows of the crop and to make loose the surface soil at the base of plants. Each turn of hoeing is generally followed by weeding.

Harvesting :- Flowering of cotton continues over a long period. All cotton plants do not flower simultaneously, nor individual plants produce all their flowers at once. The flowering season usually starts from two to two and a half

1 Ibid, p. 132.

months after sowing i.e. from the middle of September, and extends till November end. As a result, the production of ripe bolls is also gradual, being spread over a period of two to three months. Harvesting, therefore, cannot be done in one operation. Ripe cotton is usually picked in four to five pickings at successive intervals of two to three weeks. The first picking is done in the third week of October and the last, in the end of December or January.

The entire cotton crop is picked by hand, and hence, the operation of harvesting is a slow and very tedious process. It is more so if the bolls are small sized and not well developed. The work of picking is generally done by female and children. In these villages the wages for picking cotton are invariably paid in cash. The wage rate is generally high during the initial stages of picking season, comes down during its peak period, and rises again at the end of it. Harvesting of produce is perhaps the most costly operation in the growing of cotton.

Jowar, grown along with the main crop of cotton, is harvested in November or December. Much of the jowar crop, is in fact used as fodder when it is young and green. Harvesting of the remaining crop is done by cutting the ear-heads from the standing stalks. The ear-heads, thus cut, are taken to tread out the grains. The stalks are cut later and used as fuel. These stalks are not used as fodder, because they are thick and not easily eaten by the cattle. Tur is harvested in December or January.

Groundnut :- Groundnut is another major cash-crop, grown in these villages. It is valued more as it has an advantage over cotton, in the sense that it can be used as food and its plants as fodder. Groundnut or 'Archie Hypogaea' is a leguminous plant. There are two varieties of the crop; one grows rather erect, while other spreads out. The erect variety is also called 'bunch type' as the nuts are borne in a bunch, close to the base of the plants. The other variety gives nuts under the branches in lines and some around the base roots. The erect variety is of short duration, maturing in three months. The spreading type is comparatively of long duration, taking five to six months to mature. In these villages the erect variety (Small Japan) is grown as a dry crop.

Groundnut is a crop of light soils. It requires well-drained and aerated soil, supplied with calcium and a moderate amount of organic matter. It is a common crop on sandy loam and fertile red soils. Heavy black soil is not suited to this crop as it offers too great a resistance to penetration of fruit stalk and also makes its harvesting more difficult.

Groundnut is a soil ameliorant crop and hence more valued in rotation. As pointed out earlier it is a leguminous crop and has a unique characteristic of gathering nitrogen from atmosphere and depositing it in soil. It has been pointed out that some kind of bacteria, in association with the roots of legumes, fix free nitrogen of air in soil and plants utilize it in their growth process. This phenomenon accounts for the greatest supply of fixed nitrogen available to plants.

Sowing :- Groundnut is grown as a kharif crop. It is generally sown in the period of 'Aradra' constellation i.e. in the last week of June. As far as the sowing of different crops is concerned, cotton gets the first preference; groundnut, the second; and jowar, the third. The nature of rainfall received determines the sowing season. Groundnut crop needs most rain in its early period of growth; after flowering, its seeds have to ripen with a diminishing rainfall and the crop is harvested in dry weather. Groundnut is therefore sown at the end of June, so that it gets the maximum rainfall received in July; its flowering occurs in August and September when rains become lighter; and it is harvested in October or November during the short spell of dry weather. It has to be harvested before the commencement of 'Hasta' and 'Chitra' constellations. If the crop is sown later than 'Aradra' constellation, its harvesting occurs in 'Hasta' and 'Chitra', during which heavy rains do much damage to the ripe crop. After the onset of monsoon, groundnut is sown as early as possible and never after the period of 'Aradra' constellation. The rainfall conditions also explain why a short duration variety of groundnut is largely grown in these villages.

The crop is largely sown in rows with the seed-drill, having four coulters fixed at an equal distance of 14 to 16 inches. The seed requirement of groundnut is 25 to 30 seers per acre. Like cotton, groundnut is also grown as a mixed crop, along with jowar and tur. The jowar seeds are generally mixed with tur and both are sown together in the same row.

The proportion of jowar seeds is generally very low, varying between 0.5 and 1.0 seer per acre. It is mixed in 5.0 to 6.0 seers of tur seeds required per acre. One row of tur and jowar is sown after every twelve or sixteen rows of groundnut.

Interculturing :- In the first two to three weeks after sowing no operation is undertaken in the fields of groundnut. Thinning of this crop is not done. In the fourth week, when the crop is about one month old, the first turn of hoeing is applied. Hoeing keeps down weed growth and helps easy penetration of pegs (stalks of pods) into soil and proper development of pods. For hoeing, bullock hoes are commonly used. Normally two turns of such hoeing are applied to this crop, at an interval of a fortnight.

Each turn of hoeing is generally followed by hand-weeding to clear off weeds grown in rows of the crop. Hand-weeding is also done to keep surface soil around the base of plants, loose and friable so that pegs can penetrate into it more easily. After flowering of the crop, both weeding and hoeing are not done, as these are likely to damage the crop by disturbing penetration of pegs into soil and development of young pods.

Harvesting :- In the case of the erect variety of groundnut, flowering begins in two months from sowing; and bulk of the flowering is over in a fortnight. Irregular flowering goes on for some time longer, but these later flowers do not develop into mature seed. In three to three and a half months, the crop of this variety gets matured for

harvest. In these villages harvesting of the crop as it is a bunchy type, is done by pulling out the plants. The pods are then separated from plants, only by hand, either in the field itself or leisurely at home where the crop is carted. For harvesting, female labourers and children are largely engaged. The wages for harvesting groundnut are paid in cash.

The subsidiary crops like jowar and tur grown along with groundnut are harvested later in November and December. The details of their harvesting practices are given earlier.

Banana :- Banana is the major irrigated cash-crop grown in Waghode and Rozode where well irrigation facilities are available. Banana grown extensively in these villages, belongs to dwarf cavandish or Basarai clone. A plant of this variety is comparatively short in height, ranging from five to six feet. The low stature of the plant makes it less susceptible to wind damage than most other varieties and also makes treatment of bunch with insecticides, protective bags etc., easy. But in winter, the stature permits chilling which a taller clone may avoid.¹ Its fruit bunch is large, moderately compact, having fingers clothed in persistent staminate flowers and bracts. Its fruits are about seven inches long, one and a half to two inches in diameter, distinctly subcylindrical and having greenish yellow to straw-yellow colour on ripening.

Adequate drainage system and depth are the two important factors in determining the suitable soil for banana cultivation.

1 Simmonds, N.W., Bananas, Longmans, London, 1960, p. 79.

Black loamy soil or silt with plenty of plant food and possessing good drainage are ideal for this crop. Heavy clayey soils are not suitable as ill drained conditions and stagnation of water in rains prove harmful to banana plants.

Panama, Leaf spot, Bunchy top, Banana borer, and Banana aphids are some of the major diseases and pests from which the crop suffers. In the villages surveyed, however, these diseases and pests are very rare and are not considered serious. The only trouble, which is also not very frequent, is of low temperature which at times goes below 40°F in the winter season and causes chilling effect on banana plants. In these villages, therefore, banana is grown as a crop of certainty, which gives good yield, if sufficient water, manure and fertilizers are applied to it. In this sense it has an advantage over other cash-crops like cotton and groundnut, which suffer frequently from several types of diseases and pests. It is reported that this factor of certainty of yield is one of the major factors which induce many of the cultivators to grow banana, even though it is comparatively more expensive.

Transplanting :- In these villages, banana is grown as a plant crop, which normally lasts for one and a half years. Ratooning of the crop is not practised. The suckers of banana are planted in the period of 'Mrug' constellation i.e. in the second and third weeks of June, when the south-west monsoon is on and there is no need for immediate irrigation, and the crop is harvested in October and November of the following year. Such plantations are locally known as 'Mrug Bāg'. Some

cultivators, however, in order to take advantage of market conditions in the off season, plant the crop in October and harvest it in April and May of the following year. This type of cultivation has been recently adopted and is known as 'Kandya Bāg' as the crop is planted during the planting season of onions. The bananas planted in October require more number of waterings as it has to be tended through two summer seasons. The cost of its irrigation is, therefore, comparatively higher than that of the 'Mrug Bāg'. Because of this fact the cultivators generally do not prefer it. The cultivation of banana planted in June is more common and claims major portion of the total area under this crop. The cultivation practices both for 'Mrug' and 'Kandya Bāg' are more or less the same except timing and extent of turns given of different operations. We give below the details of cultivation practices followed for 'Mrug Bāg'.

There are three forms of planting material - crows, bits and suckers.¹ In these two villages, however, the suckers are invariably used by all the cultivators. Suckers are planted in furrows, after one or two showers of the monsoon rains. The suckers required for transplanting are brought from the fields where the crop of the mother plants is already harvested and where the daughter plants are deliberately allowed to grow. About two thousand suckers are required, if they are planted at $4\frac{1}{2}$ ' x $4\frac{1}{2}$ ' spacing. These suckers are dug up, their roots

1 Ibid, p. 161.

are treamed off, keeping only the growing part. All the suckers planted do not survive. Some of them dry out or are spoiled. These suckers are replaced. Re-plantation of such suckers is repeated twice or thrice, up to August, so that no space of plant should go vacant. The suckers required for re-planting have to be purchased at a high price, as the supply of suckers gets exhausted. It is reported that in an acre of banana plantation, three to four hundred suckers have to be re-planted.

Interculturing :- The first turn of hoeing is applied to this crop, when it is about a month old. The bullock hoe of a bigger size is used for this purpose. Hoeing is done across the field to keep land loose and friable as far as possible. Such hoeings are repeated at an interval of a fortnight, till the crop reaches three to four feet height. Once this stage is reached, hoeing is discontinued as it is likely to damage the crop by breaking its leaves. Moreover with the plants grown up, it goes difficult for bullocks to draw the hoe. About five to six turns of hoeings are applied to this crop.

After two to three turns of hoeing, the operation of weeding is carried out to remove weeds grown under the plants. Two turns of weeding, one in August and the second in September are generally undertaken. For this operation, female labourers are largely engaged.

Irrigation :- Banana requires heavy irrigation. Four to five months after planting i.e. in October water-beds are prepared and after the Divali festival, regular watering starts.

From October to January which is the winter season, one watering per week is applied. In summer, i.e. from February to May, two waterings per week is the practice. In the monsoon, when the crop is due to mature, about twenty waterings are given depending on the rainfall. In all, seventy to seventy-five waterings are applied to this crop during its period of growth. It may be pointed out that if for any reason sufficient waterings are not applied, the yield is affected adversely.

Banana is largely irrigated by water pumps operated by oil engines or electric motors. The small plantations below one acre only are irrigated by bullock-drawn water-lifts. The per acre cost of irrigation largely depends on supply of water in the well and on the type of technique used. In the case of water pumps operated by oil engines the fuel and lubricant oil required by the machine, claim a major part of irrigation cost. The consumption of fuel oil and lubricants depends on the strength and the general efficiency of the machine.

For irrigation two male labourers are required, one to look after the pumping set and the other for channelising water in the plantation. The landowner himself takes up the first type of work as it requires careful handling of the machine and the technical knowledge, which a casual labourer may not have. The casual labourer does the latter type of work. In the summer season, when there is heavy demand on irrigation, the cultivators take to watering work even at night to complete the course of two waterings per week. For night shift, one additional labourer is engaged to hold

lantern in the orchard while channelising water.

Fertilizing :- Banana is a surface feeder crop. It, therefore, requires heavy manuring and fertilizing. In addition to the heavy dose of manure of 35 to 40 cart-loads per acre, fertilizers are also applied in large quantities. Three doses of fertilizers, each dose varying between 200 and 250 lbs., are given per thousand plants of banana. The first dose is applied in October or November after two to three waterings; the second, in January and the third in May or June when the bunches have all emerged out. The first dose is mostly given of groundnut-cake, the second of ammonium sulphate and the third of urea or super phosphate. This order of doses, however, is not strictly followed as it depends on the availability of fertilizers and their relative prices. The use of fertilizers like bone-meal, fish and blood-meal is not preferred as many of the cultivators are vegetarian.

Harvesting :- After flowering, the crop takes three to four months to mature. The harvesting of bunches generally starts from August and continues up to December or January. The peak period of harvesting falls in September and October. All the bunches in an orchard do not mature simultaneously. The operation of harvesting, therefore, has to be repeated several times with an interval of two to three weeks. Banana bunches are harvested when the fruits are still green and hard. The fruits are not allowed to ripe on the plants. The stage of maturity of a bunch is commonly judged by observing the general appearance of fruits, by looking to the edges of

fingers. When the edges of fingers are smoothened and the general colour of bunch changes to light green, it is supposed to have reached its maturity.

Bananas are harvested by cutting a bunch from the aerial stem by means of sickle. For this purpose, aerial stem of the plant is first cut to about two-thirds of its thickness and the plant is pulled down gently for serving the bunch from it. The bunches are cut at least four to five inches above the top hand so as to leave enough portion to facilitate subsequent handling. While cutting bunches, proper care is taken to see that the sap from the cut stalk or earth does not stain the fruits.

Harvesting of the crop is necessarily done by the traders, and all the expenses of this operation are borne by them. The cultivator is required to pay only for the collection of bunches in the orchard. If an orchard is not on roadside, he is also required to arrange for transport of bunches to a convenient place of loading where a motor truck or a bullock-cart can easily reach. For this work young boys and girls, who are quick in carrying bunch loads, are preferred.

2.2. Cost of Cultivation

In this section an attempt is made to present the cost of cultivation of the major crops. The costs incurred can be divided into two classes - fixed and variable.¹ The fixed

¹ Other terms sometimes used are for fixed costs: overhead, common or basic; and for variable costs: direct, working, specific etc.

costs are those which are incurred in any event and which do not vary with the level of production. For example, the land revenue or the rent which has to be paid irrespective of the value of the commodities produced from the land. Other costs included in the same category are the wages paid to attached labour, the depreciation charges on bullocks and implements used etc. The variable costs, on the other hand, are those which vary in proportion to the size of enterprise, and are specific to the particular line of production. The variable costs include all the inputs such as hired labour - bullock and human, seeds, manure, fertilizers and irrigation charges etc. which are directly applied to each enterprise. In the present study the variable costs are of importance as our objective is to estimate the gross profit or gross margin of different enterprises. Gross margin is the difference between the gross output from each enterprise and the variable costs of obtaining that output.¹ The farmer is primarily concerned

1 The concept of gross margin has been fully described in a number of recent publications:

1) Clark, G.B. and Simpson, I.G., "A Theoretical Approach to the Profit Maximisation Problems in Farm Management," Journal of Agricultural Economics, Vol. XIII, No.3 (June 1959).

2) Clark, G.B. and White, J., "New Tools in Farm Management," N.A.A.S. Quarterly Review, No.49 (October 1960).

3) Selly, C. and Wallace, D., Planning for Profit, University of Cambridge (1961).

4) Harrison, J.E., Guide to Programme Planning, University of Bristol, Bristol II Province (January 1961).

5) Peast, B. and Rowbottom, J.D., The Gross Margin Technique of Farm Planning, The Edinburgh School of Agriculture (1962).

with the gross' margin of different enterprises as he makes their selection on that basis only. We, therefore, propose to present in the following, only the variable costs of the major crops and point out the gross margin of each of them.

The variable costs include both the type of payments - cash and kind. The payments in kind are valued at the prices prevailing in the villages during the harvest season. The data regarding all the inputs - labour and materials - applied to different crops pertain to the year of investigation - 1962-63. Such data were collected only for that year. The home-preserved seeds and the home-collected manure applied to the crops in that year are also valued at their respective prices prevailing in that year. We present below the variable costs of each individual crop separately.

Jowar :- As pointed out earlier, jowar is the staple food in these villages. It is, therefore, grown every year by almost all the cultivators. Almost all the sample cultivators had taken it in that year. The number of such cultivators was 28 in Khirode; 26 in Vivare; 25 in Waghode and 27 in Rozode.

The area reported under this crop in the year 1962-63 was 97.48 acres in Khirode; 68.26 acres in Vivare; 72.31 acres in Waghode and 76.10 acres in Rozode.¹ As stated earlier, the common accepted practice in these villages was to sow jowar

¹ The total area under jowar in Rozode was 76.10 acres, but one cultivator having an area of 1.83 acres under jowar, did not report properly all the inputs applied to the crop. His area under jowar, therefore, could not be taken into account in this section. Hence the total area under jowar in Rozode, considered in the input tables of this section is 74.27 acres.

along with the mixtures of udid, mug and chavali. The reported area under jowar, therefore, included the land under these mixtures. We have treated such jowar mixtures as a single crop for calculating its variable costs.

In Tables 2.1 to 2.4 are given the physical inputs of labour - human and bullock, applied to jowar in its different operations.¹ The family and hired labour inputs are separately shown. The wages paid to the hired labour are also given in these tables. It can be seen from these tables that male-labour was used for all the operations except weeding which was mainly done by females. Male-labour was largely used for those operations in which bullock-labour was simultaneously required, such as ploughing, harrowing, sowing, hoeing, etc. Female-labour was employed mainly for weeding, harvesting and threshing of jowar and the subsidiary crops. Bullock-labour was largely required in the pre-sowing operations like ploughing and harrowing. It may be seen from the tables that for all the operations taken together, the average male-labour input per acre of jowar was 13.43 days in Khirode, 11.83 days in Vivare, 16.09 days in Waghode and 13.27 days in Rozode. A working day for both human and bullock was of eight hours. The average per acre input of female-labour was also near about the same - about 13 days in Khirode, Vivare and Rozode. It was slightly higher in Waghode - 18.25 days. The average bullock-labour

¹ For convenience, the figures of physical inputs of labour and of wages are given up to one decimal in all the input tables for jowar, cotton, groundnut and banana.

Table 2.1 : Cost of Human and Bullock Labour for Jowar in Khirode (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	87.29	132.5	136.9	269.4	2.8	-	-	-	-	187.1	180.1	367.2	3.8	559.1	-	559.1	5.7
Harrowing	97.48	145.3	43.3	188.6	1.9	-	-	-	-	295.7	81.5	377.2	3.9	190.8	-	190.8	2.0
Cleaning	97.48	37.8	43.3	81.1	0.8	-	-	-	-	-	-	-	-	57.8	-	57.8	0.6
Transporting manure	2.73	2.0	2.0	4.0	-	-	-	-	-	4.0	-	4.0	-	3.0	6.0	9.0	0.1
Spreading manure	2.73	-	1.5	1.5	-	-	-	-	-	-	-	-	-	1.9	-	1.9	-
Sowing	97.48	31.1	25.6	56.7	0.6	10.1	6.6	16.7	0.2	32.4	9.0	41.4	0.4	192.8	-	192.8	2.0
Transporting fertilizers	64.61	0.4	0.3	0.7	-	-	0.3	0.3	-	0.1	0.3	0.4	-	1.0	-	1.0	-
Spreading fertilizers	64.61	1.0	-	1.0	-	5.0	16.3	21.3	0.2	-	-	-	-	9.6	-	9.6	0.1
Hoeing	97.48	78.4	92.1	170.5	1.7	-	-	-	-	130.7	43.7	174.4	1.8	233.4	-	233.4	2.4
Weeding	97.48	-	-	-	-	126.0	396.5	522.5	5.4	-	-	-	-	287.0	-	287.0	2.9
Harvesting jowar	97.48	104.5	185.0	289.5	3.0	78.6	192.6	271.2	2.8	32.6	8.8	41.4	0.4	715.0	-	715.0	7.3
Threshing jowar	97.48	138.3	89.0	227.3	2.3	69.0	14.0	83.0	0.9	143.3	15.0	158.3	1.6	346.0	-	346.0	3.5
Harvesting the Subsidiary Crops	97.48	12.0	-	12.0	0.1	106.0	192.0	298.0	3.1	-	-	-	-	156.4	-	156.4	1.6
Threshing the Subsidiary Crops	97.48	6.0	1.0	7.0	0.1	49.4	2.0	51.4	0.5	1.0	-	1.0	-	3.3	-	3.3	-
Total	97.48	689.3	620.0	1,309.3	13.4	444.1	820.3	1,264.4	13.0	826.9	338.4	1,165.3	12.0	2,757.1	6.0	2,763.1	28.3

Table 2.2 : Cost of Human and Bullock Labour for Jowar in Vivare (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	9.21	5.5	10.9	16.4	0.2	-	-	-	-	11.0	11.3	22.3	0.3	166.0	-	166.0	2.4
Harrowing	68.26	90.5	61.0	151.5	2.2	-	-	-	-	181.8	121.5	303.3	4.4	267.0	-	267.0	3.9
Cleaning	68.26	31.3	8.0	39.3	0.6	-	-	-	-	-	-	-	-	10.0	-	10.0	0.1
Transporting manure	3.11	1.0	-	1.0	-	-	-	-	-	2.0	-	2.0	-	-	14.5	14.5	0.2
Spreading manure	3.11	3.5	-	3.5	0.1	-	-	-	-	-	-	-	-	-	-	-	-
Sowing	68.26	22.7	23.2	45.9	0.7	1.8	0.3	2.1	-	18.7	12.5	31.1	0.5	123.1	-	123.1	1.8
Transporting fertilizers	26.00	1.4	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-
Spreading fertilizers	26.00	3.8	1.0	4.8	0.1	5.3	6.0	11.3	0.2	-	-	-	-	7.0	-	7.0	0.1
Hoeing	68.26	48.0	40.6	88.6	1.3	-	-	-	-	51.8	36.5	88.3	1.3	142.3	-	142.3	2.1
Weeding	68.26	15.0	-	15.0	0.2	117.2	295.0	412.2	6.0	-	-	-	-	199.1	-	199.1	2.9
Harvesting jowar	68.26	71.5	122.0	193.5	2.8	43.5	150.0	193.5	2.8	19.3	7.1	26.4	0.4	469.0	-	469.0	6.9
Threshing jowar	68.26	103.0	70.0	173.0	2.5	48.0	4.0	52.0	0.8	183.5	42.0	225.5	3.3	359.0	-	359.0	5.3
Harvesting the Subsidiary Crops	68.26	26.1	1.1	27.2	0.4	51.5	78.0	129.5	1.9	-	-	-	-	55.8	-	55.8	0.8
Threshing the Subsidiary Crops	68.26	44.8	2.0	46.8	0.7	38.3	18.0	56.3	0.8	-	-	-	-	12.0	-	12.0	0.2
Total	68.26	468.1	339.8	807.9	11.8	305.6	551.3	856.9	12.6	468.1	230.9	698.9	10.2	1,810.3	14.5	1,824.8	26.7

Table 2.3 : Cost of Human and Bullock Labour for Jowar in Waghode (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	29.26	47.8	60.3	108.1	1.5	-	-	-	-	65.8	91.8	157.6	2.2	334.4	-	334.4	11.4
Harrowing	72.31	128.8	49.0	177.8	2.5	-	-	-	-	270.0	81.5	351.5	4.9	218.5	-	218.5	3.0
Cleaning	72.31	20.0	17.0	37.0	0.5	-	-	-	-	-	-	-	-	26.0	-	26.0	0.4
Transporting manure	17.67	20.0	2.0	22.0	0.3	-	-	-	-	26.0	4.0	30.0	0.4	11.0	-	11.0	0.2
Spreading manure	17.67	7.0	8.0	15.0	0.2	-	-	-	-	-	-	-	-	31.0	15.0	46.0	0.6
Sowing	72.31	33.3	8.0	41.3	0.6	5.4	42.2	47.6	0.7	26.9	14.0	40.9	0.6	130.0	-	130.0	1.8
Transporting fertilizers	34.81	1.7	0.3	2.0	-	0.6	0.1	0.7	-	0.8	-	0.8	-	0.6	-	0.6	-
Spreading fertilizers	34.81	2.0	-	2.0	-	4.5	25.5	30.0	0.4	-	-	-	-	21.5	-	21.5	0.3
Hoing	72.31	83.4	41.5	124.9	1.7	-	-	-	-	69.0	32.3	101.3	1.4	156.0	-	156.0	2.2
Weeding	72.31	-	-	-	-	121.0	644.0	765.0	10.6	-	-	-	-	379.6	-	379.6	5.2
Harvesting Jowar	72.31	136.5	190.5	327.0	4.5	32.0	185.5	217.5	3.0	49.3	11.0	60.3	0.8	577.3	-	577.3	8.0
Threshing Jowar	72.31	184.3	90.8	275.1	3.8	18.5	12.0	30.5	0.4	267.3	24.0	291.3	4.0	209.0	-	209.0	2.9
Harvesting the Subsidiary Crops	72.31	5.8	1.0	6.8	0.1	37.0	168.0	205.0	2.8	-	-	-	-	138.6	-	138.6	1.9
Threshing the Subsidiary Crops	72.31	24.8	-	24.8	0.3	19.0	4.0	23.0	0.3	-	-	-	-	4.0	-	4.0	0.1
Total	72.31	695.4	468.4	1,163.8	16.1	238.0	1,081.3	1,319.3	18.2	775.1	258.6	1,033.7	14.3	2,237.5	15.0	2,252.5	31.1

Table 2.4 : Cost of Human and Bullock Labour for Jowar in Rozode (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	43.39	68.0	67.5	135.5	1.8	-	-	-	-	55.0	117.0	172.0	2.3	294.3	-	294.3	4.2
Harrowing	74.27	128.3	24.8	153.1	2.1	-	-	-	-	252.3	47.7	300.0	4.0	118.2	-	118.2	1.6
Cleaning	74.27	24.1	13.5	37.6	0.5	-	-	-	-	-	-	-	-	18.5	-	18.5	0.1
Transporting manure	8.15	12.0	1.0	13.0	0.2	-	-	-	-	24.0	-	24.0	0.3	1.5	-	1.5	-
Spreading manure	8.15	2.5	2.0	4.5	0.1	-	-	-	-	-	-	-	-	3.0	-	3.0	-
Sowing	74.27	31.5	19.4	50.9	0.7	1.0	-	1.0	-	30.3	4.1	34.4	0.5	62.3	-	62.3	0.8
Transporting fertilizers	61.05	0.1	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
Spreading fertilizers	61.05	0.5	-	0.5	-	10.1	4.6	14.7	0.2	-	-	-	-	4.5	-	4.5	-
Hoeing	74.27	71.3	41.3	112.6	1.5	-	-	-	-	101.0	14.8	115.8	1.6	100.8	-	100.8	1.4
Weeding	74.27	6.3	-	6.3	0.1	137.0	266.0	403.0	5.4	-	-	-	-	251.0	-	251.0	3.4
Harvesting Jowar	74.27	78.0	123.0	201.0	2.7	77.0	151.0	228.0	3.1	27.5	0.3	27.8	0.4	556.6	-	556.6	7.5
Threshing Jowar	74.27	117.0	79.0	196.0	2.6	46.0	2.0	48.0	0.6	148.0	23.0	171.0	2.3	195.8	-	195.8	2.6
Harvesting the Subsidiary Crops	74.27	37.3	3.0	40.3	0.5	60.0	125.0	185.0	2.5	0.3	-	0.3	-	118.8	-	118.8	1.6
Threshing the Subsidiary Crops	74.27	34.8	-	34.8	0.5	46.0	-	46.0	0.6	-	0.5	0.5	-	1.0	-	1.0	-
Total	74.27	611.7	374.5	986.2	13.3	377.1	548.6	925.7	12.5	638.4	207.4	845.8	11.4	1,726.3	-	1,726.3	23.2

input per acre was between 10 and 14 days in all the villages. In the case of male-labour in all the villages, the proportion of hired labour was relatively smaller - less than 40 per cent of the total. In the case of the bullock-labour the proportion of hired labour was still small - less than 25 per cent. The case of female-labour, however, was reverse. In its case the hired labour was proportionately high. More than three-fourths of the average female-labour input per acre was hired in all the villages.

The payment of wages to the hired labour, both human and bullock, was largely in cash. In the harvesting season only, the hired labourers employed for harvesting and threshing jowar and the subsidiary crops were paid in kind. It may be seen from the tables that the average per acre wage payment for the hired labour used in all the operations of jowar was Rs.28.34 in Khirode, Rs.26.73 in Vivare, Rs.31.15 in Waghode, and Rs.23.24 in Rozode.

The material inputs like manure, seeds, and fertilizers, applied to jowar are presented in the Tables 2.5 to 2.8. Manure is generally not applied to this crop as it causes more of vegetative growth at the cost of yield. The manurial inputs reported in all the villages, therefore, were negligible. In no village, the average quantity of manure applied per acre was more than a cart-load. The average cost of manure per acre was below Rs.5 in all the villages. Similar was the case of fertilizers. The average per acre cost of fertilizers was not more than Rs.8 in any of the villages. The cost of seeds

Table 2.5 : Cost of Material Inputs for Jowar in Khirode (1962-63)

Material	Quantity of material used			Average* per acre	Total value (Rs.)	Average* expenditure per acre (Rs.)
	Owned	Purchased	Total			
Farm-yard manure (cart-loads)	12.00	-	12.00	0.12	120.00	1.23
Seeds : Jowar (Maunds)	11.73	0.08	11.81	0.12	235.38	2.41
Udid	14.30	0.13	14.43	0.15	356.82	3.67
Mug	0.95	-	0.95	0.01	23.57	0.24
Chavali	0.60	-	0.60	0.01	14.89	0.15
Fertilizers: Sulphate (Maunds)	-	16.65	16.65	0.17	265.70	2.73
Phosphate	-	28.33	28.13	0.29	344.60	3.53
Mixture	-	2.50	2.50	0.03	30.00	0.31
Total	-	-	-	-	1,390.96	14.27

* Averages refer to the sown area (97.48 acres)

Table 2.6 : Cost of Material Inputs for Jowar in Vivare: (1962-63)

Material	Quantity of material used			Average* per acre	Total value (Rs.)	Average* expenditure per acre (Rs.)
	Owned	Purchased	Total			
Farm-yard manure (cart-loads)	22.50	3.00	25.50	0.37	228.00	3.34
Seeds : Jowar (Maunds)	8.88	0.20	9.08	0.13	181.25	2.66
Udid	3.08	0.13	3.21	0.05	79.03	1.16
Mug	0.83	0.13	0.96	0.01	19.31	0.28
Chavali	0.18	0.03	0.21	-	.4.39	0.06
Fertilizers: Sulphate (Maunds)	-	13.68	13.68	0.20	215.00	3.15
Phosphate	-	2.13	2.13	0.03	18.00	0.26
Total	-	-	-	-	744.98	10.91

* Averages refer to the sown area (68.26 acres)

Table 2.7 : Cost of Material Inputs for Jowar in Waghode (1962-63)

Material	Quantity of material used			Average* per acre	Total value (Rs.)	Average * expenditure per acre (Rs.)
	Owned	Purchased	Total			
Farm-yard manure (cart-loads)	24.00	-	24.00	0.33	310.00	4.29
Seeds : Jowar (Maunds)	9.75	0.55	10.30	0.14	205.55	2.84
Udid	3.08	0.25	3.33	0.05	72.96	1.01
Mug	0.38	0.10	0.48	0.01	13.56	0.19
Chavali	0.03	-	0.03	-	0.62	0.01
Fertilizers: Sulphate (Maunds)	-	12.28	12.28	0.17	205.00	2.83
Urea	-	3.50	3.50	0.05	49.50	0.68
Mixture	-	14.00	14.00	0.19	216.00	2.99
Total	-	-	-	-	1,073.19	14.84

* Averages refer to the sown area (72.31 acres)

Table 2.8 : Cost of Material Inputs for Jowar in Rozode (1962-63)

Material	Quantity of material used				Total value (Rs.)	Average * expenditure per acre (Rs.)
	Owned	Purchased	Total	Average * per acre		
Farm-yard manure (cart-loads)	7.00	32.00	39.00	0.53	278.00	3.73
Seeds : Jowar (Maunds)	10.75	0.35	11.10	0.15	221.75	2.99
Udid	4.75	0.10	4.85	0.07	118.20	1.59
Mug	0.40	-	0.40	0.01	8.64	0.12
Chavali	0.15	-	0.15	-	3.41	0.05
Fertilizers: Sulphete (Maunds)	-	16.93	16.93	0.23	284.37	3.82
Phosphate	-	16.25	16.25	0.22	167.50	2.26
Urea	-	2.50	2.50	0.03	37.00	0.50
Mixture	-	5.00	5.00	0.07	48.00	0.65
Total	-	-	-	-	1,166.87	15.71

* Averages refer to the sown area (74.27 acres)

of all the mixtures used, was also not high. On an average, the cost of seeds was Rs.4 to Rs.5 per acre. The average total cost of all the material inputs was Rs.14.27 per acre in Khirode, Rs.10.91 per acre in Vivare, Rs.14.84 per acre in Waghode, and Rs.15.71 per acre in Rozode. Thus, in the case of jowar the average per acre cost of labour was higher than the cost of material inputs.

The total variable cost of jowar was Rs.42.61 per acre in Khirode; Rs.37.64 per acre in Vivare; Rs.45.99 per acre in Waghode; and Rs.38.95 per acre in Rozode.

Cotton :- Cotton assumed great importance as a cash-crop particularly in the two dry villages. Most of the cultivators in these villages, therefore, devoted large areas to cotton every year. Of the sample cultivators, 28 cultivators in Vivare, 21 cultivators each in Khirode and Waghode, and 9 cultivators in Rozode had grown cotton on their land in 1962-63. The area reported under the crop was 87.91 acres in Khirode; 119.07 acres in Vivare; 106.92 acres in Waghode; and 32.03 acres in Rozode. As stated earlier, cotton was commonly grown along with the mixtures of tur and jowar. The area reported under cotton was inclusive of the land under such mixtures.

The labour inputs applied to this crop in 1962-63 are presented in Tables 2.9 to 2.12. It may be seen from the tables that the average per acre inputs of male-labour were comparatively higher in those operations where bullock-labour was also used. Thus, the operations like ploughing, harrowing, and hoeing required relatively high inputs of male and bullock-

Table 2.9 : Cost of Human and Bullock labour for Cotton in Khirode (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	87.91	144.0	114.5	258.5	2.9	-	-	-	-	245.3	110.0	355.3	4.0	384.3	-	384.3	4.4
Harrowing	87.91	138.3	45.3	183.6	2.1	-	-	-	-	321.0	46.0	367.0	4.2	122.3	-	122.3	1.4
Cleaning	87.91	40.0	59.0	99.0	1.1	-	-	-	-	-	-	-	-	73.5	-	73.5	0.8
Transporting manure	35.28	59.8	25.5	85.3	1.0	-	-	-	-	111.3	4.0	115.3	1.3	56.8	83.0	139.8	1.6
Spreading manure	35.28	12.6	15.0	27.6	0.3	5.0	2.0	7.0	0.1	-	-	-	-	21.3	-	21.3	0.2
Sowing	87.91	21.3	15.6	36.9	0.4	14.5	39.5	54.0	0.6	32.8	4.0	36.8	0.4	111.5	-	111.5	1.3
Transporting fertilizers	54.89	1.0	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Spreading fertilizers	54.89	2.8	1.0	3.8	-	10.0	10.0	20.0	0.2	-	-	-	-	7.1	-	7.1	0.1
Hoeing	87.91	111.3	98.0	209.3	2.4	0.3	-	0.3	-	165.7	26.0	191.7	2.2	214.4	-	214.4	2.4
Weeding	87.91	-	-	-	-	155.0	522.0	677.0	7.7	-	-	-	-	268.8	-	268.8	3.1
Picking Cotton	87.91	10.5	-	10.5	0.1	64.0	13.0	77.0	0.9	-	-	-	-	1,381.0	-	1,381.0	15.7
Harvesting the Subsidiary Crops	87.91	75.5	26.0	101.5	1.2	32.5	1.0	33.5	0.4	16.5	0.6	17.1	0.2	45.0	-	45.0	0.5
Threshing the Subsidiary Crops	87.91	65.5	8.0	73.5	0.8	58.0	13.0	71.0	0.8	14.7	3.0	17.7	0.2	24.0	-	24.0	0.3
Total	87.91	682.6	407.9	1,090.5	12.4	339.3	600.5	939.8	10.7	907.3	193.6	1,100.9	12.5	2,710.0	83.0	2,793.0	31.8

Table 2.10 : Cost of Human and Bullock Labour for Cotton in Vivare (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	13.66	20.0	52.0	72.0	0.6	-	-	-	-	8.0	28.0	36.0	0.3	146.0	7.0	153.0	1.3
Harrowing	119.07	171.0	110.6	281.6	2.4	-	-	-	-	334.0	229.3	563.3	4.7	505.5	-	505.5	4.2
Cleaning	119.07	40.5	17.5	58.0	0.5	-	-	-	-	-	-	-	-	22.0	-	22.0	0.2
Transporting manure	71.54	45.3	34.3	79.6	0.7	-	-	-	-	88.5	6.0	94.5	0.8	121.0	42.5	163.5	1.4
Spreading manure	71.54	41.0	9.0	50.0	0.4	3.0	20.0	23.0	0.2	-	-	-	-	28.8	-	28.8	0.2
Sowing	119.07	31.4	29.6	61.0	0.5	25.3	99.8	125.1	1.1	38.5	24.0	62.5	0.5	245.0	-	245.0	2.1
Transporting fertilizers	67.30	4.4	-	4.4	-	0.5	-	0.5	-	-	-	-	-	-	-	-	-
Spreading fertilizers	67.30	19.0	-	19.0	0.2	28.5	46.3	74.8	0.6	-	-	-	-	35.4	-	35.4	0.3
Hoeing	119.07	95.8	105.0	200.8	1.7	-	-	-	-	122.5	85.0	207.5	1.7	319.5	-	319.5	2.7
Weeding	119.07	86.0	-	86.0	0.7	217.5	701.0	918.5	7.7	-	-	-	-	816.4	-	816.4	6.9
Picking cotton	119.07	26.0	-	26.0	0.2	117.0	16.0	133.0	1.1	-	-	-	-	1,486.8	-	1,486.8	12.5
Harvesting the Subsidiary Crops	119.07	75.8	9.0	84.8	0.7	86.3	16.0	102.3	0.9	-	-	-	-	61.0	-	61.0	0.5
Threshing the Subsidiary Crops	119.07	42.3	-	42.3	0.4	52.3	12.0	64.3	0.5	4.1	1.0	5.1	-	25.0	-	25.0	0.2
Total	119.07	698.5	367.0	1,065.5	8.9	530.4	911.1	1,441.5	12.1	595.6	373.3	968.9	8.1	3,812.4	49.5	3,861.9	32.4

Table 2.11 : Cost of Human and Bullock Labour for Cotton in Waghode (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	31.97	25.0	89.5	114.5	1.1	-	-	-	-	27.0	128.0	155.0	1.4	530.5	20.0	550.5	5.1
Harrowing	106.92	162.0	98.0	260.0	2.4	-	-	-	-	318.0	195.3	513.3	4.8	435.0	-	435.0	4.1
Cleaning	106.92	22.0	30.0	52.0	0.5	-	-	-	-	-	-	-	-	45.0	-	45.0	0.4
Transporting manure	5.43	1.0	7.0	8.0	0.1	-	-	-	-	2.0	14.0	16.0	0.1	28.0	-	28.0	0.3
Spreading manure	5.43	1.0	6.0	7.0	0.1	-	-	-	-	-	-	-	-	11.0	2.0	13.0	0.1
Sowing	106.92	31.2	22.5	53.7	0.5	12.9	67.4	80.3	0.8	30.2	23.3	54.5	0.5	223.0	-	223.0	2.1
Transporting fertilizers	43.30	2.4	0.2	2.6	-	1.3	0.4	1.6	-	0.9	0.4	1.3	-	2.5	-	2.5	-
Spreading fertilizers	43.30	0.8	-	0.8	-	8.0	35.0	43.0	0.4	-	-	-	-	31.8	-	31.8	0.3
Hoing	106.92	104.0	119.5	223.5	2.1	-	-	-	-	117.0	96.5	213.5	2.0	404.0	-	404.0	3.8
Weeding	106.92	3.0	1.5	4.5	-	237.0	1,217.0	1,454.0	13.6	-	-	-	-	682.5	-	682.5	6.4
Picking Cotton	106.92	-	-	-	-	36.0	38.0	74.0	0.7	-	-	-	-	894.5	-	894.5	8.4
Harvesting the Subsidiary Crops	106.92	76.5	66.0	142.5	1.3	19.0	63.0	82.0	0.8	14.5	15.5	30.0	0.3	244.8	-	244.8	2.3
Threshing the Subsidiary Crops	106.92	91.5	58.0	149.5	1.4	20.0	10.0	30.0	0.3	47.3	40.0	87.3	0.8	226.5	-	226.5	2.1
Total	106.92	520.4	498.2	1,018.6	9.5	334.2	1,430.8	1,764.9	16.5	556.9	513.0	1,070.9	10.0	3,759.1	22.0	3,781.1	35.4

Table 2.12 : Cost of Human and Bullock Labour for Cotton in Rozode (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	15.94	28.0	29.0	57.0	1.8	-	-	-	-	42.0	38.0	80.0	2.5	122.8	-	122.8	3.8
Harrowing	32.03	53.5	9.3	62.8	2.0	-	-	-	-	107.0	18.5	125.5	3.9	47.0	-	47.0	1.5
Cleaning	32.03	18.0	1.0	19.0	0.6	-	-	-	-	-	-	-	-	1.5	-	1.5	-
Transporting manure	13.01	19.0	-	19.0	0.6	-	-	-	-	30.0	-	30.0	0.9	-	-	-	-
Spreading manure	13.01	5.0	10.0	15.0	0.5	-	-	-	-	-	-	-	-	20.0	-	20.0	0.6
Sowing	32.03	11.3	2.8	14.0	0.4	2.5	18.9	21.4	0.7	11.0	3.0	14.0	0.4	40.3	-	40.3	1.3
Transporting fertilizers	15.24	1.0	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Spreading fertilizers	15.24	-	-	-	-	-	2.5	2.5	0.1	-	-	-	-	2.0	-	2.0	0.1
Hoeing	32.03	40.5	12.0	52.5	1.6	-	-	-	-	44.0	8.5	52.5	1.6	42.3	-	42.3	1.3
Weeding	32.03	2.0	-	2.0	0.1	80.0	194.0	274.0	8.6	-	-	-	-	218.0	-	218.0	6.8
Picking Cotton	32.03	-	-	-	-	-	-	-	-	-	-	-	-	606.3	-	606.3	18.9
Harvesting the Subsidiary Crops	32.03	18.0	2.0	20.0	0.6	21.0	5.0	26.0	0.8	5.0	0.8	5.8	0.2	12.0	-	12.0	0.4
Threshing the Subsidiary Crops	32.03	18.0	2.0	20.0	0.6	16.0	2.0	18.0	0.6	2.0	-	2.0	0.1	6.0	-	6.0	0.2
Total	32.03	214.3	68.1	282.3	8.8	119.5	222.4	341.9	10.7	241.0	68.8	309.8	9.7	1,118.0	-	1,118.0	34.9

labour than other operations. The hired male and bullock-labour featured largely in respect of ploughing, for which more than one pair of bullocks were necessarily required. The practice of exchange of labour was not in vogue in any of these villages. In Vivare, where the deep-black soil was predominant, ploughing was done once in three or four years. In this year, therefore, the ploughed area under cotton in 1962-63 was very small - 13.66 acres or 11.47 per cent of the total area. Female-labour was largely reported for the operations like weeding and picking. Both these operations were mostly carried out by the female-labour only. The information regarding female-labour inputs required for picking cotton could not be collected in terms of days as females were invariably employed on the basis of piece-wage rate. In these villages, the wages for picking cotton were invariably paid in cash, according to the weight of the picked cotton of each labourer. The wage rate for picking was high (between Rs.2.50 and Rs.2.75 per maund) for the initial pickings; came down to Rs.2 per maund in the peak season and moved up again to Rs.2.75 to Rs.3 per maund at the end of the picking season. It may be noted that in the case of cotton, harvesting the produce was a costly operation. The Tables 2.9 to 2.12 reveal that the average per acre cost of the hired labour used in all the operations of cotton was Rs.31.77 in Khirode; Rs.32.43 in Vivare; Rs.35.36 in Waghode; and Rs.34.90 in Rozode.

The material inputs - manure, seeds and fertilizers - given to cotton are presented in Tables 2.13 to 2.16. Cotton

Table 2.13 : Cost of Material Inputs for Cotton in Khirode (1962-63)

Material	Quantity of material used			Average* per acre	Total value (Rs.)	Average* expenditure per acre (Rs.)
	Owned	Purchased	Total			
Farm-yard manure (cart-loads)	162.00	19.00	181.00	2.01	1,890.00	21.50
Seeds : Cotton-seeds (Maunds)	-	17.68	17.68	0.20	369.00	4.20
Tur	2.58	-	2.58	0.03	51.25	0.58
Jowar	0.55	-	0.55	0.01	10.63	0.12
Fertilizers: Sulphate (Maunds)	-	5.10	5.10	0.06	88.00	1.00
Phosphate	-	6.10	6.10	0.07	65.00	0.74
Mixture	-	51.10	51.10	0.58	727.00	8.27
Groundnut- cake	-	10.00	10.00	0.11	100.00	1.14
Total	-	-	-	-	3,300.88	37.55

* Averages refer to the sown area (87.91 acres)

Table 2.14 : Cost of Material Inputs for Cotton in Vivare (1962-63)

Material	Quantity of material used				Total value	Average* expenditure per acre (Rs.)
	Owned	Purchased	Total	Average* per acre		
Farm-yard manure (cart-loads)	303.00	97.00	400.00	3.36	3,986.00	33.48
Seeds : Cotton-seeds (Maunds)	-	16.28	16.28	0.14	381.25	3.20
Tur	3.90	0.18	4.08	0.03	81.50	0.68
Jowar	4.03	0.08	4.11	0.03	81.82	0.69
Fertilizers: Sulphate (Maunds)	-	55.48	55.48	0.47	806.75	6.78
Phosphate	-	22.08	22.08	0.19	170.40	1.43
Nitrate	-	5.00	5.00	0.04	36.00	0.30
Total	-	-	-	-	5,543.72	46.56

* Averages refer to the sown area (119.07 acres)

Table 2.15 : Cost of Material Inputs for Cotton in Waghode (1962-63)

Material	Quantity of material used				Total value (Rs.)	Average * expenditure per acre (Rs.)
	Owned	Purchased	Total	Average* per acre		
Farm-yard manure (cart-loads)	30.00	-	30.00	0.28	347.00	3.25
Seeds : Cotton-seeds (Maunds)	-	19.85	19.85	0.19	638.25	5.97
Tur	4.68	0.18	4.86	0.05	99.12	0.93
Jowar	1.68	0.08	1.76	0.02	35.00	0.33
Fertilizers: Sulphate (Maunds)	-	31.00	31.00	0.29	558.00	5.20
Urea	-	6.00	6.00	0.06	93.00	0.87
Mixture	-	12.00	12.00	0.11	190.00	1.78
Total	-	-	-	-	1,960.37	18.33

* Averages refer to the sown area (106.92 acres)

Table 2.16 : Cost of Material Inputs for Cotton in Rozode (1962-63)

Material	Quantity of material used				Total value (Rs.)	Average * expenditure per acre (Rs.)
	Owned	Purchased	Total	Average* per acre		
Farm-yard manure (cart-loads)	22.00	54.00	76.00	2.37	1,040.00	32.47
Seeds : Cotton-seeds (Maunds)	-	7.10	7.10	0.22	151.00	4.71
Tur	1.00	0.03	1.03	0.03	20.50	0.64
Jowar	0.18	0.03	0.21	-	3.50	0.11
Fertilizers: Sulphate (Maunds)	-	7.85	7.85	0.25	131.00	4.09
Phosphate	-	1.10	1.10	0.03	13.00	0.41
Mixture	-	12.50	12.50	0.39	122.00	3.81
Total	-	-	-	-	1,481.00	46.24

* Averages refer to the sown area (32.03 acres)

being an important cash-crop, manure was generally applied to it, particularly in the dry villages. The average per acre cost of manure applied to the crop was between Rs.20 and Rs.34 in Khirode, Vivare and Rozode. In Waghode, however, it was considerably low, Rs.3.25 per acre. In Waghode the general practice was to grow cotton after banana which was invariably manured heavily. It was reported that cotton taken after banana grew well on the residuals of the manure applied to banana and there was no need to give any fresh dose of manure to it. The cost of manurial inputs directly given to cotton, therefore, was very low in this village. Cotton seeds were invariably purchased. The seeds of the subsidiary crops, however, were largely home preserved. The average per acre cost of seed inputs was between Rs.4 and Rs.8. Fertilizers like sulphate, urea, mixture and groundnut-cakes etc. were commonly applied to cotton in these villages. The average cost of fertilizers given to the crop was between Rs. 7 and Rs.12 per acre. The total average cost of all the material inputs was Rs.37.55 per acre in Khirode; Rs.46.56 per acre in Vivare; Rs.46.24 per acre in Rozode and Rs.18.33 per acre in Waghode. The average per acre cost of material inputs was the lowest in Waghode, mainly because of the low cost of manure.

It may be seen from the tables that the total variable cost of cotton was Rs.69.32 per acre in Khirode; Rs. 78.99 per acre in Vivare; Rs.81.14 per acre in Rozode and Rs. 53.69 per acre in Waghode.

Groundnut :- Groundnut was another important cash-crop,

particularly in Khirode where the land was predominantly of light soil. In this village 26 cultivators had put 99.50 acres of their land under groundnut in 1962-63. In the other dry village - Vivare - the area occupied by this crop was considerably low - 15.96 acres, reported by the twelve sample cultivators.¹ This was mainly because the deep-black land predominantly available in the village did not suit the crop. Similar was the case in Waghode as well. Because of the availability of irrigation, and the deep-black soil, groundnut was not preferred in this village also.¹ The case in Rozode was altogether different. As pointed out earlier, many of the cultivators in this village had lands outside the village. These lands were at the foots of the Satpuda hill range, and were of light soil suited to groundnut crop. The cultivators, therefore, generally preferred to grow groundnut on such lands. In 1962-63, twenty-one of the sample cultivators had grown groundnut on 72.95 acres of their land.

In Tables 2.17 to 2.20 are shown the labour inputs given to groundnut in 1962-63. The tables reveal that in the case of groundnut also, ploughing, harrowing, and hoeing were

1 In Vivare, one cultivator having an area of 2.61 acres under groundnut, did not report properly all the inputs applied to the crop. His area, therefore, could not be taken into account in this section. Hence, the total area under groundnut in Vivare, considered in the input tables is 13.35 instead of 15.96 acres. Similar is the case in Waghode. In this village the total area under groundnut was 20.33 acres, but one cultivator did not report correctly all the inputs applied to groundnut grown on 2.78 acres of his land. This area could not be considered in this section. Therefore, the total area under groundnut in Waghode, considered in the input tables, is 17.55 acres.

Table 2.17 : Cost of Human and Bullock Labour for Groundnut in Khirode (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	99.50	154.3	128.3	282.6	2.8	-	-	-	-	255.0	131.0	386.0	3.9	486.4	-	486.4	4.9
Harrowing	99.50	153.5	55.8	209.3	2.1	-	-	-	-	336.0	82.5	418.5	4.2	210.0	-	210.0	2.1
Cleaning	99.50	38.8	53.0	91.8	0.9	-	-	-	-	-	-	-	-	70.3	-	70.3	0.7
Transporting manure	30.04	31.0	10.5	41.5	0.4	-	-	-	-	62.0	-	62.0	0.6	57.0	15.0	72.0	0.7
Spreading manure	30.04	4.0	14.0	18.0	0.2	3.0	1.0	4.0	-	-	-	-	-	20.3	-	20.3	0.2
Sowing	99.50	24.5	21.5	46.0	0.5	17.7	49.8	67.5	0.7	36.8	10.3	47.1	0.5	209.4	-	209.4	2.1
Transporting fertilizers	82.01	3.1	-	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-
Spreading fertilizers	82.01	8.3	1.5	9.8	0.1	21.5	16.8	38.3	0.4	-	-	-	-	13.3	-	13.3	0.1
Heeing	99.50	88.9	95.2	184.1	1.9	-	-	-	-	152.7	34.9	187.6	1.9	254.9	-	254.9	2.6
Weeding	99.50	-	-	-	-	178.0	554.0	732.0	7.4	-	-	-	-	400.0	-	400.0	4.0
Harvesting Groundnut	99.50	5.0	-	5.0	0.1	4.0	0.3	4.3	-	-	-	-	-	3,253.0	-	3,253.0	32.7
Harvesting the Subsidiary Crops	99.50	50.1	8.0	58.1	0.6	33.6	-	33.6	0.3	9.3	0.5	9.8	0.1	21.0	-	21.0	0.2
Threshing the Subsidiary Crops	99.50	44.8	1.0	45.8	0.5	37.8	9.0	46.8	0.5	3.5	-	3.5	-	6.5	-	6.5	0.1
Total	99.50	606.3	388.8	995.1	10.0	295.6	630.9	926.5	9.3	855.3	259.2	1,114.5	11.2	5,002.1	15.0	5,017.1	50.4

Table 2.18 : Cost of Human and Bullock Labour for Groundnut in Vivare (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	3.89	5.0	18.0	23.0	1.7	-	-	-	-	8.0	28.0	36.0	2.7	77.5	-	77.5	5.8
Harrowing	13.35	15.5	11.5	27.0	2.0	-	-	-	-	33.0	23.0	56.0	4.2	55.0	-	55.0	4.1
Cleaning	5.46	1.8	1.5	3.3	0.2	-	-	-	-	-	-	-	-	2.0	-	2.0	0.1
Transporting manure	1.33	0.3	-	0.3	-	-	-	-	-	0.5	-	0.5	-	2.5	-	2.5	0.2
Spreading manure	1.33	0.4	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-
Sowing	13.35	4.5	4.0	8.5	0.6	5.8	8.5	14.3	1.1	5.3	4.3	9.5	0.7	36.3	-	36.3	2.7
Transporting fertilizers	8.51	0.9	-	0.9	0.1	-	-	-	-	-	-	-	-	-	-	-	-
Spreading fertilizers	8.51	2.5	-	2.5	0.2	4.5	5.1	9.6	0.7	-	-	-	-	5.3	-	5.3	0.4
Hoing	13.35	11.0	7.0	18.0	1.3	-	-	-	-	14.7	7.9	22.6	1.7	36.5	-	36.5	2.7
Weeding	13.35	1.3	-	1.3	0.1	29.5	70.0	99.5	7.5	-	-	-	-	51.0	-	51.0	3.8
Harvesting Groundnut	13.35	2.5	-	2.5	0.2	6.0	2.0	8.0	0.6	-	-	-	-	239.0	-	239.0	17.9
Harvesting the Subsidiary Crops	9.19	9.5	-	9.5	0.7	5.0	2.0	7.0	0.5	2.3	-	2.3	0.2	2.0	-	2.0	0.1
Threshing the Subsidiary Crops	9.19	6.0	-	6.0	0.4	8.0	-	8.0	0.6	0.5	-	0.5	-	-	-	-	-
Total	13.35	61.2	42.0	103.2	7.7	58.8	87.6	146.4	11.0	64.3	63.2	127.4	9.5	507.1	-	507.1	38.0

Table 2.19 : Cost of Human and Bullock Labour for Groundnut in Waghode (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	10.65	13.0	29.0	42.0	2.4	-	-	-	-	16.0	48.0	64.0	3.6	168.0	-	168.0	9.6
Harrowing	17.55	30.5	10.8	41.3	2.4	-	-	-	-	61.0	21.3	82.3	4.7	59.5	-	59.5	3.4
Cleaning	2.30	-	-	-	-	-	8.0	8.0	0.5	-	-	-	-	4.0	-	4.0	0.2
Transporting manure	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spreading manure	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sowing	17.55	6.1	3.0	9.1	0.5	2.6	10.5	13.1	0.7	5.5	2.7	8.1	0.5	31.3	-	31.3	1.8
Transporting fertilizers	10.50	0.3	-	0.3	-	0.3	-	0.3	-	0.3	-	0.3	-	-	-	-	-
Spreading fertilizers	10.50	0.3	-	0.3	-	1.0	15.8	16.8	1.0	-	-	-	-	13.4	-	13.4	0.8
Hoeing	17.55	18.0	26.8	44.8	2.6	-	-	-	-	20.0	20.8	40.8	2.3	87.0	-	87.0	5.0
Weeding	17.55	-	-	-	-	51.0	199.0	250.0	14.2	-	-	-	-	111.1	-	111.1	6.3
Harvesting Groundnut	17.55	1.5	-	1.5	0.1	6.0	11.0	17.0	1.0	-	-	-	-	213.4	-	213.4	12.2
Harvesting the Subsidiary Crops	17.55	6.0	1.0	7.0	0.4	2.5	12.0	14.5	0.8	0.5	-	0.5	-	13.0	-	13.0	0.7
Threshing the Subsidiary Crops	17.55	11.3	1.0	12.3	0.7	3.0	-	3.0	0.2	2.8	-	2.8	0.2	1.3	-	1.3	0.1
Total	17.55	87.0	71.6	158.6	9.0	66.4	256.3	322.7	18.4	106.1	92.8	198.8	11.3	702.0	-	702.0	40.0

Table 2.20 : Cost of Human and Bullock Labour for Groundnut in Rozode (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	63.49	113.5	91.0	204.5	2.8	-	-	-	-	123.0	151.0	274.0	3.8	445.4	-	445.4	6.1
Harrowing	72.95	144.0	19.0	163.0	2.2	-	-	-	-	290.0	36.0	326.0	4.5	84.0	-	84.0	1.2
Cleaning	64.94	26.3	20.5	46.8	0.6	-	-	-	-	-	-	-	-	29.3	-	29.3	0.4
Transporting manure	22.54	8.0	10.0	18.0	0.2	-	-	-	-	16.0	10.0	26.0	0.4	157.0	-	157.0	2.2
Spreading manure	22.54	10.0	10.5	20.5	0.3	1.0	-	1.0	-	-	-	-	-	18.8	-	18.8	0.3
Sowing	72.95	27.8	10.0	37.8	0.5	19.5	46.5	66.0	0.9	29.0	3.0	32.5	0.4	101.5	-	101.5	1.4
Transporting fertilizers	64.44	1.6	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-
Spreading fertilizers	64.44	7.0	-	7.0	0.1	12.5	32.8	45.3	0.6	-	-	-	-	30.0	-	30.0	0.4
Hoeing	72.95	72.8	47.5	120.3	1.6	-	-	-	-	119.3	-	119.3	1.6	106.3	-	106.3	1.5
Weeding	72.95	11.0	-	11.0	0.2	131.0	322.0	453.0	6.2	-	-	-	-	318.3	-	318.3	4.4
Harvesting Groundnut	72.95	2.0	-	2.0	-	2.0	-	2.0	-	-	-	-	-	2,174.8	-	2,174.8	29.8
Harvesting the Subsidiary Crops	64.04	50.5	2.0	52.5	0.7	39.0	-	39.0	0.5	27.0	0.5	27.5	0.4	5.0	-	5.0	0.1
Threshing the Subsidiary Crops	64.04	23.0	10.0	33.0	0.5	20.0	9.0	29.0	0.4	-	-	-	-	29.0	-	29.0	0.4
Total	72.95	497.5	220.5	718.0	9.8	225.0	410.3	635.3	8.7	604.3	200.5	805.3	11.0	3,499.4	-	3,499.4	48.0

the three major operations, which required higher inputs of male and bullock-labour. These three operations taken together, accounted for more than half of the average male and bullock-labour inputs per acre. The hired male and bullock-labour were largely reported for ploughing, which was carried out by more than one pair of bullocks. Female-labour was predominantly employed for two operations - weeding and harvesting of groundnut. The female-labour inputs required for harvesting the crop could not be measured in terms of days, as these were employed on the basis of piece-wage rate. These labourers were paid in cash according to the weight of the pods plucked in the whole day. In 1962-63, the wage rate for harvesting was between Rs.2 and Rs.2.50 per maund. It may be seen from the tables that harvesting the crop was the most costly operation, accounting for more than half of the average labour cost per acre. The tables reveal that the average per acre cost of labour inputs was Rs.50.42 in Khirode; Rs.37.97 in Vivare; Rs.40.00 in Waghode; and Rs.47.97 in Rozode.

The data regarding the material inputs given to groundnut are presented in Tables 2.21 to 2.24. Like jowar, groundnut was generally not manured in these villages. The cultivators reported that manuring caused more of vegetative growth in the plants and affected the yield adversely. However, in Khirode and Rozode, because of the poor soil, manure was applied to the crop in small quantities. The average expenditure on manure reported in these two villages was relatively high - Rs.15.33 per acre in Khirode and Rs.18.04 per acre in

Table 2.21 : Cost of Material Inputs for Groundnut in Khirode (1962-63)

Material	Quantity of material used				Total value (Rs.)	Average* expenditure per acre (Rs.)
	Owned	Purchased	Total	Average* per acre		
Farm-yard manure (cart-loads)	147.00	12.00	159.00	1.60	1,525.00	15.33
Seeds : Groundnut-seeds (Maunds)	43.98	12.00	55.98	0.56	2,420.84	24.33
Jowar	0.35	-	0.35	-	6.90	0.07
Tur	3.68	0.3	3.71	0.04	74.63	0.75
Fertilizers: Sulphate (Maunds)	-	7.50	7.50	0.08	95.00	0.95
Phosphate	-	100.00	100.00	1.01	1,081.00	10.86
Mixture	-	10.00	10.00	0.10	104.00	1.05
Total	-	-	-	-	5,307.37	53.34

* Averages refer to the sown area (99.50 acres)

Table 2.22 : Cost of Material Inputs for Groundnut in Vivare (1962-63)

Material	Quantity of material used				Total Value (Rs.)	Average* expenditure per acre (Rs.)
	Owned	Purchased	Total	Average* per acre		
Farm-yard manure (cart-loads)	3.00	-	3.00	0.22	30.00	2.25
Seeds : Groundnut-seeds	4.53	3.45	7.98	0.60	319.00	23.89
Jowar	0.30	-	0.30	0.02	0.75	0.06
Tur	0.50	-	0.50	0.04	9.00	0.67
Fertilizers: Phosphate (Maunds)	-	12.50	12.50	0.94	113.50	8.50
Total	-	-	-	-	472.25	35.37

* Averages refer to the sown area (13.35 acres)

Table 2.23 : Cost of Material Inputs for Groundnut in Waghode (1962-63)

Material	Quantity of material used				Total value (Rs.)	Average* expenditure per acre (Rs.)
	Owned	Purchased	Total	Average* per acre		
Farm-yard manure (cart-loads)	-	-	-	-	-	-
Seeds : Groundnut-seeds (Maunds)	3.02	7.53	10.55	0.60	426.00	24.27
Jowar	0.8	-	0.8	-	1.50	0.09
Tur	0.55	0.5	0.60	0.03	12.00	0.68
Fertilizers: Sulphate (Maunds)	-	2.00	2.00	0.11	36.00	2.05
Phosphate	-	10.00	10.00	0.57	97.00	5.53
Mixture	-	2.00	2.00	0.11	30.00	1.71
Total	-	-	-	-	602.50	34.33

* Averages refer to the sown area (17.55 acres)

Table 2.24 : Cost of Material Inputs for Groundnut in Rozode (1962-63)

Material	Quantity of material used				Total value (Rs.)	Average* expenditure per acre (Rs.)
	Owned	Purchased	Total	Average* per acre		
Farm-yard manure (cart-loads)	42.00	105.00	147.00	2.02	1,316.00	18.04
Seeds : Groundnut-seeds (Maunds)	34.50	8.15	42.65	0.58	1,727.00	23.67
Jowar	0.10	-	0.10	-	2.13	0.03
Tur	3.68	0.15	3.83	0.05	76.50	1.05
Fertilizers: Sulphate (Maunds)	-	12.50	12.50	0.17	90.00	1.23
Phosphate	-	108.00	108.00	1.48	1,219.50	16.72
Mixture	-	2.20	2.20	0.03	34.00	0.47
Total	-	-	-	-	4,465.13	61.21

* Averages refer to the sown area (72.95 acres)

Rozode. In Vivare the average per acre cost of manure was very low - Rs.2.25. In Waghode, the cultivators did not report manuring of this crop. In the case of groundnut, the cost of seed inputs was the highest of all, accounting for about 25 to 30 per cent of the total variable cost. It may be seen from the tables that the average cost of groundnut seeds alone, was Rs.23 to Rs.25 per acre. In the case of most of the cultivators, however, groundnut seeds were home-preserved. The average per acre cost on fertilizers was relatively high in Khirode and Rozode - Rs.12.86 and Rs.18.42 per acre respectively. In Vivare and Waghode, it was between Rs.8 and Rs.10 per acre. In all the villages, phosphate was widely applied to this crop than any other type of fertilizer. The total average cost of all the material inputs was Rs.53.34 per acre in Khirode; Rs.35.37 per acre in Vivare; Rs.34.33 per acre in Waghode; and Rs.61.21 per acre in Rozode.

The total variable cost of the crop was Rs.103.76 per acre in Khirode; Rs.73.34 per acre in Vivare; Rs.74.33 per acre in Waghode, and Rs.109.18 per acre in Rozode. It may be noted that the per acre variable cost of groundnut was quite high in comparison with that of the other dry crops. This was largely because of its seed inputs and labour requirement. The largest call on the labour supply was at harvest time, when every cultivator was after collecting his produce within the shortest period, so that it should not be ruined by rains.

Banana :- Banana is the most important cash-crop in the two irrigated villages. As pointed out earlier, banana

is a crop of one and half years. However, it occupies the land practically for two years as even after harvesting, the rhizomes are kept in the fields to get suckers for transplantation. Banana in the first year of its plantation is locally known as 'Nawati' banana, and that in the second year of its plantation, as 'Junar' banana. In a year, therefore, we get two areas under banana: (1) the area under 'Nawati' banana; and (2) the area under 'Junar' banana.¹ In 1962-63, the area reported under the 'Nawati' banana was 32.33 acres in Waghode, and 25.41 acres in Rozode. The area reported under the 'Junar' banana, on the other hand, was 41.33 acres in Waghode and 29.77 acres in Rozode. The number of cultivators reporting the areas under the 'Junar' banana was ten in Waghode and nine in Rozode. Here, only the areas under the 'Junar' banana, about which all the data could be collected, are considered. In the case of the 'Nawati' banana, the data were incomplete as its operations in the second year could not be covered in the year of investigation.

The data of human and bullock-labour inputs given to 'Junar' banana are presented in Tables 2.25 and 2.26. It may be seen from these tables that the per acre inputs of male-labour, both family and hired, were as high as 132.34 days in Waghode and 124.33 days in Rozode. Besides this, there

1 Henceforward, the term 'Nawati' banana is used to denote the banana planted in the current year and to be harvested in the next year, and 'Junar' banana is used to denote the banana planted in the previous year and to be harvested in the current year.

Table 2.25 : Cost of Human and Bullock Labour for Banana in Waghode (1962-63).

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	41.23	200.0	118.5	318.5	7.7	-	-	-	-	251.0	223.0	474.0	11.5	702.5	-	702.5	17.0
Harrowing	41.23	100.8	17.0	117.8	2.9	-	-	-	-	185.5	50.0	235.5	5.7	91.0	-	91.0	2.2
Cleaning	7.00	-	-	-	-	1.0	20.0	21.0	0.5	-	-	-	-	20.0	-	20.0	0.5
Transporting manure	41.23	61.5	3.0	64.5	1.6	-	-	-	-	75.5	6.0	81.5	2.0	21.0	-	21.0	0.5
Spreading manure	41.23	-	3.0	3.0	0.1	-	6.0	6.0	0.1	-	-	-	-	10.5	512.0	522.5	12.7
Furrowing	41.23	74.5	28.0	102.5	2.5	-	-	-	-	46.0	22.5	68.0	1.6	112.0	-	112.0	2.7
Planting	41.23	29.0	96.0	125.0	3.0	22.0	203.0	225.0	5.5	-	-	-	-	417.0	-	417.0	10.1
Re-planting	41.23	25.0	5.0	30.0	0.7	11.0	39.0	50.0	1.2	-	-	-	-	49.0	-	49.0	1.2
Hoeing	41.23	112.0	34.0	146.0	3.5	-	-	-	-	224.0	68.0	292.0	7.1	218.0	-	218.0	5.3
Transporting fertilizers	41.23	19.5	1.8	21.3	0.5	-	0.5	0.5	-	26.6	3.1	29.8	0.7	11.0	-	11.0	0.3
Spreading fertilizers	41.23	1.0	9.0	10.0	0.2	16.0	143.5	159.5	3.9	-	-	-	-	141.0	-	141.0	3.4
Weeding	41.23	-	-	-	-	108.0	578.0	686.0	16.6	-	-	-	-	324.3	-	324.3	7.9
Repairing water beds	41.23	-	-	-	-	-	-	-	-	-	-	-	-	-	1,140.0	1,140.0	27.6
Pruning	41.23	65.0	18.0	83.0	2.0	-	-	-	-	-	-	-	-	29.0	-	29.0	0.7
Earthing-up	41.23	-	-	-	-	-	-	-	-	-	-	-	-	-	1,114.0	1,114.0	27.0
Watering	41.23	4,285.0	150.0	4,435.0	107.6	-	-	-	-	-	-	-	-	225.0	-	225.0	5.5
Transporting bunches	41.23	-	-	-	-	-	-	-	-	-	-	-	-	-	3,245.0	3,245.0	78.7
Total	41.23	4,973.3	483.3	5,456.6	132.3	158.0	990.0	1,148.0	27.8	808.6	372.6	1,180.8	28.6	2,371.3	6,011.0	8,382.3	203.3

Table 2.26 : Cost of Human and Bullock Labour for Banana in Rozode (1962-63)

Operation	Area of operation in acres	Male labour (days)				Female labour (days)				Bullock labour (days)				Wages paid (Rs.)			
		Family	Hired	Total	Average per acre	Family	Hired	Total	Average per acre	Owned	Hired	Total	Average per acre	Casual	Contractual	Total	Average per acre
Ploughing	29.77	136.0	73.0	209.0	7.0	-	-	-	-	188.0	100.0	288.0	9.7	265.0	-	265.0	
Harrowing	29.77	59.5	-	59.5	2.0	-	-	-	-	119.0	-	119.0	4.0	-	-	-	
Cleaning	3.20	-	2.0	2.0	0.1	-	-	-	-	-	-	-	-	3.0	-	3.0	
Transporting manure	29.77	163.0	59.0	222.0	7.5	-	-	-	-	312.0	14.0	326.0	11.0	86.5	-	86.5	
Spreading manure	29.77	21.0	22.0	43.0	1.4	4.0	61.0	65.0	2.2	-	-	-	-	161.3	-	161.3	
Furrowing	29.77	38.0	9.0	47.0	1.6	-	-	-	-	32.0	6.0	38.0	1.3	33.5	-	33.5	
Planting	29.77	13.0	24.0	37.0	1.2	-	30.0	30.0	1.0	-	-	-	-	562.5	-	562.5	
Re-planting	29.77	14.0	3.0	17.0	0.6	-	8.0	8.0	0.3	-	-	-	-	17.0	65.5	82.5	
Hoeing	29.77	199.0	-	199.0	6.7	-	-	-	-	398.0	-	398.0	13.4	-	-	-	
Transporting fertilizers	29.77	10.5	-	10.5	0.4	13.5	-	13.5	0.5	-	-	-	-	-	-	-	
Spreading fertilizers	29.77	41.0	8.0	49.0	1.6	52.0	152.0	204.0	6.9	-	-	-	-	159.6	-	159.6	
Weeding	29.77	2.0	-	2.0	0.1	15.0	208.0	223.0	7.5	-	-	-	-	186.5	91.0	277.5	
Repairing water beds	29.77	-	-	-	-	-	-	-	-	-	-	-	-	-	895.0	895.0	
Pruning	29.77	28.5	16.0	44.5	1.5	39.0	104.0	143.0	4.8	-	-	-	-	123.5	-	123.5	
Earthing-up	29.77	4.0	-	4.0	0.1	-	-	-	-	-	-	-	-	-	1,056.0	1,056.0	
Watering	29.77	2,184.0	572.0	2,756.0	92.6	-	-	-	-	-	-	-	-	675.0	-	675.0	
Transporting bunches	29.77	-	-	-	-	-	-	-	-	-	-	-	-	-	2,515.0	2,515.0	
Total	29.77	2,913.5	788.0	3,701.5	124.3	123.5	563.0	686.5	23.1	1,049.0	120.0	1,169.0	39.3	2,273.4	4,622.5	6,895.9	

was the contribution of the contractual labour also. The number of days put in by this type of labour was not available. The contractual labour was engaged largely for some specific operations like spreading manure, preparing water-beds and earthing-up. The hired casual labour was largely used for ploughing, planting, harrowing and watering. The major operation which required the largest male-labour inputs was of watering - 107.57 days per acre in Waghode and 92.57 days per acre in Rozode. The labour input for this operation was so high that it accounted for more than three-fourths of the average male-labour inputs per acre. The other operations were minor, requiring comparatively small inputs of male-labour. In the case of this crop the inputs of female-labour were very low in comparison with that of male-labour. It was 27.84 days per acre in Waghode and 23.06 days per acre in Rozode. Weeding was the only major operation carried out exclusively by the female-labour. The other important operations where the female-labour was largely employed were spreading manure and fertilizers and planting. Of the total female-labour used for the crop, more than three-fourths was hired. The average bullock-labour inputs reported for this crop were also low - 28.64 days per acre in Waghode and 39.27 days per acre in Rozode. This was largely because in both the villages the crop was irrigated exclusively by pumping sets operated on oil engines. The major operations for which high proportion of bullock-labour was required were ploughing, harrowing, transport of manure and hoeing. The cultivators growing banana

generally owned a pair of bullocks and so the contribution of the hired bullock-labour was largely limited to ploughing which necessarily required more than one pair. It may be seen from the tables that the average per acre cost of labour inputs was Rs.203.30 in Waghode and Rs.231.64 in Rozode. A large proportion of this was on account of the contractual labour. The payments made to the contractual labour were so high that these accounted for about three-fourths of the average cost per acre.

In Tables 2.27 and 2.28 are given all the material inputs applied to the crop. Manure, fertilizers, fuel and lubricating oils required for pumping sets were the major material inputs required for this crop. As pointed out earlier, the crop was heavily manured in both the villages. In Waghode, the average per acre input of manure applied was as high as 32.38 cart-loads. In Rozode it was slightly low - 28.05 cart-loads per acre. The average cost of manure applied was Rs.379.83 per acre in Waghode and Rs.423.98 per acre in Rozode. In Rozode the cost of manure was high because of its high prices there. Besides manure, fertilizers were also heavily applied to the crop. The average cost of fertilizers was also considerably high - Rs.274.11 per acre in Waghode and Rs.294.51 per acre in Rozode. The average cost of fuel and lubricating oils required for oil engine pumping sets used to irrigate the crop was still high - Rs.546.69 per acre in Waghode and Rs.488.56 per acre in Rozode. The total average cost of all the material inputs applied to the crop was as

Table 2.27 : Cost of Material Inputs for Banana in Waghode (1962-63)

Material	Quantity of material used			Average* per acre	Total value (Rs.)	Average* expendi- ture per acre (Rs.)
	Owned	Purchased	Total			
Farm-yard manure (cart-loads)	245.00	1,080.00	1,325.00	32.14	15,660.00	379.82
Crops : Planting (Number)	38,000	32,500	70,500	1,710	2,908.00	70.53
Re-planting	4,550	5,900	10,450	253	450.00	10.91
Fertilizers: Sulphate (Maunds)	-	379.00	379.00	9.19	7,377.00	178.92
Phosphate	-	6.00	6.00	0.15	168.00	4.07
Urea	-	56.00	56.00	1.36	912.00	22.12
Mixture	-	138.00	138.00	3.35	2,220.00	53.84
Groundnut- cakes	-	56.00	56.00	1.36	625.00	15.16
Fuel and lubricants **	-	-	-	-	22,540.00	546.69
Total	-	-	-	-	52,860.00	1,282.07

* Averages refer to the planted area (41.23 acres)

** Fuel includes :	Gallons	Value in Rs.
Crude oil	10,060	15,590.00
Lubricants include:		
Mobil oil	1,986	6,950.00

Table 2.28 : Cost of Material Inputs for Banana in Rozode (1962-63)

Material	Quantity of material used				Total value (Rs.)	Average * expenditure per acre (Rs.)
	Owned	Purchased	Total	Average* per acre		
Farm-yard manure (cart-loads)	313.00	522.00	835.00	28.05	12,622.00	423.97
Crops : Planting (Number)	38,750	15,500	54,250	1,822	2,150.00	72.22
Re-planting	8,400	4,500	12,900	433	504.00	16.93
Fertilizers: Sulphate (Maunds)	-	180.00	180.00	6.05	3,670.00	123.28
Phosphate	-	54.00	54.00	1.81	614.00	20.62
Urea	-	44.00	44.00	1.48	694.00	23.31
Mixture	-	88.00	88.00	2.96	1,385.00	46.52
Groundnut- cakes	-	190.00	190.00	6.38	2,365.00	79.44
Fuels and lubricants**	-	-	-	-	14,585.00	489.91
Total	-	-	-	-	38,589.00	1,296.20

* Averages refer to the planted area (29.77 acres)

** Fuel includes :
 Gallons Value in Rs.
 Crude oil 6,400 9,631.00
 Kerosene oil 695 1,599.00
 Lubricants include:
 Mobil oil 983 3,355.00

high as Rs.1,282.07 per acre in Waghode and Rs.1,296.20 per acre in Rozode. More than three-fourths of this cost was incurred on manure, fertilizers and irrigation.

Thus, banana was the most expensive crop. Its total variable cost was Rs.1,485.37 per acre in Waghode and Rs.1,527.84 per acre in Rozode. More than half of this cost was on account of manurial and fertilizer inputs. The cost of irrigation was also considerably high - more than one-third of the total variable cost per acre.

2.3. Relative Profitability of Crops

Given the physical and technical factors which influence and condition the cropping, the cultivator is required to adjust his crop-pattern over the rotational period in such a way that he gets stable maximum income over years. With this objective in view, he selects different crops and their rotations over a period. In making such a choice of crops he is guided more by the relative profitability of different crops. He considers only the gross-profit or gross margin (gross output - variable costs = gross margin) of each crop. The costs on the fixed factors like bullocks, implements, and family labour etc. cannot be varied in the short run whatever be the crop-combination. Rent or revenue payments are also fixed for each type of land irrespective of the crops to be grown. Therefore, a combination of crops which gives maximum gross margin after meeting the variable costs, will also give the maximum farm income. The costs on fixed factors are incurred for the farm as a whole and the cultivator may

choose a combination of crops which makes for the intensive utilization of these factors. The imputation of fixed costs to crops, therefore, would unnecessarily inflate the costs and give a distorted picture of relative profitability - quite different from the one which influences the allocative decisions. We have, therefore, calculated gross margin of each crop, deducting only the variable costs from the gross output. The cultivator is primarily concerned with such margin and takes decisions regarding allocation of land for different crops mainly on it.

In Tables 2.29 to 2.32 are presented relative profitability of the major crops grown in the villages. It may be seen from Tables 2.29 and 2.30, that in the two dry villages, cotton was the most profitable crop. However, there was a marked difference in the gross profits received from the crops in the two villages. In Vivare it was considerably higher than that in Khirode. This was mainly because of the difference in the type of land available in the two villages, leading to the difference in the average per acre yield of cotton. In Vivare, the land was predominantly of deep-black soil, most suited to cotton. The average per acre yield of cotton, therefore, was comparatively high (5.95 mds. per acre) in this village. In Khirode, on the other hand, the light and medium-black lands were predominant and hence the average per acre yield of cotton was comparatively low (4.02 mds. per acre). Groundnut was the next profitable crop in Khirode, while in Vivare, it occupied the third place. Because

Table 2.29 : Relative Profitability of the Major Crops Grown in Khirode

	Jowar (Rs.)	Cotton (Rs.)	Groundnut (Rs.)
Total value of the gross yield per acre	143.51	210.80	223.42
Variable costs per acre:			
Hired labour (human and bullock)	28.34	31.77	50.42
Farmyard manure	1.23	21.50	15.33
Seeds	6.47	4.90	25.15
Fertilizers	6.57	11.15	12.86
Total variable costs per acre	42.61	69.32	103.76
Gross margin per acre	100.90	141.48	119.66

Table 2.30 : Relative Profitability of the Major Crops Grown in Vivare

	Jowar (Rs.)	Cotton (Rs.)	Groundnut (Rs.)
Total value of the gross yield per acre	179.60	294.92	159.68
Variable costs per acre:			
Hired labour (human and bullock)	26.73	32.43	37.97
Farmyard manure	3.34	33.48	2.25
Seeds	4.16	4.57	24.62
Fertilizers	3.41	8.51	8.50
Total variable costs per acre	37.64	78.99	73.34
Gross margin per acre	141.96	215.93	86.34

Table 2.31 : Relative Profitability of the Major Crops Grown in Waghode

	Jowar (Rs.)	Cotton (Rs.)	Groundnut (Rs.)	Banana (Rs.)
Total value of the gross yield per acre	166.86	260.29	182.23	2,735.85
Variable costs per acre:				
Hired labour (human and bullock)	31.15	35.36	40.00	203.30
Farmyard manure	4.29	3.25	-	379.83
Seeds	4.05	7.23	25.04	81.44
Fertilizers	6.50	7.85	9.29	274.11
Irrigation	-	-	-	546.69
Total variable costs per acre	45.99	53.69	74.33	1,485.37
Gross margin per acre	120.87	206.60	107.90	1,250.48

Table 2.32 : Relative Profitability of the Major Crops Grown in Rozode

	Jowar (Rs.)	Cotton (Rs.)	Groundnut (Rs.)	Banana (Rs.)
Total value of the gross yield per acre	170.91	249.33	208.88	2,714.51
Variable costs per acre:				
Hired labour (human and bullock)	23.24	34.90	47.97	231.64
Farmyard manure	3.73	32.47	18.04	423.98
Seeds	4.75	5.46	24.75	89.15
Fertilizers	7.23	8.31	18.42	294.51
Irrigation	-	-	-	488.56
Total variable costs per acre	38.95	81.14	109.18	1,527.84
Gross margin per acre	131.96	168.19	99.70	1,186.67

of the deep-black land, not suited to groundnut, its average yield per acre was considerably low (5.27 mds. per acre) in Vivare. In this village, therefore, the gross profit from groundnut was lower than that of jowar even, which claimed the second place. In Khirode, jowar occupied the third place, its gross profit being slightly lower than that of groundnut. The average per acre gross profit of groundnut was lower because of its high cost of cultivation.

In the two irrigated villages, banana was the most remunerative crop. (See Tables 2.31 and 2.32.) As stated earlier, this crop occupied the land practically for two years. The per acre gross profit of this crop was Rs.1,250.48 in Waghode and Rs.1,186.67 in Rozode. This means, its gross profit per year was Rs.625.24 in Waghode and Rs.593.34 in Rozode. Cotton occupied the second position in both the villages, though its gross profit per acre was considerably lower than that of banana. Between the two villages, the gross profit from cotton was higher in Waghode than in Rozode. This might be due to the difference in the quality of land available in the two villages. In Rozode the land was relatively poor in quality than that in Waghode. The average per acre yield of cotton was, therefore, lower in Rozode (11.73 mds. per acre) than in Waghode (12.07 mds. per acre). Jowar was third in line in both the irrigated villages. The gross margin in its case was Rs.120.87 per acre in Waghode and Rs.131.96 per acre in Rozode. Of the major crops grown in these two villages, groundnut was the least profitable.

This was largely because of the type of land and irrigation available in both the villages. It was partly due to the high cost of cultivation also.

2.4. Relative Profitability and Rotation-Plan

The relative profitability of the major crops presented in Tables 2.29 to 2.32 are calculated on the basis of the prices prevailing in the year of investigation (1962-63). The cultivator, however, generally does not base his crop-decisions on the relative profitability of different crops seen in a short term of a year or two. He takes a long term view. In formulating his rotation-plan or the cropping programme he is guided more by the relative profitability of different crops, observed for a fairly long period of five to ten years or even more. It is, in fact, a continuous process--the cultivator formulating and re-formulating his rotation-plan, according to the changes in the relative profitability of crops observed from time to time. He considers the yearly variations in prices and their effects on the relative profitability of crops for a long period and when he feels assured of the continuity of the change in prices or the stabilization of prices on a different level, only then does he think of re-casting his entire rotation-plan. Even the work of re-casting the plan is done gradually and very cautiously. The changes are first made, only on the marginal areas, on an experimental basis and only when he feels assured that higher benefits do accrue from the changes introduced in cropping, he tries to incorporate those changes in the rotation-plan. During the period of experimentation,

as he finds that the new changes in cropping are profitable, he has also checked the resource requirements of those changes and his ability to meet them.

In the present study, however, the data as regards relative profitability of crops for such a long period could not be presented. It was not possible to collect such data for a long-term in one year of investigation. However, the data about prices prevailing in the period of fourteen years, preceding the survey year (1962-63) were collected. The price data are presented in Table 2.33. From these price data one can have a broad idea about the relative profitability of different crops in the long period of fourteen years. It may be seen from the Table that the prices of all the major crops have gone up over the period of fourteen years. In between the period there are ups and downs, but the general trend is towards increase. The cost of cultivation of all the crops has also increased in the period. In this long period, therefore, there appears to be no major change in the relative profitability of different crops in the four villages. The cultivators reported that in this period of fourteen to fifteen years, cotton was the most profitable crop in the dry villages. Next to cotton were groundnut and jowar. Jowar was the least profitable crop in the dry villages. In the irrigated villages banana was the most remunerative crop. Next in rank was cotton but its profitability was far lower than that of banana. Jowar was the third in line in both the irrigated villages. While formulating the rotation-plan the cultivator has this relative

profitability of different crops in his mind, observed for a fairly long period.

Table 2.33 : Average Annual Price Per Maund of the Major Crops

Year	Jowar (Rs.)	Cotton unginned (Rs.)	Groundnut (Rs.)	Banana* (Rs.)
1950	5.50	24.50	22.25	6.50
1951	6.75	35.03	24.73	5.75
1952	6.45	26.56	17.35	5.18
1953	5.85	22.50	17.58	6.30
1954	6.25	31.29	18.78	5.90
1955	6.75	22.75	13.35	5.50
1956	13.46	27.39	17.38	6.25
1957	12.48	32.89	19.94	8.00
1958	11.10	32.96	19.15	7.25
1959	12.73	29.20	21.64	6.50
1960	14.11	33.87	25.14	8.25
1961	13.12	37.21	30.43	9.00
1962	15.00	31.30	29.57	10.50
1963	13.89	35.11	31.67	8.89

Sources : 1) Annual Reports of the Agricultural Produce Market Committee, Jalgaon.

*2) Annual Reports of the Raver Taluka Co-operative Fruit Sale Society, Waghode.

Summary

Jowar, cotton and groundnut were the three major dry crops grown in the four villages. In the two irrigated villages, besides these three crops, banana was the major irrigated crop. The cultivation practices of these crops may be divided into two parts: (1) preparatory tillage; and (2) tillage of the crop. The preparatory tillage was more or less the same for all the crops. The tillage of the crop, however, differed from crop to crop. The requirements of each crop were different and so its tillage. Therefore, the variable costs also differed from crop to crop. In the dry villages, groundnut was the costliest crop, followed by cotton and jowar. Jowar was the cheapest crop in all the villages. In the irrigated villages, banana was the most expensive crop. The position of the other crops was the same as in the dry villages.

The cultivator selects different crops and their rotations in such a way that he gets the stable maximum income over a period. In making such selection he considers the relative profitability of different crops observed for a fairly long period. In this regard it was seen that in the dry villages, cotton was the most profitable crop; second was groundnut; and third, jowar. In the irrigated villages, banana was the most paying crop. The gross profit from the other dry crops was more or less in the same order as in the dry villages.

CHAPTER III
THE CROP-PATTERN

The aggregate crop-pattern is the sum-total of the crop-patterns of individual cultivators. The crop-patterns of individual cultivators are mainly based on the accepted crop-rotations according to which they grow their crops every year. The individual crop-patterns, therefore, may or may not change from year to year depending on the crop-rotations accepted and the area allotment to different crops in the rotations. In the case of most of the cultivators, however, the crop-patterns do change from year to year. The changes and shifts in the individual cases which add up to make the aggregate crop-pattern, may or may not bring about a visible change at the aggregate level. The additions and subtractions of the area changes of individual cultivators may cancel out in the aggregation and the crop-pattern at the aggregate level may remain almost the same. An unchanging aggregate crop-pattern, therefore, does not necessarily mean that there are no changes in the crop-patterns of individual cultivators. In most of the cases, however, the aggregate crop-pattern also changes from year to year.

In this chapter, the aggregate crop-pattern of the sample cultivators in each of the four villages, is presented, showing yearly variations in the areas under different crops grown in the four years. These variations in the aggregate areas have been further analysed to bring out the impact of the crop-rotations

practised by the sample cultivators. The variations caused by the different types of crop-rotations are shown separately. These are added up to see to what extent the rotational practices are responsible for the variations in the area under different crops. In the following, the crop-pattern of the sample cultivators in the dry villages is first considered, and then that of the sample cultivators in the irrigated villages.

3.1. Crop-Pattern of the Sample Cultivators in the Dry Villages

The aggregate crop-patterns of the sample cultivators in the two dry villages--Khirode and Vivare--for the period of four years are presented in Tables 3.1 and 3.2. The total net cropped area of the sample cultivators in the two villages, varied from year to year during the four year period. In Khirode, it varied between 273.85 acres in 1960-61 and 292.50 acres in 1962-63. In Vivare also, it varied from 233.00 acres in 1963-64 to 245.26 acres in the other three years. These variations in the net cropped area were due to leasing-in and leasing-out, and purchase and sale of land by the sample cultivators during the period. In Tables 3.3 and 3.4 are given the area of such land cultivated by the sample cultivators. The data regarding the crops grown on such land during all the four years of study could not be collected. In the case of the leased-in and purchased land, the crops grown during the years preceding the lease or purchase were not known. Similar was the case with the land leased-out or sold during the period of four years. However, the total area of such land was not large in either of the villages. It varied

Table 3.1 : Cropping Pattern Followed by the Selected Cultivators in Khirode in the Four-Year Period (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Jowar	93.96	34.31	77.97	27.90	97.48	33.33	78.51	27.63
Cotton	90.19	32.93	73.96	26.46	87.91	30.05	81.81	28.78
Groundnut	82.26	30.04	120.56	43.14	99.50	34.02	108.66	38.23
Bajara	4.45	1.62	4.45	1.59	6.68	2.28	4.45	1.57
Wheat	1.63	0.60	1.63	0.58	-	-	3.40	1.20
Paddy	0.93	0.34	0.93	0.33	0.93	0.32	0.93	0.33
Mug	0.43	0.16	-	-	-	-	-	-
Udid	-	-	-	-	-	-	2.43	0.86
Chillies	-	-	-	-	-	-	0.33	0.12
'Nawati' banana	-	-	-	-	-	-	3.65	1.28
Total net cropped area	273.85	100.00	279.50	100.00	292.50	100.00	284.17	100.00

Table 3.2 : Cropping Pattern Followed by the Selected Cultivators in Vivare in the Four-Year Period (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Jowar	74.62	29.81	77.30	30.96	68.26	27.14	72.80	30.87
Cotton	119.65	47.80	119.46	47.86	119.07	47.34	97.65	41.42
Groundnut	15.25	6.09	12.69	5.08	15.96	6.35	14.44	6.12
Bajara	1.00	0.40	-	-	-	-	-	-
Wheat	34.24	13.68	33.06	13.24	41.37	16.45	42.40	17.98
Paddy	-	-	1.00	0.40	1.00	0.40	-	-
Mug	3.80	1.52	4.40	1.76	5.73	2.28	2.80	1.19
Chillies	0.10	0.04	0.10	0.04	0.10	0.04	-	-
'Nawati' banana	1.65	0.66	-	-	-	-	5.71	2.42
'Junar' banana	-	-	1.65	0.66	-	-	-	-
Total gross cropped area	250.31	100.00	249.66	100.00	251.49	100.00	235.80	100.00
Total double cropped area	5.05	2.06	4.40	1.79	6.23	2.54	2.80	1.20
Total net cropped area	245.26	100.00	245.26	100.00	245.26	100.00	233.00	100.00

Table 3.3 : Total Area Under Cultivation of the Same Cultivators in Khirode for All the Four Years (1960-61 to 1963-64)

	Area in Acres			
	1960-61	1961-62	1962-63	1963-64
Total net cropped area	273.85	279.50	292.50	284.17
Of which:				
Leased-in	1.18	6.83	19.83	15.90
Purchased	-	-	-	4.81
Leased-out	-	-	1.08	5.33
Sold	-	-	-	2.80
Total area under cultivation of the same cultivators for all the four years	263.46	263.46	263.46	263.46

Table 3.4 : Total Area Under Cultivation of the Same Cultivators in Vivare for All the Four Years (1960-61 to 1963-64)

	Area in Acres			
	1960-61	1961-62	1962-63	1963-64
Total net cropped area	245.26	245.26	245.26	233.00
Of which :				
Given in exchange	-	-	-	1.50
Taken in exchange	-	-	-	1.45
Leased-out	-	-	-	5.78
Sold	-	-	-	6.43
Total area under cultivation of the same cultivators for all the four years	231.55	231.55	231.55	231.55

between 1.18 and 20.91 acres in Khirode and between 1.45 and 13.71 acres in Vivare. For convenience, this area has been excluded from the total net cropped area reported in each year; and only the total area which was under cultivation of the sample cultivators for the entire period of the four years is considered for further analysis. The transactions of sale and purchase, and leasing-in and leasing-out of land are, no doubt, important factors which affect the crop-pattern on the individual holding, but we will deal with these at a later stage.

The total net cultivated area which was under the cultivation of the same cultivators for all the four years, was 263.46 acres in Khirode and 231.55 acres in Vivare. The crop-pattern followed on this land by the sample cultivators in the two villages, is presented in Tables 3.5 and 3.6. The year to year fluctuations of the areas under different crops in the two villages are shown in Graphs 3.1 and 3.2. As pointed out earlier, in both the dry villages, jowar, groundnut and cotton were the three major crops occupying more than three-fourths of the total cultivated land every year. In the graphs, therefore, the movements of the areas under these three crops only are depicted. The Graph 3.1 clearly reveals that in Khirode there was an inverse relationship between the area of groundnut on one side and the areas of cotton and jowar on the other. Thus, whenever the area under groundnut went up the areas of jowar and cotton declined and vice versa. The areas under cotton and jowar, however, moved in the same direction every year. There was a direct relationship between these two crops. When there was

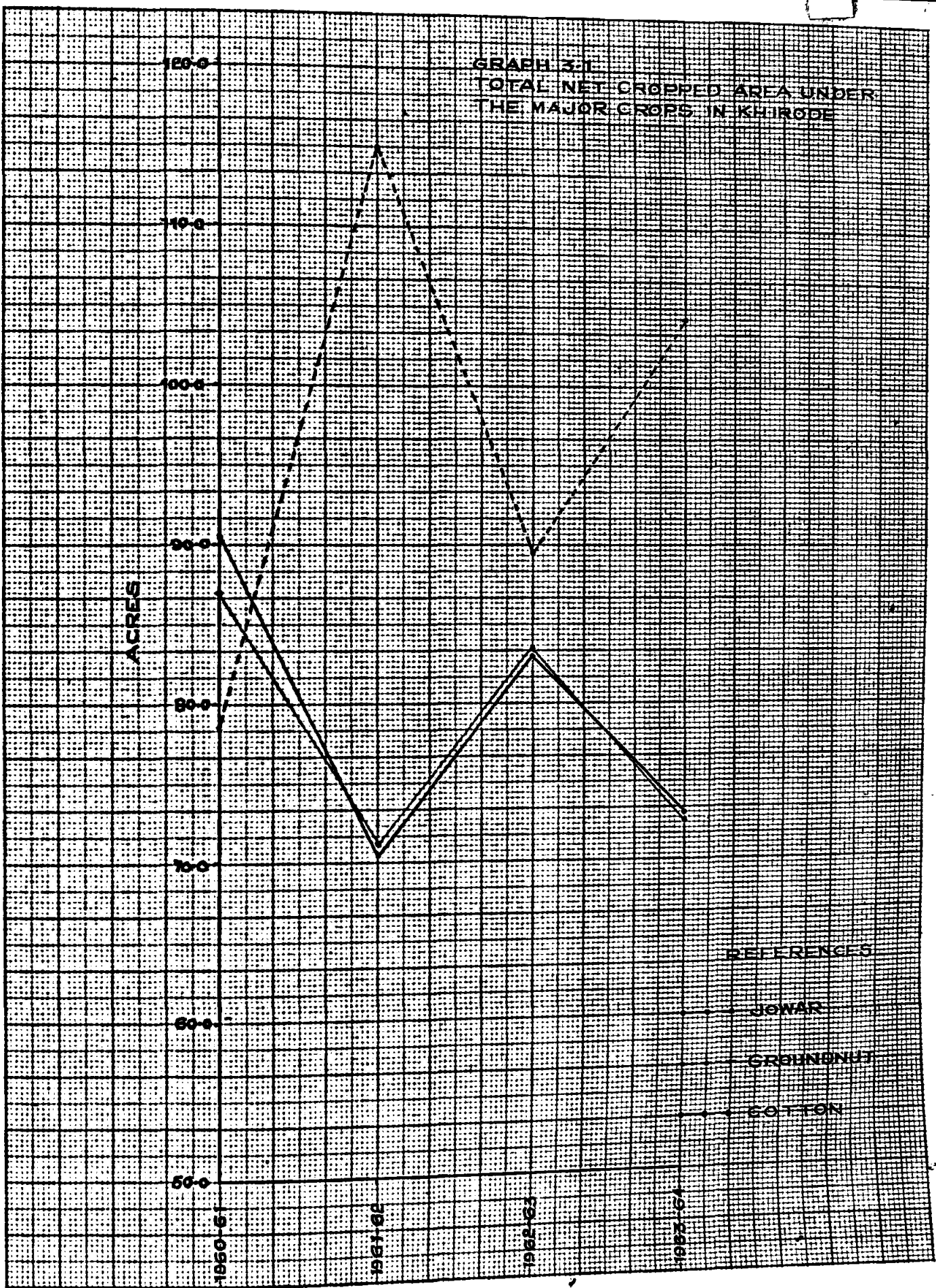
Table 3.5 : Cropping Pattern Followed by the Cultivators in Khirode, on the Area which was under Their Possession for All the Four Years (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Jowar	90.46	34.34	70.63	26.81	83.08	31.53	73.11	27.75
Cotton	87.28	33.13	70.91	26.92	83.40	31.66	72.88	27.66
Groundnut	78.28	29.71	114.91	43.61	89.37	33.92	104.71	39.74
Bajara	4.45	1.69	4.45	1.69	6.68	2.54	4.45	1.69
Wheat	1.63	0.62	1.63	0.62	-	-	3.40	1.29
Paddy	0.93	0.35	0.93	0.35	0.93	0.35	0.93	0.35
Mug	0.43	0.16	-	-	-	-	-	-
Chillies	-	-	-	-	-	-	0.33	0.13
'Nawati' banana	-	-	-	-	-	-	3.65	1.39
Total net cropped area	263.46	100.00	263.46	100.00	263.46	100.00	263.46	100.00

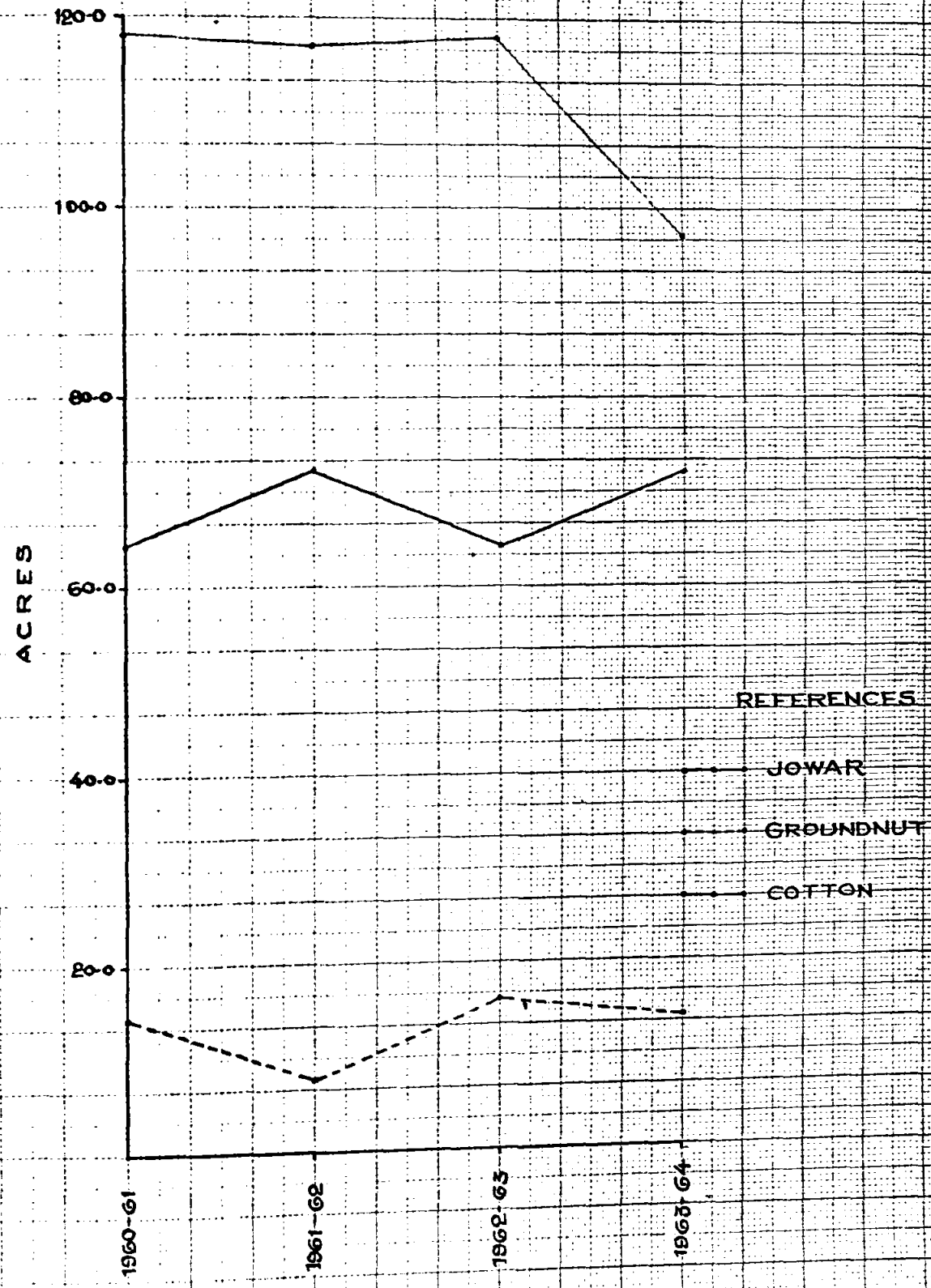
Table 3.6 : Cropping Pattern Followed by the Cultivators in Vivare on the Area which was under Their Possession for All the Four Years (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Jowar	64.56	27.29	72.54	30.74	64.21	27.00	72.04	30.74
Cotton	118.15	49.93	117.66	49.88	118.20	49.72	97.49	41.61
Groundnut	14.80	6.26	7.19	3.05	15.96	6.71	14.44	6.16
Bajara	1.00	0.42	-	-	-	-	-	-
Wheat	34.19	14.45	33.06	14.01	32.58	13.70	42.40	18.09
Paddy	-	-	1.00	0.42	1.00	0.42	-	-
Mug	3.80	1.61	4.40	1.86	5.73	2.41	2.80	1.19
Chillies	0.10	0.04	0.10	0.04	0.10	0.04	-	-
'Nawati' banana	-	-	-	-	-	-	5.18	2.21
Total gross cropped area	236.60	100.00	235.95	100.00	237.78	100.00	234.35	100.00
Total double cropped area	5.05	2.18	4.40	1.90	6.23	2.69	2.80	1.21
Total net cropped area	231.55	100.00	231.55	100.00	231.55	100.00	231.55	100.00

GRAPH 3-1
TOTAL NET CROPPED AREA UNDER
THE MAJOR CROPS IN KHIRODE



GRAPH 3-2
TOTAL NET CROPPED AREA UNDER
THE MAJOR CROPS IN VIVRE



an increase in the area under jowar, the area under cotton also rose; and when the area under jowar fell, the area under cotton also decreased. The proportion of increase or decrease in the areas of both the crops, however, were different. (See Graph 3.1.) In Vivare, the relations between the different major crops were not so distinctly seen. In this village, the areas under the three major crops moved on three different levels and were related to one another, though their relationship was rather complicated and not as direct as noticed in the case of Khirode. Thus, in 1961-62, the area under jowar increased mainly at the cost of groundnut. In 1962-63, the area under groundnut went up, causing a fall in the area under jowar. The area under cotton remained almost constant in this year. In 1963-64, however, the area under jowar went up mainly at the cost of cotton, which lost considerable of its area. The variations in the areas under different crops were thus inter-related in both the villages.

3.2. Area Under Crop-Rotations

The relationships between the different crops depicted in the two graphs, clearly indicated that the fluctuations in their areas were largely rotational. Because of the various types of crop-rotations followed by the sample cultivators on the fragments and plots of their holdings, the areas under different crops changed from year to year. It was evident from the data, that a large portion of the net cropped area in both the dry villages, was under the accepted crop-rotations. In Khirode, it was always more than 200 acres or 80 per cent of the total; while in Vivare, it was always above 155 acres or 68 per cent.

Of this, the area which was continuously under the crop-rotations for all the four years was 183.53 acres in Khirode and 120.20 acres in Vivare. The rest of the rotated area was not under the accepted crop-rotations, for the entire period of four years, but deviations occurred on it for once or more during the four years. In this chapter, only the area which was under the accepted rotations for the entire period is considered in order to point out how the crop-rotations themselves caused variations in the areas under different crops.

The total area which was continuously under the rotations for the entire period, could be further classified according to the major kinds of crop-rotations practised by the cultivators. In Khirode, two kinds of major rotations--two and three-year rotations--were practised. The total area under the two-year rotations was considerably large--131.76 acres or 72 per cent of the total rotated area. The three-year rotations claimed the remaining area of 51.77 acres or 28 per cent. (See Table 3.7.) In the two kinds of rotations, there were different types, which are listed along with their areas in Table 3.7. Among the two-year rotations practised, the rotations of G-J and G-C were predominant and claimed the major portion (85.10 per cent) of the total area under the two-year rotations. The other two types of the two-year rotations (C-J and B-J), were minor, having a very low proportion of the total area. In the case of the three-year rotations, the rotation of G-C-J, was the major one, claiming about 67.39 per cent of the total area under the three-year rotations. It was followed by the rotation of G-J-C.

Table 3.7 : The Area Which Was Under the Rotations in Khirode for the Entire Period of Four Years (1960-61 to 1963-64)

Rotation	No. of Plots	Area in Acres	Percentage to total area
Two-year rotation:			
Groundnut-Jowar	28	52.03	39.49
Groundnut-Cotton	19	60.09	45.61
Cotton-Jowar	7	13.14	9.97
Bajara-Jowar	2	6.50	4.93
Total	56	131.76	71.79
Three-year rotation:			
Groundnut-Cotton-Jowar	14	34.89	67.39
Groundnut-Jowar-Cotton	5	13.28	25.65
Groundnut-Cotton-Bajara	3	3.60	6.95
Total	22	51.77	28.21
Grand Total	78	183.53	100.00

The third type of the three-year rotation of G-J-B was rarely practised. In Khirode it was practised by a big cultivator, who generally grew bajara every year to meet the fodder requirements of his livestock.

In Vivare, three kinds of rotations--two, three and four-year rotations--were reported. All the three types of rotations were commonly practised by the sample cultivators. However,

among the three types, the four and two-year rotations appeared to be more common with them. The land in the village being very fertile, cotton could be grown repeatedly for two to three years, and hence the cultivators preferred the four-year rotations to other types. The four-year rotations, therefore, claimed the largest area--42.70 acres or about 35.52 per cent of the total rotated area. It was closely followed by the two-year rotations, which had under them about 40.89 acres or about 34.02 per cent of the total. The three-year rotations had 36.61 acres or about 30.46 per cent of the total. (See Table 3.8.) It can be seen

Table 3.8 : The area Which Was Under the Rotations in Vivare for the Entire Period of Four Years (1960-61 to 1963-64)

Rotation	No. of Plots	Area in Acres	Percentage to total area
Two-year rotation:			
Groundnut-Jowar	5	6.16	15.06
Groundnut-Cotton	1	0.50	1.22
Cotton-Jowar	19	23.85	58.34
Cotton-Wheat	5	9.63	23.55
Jowar-Wheat	1	0.75	1.83
Total	31	40.89	34.02
Three-year rotation:			
Groundnut-Cotton-Jowar	3	4.36	11.91
Wheat-Cotton-Jowar	5	17.06	46.60
Cotton-Cotton-Jowar	9	14.01	38.27
Cotton-Cotton-Wheat	1	1.18	3.22
Total	18	36.61	30.46
Four-year rotation:			
Cotton-Cotton-Cotton-Jowar	2	2.91	6.81
Cotton-Cotton-Jowar-Wheat	8	39.79	93.19
Total	10	42.70	35.52
Grand Total	59	120.20	100.00

from the Table that of the different types of rotations, the C-J rotation among the two-year rotations; the W-C-J rotation among the three-year rotations; and the C-C-J-W rotation among the four-year rotations, were predominant, claiming a larger proportion of the total area under each kind.

The yearly variations in the areas of the different crops caused by the rotations alone are given in Tables 3.9 and 3.10. These variations are cyclical in nature, the area under different crops moving according to the proportion of area and the sequence of the crops included in the rotations. The variations caused by the two and three-year rotations practised in Khirode are shown in Table 3.9. At the end of the table is given the combined effect of these two kinds of rotations. These variations in the rotated area under different crops are plotted in Graphs 3.3, 3.4 and 3.5. From Graph 3.3 it may be seen that the two-year rotations caused comparatively wider variations in the areas of jowar and groundnut than in that of cotton. The area under cotton varied within a narrow range of 33 to 40 acres. It may be noted that in every alternate year the areas under the three crops came very close to one another, and in the next year, they moved widely apart with a high increase in the area of groundnut at the cost of both cotton and jowar. Another point to be noted is that the area under groundnut moved always on a higher level than that of cotton and jowar. This was because in the first two types of the two-year rotations, which claimed the major portion of the two-year rotated area, groundnut was the common crop, rotated both with cotton and jowar. The area of groundnut,

Table 3.9 : Area under Different Rotations and Variations in Areas under Different Crops in Khirode (1960-61 to 1963-64) (Area in Acres)

Rotation	No. of Plots	1960-61				1961-62				1962-63				1963-64				Total area
		J	G	C	B	J	G	C	B	J	G	C	B	J	G	C	B	
Two-year rotation:																		
Groundnut-Jowar																		
Groundnut in 1960-61	10	-	18.44	-	-	18.44	-	-	-	-	18.44	-	-	18.44	-	-	-	18.44
Jowar in 1960-61	18	33.59	-	-	-	-	33.59	-	-	33.59	-	-	-	-	33.59	-	-	33.59
Groundnut-Cotton																		
Groundnut in 1960-61	10	-	25.87	-	-	-	-	25.87	-	-	25.87	-	-	-	-	25.87	-	25.87
Cotton in 1960-61	9	-	-	34.22	-	-	34.22	-	-	-	-	34.22	-	-	34.22	-	-	34.22
Cotton-Jowar																		
Cotton in 1960-61	4	-	-	6.00	-	6.00	-	-	-	-	-	6.00	-	6.00	-	-	-	6.00
Jowar in 1960-61	3	7.14	-	-	-	-	-	7.14	-	7.14	-	-	-	-	-	7.14	-	7.14
Bajara-Jowar																		
Bajara in 1960-61	1	-	-	-	3.25	3.25	-	-	-	-	-	-	3.25	3.25	-	-	-	3.25
Jowar in 1960-61	1	3.25	-	-	-	-	-	-	3.25	3.25	-	-	-	-	-	-	3.25	3.25
Total	56	43.98	44.31	40.22	3.25	27.69	67.81	33.01	3.25	43.98	44.31	40.22	3.25	27.69	67.81	33.01	3.25	131.76
Three-year rotation:																		
Groundnut-Cotton-Jowar																		
Groundnut in 1960-61	3	-	8.03	-	-	-	-	8.03	-	8.03	-	-	-	-	8.03	-	-	8.03
Cotton in 1960-61	6	-	-	14.80	-	14.80	-	-	-	-	14.80	-	-	-	-	14.80	-	14.80
Jowar in 1960-61	5	12.06	-	-	-	-	12.06	-	-	-	-	12.06	-	12.06	-	-	-	-
Groundnut-Jowar-Cotton																		
Groundnut in 1960-61	1	-	0.93	-	-	0.93	-	-	-	-	-	0.93	-	-	0.93	-	-	0.93
Jowar in 1960-61	1	3.75	-	-	-	-	-	3.75	-	8.60	3.75	-	-	3.75	-	8.60	-	3.75
Cotton in 1960-61	3	-	-	8.60	-	-	8.60	-	-	8.60	-	-	-	-	-	-	-	8.60
Groundnut-Cotton-Bajara																		
Groundnut in 1960-61	1	-	1.20	-	-	-	-	1.20	-	-	-	-	1.20	-	1.20	-	-	1.20
Cotton in 1960-61	1	-	-	1.20	-	-	1.20	-	1.20	-	-	1.20	-	-	-	-	1.20	1.20
Bajara in 1960-61	1	-	-	-	1.20	-	1.20	-	-	-	-	-	-	-	-	-	1.20	1.20
Total	22	15.81	10.16	24.60	1.20	15.73	21.86	12.98	1.20	16.63	19.75	14.19	1.20	15.81	10.16	24.60	1.20	51.77
Grand Total	78	59.79	54.47	64.82	4.45	43.42	89.67	45.99	4.45	60.61	64.06	54.41	4.45	43.50	77.97	57.61	4.45	183.53

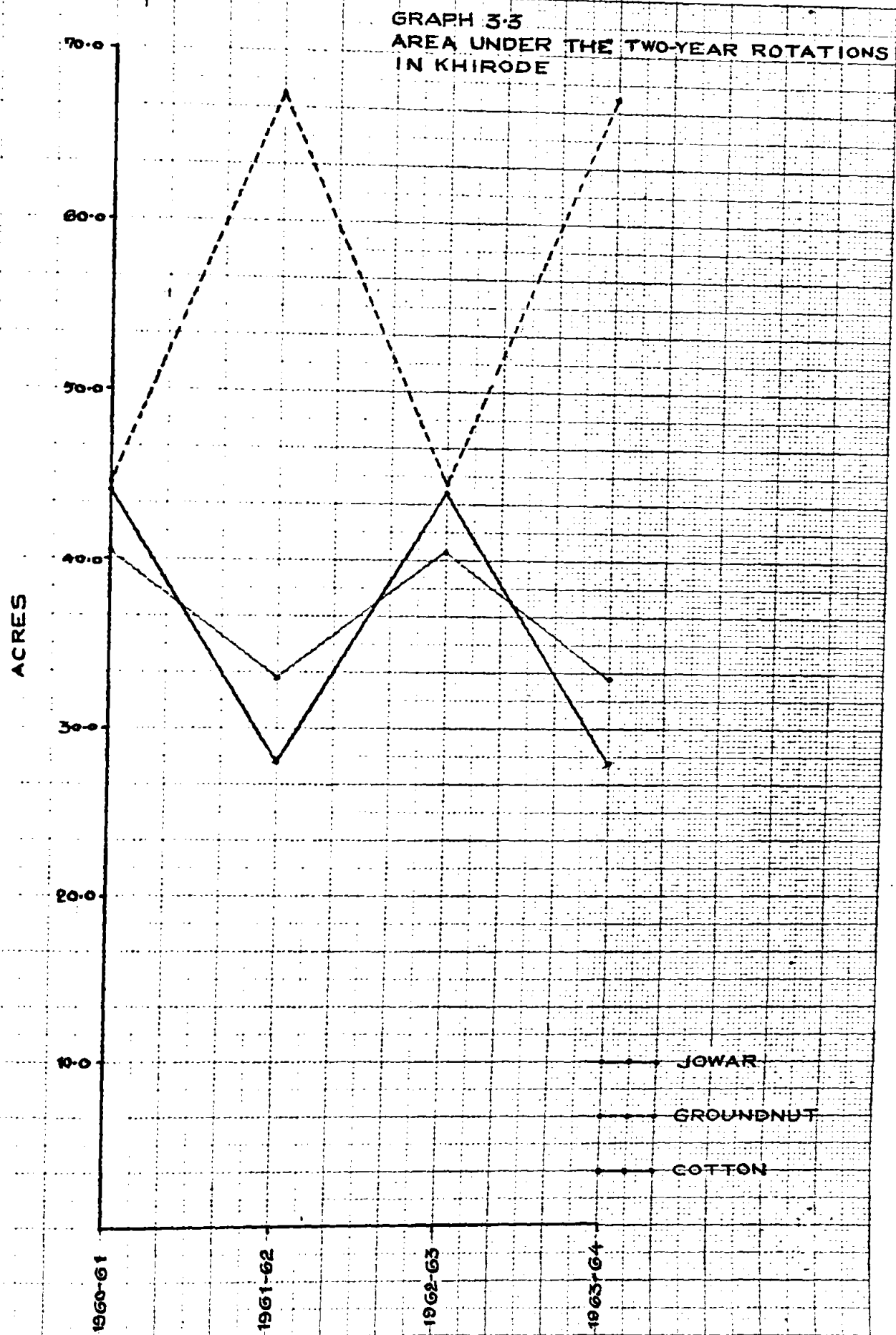
Table 3.10 : Area under Different Rotations and Variations in Areas under Different Crops in Vivare (1960-61 to 1963-64) (Area in Acres)

Rotation	No. of Plots	1960-61				1961-62				1962-63				1963-64				Total area
		J	G	C	W	J	G	C	W	J	G	C	W	J	G	C	W	
Two-year rotation:																		
Groundnut-Jowar																		
Groundnut in 1960-61	3	-	3.38	-	-	3.38	-	-	-	-	3.38	-	-	3.38	-	-	-	3.38
Jowar in 1960-61	2	2.78	-	-	-	-	2.78	-	-	2.78	-	-	-	-	2.78	-	-	2.78
Groundnut-Cotton																		
Groundnut in 1960-61	1	-	0.50	-	-	-	-	0.50	-	-	0.50	-	-	-	-	0.50	-	0.50
Cotton-Jowar																		
Cotton in 1960-61	12	-	-	15.31	-	15.31	-	-	-	-	-	15.31	-	15.31	-	-	-	15.31
Jowar in 1960-61	7	8.54	-	-	-	-	-	8.54	-	8.54	-	-	-	-	-	8.54	-	8.54
Cotton-Wheat																		
Cotton in 1960-61	1	-	-	2.68	-	-	-	-	2.68	-	-	2.68	-	-	-	-	2.68	2.68
Wheat in 1960-61	4	-	-	-	6.95	-	-	6.95	-	-	-	-	6.95	-	-	6.95	-	6.95
Jowar-Wheat																		
Jowar in 1960-61	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wheat in 1960-61	1	0.75	-	-	-	-	-	-	0.75	0.75	-	-	-	-	-	-	0.75	0.75
Total	31	12.07	3.88	17.99	6.95	18.69	2.78	15.99	3.43	12.07	3.88	17.99	6.95	18.69	2.78	15.99	3.43	40.89
Three-year rotation:																		
Groundnut-Cotton-Jowar																		
Cotton in 1960-61	3	-	-	4.36	-	4.36	-	-	-	-	4.36	-	-	-	-	4.36	-	4.36
Wheat-Cotton-Jowar																		
Wheat in 1960-61	2	-	-	-	9.88	-	-	9.88	-	9.88	-	-	-	-	-	-	9.88	9.88
Cotton in 1960-61	2	-	-	4.28	-	4.28	-	-	-	-	-	4.28	-	-	-	4.28	-	4.28
Jowar in 1960-61	1	2.90	-	-	-	-	-	-	2.90	-	-	2.90	-	2.90	-	-	-	2.90
Cotton-Cotton-Jowar																		
Cotton in 1960-61	2	-	-	2.33	-	-	-	2.33	-	2.33	-	-	-	-	-	2.33	-	2.33
Cotton in 1960-61	3	-	-	5.10	-	5.10	-	-	-	-	-	5.10	-	-	-	5.10	-	5.10
Jowar in 1960-61	4	6.58	-	-	-	-	-	6.58	-	-	-	6.58	-	6.58	-	-	-	6.58

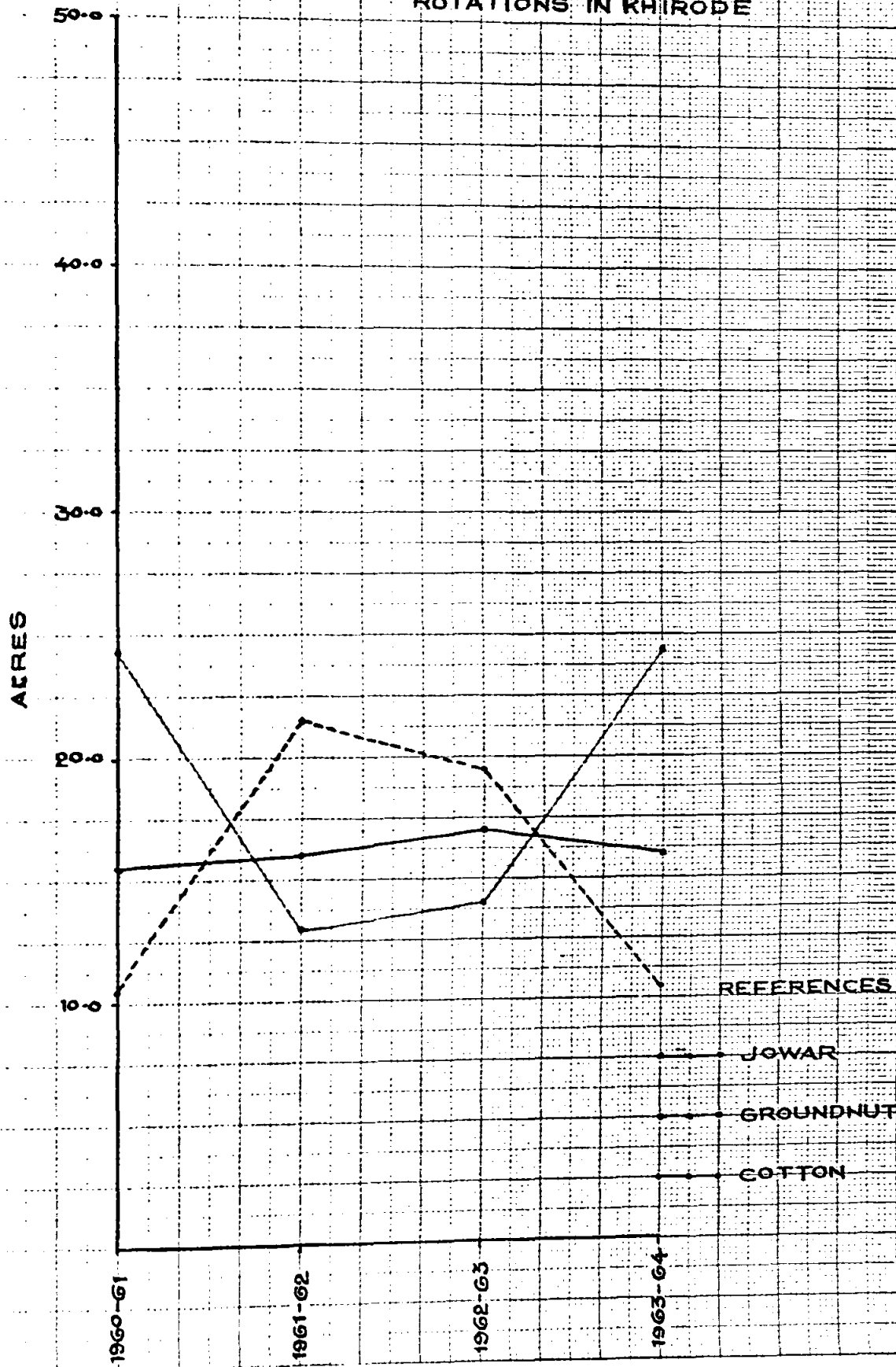
(continued)

Table 3.10 : (continued)

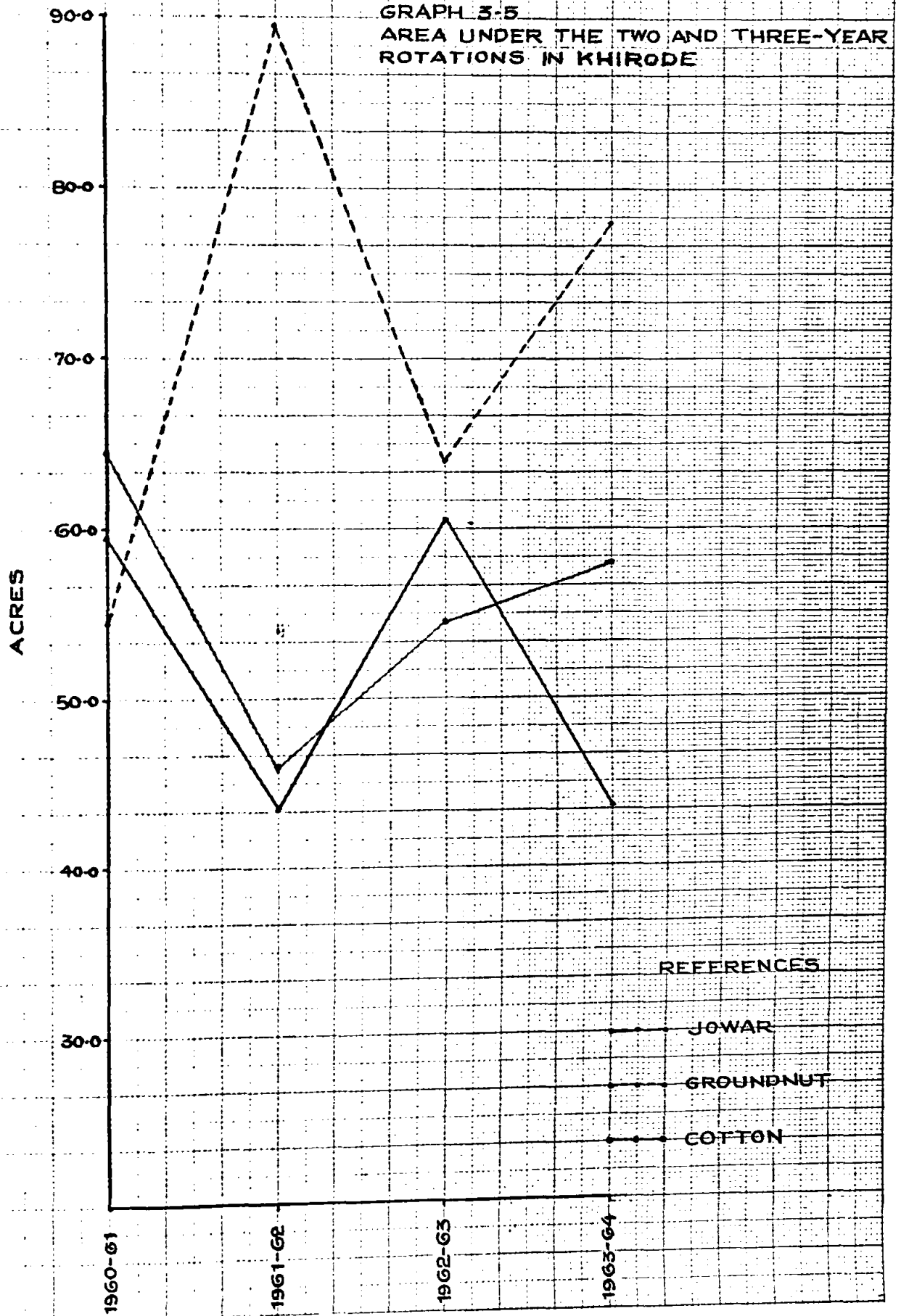
Rotation	No. of Plots	1960-61				1961-62				1962-63				1963-64				Total area	
		J	G	C	W	J	G	C	W	J	G	C	W	J	G	C	W		
Three-year rotation: (continued)																			
Cotton-Cotton-Wheat																			
Cotton in 1960-61	1	-	-	1.18	-	-	-	-	1.18	-	-	-	1.18	-	-	-	1.18	-	1.18
Total	18	9.48	-	17.25	9.88	13.74	-	18.79	4.08	12.21	4.36	15.76	4.28	9.48	-	17.25	9.88	36.61	
Four-year rotation:																			
Cotton-Cotton-Cotton-Jowar																			
Cotton in 1960-61	2	-	-	2.91	-	-	-	2.91	-	-	-	2.91	-	2.91	-	-	-	2.91	
Cotton-Cotton-Jowar-Wheat																			
Cotton in 1960-61	2	-	-	10.38	-	-	-	10.38	-	10.38	-	-	-	-	-	-	10.38	10.38	
Cotton in 1960-61	2	-	-	10.41	-	10.41	-	-	-	-	-	10.41	-	-	-	10.41	-	10.41	
Jowar in 1960-61	3	12.75	-	-	-	-	-	-	12.75	-	-	12.75	-	-	-	12.75	-	12.75	
Wheat in 1960-61	1	-	-	-	6.25	-	-	6.25	-	-	-	6.25	-	6.25	-	-	-	6.25	
Total	10	12.75	-	23.70	6.25	10.41	-	19.54	12.75	10.38	-	21.91	10.41	9.16	-	23.16	10.38	42.70	
Grand Total	59	34.30	3.88	58.94	23.08	42.84	2.78	54.32	20.26	34.66	8.24	55.66	21.64	37.33	2.78	56.40	23.69	120.20	



GRAPH 3-4
 AREA UNDER THE THREE-YEAR
 ROTATIONS IN KHIRODE



GRAPH 3-5
AREA UNDER THE TWO AND THREE-YEAR
ROTATIONS IN KHIRODE



therefore, shot up when by rotation, the areas of cotton and jowar taken in the preceding year came under it. When the area of groundnut fell, the areas under each of the other two crops increased, but not to the same extent as the groundnut area got divided between them.

In the case of the three-year rotated area we find that there were rather large variations in the areas of groundnut and cotton, while the area under jowar was almost constant during all the four years (see Graph 3.4). In the year 1963-64, the three year cycle of the crop-rotations completed one round and the areas under the three crops reached their corresponding points as in 1960-61. The area under cotton reached its highest point, claiming nearly half of the total area and the areas of groundnut and jowar sank to their lowest points. It may be pointed out that in the first year of the rotation (1961-62) the areas under groundnut and jowar increased at the cost of cotton; in the second year (1962-63) the areas under cotton and jowar moved up at the cost of groundnut; and in the third year (1963-64) the area of cotton alone went up at the cost of both groundnut and jowar (see Graph 3.4). This was because of the basic differences in the proportion of the areas reported under each of the three crops rotated and their sequence in the different types of the three-year rotations.

In Graph 3.5, the variations caused by both two and three-year rotations taken together are plotted. The fluctuations in the areas of the three crops were largely due to the two-year rotations as these commanded more than 70 per cent of the total

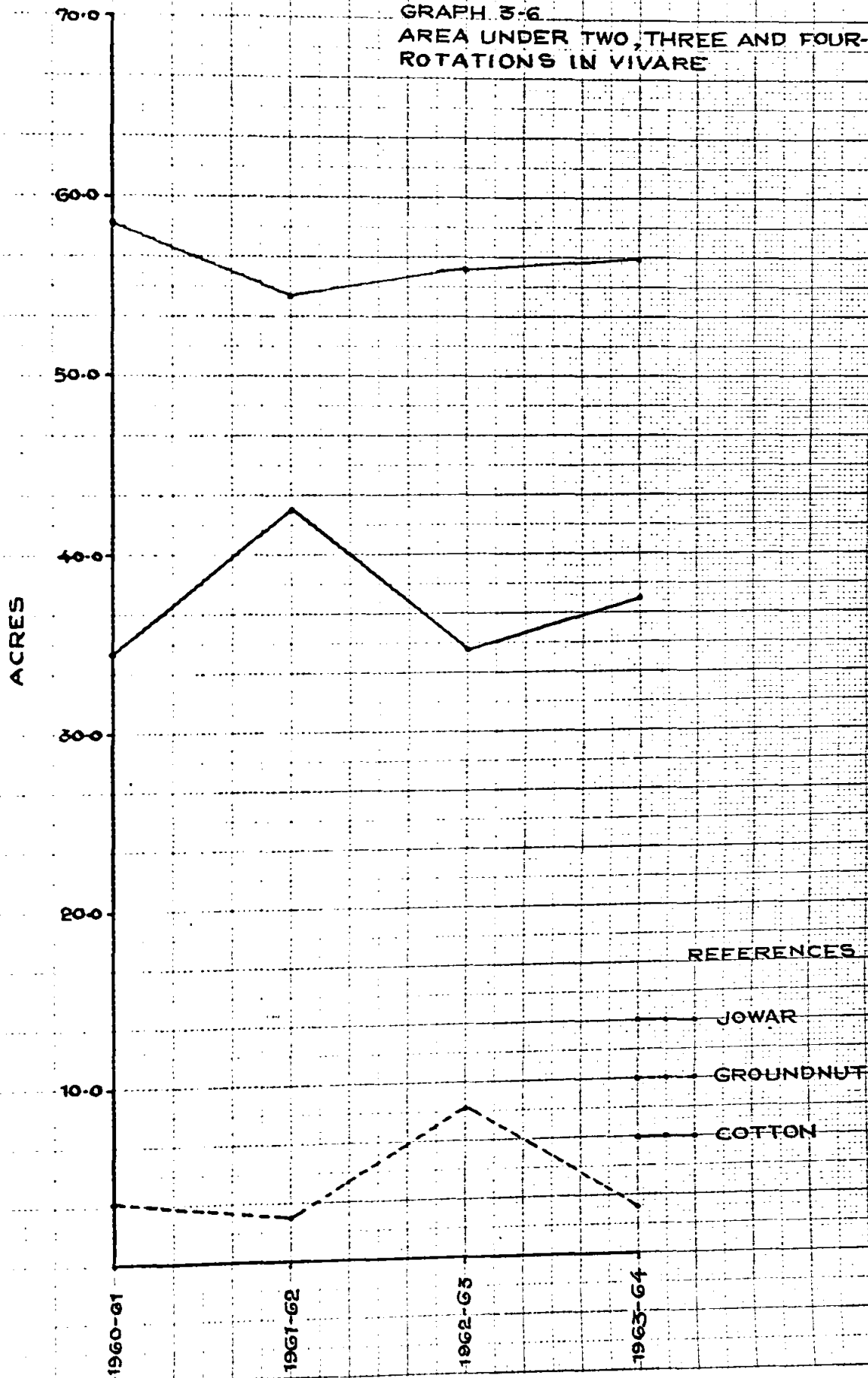
rotated area. In the year 1960-61 the division of the total rotated area between the three crops was most even. In the second year (1961-62), however, they went widely apart, the area under groundnut rising high at the cost of both jowar and cotton. The rise in the area of groundnut was largely due to the first two types of the two-year rotations, where it was rotated with both cotton and jowar. The fall in the area of jowar in this year was larger than that of cotton. It was also largely caused by the two-year rotations. The fall in the area of cotton, however, was largely due to the three-year rotations. In the third year (1962-63), the areas of jowar and cotton moved up at the cost of groundnut. This was again largely due to the two-year rotations. In the fourth year (1963-64), the areas of groundnut and cotton increased by pushing down the area of jowar. The rise in the area of groundnut was mainly due to the two-year rotations. In the case of cotton, however, the improvement was largely caused by the three-year rotations. The fluctuations in the areas under the three crops narrow down from year to year and in the seventh year, these will come very close to one another as in 1960-61.

The variations caused by the three kinds of the rotations followed in Vivare are shown in Table 3.10. The total effect of all these rotations is given at the end of the table. These variations caused by each kind of rotations are of the same nature as we saw in the case of Khirode, and hence are not depicted in separate graphs. As pointed out earlier, cotton and jowar were the two dominating crops in this village. Wheat

claimed somewhat larger area and occupied the third place. Because of the heavy black-soil in the village, groundnut had an insignificant area under it. It can be seen from the table that the two-year rotations caused wider variations in the areas under cotton and jowar. The areas of these two crops were almost interchangeable. This was largely because, the two-year rotation of C-J was more common with the sample cultivators and commanded the largest area (58.34 per cent of the total) under it. The variations in the areas of the two crops were partly because of the difference in the areas under these two crops at the starting point in the year 1960-61. The two-year rotation of C-W was responsible in keeping the area of cotton on a higher level. In the case of the three-year rotations also cotton and jowar claimed larger areas. Cotton moved always on a higher plane than jowar. This was because it was included in all the types of the three-year rotations, some of them having cotton even for two continuous years. Similar was the case with the area under different crops taken according to the four-year rotations. As cotton was repeatedly taken in these types of rotations, its area was always higher than that of the other crops.

The total effect of the three kinds of the rotations is presented in Graph 3.6. It can be seen from the graph that the areas under the major crops moved on different levels. Of the major crops, cotton was always on the higher plane than all the other crops. It varied between 54.32 acres in 1961-62 and 58.94 acres in the year 1960-61. This was because cotton was included in most of the rotation types of all the three kinds of

GRAPH 3-6
AREA UNDER TWO, THREE AND FOUR-YEAR
ROTATIONS IN VIVARE



rotations. It was included in nine rotation types out of eleven. In four of the rotation types it was repeatedly grown for two or three years. The area under cotton, therefore, always remained high every year than that of the other crops. Cotton was distantly followed by jowar. The area under jowar varied between 34.30 acres in 1960-61 and 42.84 acres in 1961-62. Jowar was included in eight of the eleven rotation types. However, in no rotation it was repeatedly grown for more than one year. The variations in the area under jowar were comparatively wider than that of cotton and the other crops. It can be seen from the graph that there was inverse type of relationship between cotton and jowar except in the year 1963-64. Thus, in the first three years, whenever there was a fall in the area of cotton, there was a rise in the area of jowar and vice versa. The proportions of rise and fall in the areas of the two crops, however, were different. The areas under the other two crops--wheat and groundnut--were minor and the variations in them were also not wide.

3.3. Variations in the Total and the Rotated Areas Under Different Crops

In both the dry villages, the variations in the total areas under different crops were largely caused by the crop-rotations practised by the sample cultivators. This is evident from Graphs 3.1 and 3.5 of Khirode; and 3.2 and 3.6 of Vivare. These graphs clearly show that the movements of the total areas under the major crops were similar to those of the rotated areas.

3.4. Crop Pattern of the Sample Cultivators in the Irrigated Villages

The crop-pattern followed by the sample cultivators in the two irrigated villages is given in Tables 3.11 and 3.12. It can be seen from these tables that the total net cropped area in both the villages varied from year to year. In Waghode, it varied from 297.68 acres in 1963-64 to 332.30 acres in 1960-61; and in Rozode, from 244.75 acres in 1962-63 to 259.82 acres in 1961-62. In Tables 3.13 to 3.16 the crop-patterns followed on the irrigated and the dry lands in each village are presented separately. The tables reveal that the variations in the total net cropped areas were large because of the variations in the irrigated land. The area variations in the total dry land were negligible in both the villages.

As it was observed in the case of the cultivators in the dry villages, the variations in the total net cropped area of the sample cultivators in the irrigated villages also, were due to leasing-in and leasing-out and purchase and sale of land in the four years. In Tables 3.17 and 3.18 is given the extent of such area cultivated by the sample cultivators in each village. The information about the crops grown on this area during all the four years could not be gathered for obvious reasons. For convenience, therefore, we consider only the total net cropped area which was with the sample cultivators for all the four years. A major exception to this, however, was of the area leased-out, specifically for banana cultivation. It was observed that in both the irrigated villages, the practice of leasing-out land

Table 3.11 : Cropping Pattern Followed by the Selected Cultivators in Waghode in the Four-Year Period (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Jowar	101.27	30.48	75.65	24.22	72.31	21.74	59.29	19.58
Cotton	84.71	25.49	86.81	27.78	106.92	32.14	112.29	37.09
Groundnut	22.68	6.83	18.67	5.98	20.33	6.11	16.81	5.55
'Nawati' banana	49.75	14.97	42.43	13.58	37.31	11.22	40.07	13.23
'Junar' banana	28.31	8.52	49.75	15.92	41.23	12.40	36.31	11.99
Wheat	21.02	6.33	10.28	3.29	20.43	6.14	8.76	2.89
Paddy	1.50	0.45	2.80	0.90	2.47	0.74	1.25	0.41
Mug	-	-	0.83	0.27	-	-	2.86	0.94
Udid	-	-	-	-	1.49	0.45	-	-
Gram	-	-	1.30	0.42	5.50	1.65	0.25	0.08
Chillies	0.68	0.20	-	-	-	-	3.45	1.14
Sugarcane	3.13	0.94	4.63	1.48	5.38	1.62	2.25	0.74
Oranges	15.75	4.74	15.75	5.04	15.75	4.74	15.75	5.20
Lemons	3.00	0.90	3.00	0.96	3.00	0.90	3.00	0.99
Lucerne	0.50	0.15	0.50	0.16	0.50	0.15	0.50	0.17
Total gross cropped area	332.30	100.00	312.40	100.00	332.62	100.00	302.84	100.00
Total double cropped area	-	-	2.13	0.69	5.75	1.76	5.16	1.73
Total net cropped area	332.30	100.00	310.27	100.00	326.87	100.00	297.68	100.00

Table 3.12 : Cropping Pattern Followed by the Selected Cultivators in Rozode in the Four-Year Period (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Jowar	96.04	35.50	71.53	26.46	76.10	29.63	73.43	29.46
Cotton	41.70	15.42	30.27	11.19	32.03	12.48	56.90	22.83
Groundnut	49.55	18.32	80.24	29.68	72.95	28.41	61.55	24.69
'Nawati' banana	32.16	11.89	25.83	9.55	25.45	9.91	23.69	9.50
'Junar' banana	24.65	9.11	32.16	11.89	29.77	11.60	25.45	10.21
Wheat	12.55	4.64	14.91	5.51	11.01	4.29	2.98	1.20
Maize	2.95	1.09	4.93	1.82	2.28	0.89	2.15	0.86
Bajara	0.98	0.36	4.48	1.66	0.48	0.19	-	-
Paddy	0.35	0.13	0.10	0.04	0.48	0.19	-	-
Mug	0.85	0.31	5.96	2.20	2.71	1.06	2.18	0.87
Udid	7.98	2.95	-	-	2.48	0.97	0.95	0.38
Chillies	0.60	0.22	-	-	0.50	0.19	-	-
Brinjal	0.15	0.06	-	-	0.50	0.19	-	-
Total gross cropped area	270.51	100.00	270.41	100.00	256.74	100.00	249.28	100.00
Total double cropped area	12.55	4.87	10.59	4.08	11.99	4.90	4.13	1.68
Total net cropped area	257.96	100.00	259.82	100.00	244.75	100.00	245.15	100.00

Table 3.13 : Cropping Pattern on the Irrigable Land in Waghode (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percen- tage to total area	Area in acres	Percen- tage to total area	Area in acres	Percen- tage to total area	Area in acres	Percen- tage to total area
Jowar	76.85	28.23	48.04	19.03	40.88	15.00	46.24	17.98
Cotton	62.39	22.91	64.79	25.68	82.08	30.11	85.73	33.33
Groundnut	16.68	6.13	8.28	3.28	13.80	5.06	13.18	5.12
'Nawati' banana	49.75	18.27	42.43	16.81	37.31	13.69	40.07	15.58
'Junar' banana	28.31	10.40	49.75	19.71	41.23	15.12	36.31	14.12
Wheat	13.74	5.05	10.28	4.07	20.43	7.49	6.39	2.48
Paddy	1.50	0.55	2.80	1.11	2.47	0.91	1.25	0.49
Mug	-	-	0.83	0.33	-	-	2.86	1.11
Udid	-	-	-	-	4.27	1.57	-	-
Gram	-	-	1.30	0.52	5.50	2.02	0.25	0.10
Chillies	0.68	0.25	-	-	-	-	3.45	1.34
Sugarcane	3.13	1.15	4.63	1.83	5.38	1.97	2.25	0.87
Oranges	15.75	5.78	15.75	6.24	15.75	5.78	15.75	6.12
Lemons	3.00	1.10	3.00	1.19	3.00	1.10	3.00	1.17
Lucerne	0.50	0.18	0.50	0.20	0.50	0.18	0.50	0.19
Total gross cropped area	272.28	100.00	252.38	100.00	272.60	100.00	257.23	100.00
Total double cropped area	-	-	2.13	0.85	5.75	2.15	5.16	2.05
Total net cropped area	272.28	100.00	250.25	100.00	266.85	100.00	252.07	100.00

Table 3.14 : Cropping Pattern on the Dry Land in Waghode (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Jowar	24.42	40.68	27.61	46.00	31.43	52.36	13.05	28.61
Cotton	22.32	37.19	22.02	36.69	24.84	41.39	28.93	63.43
Groundnut	6.00	10.00	10.39	17.31	3.75	6.25	3.63	7.96
Wheat	7.28	12.13	-	-	-	-	-	-
Total net cropped area	60.02	100.00	60.02	100.00	60.02	100.00	45.61	100.00

Table 3.15 : Cropping Pattern on the Irrigable Land in Rozode
1963-64)

(1960-61 to

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percen- tage to total area	Area in acres	Percen- tage to total area	Area in acres	Percen- tage to total area	Area in acres	Percen- tage to total area
Jowar	31.87	22.25	18.81	13.14	15.80	11.89	17.67	14.09
Cotton	26.50	18.50	27.12	18.95	20.74	15.61	44.65	35.59
Groundnut	1.67	1.17	8.86	6.19	19.34	14.55	5.71	4.55
'Nawati' banana	32.16	22.45	25.83	18.04	25.45	19.15	23.69	18.89
'Junar' banana	24.65	17.21	32.16	22.47	29.77	22.39	25.45	20.29
Wheat	12.55	8.76	14.91	10.41	12.84	9.66	4.13	3.29
Maize	2.95	2.06	4.93	3.44	2.28	1.72	-	-
Bajara	0.98	0.68	4.48	3.13	-	-	-	-
Paddy	0.35	0.24	0.10	0.07	0.48	0.36	-	-
Mug	0.85	0.59	5.96	4.16	2.71	2.04	3.18	2.54
Udid	7.98	5.57	-	-	2.48	1.87	0.95	0.76
Chillies	0.60	0.42	-	-	0.50	0.38	-	-
Brinjal	0.15	0.10	-	-	0.50	0.38	-	-
Total gross cropped area	143.26	100.00	143.16	100.00	132.89	100.00	125.43	100.00
Total double cropped area	12.55	9.60	10.59	7.99	11.99	9.92	4.13	3.40
Total net cropped area	130.71	100.00	132.57	100.00	120.90	100.00	121.30	100.00

Table 3.16 : Cropping Pattern on the Dry Land in Rozode (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Jowar	64.17	50.43	52.72	41.43	58.47	47.21	55.76	45.02
Cotton	11.72	9.21	3.15	2.48	11.29	9.12	12.25	9.89
Groundnut	51.36	40.36	71.38	56.09	53.61	43.29	55.84	45.09
Bajara	-	-	-	-	0.48	0.39	-	-
Total net cropped area	127.25	100.00	127.25	100.00	123.85	100.00	123.85	100.00

Table 3.17 : Total Area Under Cultivation of the Same Cultivators in Waghode for All the Four Years (1960-61 to 1963-64)

	Area in Acres			
	1960-61	1961-62	1962-63	1963-64
Total net cropped area	332.30	310.27	326.87	297.68
Of which:				
Leased-in	34.52	44.94	38.01	2.00
Bought	-	-	-	-
Leased-out	-	-	-	-
Sold	-	-	-	4.88
Total area under cultivation of the same cultivators for all the four years	292.90	260.45	283.98	295.68
Total area leased-out specifically for banana cultivation	61.34	93.79	70.26	58.56
Total area under cultivation of the same cultivators for all the four years	354.24	354.24	354.24	354.24

specifically for banana cultivation was very common. The cultivators who did not have irrigation facility of their own generally followed this practice and leased-out their land specifically for the cultivation of banana, to their neighbouring cultivators having irrigation and other resources. Such cultivators basically practise the cultivation of dry crops only, which they themselves could grow, but whenever irrigation was made available to them, they leased-out the land for banana.

Table 3.18 : Total Area Under Cultivation of the Same Cultivators in Rozode for All the Four Years (1960-61 to 1963-64)

	Area in Acres			
	1960-61	1961-62	1962-63	1963-64
Total net cropped area	257.96	259.82	244.75	245.15
Of which:				
Leased-in	15.24	19.62	13.19	18.94
Bought	-	-	13.58	-
Leased-out	-	-	-	-
Sold	-	-	16.50	-
Total area under cultivation of the same cultivators for all the four years	226.22	223.70	217.98	212.63
Total area leased-out specifically for banana cultivation	21.73	24.25	29.97	35.32
Total area under cultivation of the same cultivators for all the four years	247.95	247.95	247.95	247.95

The leased-out area under banana, therefore, had to be considered in the total net cropped area as it was leased-out for a specific crop (banana) and for a definite period after which it was available to the cultivators for their own cultivation. In Waghode, such areas under banana varied between 58.56 acres in 1963-64 and 93.79 acres in 1961-62. In Rozode, however, the extent of such area was comparatively small. It varied between 21.73 acres in 1960-61 and 35.32 acres in 1963-64. All the area

of such land in each year has been added to the total net cropped area so as to arrive at the grand total of the net cropped land which was with the sample cultivators for all the four years. (See Tables 3.17 and 3.18.) Thus, the total net cropped area which was under the cultivation of the same cultivators for all the four years was 354.24 acres in Waghode and 247.95 acres in Rozode.

The aggregate crop patterns followed by the sample cultivators on the total net cropped areas in both the villages, are presented in Tables 3.19 and 3.20. In both the villages, banana, jowar, cotton and groundnut, were the four major crops. The year to year variations of the areas under these crops are shown in Graphs 3.7 and 3.8. These graphs clearly reveal the inter-relationships between the crops. In Waghode, for example, the area under cotton only increased in 1961-62, when there was fall in the areas of all the other crops--jowar, 'Nawati' banana and groundnut. The rise in the area under cotton was mainly at the cost of these three crops. In the next year (1962-63) there was a rise in the areas of all the crops except 'Nawati' banana. The 'Nawati' banana crop lost a major portion of its area to the other crops. The rise in the area of cotton was comparatively high in this year. In 1963-64, the areas under cotton and 'Nawati' banana increased mainly at the cost of jowar and groundnut. Jowar, however, lost more area than groundnut. It may be noted that the area under cotton continuously increased during all the four years of study. Another point to be noted is that the area under 'Nawati' banana in the first year becomes the

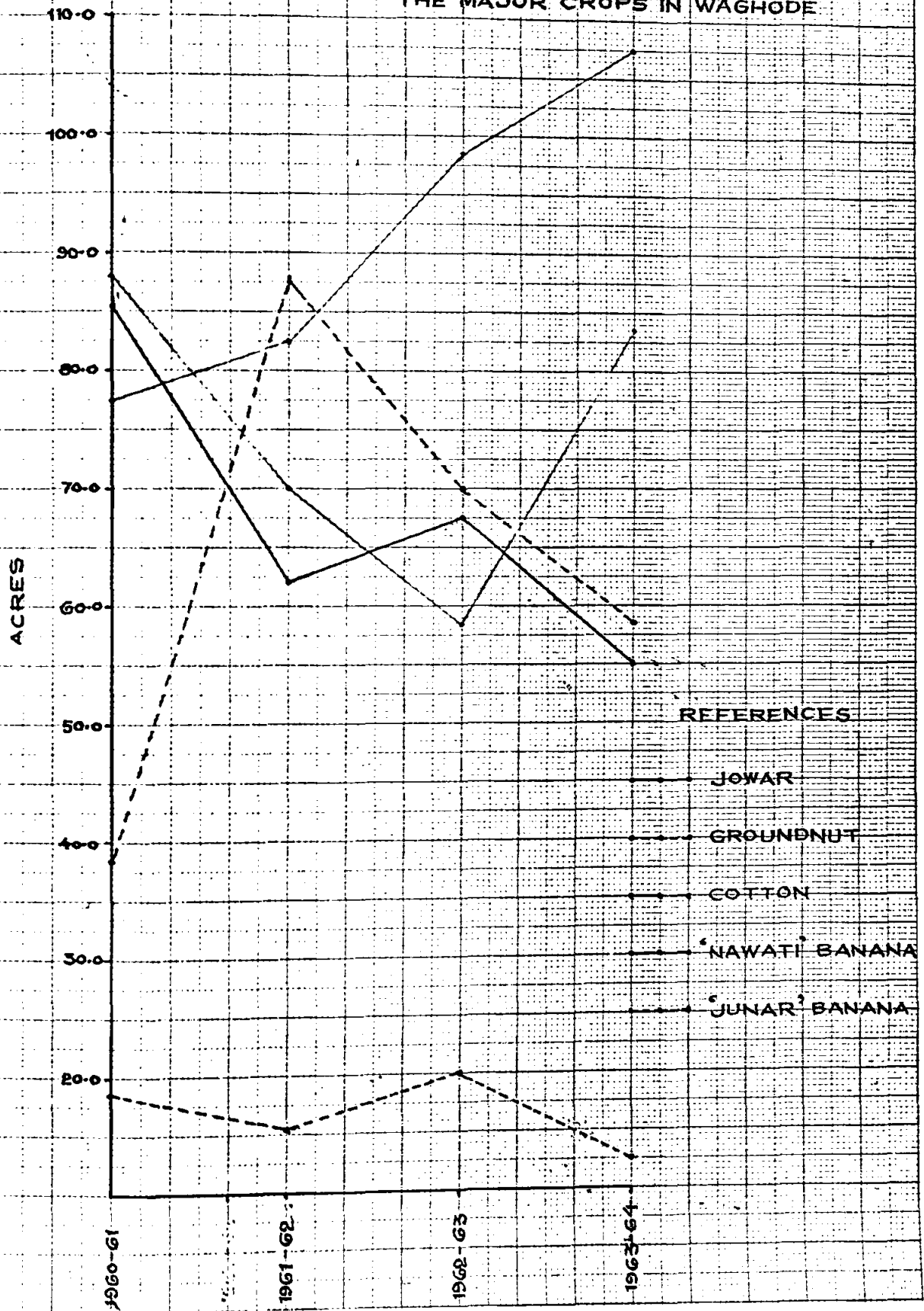
Table 3.19 : Cropping Pattern Followed by the Cultivators in Waghode on the Area which was under Their Possession for all the Four-Years (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Jowar	85.87	24.24	62.04	17.41	67.37	18.71	54.69	15.43
Cotton	77.70	21.93	82.86	23.25	98.51	27.36	107.38	30.30
Groundnut	18.73	5.29	15.42	4.33	20.33	5.65	12.31	3.47
'Nawati' banana	87.92	24.83	70.04	19.65	58.71	16.31	83.33	23.51
'Junar' banana	38.44	10.85	87.92	24.68	70.04	19.46	58.71	16.56
Wheat	21.02	5.93	9.28	2.60	12.18	3.38	8.76	2.47
Paddy	1.50	0.42	2.80	0.79	2.47	0.69	1.25	0.35
Mug	-	-	0.83	0.23	-	-	2.86	0.81
Udid	-	-	-	-	0.50	0.14	-	-
Gram	-	-	1.30	0.36	5.25	1.46	0.25	0.07
Chillies	0.68	0.19	-	-	-	-	3.45	0.97
Sugarcane	3.13	0.88	4.63	1.30	5.38	1.49	2.25	0.63
Oranges	15.75	4.45	15.75	4.42	15.75	4.38	15.75	4.44
Lemons	3.00	0.85	3.00	0.84	3.00	0.83	3.00	0.85
Lucerne	0.50	0.14	0.50	0.14	0.50	0.14	0.50	0.14
Total gross cropped area	354.24	100.00	356.37	100.00	359.99	100.00	354.49	100.00
Total double cropped area	-	-	2.13	0.60	5.75	1.62	0.25	0.07
Total net cropped area	354.24	100.00	354.24	100.00	354.24	100.00	354.24	100.00

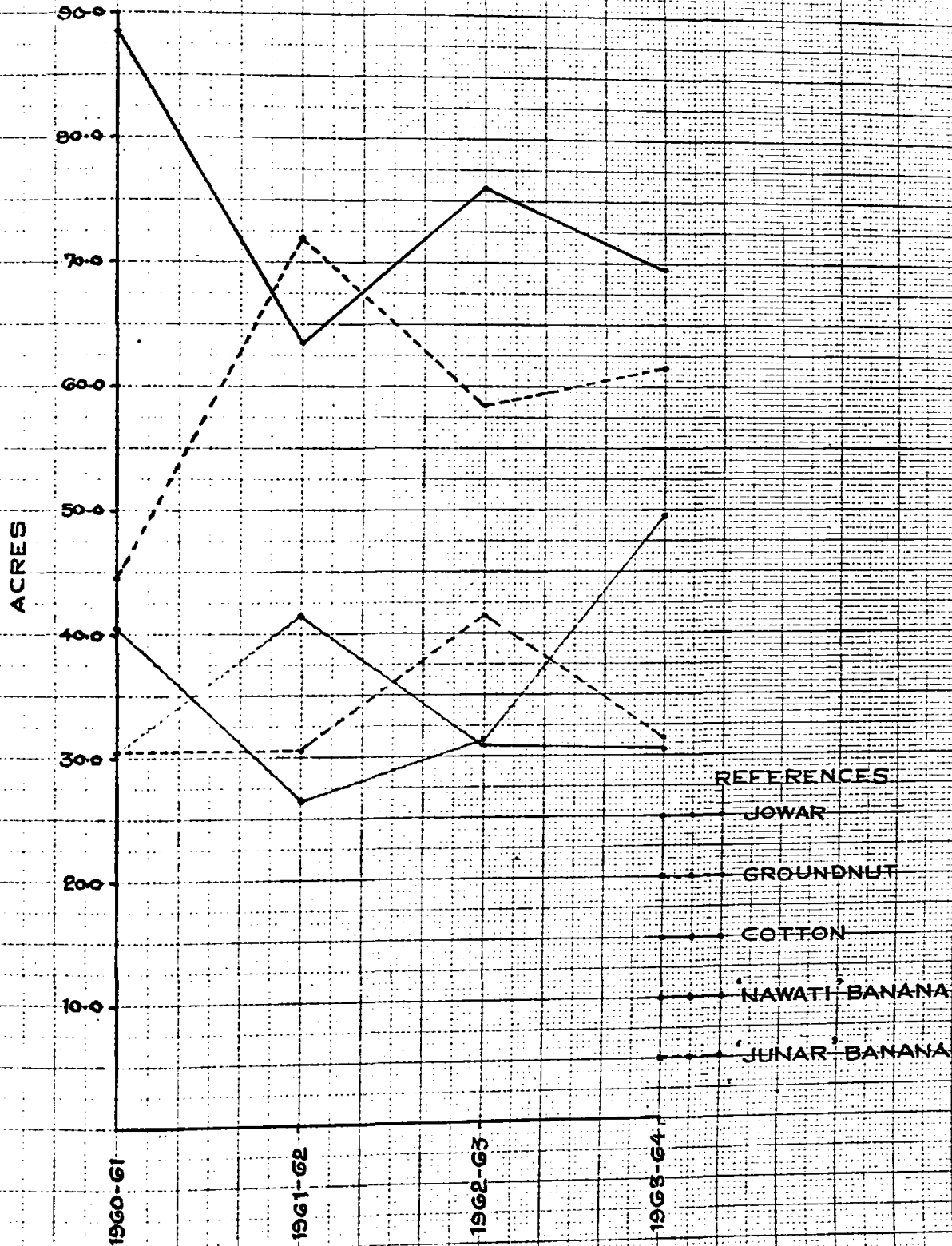
Table 3.20 : Cropping Pattern Followed by the Cultivators in Rozode, on the Area which was under Their Possession for All the Four Years (1960-61 to 1963-64)

Crop	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Jowar	88.31	33.90	63.25	24.46	76.10	29.79	69.67	27.76
Cotton	40.30	15.47	26.64	10.30	31.44	12.31	49.75	19.83
Groundnut	44.76	17.18	72.02	27.85	58.32	22.83	61.14	24.37
'Nawati' banana	30.79	11.82	41.46	16.04	31.20	12.21	30.86	12.30
'Junar' banana	30.43	11.68	30.79	11.91	41.46	16.23	31.20	12.44
Wheat	12.55	4.82	14.39	5.57	9.36	3.66	2.98	1.19
Maize	2.95	1.13	4.93	1.91	1.25	0.49	2.15	0.86
Bajara	0.98	0.38	-	-	0.48	0.19	-	-
Paddy	0.35	0.13	0.10	0.04	0.48	0.19	-	-
Mug	0.85	0.33	4.96	1.92	1.86	0.73	2.18	0.87
Udid	7.98	3.06	-	-	2.48	0.97	0.95	0.38
Chillies	0.10	0.04	-	-	0.50	0.20	-	-
Brinjal	0.15	0.06	-	-	0.50	0.20	-	-
Total gross cropped area	260.50	100.00	258.54	100.00	255.43	100.00	250.88	100.00
Total double cropped area	12.55	5.06	10.59	4.27	7.48	3.02	2.93	1.18
Total net cropped area	247.95	100.00	247.95	100.00	247.95	100.00	247.95	100.00

GRAPH 3.7
TOTAL NET CROPPED AREA UNDER
THE MAJOR CROPS IN WAGHODE



GRAPH 3-8
TOTAL NET CROPPED AREA IN ROZODE



area under 'Junar' banana in the second year, as banana is a crop of two-years' duration.

In Rozode, the yearly variations in the areas of the major crops are more interesting (see Graph 3.8). It can be seen that there is a clear-cut division of the graph into two parts. The areas under jowar and groundnut moved on a higher plane; while the areas under cotton, and 'Nawati' and 'Junar' banana, moved on a lower plane. This was largely because of the dry land owned and cultivated by the sample cultivators in the neighbouring villages. It was reported that the cultivators mainly grew jowar and groundnut on such lands. The graph clearly shows that there was an inverse type of relationship between jowar and groundnut, on the one hand; and between cotton and 'Nawati' banana, on the other. Thus, whenever there was a rise in the area under groundnut, the area under jowar fell and vice versa. Similar was the case with cotton and 'Nawati' banana.

3.5. Area Under Crop-Rotations

The yearly variations and the relationships between the major crops, suggest that the crop-rotations play a major role in the irrigated villages as well. This is more distinct in the case of Rozode than in Waghode.

In both the irrigated villages, however, a large proportion of the total net cropped area was put under the accepted rotations every year. In the case of Waghode, the total figure of such rotated area in a year was always above 243 acres or above 76 per cent of the total. In Rozode it was still high--about 213

acres or above 86 per cent of the total. Of this, the area which was under the accepted rotations for all the four years was 174.23 acres in Waghode, and 165.62 acres in Rozode. On the remaining portion of the area, the accepted rotations were not continuously practised for all the four years. The deviations from the rotations occurred on it. Here, only the area which was under the accepted rotations for all the four years is considered to show how the rotations themselves cause yearly variations in the areas of different crops. The deviated area will be considered later.

The total area rotated continuously for all the four years may be further classified according to the major kinds of rotations accepted by the cultivators (see Tables 3.21 and 3.22). In both the villages, three kinds of major rotations--two, three and four-year rotations--were reported. In Waghode, of the three kinds, the three-year rotations were more common, claiming the largest area (95.07 acres or 54.57 per cent of the total) under them (see Table 3.21). These were distantly followed by the four-year rotations, having an area of about 37.06 acres or 21.27 per cent of the total. The two-year rotations claimed comparatively a minor area--15.49 acres or 8.89 per cent. On the remaining portion of the rotated area (26.61 acres or 15.27 per cent) the cultivators accepted dual rotations. In Rozode, the two-year rotations were more dominant, claiming more than half of the total rotated area (see Table 3.22). Next to these were the three-year rotations, claiming 58.14 acres or 35.10 per cent of the total. The four-year rotations had a relatively smaller

Table 3.21 : The Area which was under the Rotations in Waghode for the Entire Period of Four Years (1960-61 to 1963-64)

Rotation	No. of Plots	Area in acres	Percentage to total area
Two-year rotation:			
Cotton-Jowar	7	11.16	72.05
Groundnut-Jowar	2	4.33	27.95
Total	9	15.49	8.89
Three-year rotation:			
'Nawati' banana-'Junar' banana-Cotton	22	57.66	60.64
'Nawati' banana-'Junar' banana-Jowar	13	25.63	26.96
'Nawati' banana-'Junar' banana-Groundnut	1	3.00	3.16
Groundnut-Cotton-Jowar	1	1.50	1.58
Wheat-Cotton-Jowar	1	7.28	7.66
Total	38	95.07	54.57

(continued)

Table 3.21 : (continued)

Rotation	No. of Plots	Area in acres	Percentage to total area
Four-year rotation:			
'Nawati' banana-'Junar' banana-Cotton-Jowar	3	5.58	15.06
'Nawati' banana-'Junar' banana-Cotton-Groundnut	1	2.55	6.88
'Nawati' banana-'Junar' banana-Wheat-Jowar	n 1	6.50	17.54
'Nawati' banana-'Junar' banana-Cotton-Cotton	2	12.68	34.21
Cotton-Cotton-Cotton-Jowar	2	9.75	26.31
Total	9	37.06	21.27
Dual rotation:			
'Nawati' banana-'Junar' banana-Jowar Or Cotton-Jowar	1	1.63	6.13
'Nawati' banana-'Junar' banana-Cotton Or Cotton-Jowar	4	5.44	20.44
'Nawati' banana-'Junar' banana-Cotton Or Groundnut-Cotton	3	9.10	34.20
'Nawati' banana-'Junar' banana-Jowar Or Groundnut-Jowar	2	1.35	5.07
'Nawati' banana-'Junar' banana-Cotton Or Groundnut-Cotton-Jowar	4	9.09	34.16
Total	14	26.61	15.27
Grand Total	70	174.23	100.00

Table 3.22 : The Area which was under the Rotations in Rozode for the Entire Period of Four Years (1960-61 to 1963-64)

Rotation	No. of Plots	Area in acres	Percentage to total area
Two-year rotation:			
Groundnut-Jowar	29	73.69	88.20
Groundnut-Cotton	2	3.91	4.68
Cotton-Jowar	1	3.15	3.77
Wheat-Jowar	3	2.80	3.35
Total	35	83.55	50.45
Three-year rotation:			
'Nawati' banana-'Junar' banana-Cotton	17	28.51	49.04
'Nawati' banana-'Junar' banana-Jowar	11	19.20	33.02
'Nawati' banana-'Junar' banana-Groundnut	3	3.42	5.88
'Nawati' banana-'Junar' banana-Wheat	1	1.03	1.77
'Nawati' banana-'Junar' banana-Maize	1	4.48	7.71
Groundnut-Cotton-Jowar	1	1.50	2.58
Total	34	58.14	35.10

(continued)

Table 3.22 : (continued)

Rotation	No. of Plots	Area in acres	Percentage to total area
Four-year rotation:			
'Nawati' banana-'Junar' banana-Jowar-Cotton	2	3.08	22.02
'Nawati' banana-'Junar' banana-Cotton-Jowar	2	1.73	12.37
'Nawati' banana-'Junar' banana-Cotton-Wheat	3	7.03	50.24
'Nawati' banana-'Junar' banana-Maize-Cotton	1	2.15	15.37
Total	8	13.99	8.45
Dual rotation:			
'Nawati' banana-'Junar' banana-Cotton Or Cotton-Jowar	2	3.63	36.51
'Nawati' banana-'Junar' banana-Jowar Or Cotton-Jowar	2	2.93	29.48
'Nawati' banana-'Junar' banana-Jowar Or Groundnut-Jowar	2	2.63	26.46
'Nawati' banana-'Junar' banana-Cotton Or Wheat-Jowar	1	0.75	7.55
Total	7	9.94	6.00
Grand Total	84	165.62	100.00

area (13.99 acres or 8.45 per cent) under them. The area claimed by the dual rotations was also small in this village.

The dual rotations were generally practised by the cultivators, who did not have sufficient water supply of their own on their lands. Because of the inadequate water supply, they themselves could not grow the heavily irrigated crops like banana. Such cultivators, however, leased-out their lands specifically for banana cultivation to their neighbouring cultivators having sufficient water supply and other resources. These cultivators could not give a definite place for banana in their rotation programme as its cultivation entirely depended on others. They were required to keep their cropping programme flexible, so that whenever irrigation was made available, they could lease-out the lands for banana cultivation. They basically followed the crop-rotations of dry crops and whenever water was made available they broke the basic rotation and shifted to another rotation with banana as one of the crops. Thus, in the case of such cultivators, there was a dualism as regards the acceptance of crop-rotations. Whenever the supply of water was available they followed the rotation with banana, if not, they continued with the basic rotation of dry crops.

Of the three-year rotations practised in Waghode, the rotation of NB-JB-C was most common with the sample cultivators (see Table 3.21). It claimed the largest area of all the types of rotations (57.66 acres or 60.64 per cent). The three-year rotation of NB-JB-J was second in rank, having 25.63 acres or 26.96 per cent of the total three-year rotated area. The area

under the other rotations of two, three and four-years, was comparatively very small. The two-year rotation of G-J and the three-year rotations of G-C-J and W-C-J were mainly practised on the dry land. In Rozode, the two-year rotation of G-J was the most dominant one, claiming the highest area of all the rotation types. It had 73.69 acres or about 88.20 per cent of the total area under the two-year rotations (see Table 3.22). In the other kinds of rotations in this village, the three-year rotations of NB-JB-C, and NB-JB-J; and the four-year rotations of NB-JB-J-C and NB-JB-C-W were more common with the sample cultivators. The two-year rotations of G-J, G-C and C-J; and the three-year rotation of G-C-J were practised mainly on the dry land.

The yearly variations in the areas under different crops, caused by the accepted rotations alone, are presented in Tables 3.23 to 3.26. The area variations on the irrigated and the dry lands are given separately. It can be seen from these tables that the area fluctuations of the different crops are cyclical in nature. The areas under different crops move according to the proportion of area at the starting point and the sequence of the crops included in the rotations. The variations of areas under different crops, caused by each of the three major kinds of rotations and the dual rotations practised in Waghode, are shown separately in Graphs 3.9 to 3.14. The combined effect of these rotations are also shown separately for the total irrigated and the dry land in Graphs 3.15 and 3.16. The total effect of all the rotations on the aggregate area, irrigated as well as dry, is shown in Graphs 3.17 for Waghode and 3.18 for Rozode.

Table 3.23 : Irrigable Areas under Different Rotations and Variations in Areas under Different Crops in Waghode (1960-61 to 1963-64) (Area in Acres)

Rotation	No. of Plots	1960-61						1961-62					
		NB	JB	C	J	G	W	NB	JB	C	J	G	W
Two-year rotation:													
Cotton-Jowar													
Cotton in 1960-61	2	-	-	1.50	-	-	-	-	-	-	1.50	-	-
Jowar in 1960-61	2	-	-	-	5.25	-	-	-	-	5.25	-	-	-
Total	4	-	-	1.50	5.25	-	-	-	-	5.25	1.50	-	-
Three-year rotation:													
'Nawati' banana-'Junar' banana-Cotton													
'Nawati' banana in 1960-61	9	20.22	-	-	-	-	-	-	20.22	-	-	-	-
'Junar' banana in 1960-61	4	-	9.28	-	-	-	-	-	-	9.28	-	-	-
Cotton in 1960-61	9	-	-	28.16	-	-	-	28.16	-	-	-	-	-
'Nawati' banana-'Junar' banana-Jowar													
'Nawati' banana in 1960-61	7	13.70	-	-	-	-	-	-	13.70	-	-	-	-
'Junar' banana in 1960-61	5	-	8.98	-	-	-	-	-	-	-	8.98	-	-
Jowar in 1960-61	1	-	-	-	2.95	-	-	2.95	-	-	-	-	-
'Nawati' banana-'Junar' banana-Groundnut													
'Nawati' banana in 1960-61	1	3.00	-	-	-	-	-	-	3.00	-	-	-	-
Total	36	36.92	18.26	28.16	2.95	-	-	31.11	36.92	9.28	8.98	-	-
Four-year rotation:													
'Nawati' banana-'Junar' banana-Cotton-Jowar													
Cotton in 1960-61	2	-	-	4.38	-	-	-	-	-	-	4.38	-	-
Jowar in 1960-61	1	-	-	-	1.20	-	-	1.20	-	-	-	-	-
'Nawati' banana-'Junar' banana-Cotton-Groundnut													
Groundnut in 1960-61	1	-	-	-	-	2.55	-	2.55	-	-	-	-	-
'Nawati' banana-'Junar' banana-Wheat-Jowar													
'Nawati' banana in 1960-61	1	6.50	-	-	-	-	-	-	6.50	-	-	-	-

(continued)

Table 3.23 : (continued)

Rotation	No. of Plots	1960-61						1961-62					
		NB	JB	C	J	G	W	NB	JB	C	J	G	W
Four-year rotation :(continued)													
'Nawati' banana-'Junar' banana-Cotton-Cotton													
'Nawati' banana in 1960-61	1	6.35	-	-	-	-	-	-	6.35	-	-	-	-
Cotton in 1960-61	1	-	-	6.33	-	-	-	-	-	6.33	-	-	-
Cotton-Cotton-Cotton-Jowar													
Jowar in 1960-61	2	-	-	-	9.75	-	-	-	-	9.75	-	-	-
Total	9	12.85	-	10.71	10.95	2.55	-	3.75	12.85	16.08	4.38	-	-
Dual rotation:													
'Nawati' banana-'Junar' banana-Jowar or Cotton-Jowar													
Cotton in 1960-61	1	-	-	1.63	-	-	-	-	-	-	1.63	-	-
'Nawati' banana-'Junar' banana-Cotton Or Cotton-Jowar													
Cotton in 1960-61	2	-	-	3.03	-	-	-	-	-	-	3.03	-	-
Jowar in 1960-61	2	-	-	-	2.41	-	-	-	-	2.41	-	-	-
'Nawati' banana-'Junar' banana-Cotton Or Groundnut-Cotton													
'Nawati' banana in 1960-61	1	4.50	-	-	-	-	-	-	4.50	-	-	-	-
Cotton in 1960-61	1	-	-	2.30	-	-	-	-	-	-	-	2.30	-
Groundnut in 1960-61	1	-	-	-	-	2.30	-	-	-	2.30	-	-	-
'Nawati' banana-'Junar' banana-Jowar Or Groundnut-Jowar													
Groundnut in 1960-61	1	-	-	-	0.70	0.65	-	-	-	-	0.65	0.70	-
Jowar in 1960-61	1	-	-	-	-	-	-	-	-	-	-	-	-
'Nawati' banana-'Junar' banana-Cotton Or Groundnut-Cotton-Jowar													
Jowar in 1960-61	2	-	-	-	5.46	-	-	3.68	-	-	-	1.78	-
Groundnut in 1960-61	2	-	-	-	-	3.63	-	-	-	3.63	-	-	-
Total	14	4.50	-	6.96	8.57	6.58	-	3.68	4.50	8.34	5.31	4.78	-
Total irrigable area	63	54.27	18.26	47.33	27.72	9.13	-	38.54	54.27	38.95	20.17	4.78	-
Total dry area	7	-	-	1.50	7.04	1.70	7.28	-	-	11.69	3.20	2.63	-
Total area	70	54.27	18.26	48.83	34.76	10.83	7.28	38.54	54.27	50.64	23.37	7.41	-

(continued)

Table 3.23 : (continued)

Rotation	1962-63						1963-64						Total area
	NB	JB	C	J	G	W	NB	JB	C	J	G	W	
Two-year rotation:													
Cotton-Jowar													
Cotton in 1960-61	-	-	1.50	-	-	-	-	-	-	1.50	-	-	1.50
Jowar in 1960-61	-	-	-	5.25	-	-	-	-	5.25	-	-	-	5.25
Total	-	-	1.50	5.25	-	-	-	-	5.25	1.50	-	-	6.75
Three-year rotation:													
'Nawati' banana-'Junar' banana-Cotton													
'Nawati' banana in 1960-61	-	-	20.22	-	-	-	20.22	-	-	-	-	-	20.22
'Junar' banana in 1960-61	9.28	-	-	-	-	-	-	9.28	-	-	-	-	9.28
Cotton in 1960-61	-	28.16	-	-	-	-	-	-	28.16	-	-	-	28.16
'Nawati' banana-'Junar' banana-Jowar													
'Nawati' banana in 1960-61	-	-	-	13.70	-	-	13.70	-	-	-	-	-	13.70
'Junar' banana in 1960-61	8.98	-	-	-	-	-	-	8.98	-	-	-	-	8.98
Jowar in 1960-61	-	2.95	-	-	-	-	-	-	2.95	-	-	-	2.95
'Nawati' banana-'Junar' banana-Groundnut													
'Nawati' banana in 1960-61	-	-	-	-	3.00	-	3.00	-	-	-	-	-	3.00
Total	18.26	31.11	20.22	13.70	3.00	-	36.92	18.26	28.16	2.95	-	-	86.29
Four-year rotation:													
'Nawati' banana-'Junar' banana-Cotton-Jowar													
Cotton in 1960-61	4.38	-	-	-	-	-	-	4.38	-	-	-	-	4.38
Jowar in 1960-61	-	1.20	-	-	-	-	-	-	1.20	-	-	-	1.20
'Nawati' banana-'Junar' banana-Cotton-Groundnut													
Groundnut in 1960-61	-	2.55	-	-	-	-	-	-	2.55	-	-	-	2.55
'Nawati' banana-'Junar' banana-Wheat-Jowar													
'Nawati' banana in 1960-61	-	-	-	-	-	6.50	-	-	-	6.50	-	-	6.50
'Nawati' banana-'Junar' banana-Cotton-Cotton													
'Nawati' banana in 1960-61	-	-	6.35	-	-	-	-	-	6.35	-	-	-	6.35
Cotton in 1960-61	6.33	-	-	-	-	-	-	6.33	-	-	-	-	6.33
Cotton-Cotton-Cotton-Jowar													
Jowar in 1960-61	-	-	9.75	-	-	-	-	-	9.75	-	-	-	9.75
Total	10.71	3.75	16.10	-	-	6.50	-	10.71	19.85	6.50	-	-	37.06

(continued)

Table 3.23 : (continued)

Rotation	1962-63						1963-64						Total area
	NB	JB	C	J	G	W	NB	JB	C	J	G	W	
Dual rotation :													
'Nawati' banana-'Junar' banana-Jowar Or Cotton-Jowar													
Cotton in 1960-61	1.63	-	-	-	-	-	-	1.63	-	-	-	-	1.63
'Nawati' banana-'Junar' banana-Cotton Or Cotton-Jowar													
Cotton in 1960-61	-	-	3.03	-	-	-	3.03	-	-	-	-	-	3.03
Jowar in 1960-61	1.33	-	-	1.08	-	-	1.08	1.33	-	-	-	-	2.41
'Nawati' banana-'Junar' banana-Cotton Or Groundnut-Cotton													
'Nawati' banana in 1960-61	-	-	4.50	-	-	-	4.50	-	-	-	-	-	4.50
Cotton in 1960-61	-	-	2.30	-	-	-	2.30	-	-	-	-	-	2.30
Groundnut in 1960-61	-	-	-	-	2.30	-	2.30	-	-	-	-	-	2.30
'Nawati' banana-'Junar' banana-Jowar Or Groundnut-Jowar													
Groundnut in 1960-61	-	-	-	-	0.65	-	0.65	-	-	-	-	-	0.65
Jowar in 1960-61	-	-	-	0.70	-	-	0.70	-	-	-	-	-	0.70
'Nawati' banana-'Junar' banana-Cotton Or Groundnut-Cotton-Jowar													
Jowar in 1960-61	-	3.68	1.78	-	-	-	1.78	-	3.68	-	-	-	5.46
Groundnut in 1960-61	3.63	-	-	-	-	-	-	3.63	-	-	-	-	3.63
Total	6.59	3.68	11.61	1.78	2.95	-	16.34	6.59	3.68	-	-	-	26.61
Total irrigable area	35.56	38.54	49.43	20.73	5.95	6.50	53.26	35.56	56.94	10.95	-	-	156.71
Total dry area	-	-	-	14.32	3.20	-	-	-	5.91	1.70	2.63	7.28	17.52
Total Area	35.56	38.54	49.43	35.05	9.15	6.50	53.26	35.56	62.85	12.65	2.63	7.28	174.23

Table 3.24 : Dry Areas under Different Rotations and Variations in Areas under Different Crops in Waghode (1960-61 to 1963-64) (Area in Acres)

Rotation	No. of Plots	1960-61				1961-62				1962-63				1963-64				Total area
		J	C	G	W	J	C	G	W	J	C	G	W	J	C	G	W	
Two-year rotation:																		
Cotton-Jowar																		
Jowar in 1960-61	3	4.41	-	-	-	-	4.41	-	-	4.41	-	-	-	-	4.41	-	-	4.41
Groundnut-Jowar																		
Groundnut in 1960-61	1	-	-	1.70	-	1.70	-	-	-	-	-	1.70	-	1.70	-	-	-	1.70
Jowar in 1960-61	1	2.63	-	-	-	-	-	2.63	-	2.63	-	-	-	-	-	2.63	-	2.63
Total	5	7.04	-	1.70	-	1.70	4.41	2.63	-	7.04	-	1.70	-	1.70	4.41	2.63	-	8.74
Three-year rotation:																		
Groundnut-Cotton-Jowar																		
Cotton in 1960-61	1	-	1.50	-	-	1.50	-	-	-	-	-	1.50	-	-	1.50	-	-	1.50
Wheat-Cotton-Jowar																		
Wheat in 1960-61	1	-	-	-	7.28	-	7.28	-	-	7.28	-	-	-	-	-	-	7.28	7.28
Total	2	-	1.50	-	7.28	1.50	7.28	-	-	7.28	-	1.50	-	-	1.50	-	7.28	8.78
Grand Total	7	7.04	1.50	1.70	7.28	3.20	11.69	2.63	-	14.32	-	3.20	-	1.70	5.91	2.63	7.28	17.52

Table 3.25 : Irrigable Areas under Different Rotations and Variations in Areas under Different Crops in Rozode (1960-61 to 1963-64) (Area in Acres)

Rotation	No. of Plots	1960-61							1961-62						
		NB	JB	W	J	C	G	M	NB	JB	W	J	C	G	M
Two-year rotation:															
Wheat-Jowar															
Wheat in 1960-61	2	-	-	1.80	-	-	-	-	-	-	-	1.80	-	-	-
Jowar in 1960-61	1	-	-	-	1.00	-	-	-	-	-	1.00	-	-	-	-
Total	3	-	-	1.80	1.00	-	-	-	-	-	1.00	1.80	-	-	-
Three-year rotation:															
'Nawati' banana-'Junar' banana-Cotton															
'Nawati' banana in 1960-61	7	9.72	-	-	-	-	-	-	-	9.72	-	-	-	-	-
'Junar' banana in 1960-61	3	-	6.04	-	-	-	-	-	-	-	-	6.04	-	-	-
Cotton in 1960-61	7	-	-	-	-	12.75	-	-	12.75	-	-	-	-	-	-
'Nawati' banana-'Junar' banana-Jowar															
'Nawati' banana in 1960-61	2	2.43	-	-	-	-	-	-	-	2.43	-	-	-	-	-
'Junar' banana in 1960-61	5	-	9.51	-	-	-	-	-	-	-	9.51	-	-	-	-
Jowar in 1960-61	4	-	-	-	7.26	-	-	-	7.26	-	-	-	-	-	-
'Nawati' banana-'Junar' banana-Groundnut															
'Nawati' banana in 1960-61	1	1.65	-	-	-	-	-	-	-	1.65	-	-	-	-	-
'Junar' banana in 1960-61	1	-	1.00	-	-	-	-	-	-	-	-	-	1.00	-	-
Groundnut in 1960-61	1	-	-	-	-	0.77	-	-	0.77	-	-	-	-	-	-
'Nawati' banana-'Junar' banana-Wheat															
'Nawati' banana in 1960-61	1	1.03	-	-	-	-	-	-	-	1.03	-	-	-	-	-
'Nawati' banana-'Junar' banana-Maize															
'Junar' banana in 1960-61	1	-	4.48	-	-	-	-	-	-	-	-	-	-	-	4.48
Total	33	14.83	21.03	-	7.26	12.75	0.77	-	20.78	14.83	-	9.51	6.04	1.00	4.48
Four-year rotation:															
'Nawati' banana-'Junar' banana-Jowar-Cotton															
'Nawati' banana in 1960-61	1	2.50	-	-	0.58	-	-	-	-	2.50	-	-	0.58	-	-
Jowar in 1960-61	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
'Nawati' banana-'Junar' banana-Cotton-Jowar															
Jowar in 1960-61	2	-	-	-	1.73	-	-	-	1.73	-	-	-	-	-	-
'Nawati' banana-'Junar' banana-Cotton-Wheat															
Wheat in 1960-61	3	-	-	7.03	-	-	-	-	7.03	-	-	-	-	-	-

(continued)

Table 3.25 : (continued)

Rotation	No. of Plots	1960-61						1961-62							
		NB	JB	W	J	C	G	M	NB	JB	W	J	C	G	M
Four-year rotation : (continued)															
'Nawati' banana-'Junar' banana-Maize-Cotton															
Maize in 1960-61	1	-	-	-	-	-	-	2.15	-	-	-	-	-	-	-
Total	8	2.50	-	7.03	2.31	-	-	2.15	8.76	2.50	-	-	2.15	-	-
Dual Rotation:															
'Nawati' banana-'Junar' banana-Cotton Or Cotton-Jowar															
Cotton in 1960-61	1	-	-	-	-	2.63	-	-	2.63	-	-	-	-	-	-
Jowar in 1960-61	1	-	-	-	1.00	-	-	-	-	-	-	-	1.00	-	-
'Nawati' banana-'Junar' banana-Jowar Or Cotton-Jowar															
'Junar' banana in 1960-61	1	-	1.45	-	-	-	-	-	-	-	-	1.45	-	-	-
Jowar in 1960-61	1	-	-	-	1.48	-	-	-	-	-	-	-	1.48	-	-
'Nawati' banana-'Junar' banana-Jowar Or Groundnut-Jowar															
Jowar in 1960-61	2	-	-	-	2.63	-	-	-	-	-	-	-	-	2.63	-
'Nawati' banana-'Junar' banana-Cotton Or Wheat-Jowar															
Jowar in 1960-61	1	-	-	-	0.75	-	-	-	0.75	-	-	-	-	-	-
Total	7	-	1.45	-	5.86	2.63	-	-	3.38	-	-	1.45	2.48	2.63	-
Total Irrigable Area	51	17.33	22.48	8.83	16.43	15.38	0.77	2.15	32.92	17.33	1.00	12.76	11.25	3.63	4.48
Total Dry Area	33	-	-	-	38.73	8.56	34.96	-	-	-	-	39.60	-	42.64	-
Total Area	84	17.33	22.48	8.83	55.16	23.94	35.73	2.15	32.92	17.33	1.00	52.36	11.25	46.27	4.48

(continued)

Table 3.25 : (continued)

Rotation	1962-63							1963-64							Total area
	NB	JB	W	J	C	G	M	NB	JB	W	J	C	G	M	
Two-year rotation :															
Wheat-Jowar															
Wheat in 1960-61	-	-	1.80	-	-	-	-	-	-	-	1.80	-	-	-	1.80
Jowar in 1960-61	-	-	-	1.00	-	-	-	-	-	1.00	-	-	-	-	1.00
Total	-	-	1.80	1.00	-	-	-	-	-	1.00	1.80	-	-	-	2.80
Three-year rotation :															
'Nawati' banana-'Junar' banana-Cotton															
'Nawati' banana in 1960-61	-	-	-	-	9.72	-	-	9.72	-	-	-	-	-	-	9.72
'Junar' banana in 1960-61	6.04	-	-	-	-	-	-	-	6.04	-	-	-	-	-	6.04
Cotton in 1960-61	-	12.75	-	-	-	-	-	-	-	-	-	12.75	-	-	12.75
'Nawati' banana-'Junar' banana-Jowar															
'Nawati' banana in 1960-61	-	-	-	2.43	-	-	-	2.43	-	-	-	-	-	-	2.43
'Junar' banana in 1960-61	9.51	-	-	-	-	-	-	-	9.51	-	7.26	-	-	-	9.51
Jowar in 1960-61	-	7.26	-	-	-	-	-	-	-	7.26	-	-	-	-	7.26
'Nawati' banana-'Junar' banana-Groundnut															
'Nawati' banana in 1960-61	-	-	-	-	-	1.65	-	1.65	-	-	-	-	-	-	1.65
'Junar' banana in 1960-61	1.00	-	-	-	-	-	-	-	1.00	-	-	-	-	-	1.00
Groundnut in 1960-61	-	0.77	-	-	-	-	-	-	-	-	-	-	0.77	-	0.77
'Nawati' banana-'Junar' banana-Wheat															
'Nawati' banana in 1960-61	-	-	1.03	-	-	-	-	1.03	-	-	-	-	-	-	1.03
'Nawati' banana-'Junar' banana-Maize															
'Junar' banana in 1960-61	4.48	-	-	-	-	-	-	-	4.48	-	-	-	-	-	4.48
Total	21.03	20.78	1.03	2.43	9.72	1.65	-	14.83	21.03	-	7.26	12.75	0.77	-	56.64
Four-year rotation :															
'Nawati' banana-'Junar' banana-Jowar-Cotton															
'Nawati' banana in 1960-61	-	-	-	2.50	-	-	-	-	-	-	-	2.50	-	-	2.50
Jowar in 1960-61	0.58	-	-	-	-	-	-	-	0.58	-	-	-	-	-	0.58
'Nawati' banana-'Junar' banana-Cotton-Jowar															
Jowar in 1960-61	-	1.73	-	-	-	-	-	-	-	-	-	1.73	-	-	1.73

(continued)

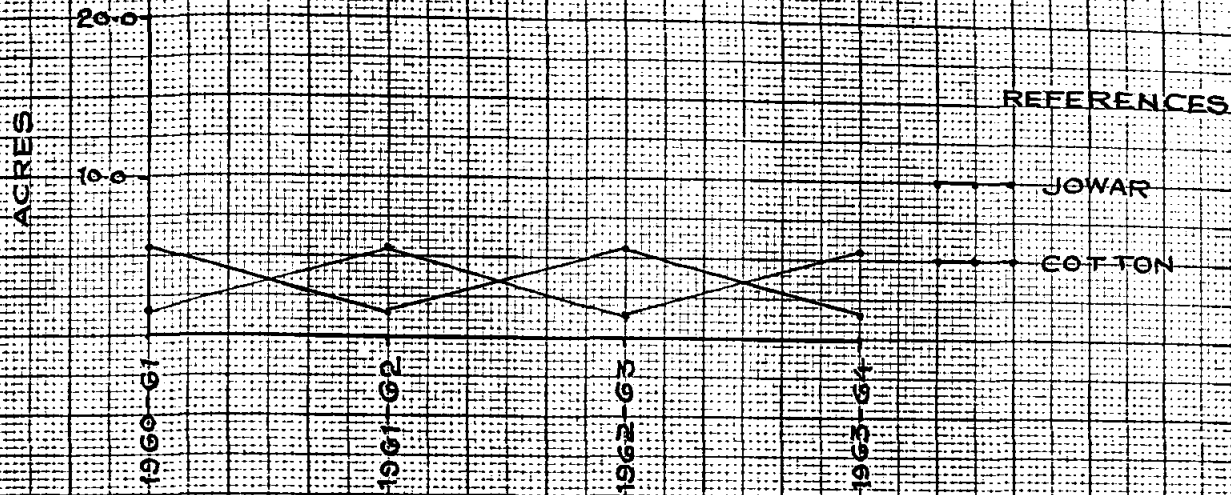
Table 3.25 : (continued)

Rotation	1962-63							1963-64							Total area
	NB	JB	W	J	C	G	M	NB	JB	W	J	C	G	M	
Four-year rotation: (continued)															
'Nawati' banana-'Junar' banana-Cotton-Wheat Wheat in 1960-61	-	7.03	-	-	-	-	-	-	-	-	-	7.03	-	-	7.03
'Nawati' banana-'Junar' banana-Maize-Cotton Maize in 1960-61	2.15	-	-	-	-	-	-	-	2.15	-	-	-	-	-	2.15
Total	2.73	8.76	-	2.50	-	-	-	-	2.73	-	-	11.26	-	-	13.99
Dual Rotation :															
'Nawati' banana-'Junar' banana-Cotton Or Cotton-Jowar Cotton in 1960-61	-	2.63	-	-	-	-	-	-	-	-	-	2.63	-	-	2.63
Jowar in 1960-61	1.00	-	-	-	-	-	-	-	1.00	-	-	-	-	-	1.00
'Nawati' banana-'Junar' banana-Jowar Or Cotton-Jowar 'Junar' banana in 1960-61	-	-	-	-	1.45	-	-	-	-	-	1.45	-	-	-	1.45
Jowar in 1960-61	-	-	-	1.48	-	-	-	1.48	-	-	-	-	-	-	1.48
'Nawati' banana-'Junar' banana-Jowar Or Groundnut-Jowar Jowar in 1960-61	1.00	-	-	1.63	-	-	-	1.63	1.00	-	-	-	-	-	2.63
'Nawati' banana-'Junar' banana-Cotton Or Wheat-Jowar Jowar in 1960-61	-	0.75	-	-	-	-	-	-	-	-	-	0.75	-	-	0.75
Total	2.00	3.38	-	3.11	1.45	-	-	3.11	2.00	-	1.45	3.38	-	-	9.94
Total Irrigable Area	25.76	32.92	2.83	9.04	11.17	1.65	-	17.94	25.76	1.00	10.51	27.39	0.77	-	83.37
Total Dry Area	-	-	-	38.73	7.06	36.46	-	-	-	-	38.11	1.50	42.64	-	82.25
Total Area	25.76	32.92	2.83	47.77	18.23	38.11	-	17.94	25.76	1.00	48.62	28.89	43.41	-	165.62

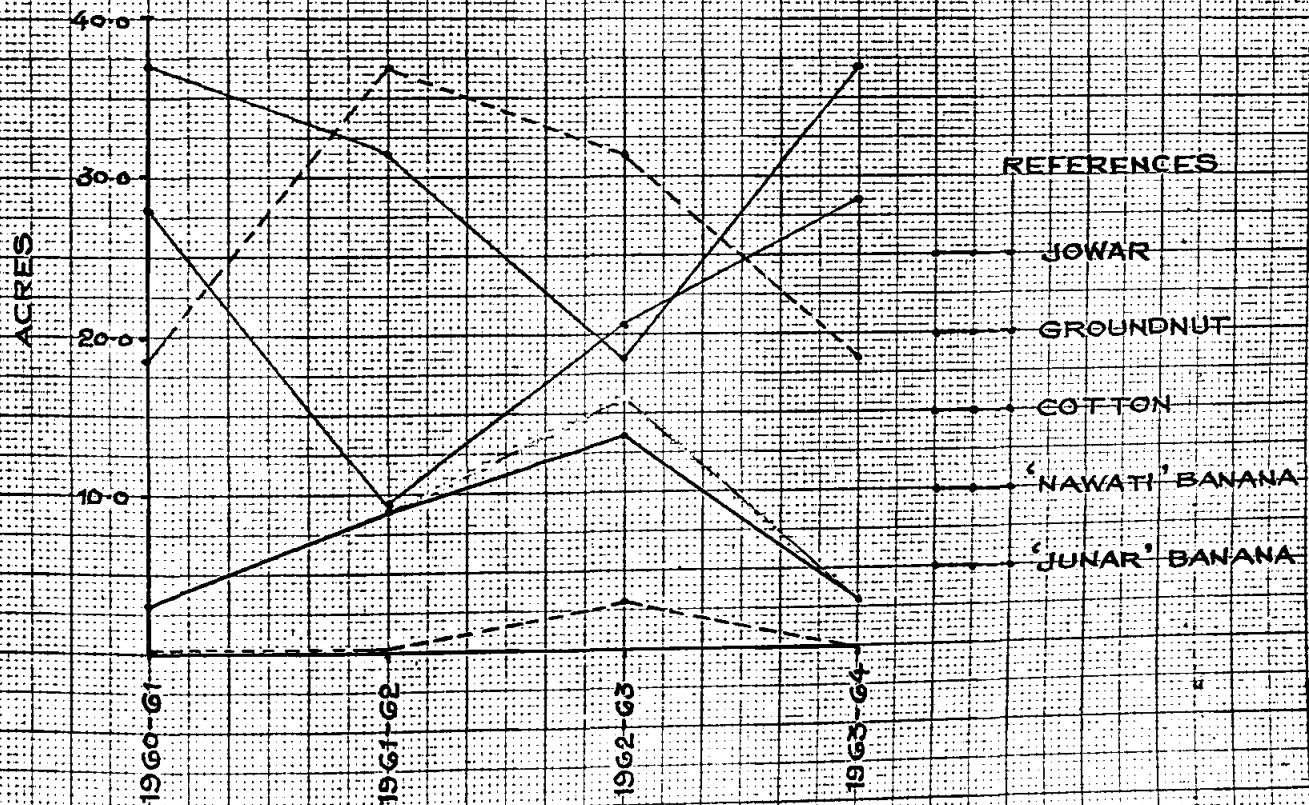
Table 3.26 : Dry Areas under Different Rotations and Variations in Areas under Different Crops in Rozode (1960-61 to 1963-64) (Area in Acres)

Rotation	No. of Plots	1960-61			1961-62			1962-63			1963-64			Total area
		J	G	C	J	G	C	J	G	C	J	G	C	
Two-year rotation:														
Groundnut-Jowar														
Groundnut in 1960-61	15	-	34.96	-	34.96	-	-	34.96	34.96	-	34.96	-	-	34.96
Jowar in 1960-61	14	38.73	-	-	-	38.73	-	38.73	-	-	-	38.73	-	38.73
Groundnut-Cotton														
Cotton in 1960-61	2	-	-	3.91	-	3.91	-	-	-	3.91	-	3.91	-	3.91
Cotton-Jowar														
Cotton in 1960-61	1	-	-	3.15	3.15	-	-	-	-	3.15	3.15	-	-	3.15
Total	32	38.73	34.96	7.06	38.11	42.64	-	38.73	34.96	7.06	38.11	42.64	-	80.75
Three-year rotation:														
Groundnut-Cotton-Jowar														
Cotton in 1960-61	1	-	-	1.50	1.50	-	-	-	1.50	-	-	-	1.50	1.50
Total	1	-	-	1.50	1.50	-	-	-	1.50	-	-	-	1.50	1.50
Grand Total	33	38.73	34.96	8.56	39.61	42.64	-	38.73	36.46	7.06	38.11	42.64	1.50	82.25

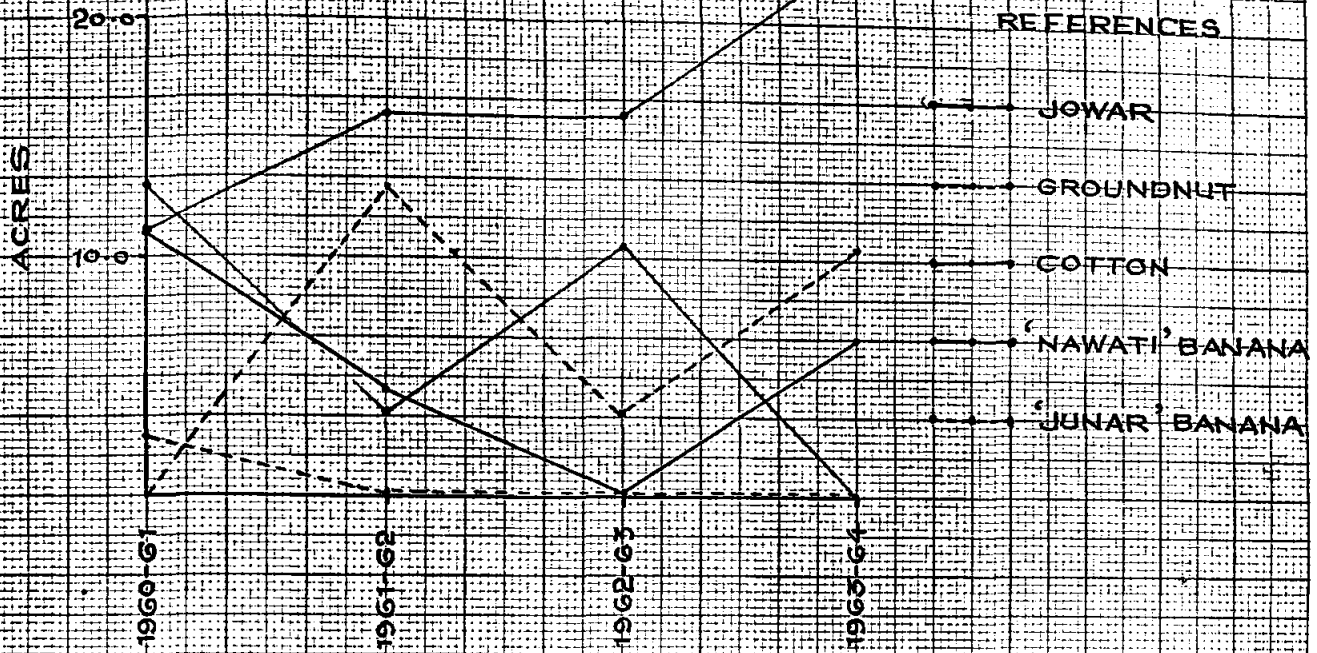
GRAPH 3.9
IRRIGABLE AREA UNDER THE TWO-YEAR
ROTATIONS IN WAGHODE



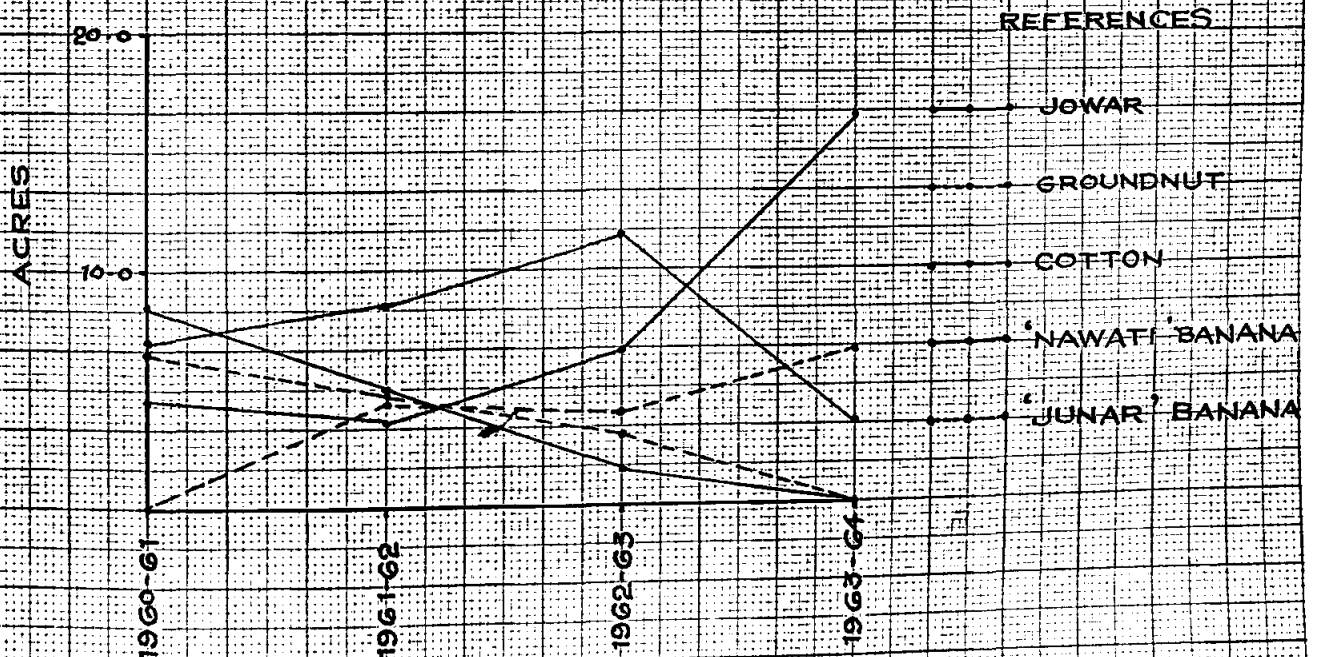
GRAPH 3.10
IRRIGABLE AREA UNDER THE THREE-YEAR
ROTATIONS IN WAGHODE



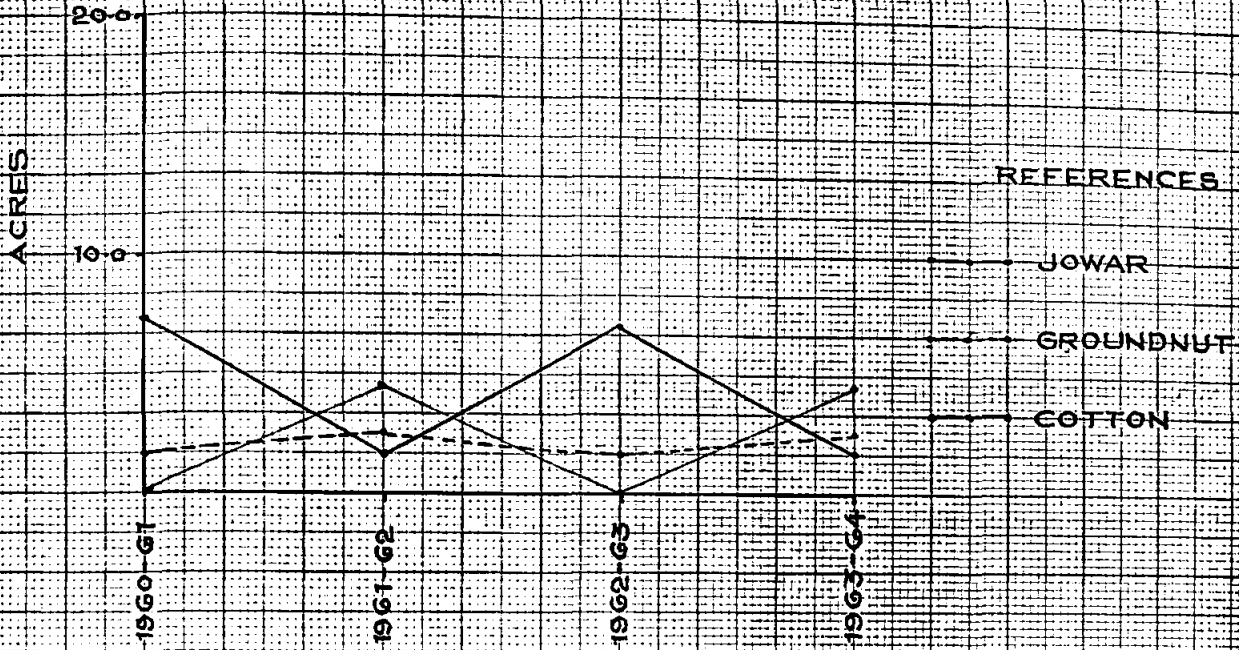
GRAPH 3-11
IRRIGABLE AREA UNDER THE FOUR-YEAR
ROTATIONS IN WAGHODE



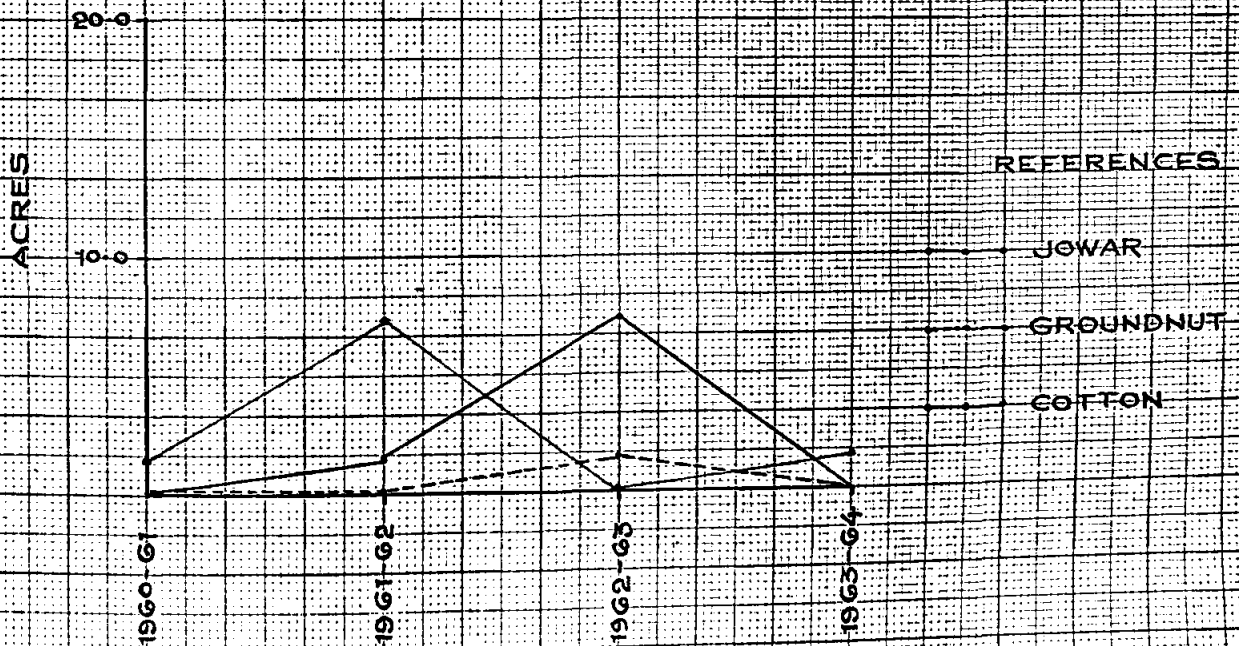
GRAPH 3-12
IRRIGABLE AREA UNDER THE DUAL
ROTATIONS IN WAGHODE



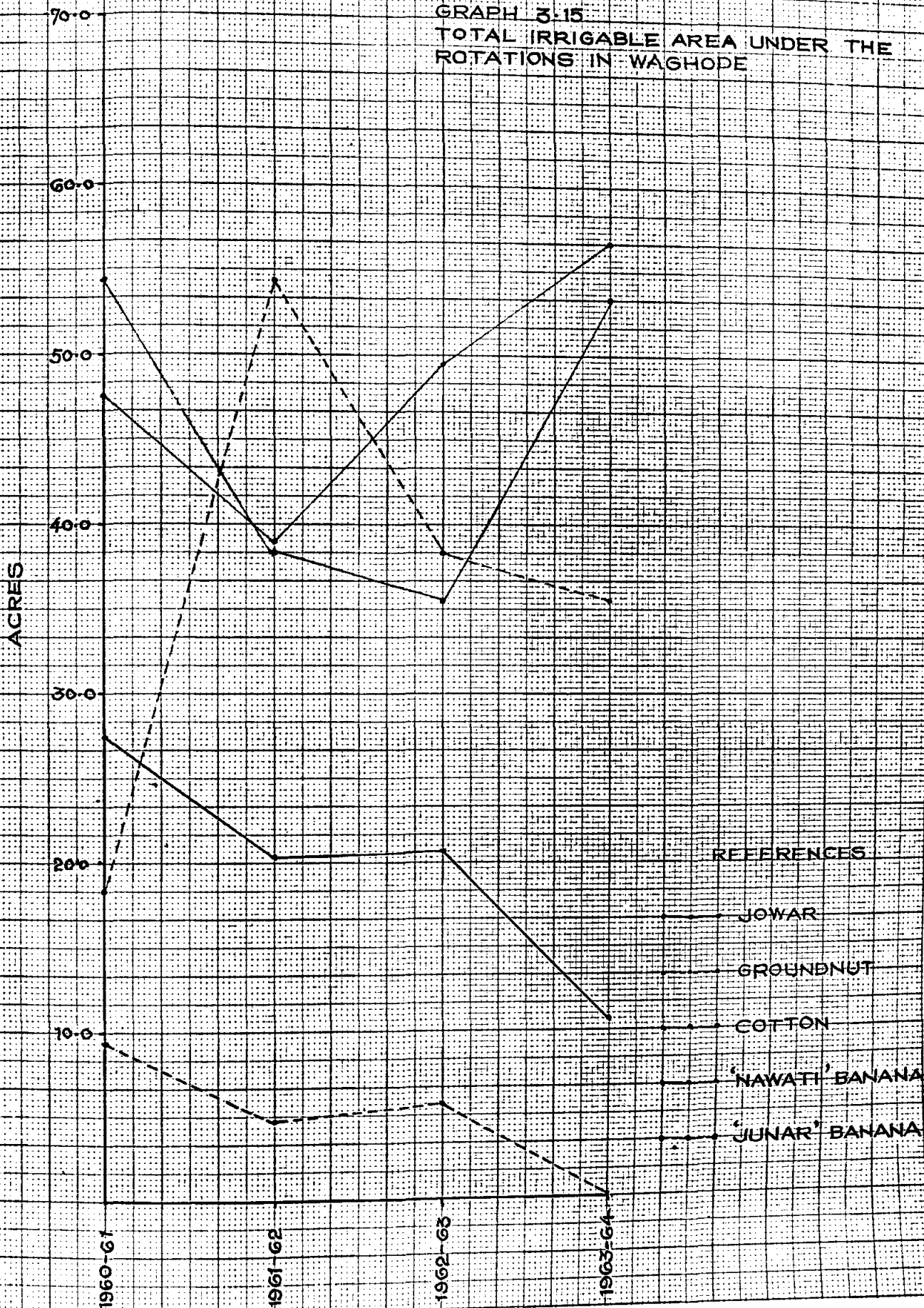
GRAPH 3-15
 DRY AREA UNDER THE TWO-YEAR
 ROTATIONS IN WAGHODE



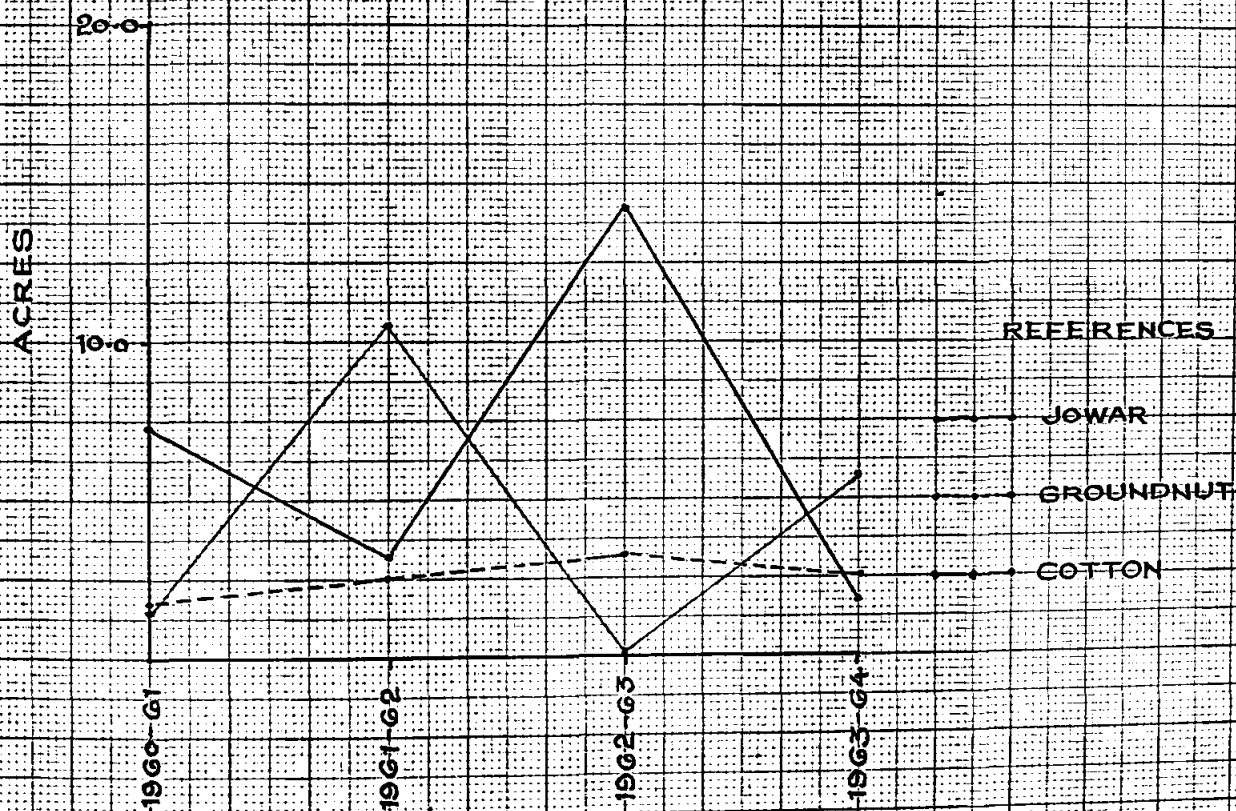
GRAPH 3-14
 DRY AREA UNDER THE THREE-YEAR
 ROTATIONS IN WAGHODE



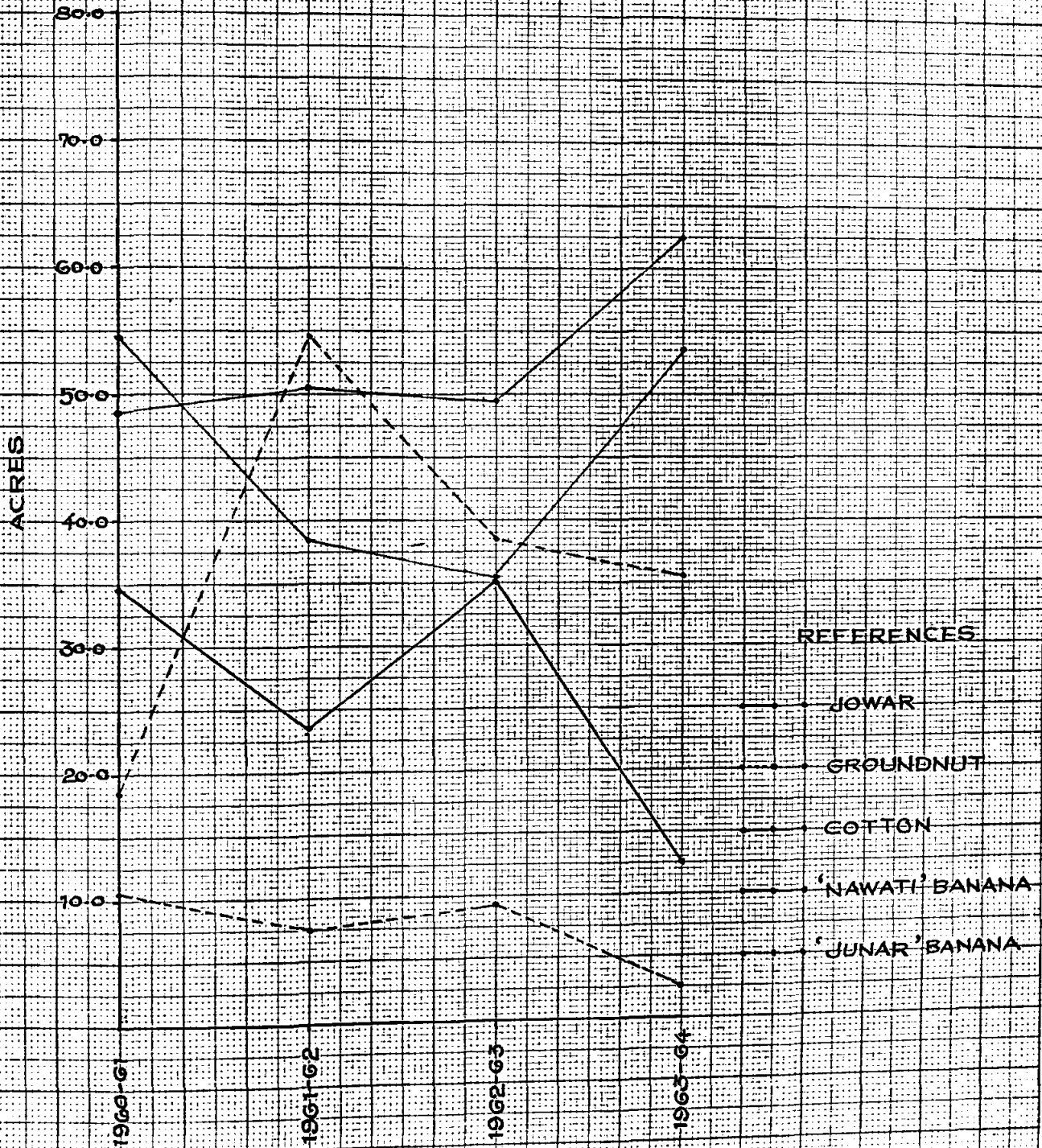
GRAPH 3-15
TOTAL IRRIGABLE AREA UNDER THE
ROTATIONS IN WAGHODE



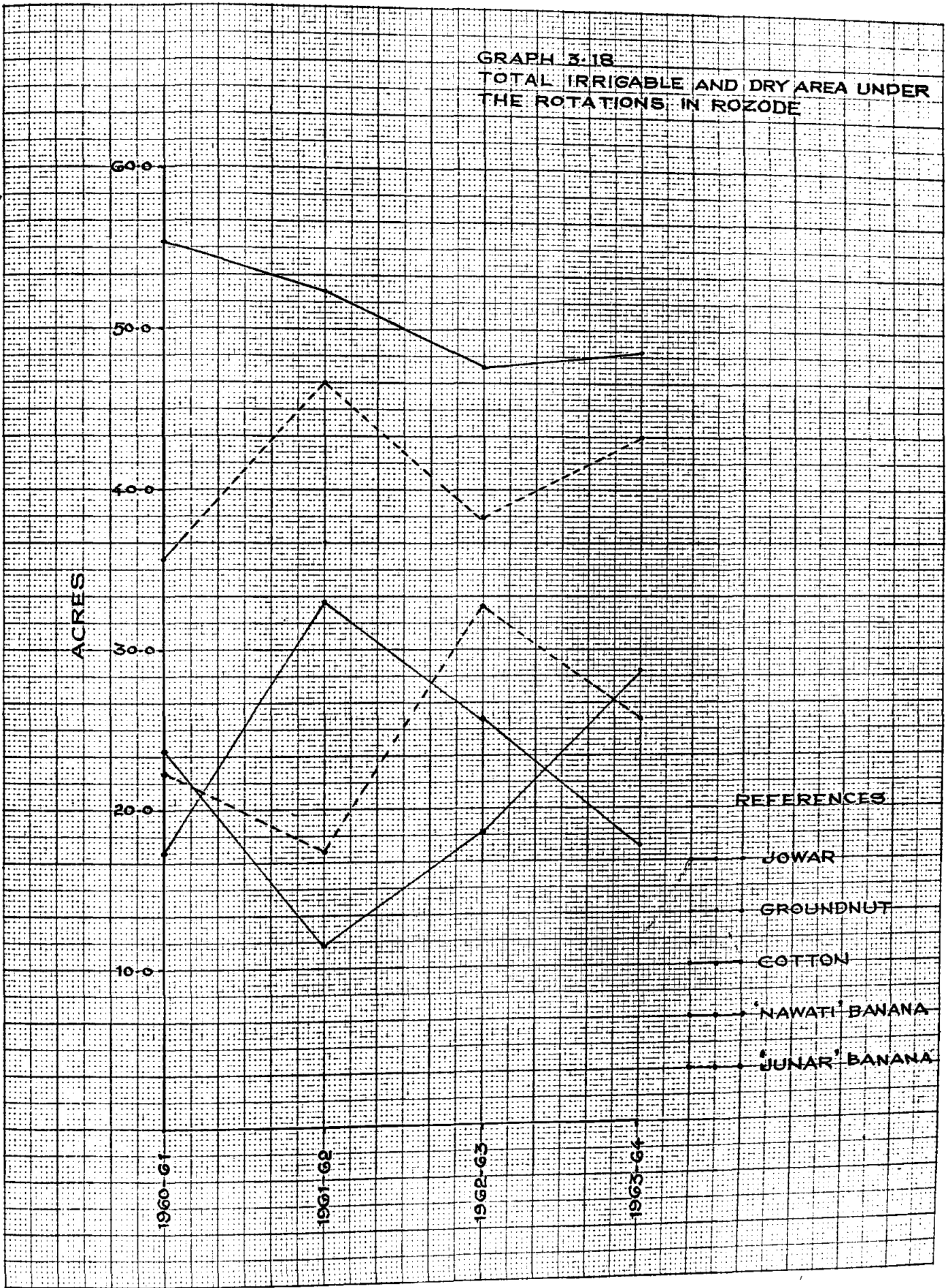
GRAPH 3.16
TOTAL DRY AREA UNDER
THE ROTATIONS IN WAGHODE



GRAPH 3.17
TOTAL IRRIGABLE AND DRY AREA UNDER
THE ROTATIONS IN WAGHODE



GRAPH 3-18
TOTAL IRRIGABLE AND DRY AREA UNDER
THE ROTATIONS IN ROZODE



The variations in the areas under different crops, caused by each type and kind of rotations are obvious from the tables and the graphs and need not be further explained. The variations in the aggregate areas of the different crops, however, are of much interest. It can be seen from the graphs that in Waghode, the area variations of different crops on the aggregate level were largely affected by the three-year rotations which commanded more than half of the total rotated area. The effect of the other rotations--two and four-year rotations and the dual rotations--which claimed smaller areas, was not significant and was mostly lost in the aggregation. It may be seen, for example, that the variations in the total areas of 'Nawati' and 'Junar' banana were largely influenced by the three-year rotations (NB-JB-C and NB-JB-J) followed on the irrigated land. The movements of the total areas under these two crops were, therefore, similar to those of the three-year rotations (see Graphs 3.10 and 3.17). In some years, however, the four-year rotations and the dual rotations on the irrigated land had a similar trend as in the three-year rotations and accentuated the rise or fall in the total areas. Whenever the trend was not similar, their effect was overshadowed by that of the three-year rotations, which commanded a large area. Thus, in 1961-62, according to the three-year rotations, there was a fall in the area under 'Nawati' banana. This was more accentuated by the four-year and the dual rotations as there was a fall in the area of 'Nawati' banana according to these also. In the next year also (1962-63), the total area under 'Nawati' banana went down; but this fall

was entirely due to the three-year rotations. Otherwise, according to the four-year and the dual rotations, there was a rise in the area of 'Nawati' banana in this year. But this rise was small and was surpassed by the fall in the area caused by the three-year rotations. In 1963-64, there was a rise in the total area under 'Nawati' banana. This was largely caused, once again, by the three-year rotations on the irrigated land. It was, however, slightly pushed up by the dual rotations which also caused a rise in the area under 'Nawati' banana. The four-year rotations caused a fall in the area under 'Nawati' banana but the fall was so small that it was lost in the aggregation (see Graphs 3.12 and 3.17). The area variations of the 'Junar' banana need not be explained separately as the area under 'Nawati' banana in a year becomes the area under 'Junar' banana in the next year.

The variations in the aggregate areas under cotton and jowar were affected more by the two and three-year rotations (C-J and W-C-J) followed on the dry land. In the case of cotton, the total effect of all the rotations on the irrigated land was overshadowed by the rotations on the dry land, particularly in 1961-62 and 1962-63. In the year 1961-62, there was a fall in the area of cotton, according to the total effect of the rotations on the irrigated land. But this fall was made good by the rise through both the kinds of rotations on the dry land and ultimately there was a slight rise in the aggregate area under cotton in this year. In the next year, the situation was just the reverse. The rise in the cotton area caused by the total

effect of the rotations on the irrigated land was nullified by the fall through the rotations on the dry land. And finally, on the aggregate level, there was a slight fall in the cotton area for this year. In 1963-64, however, the total effects of the rotations followed on both, the irrigated and the dry lands were alike, causing a rise in the area of cotton. The aggregate area under cotton, therefore, increased considerably in this year (see Graphs 3.15, 3.16 and 3.17).

The case of jowar was slightly different in the sense that the total effects of rotations followed on both, the irrigated and the dry lands were alike for all the years. Because of this, the yearly variations in the area of jowar became more wide, on the aggregate level.

In Rozode also, the variations in the aggregate areas under the 'Nawati' and 'Junar' banana crops, were largely caused by the three-year rotations (NB-JB-C and NB-JB-J) practised on the irrigated land. The movements of the aggregate areas under 'Nawati' and 'Junar' banana, were, therefore, similar to those of the three-year rotations. Similar was the case with the cotton crop which was generally rotated along with banana on the irrigated land. However, the rotations followed on the dry land accentuated the rise and fall of the area under cotton in some years. The areas under jowar and groundnut moved on a comparatively higher plane than that of the other crops (see Graph 3.18). This was largely because of the dry area, which was quite high in the case of the sample cultivators in this village. The variations in the aggregate area under groundnut

were largely caused by the two-year rotation of G-J, which was practised on almost all the dry land cultivated outside the village. The case of jowar was different. The variations in its aggregate area were largely due to the three-year rotation of NB-JB-J followed on the irrigated land. Otherwise, the area under jowar taken through the rotations followed on the dry land was almost constant for all the four years.

3.6. Variations in the Total and the Rotated Areas Under Different Crops

In the irrigated villages also, the crop-rotations were responsible for a large proportion of variations in the aggregate areas under different crops. This was evidently pointed out in the Graphs 3.7 and 3.17 of Waghode and 3.8 and 3.18 of Rozode. A comparison of these two graphs clearly showed to what extent the variations in the total areas were caused by the crop-rotations themselves.

Summary

Of the total net cropped area of the sample cultivators, a large proportion was under the accepted crop-rotations in the dry as well as the irrigated villages. In the dry villages, the proportion of such area was always higher than 68 per cent of the total. The same was the case in the irrigated villages as well. The area which was continuously under the rotations for all the four years was also large in the dry and the irrigated villages. The accepted rotations themselves, therefore, were responsible to a large extent for the yearly variations in the aggregate areas under different crops.

CHAPTER IV

CROP-ROTATIONS

In the preceding chapter, it was noted that the variations in the area of the different crops grown in the dry as well as the irrigated villages, were largely caused by the rotations followed by the cultivators. The cultivators in general decided upon the rotation-plan and adhered to it to the extent possible, in their annual cropping. Thus, in the dry as well as the irrigated villages the rotated area was considerably large in each of the four years of the study. The yearly proportions of the rotated area to the total, varied between 76.4 and 98.2 per cent. The high proportions of the rotated areas clearly bring out the extent of adherence, of the cultivators to the accepted rotations and thereby the importance of crop-rotations as such. In the present chapter, therefore, it is proposed to discuss the rotation system, its advantages and the different types of crop-rotations commonly practised in the dry and the irrigated villages.

4.1. Crop-Rotation

Crop-rotation is defined as "growing of different crops on the same land in a definite order and in recurring succession."¹ It may include any kind or order of crops regardless of their

¹ Hopkins, E.S. and Leahey, A., Crop Rotations in the Prairie Province, Publication 761, Farmers' Bulletin 124, Dominion of Canada - Department of Agriculture, 1944, p. 1.

effect on the soil. A crop-rotation, thus, may be good or bad depending on the crops included in it and their effects on the soil. The term "rotation" is used very broadly to cover both the types of changes in crops. It connotes only the alternation of crops in a definite order and succession.¹ The well planned rotations, however, have good effects on the soil and provide many benefits, as will be elaborated later. Such benefits do not accrue, if the same crop is grown continuously on the same land, or when crops are grown in a haphazard manner without any definite order or plan of succession.

The importance of crop-rotation is well recognized by the cultivators in the surveyed villages, and for that matter by the cultivators in the whole country.² The experience of many generations of farmers has taught them, not only that some kinds of crops cannot be well grown continuously on the same land, but also that some crops do not grow well after others and some if followed successively prove beneficial to the succeeding crops. In the surveyed villages the crops which are advantageous to the succeeding one are known as "biwad" crops. In the other regions of Maharashtra, the term "biwad" is used for rotation, conveying the alternation of crops in a definite order.³ In the surveyed

1 Some of the agronomists consider even the growing of a certain crop in alternation with fallow as rotation.

2 Aiyer, A.K.Y.N., Principles of Crop Husbandry in India, Bangalore Press, Bangalore 2, 1957, pp. 273-276.

3 Kulkarni, K.S. has suggested "फेरपालट" as a better term for rotation, in order to avoid confusion of "biwad". Kulkarni, K.S., आमची शेती Poona 4, 1957, p. 88.

villages, however, it has a narrow connotation covering only the rotations in which the previous crop proves advantageous to the following one. All the leguminous crops and the crops of short duration are generally recognized as "biwad" crops. To note some, groundnut, udid, mug, gram are prominent in the leguminous group, and wheat, chillies are important in the other non-leguminous group of "biwad" crops.

In rotations the change of crop may be seasonal, or annual or after several years as in the case of garden crops or after many years as with orchards. Accordingly there can be two-year, three-year or more than three-year rotation depending on the duration of each crop included in it. Norfolk's four-year crop-rotation is well known in the European countries. The fertility of soil, its tilth, drainage, rainfall, irrigation facilities and farming practices prevalent, are some of the important factors affecting the selection of crops included in a rotation. In general practice, however, a well planned rotation may comprise of food and fodder-crops like jowar and bajara, the cash-crops like cotton, tobacco, and the restorative crops like groundnut, mug, udid or the other legumes. In a rotation the sequence of crops is of high importance and is largely determined by taking into consideration the root system, the requirements of food and the effects on the following crops. Generally a soil ameliorant crop such as groundnut is followed by a cash-crop like cotton, which is also a deep rooted crop. The deep rooted crop is followed by a shallow rooted crop like jowar. Thus, the three-year rotation of G-C-J is formed and practised.

4.2. Advantages of Crop-Rotation

The advantages of a well planned rotation can be summarised in three broad headings: (1) enrichment of soil; (2) efficient utilization of plant food and the inputs given to different crops; and (3) control of plant diseases, weeds, erosion and risk conditions. We discuss below each of these advantages in some details.

4.2.1. Enrichment of soil

1. Through different types of crops taken in a rotation the supply of organic matters in the soil is maintained or increased. When a single crop is grown continuously on the same land, the organic matter is depleted at a rapid rate.¹ Humus or well decayed organic matter is very important factor in improving the physical condition of the soil. Organic matter loosens the soil and thereby promotes the development of a 'crumb' structure which makes the soil absorb and hold water more readily, thus reducing loss of valuable nutrients by leaching and erosion.² Organic matter also favours the growth and development of beneficial types of bacteria in the soil and is a valuable store-house from which supplies of nitrogen can be drawn by the growing crops.³

2. As pointed out earlier the legumes have an important

1 Delorit, R.J. and Ahlgren, H.L., Crop Production - Principles and Practices, Prentice-Hall, Inc., New York, 1953, p. 569.

2 Ibid, p. 569.

3 Ibid, p. 569.

place in crop-rotation. They are important not only for the organic matter they add to the soil but because of their unique character to gather nitrogen from atmosphere and deposit it in the soil. Compared to commercial nitrogen fertilizer, legumes are the most economical source of nitrogen available on almost all farms.¹ It is pointed out that legumes fix nitrogen only to the extent that the supply in the soil is insufficient for their needs.² In a soil wherein the nitrogen content is low, the legumes are more effective in gathering nitrogen.

3. Continuous growing of one crop may lead to the development of certain organic toxic compounds resulting from improper decomposition of soil organic matter. Crop-rotation insures the normal decomposition processes and thus prevents the formation and accumulation of injurious substances in the soil.

4.2.2. Efficient Use of Plant Food and Inputs

1. Efficient use of plant food available at different layers in the soil is effectively attained by rotation system. Crops have different root systems both in depth and in lateral development, some being deep rooted, others shallow; some spreading much in all directions and others with roots crowding close below the base. Thus, different plants according to their root system absorb their food from different layers of the soil. In a rotation system by alternating shallow rooting with deep

1 Ibid, p. 569.

2 Leighty, C. E., "Crop Rotation," Soil and Men, U.S.D.A. year book, 1938, p. 414.

rooting crops, different soil horizons may be efficiently tapped for the available supply of nutrients.

2. Crops also differ in the amount and proportion of the different nutrients they consume from the soil. If a single crop is cultivated continuously it exhausts the supply of certain nutrients very soon and the productivity of the soil is rapidly reduced. When crops are grown in rotation, the nutrients are removed in better proportion and these are not likely to become unbalanced in the soil.

3. Deep rooted plants alternating with shallow rooted improve the physical condition of the soil and sub-soil.¹ Deep root penetration not only provides better drainage, resulting from channels left after the roots decay, but leaves root residues at the deeper layers to help maintain the organic matter and plant food content of the soil.

4. Well planned system of rotation makes practicable the application of manure and fertilizers to the most responsive crops or to those which have long growing season or a high money value. For example in a rotation like NB-JB-C-J the manure and fertilizers are invariably given to banana which is the most paying crop in the region. The other two crops are taken on the residuals of these inputs.

5. Through a planned crop-rotation human and bullock-labour is efficiently utilized and is well distributed over the year. When only one crop or a number of them that are similar

¹ Ibid, p. 411.

are grown, labour requirements are especially heavy at the time of sowing and harvesting and relatively light for the remainder of the growing period. In well planned rotations are included a variety of crops that do not have heavy labour requirements at one and the same time. Labour is thus distributed more uniformly throughout the growing period and the need for employing additional labour is reduced.

4.2.3. Crop-Rotation as a Control Measure

1. Crop-rotations are also much valued as a measure to control plant diseases, weeds and soil-erosion. Some insects and diseases attack only one type of plant or a group of closely related plants. With continuous cropping these pests live from year to year in the soil on the plant refuse. At times they increase to such an extent that production of the crop becomes no longer profitable. When crops that are resistant to these diseases and insects are grown at regular intervals in a rotation, damage to the susceptible crops is often reduced considerably. The diseases or insects that depend on a particular crop or a group of crops, do not survive during the periods when resistant types are grown.¹

2. Rotation of crops is the most effective means yet devised for keeping the land free from weeds. No other method of weed control, mechanical, chemical or biological is so economical or so easily practised as a well arranged sequence of tillage and cropping.² Not all weeds can be controlled by crop-

1 Leighty, C.E., op. cit., p. 414.

2 Leighty, C.E., op. cit., p. 417.

rotation; but it is quite effective in checking and reducing the prevalence of many of them.¹ Crops which have trailing habit of growth, for example, groundnut, kill out the surface weeds by smothering them.²

3. The soil losses by erosion are also effectively controlled by determining the proper kind and sequence of crops in a rotation. Sod-forming grasses and legumes are, for example, very effective in reducing the losses of erosion.

4. The rotation practice reduces the risks and uncertainties involved in crop production. At the time of sowing, the cultivators are not sure that they will reap a bountiful crop. During some years certain crops fail while others produce good yields. Consequently the risk of total failure or of poor production is usually greater with one crop than when several crops are grown. The risk of price variations is also minimised when instead of one, several crops are grown. Thus, the diversification of crops which is best accomplished through crop-rotation, is always safe. On the one hand it assures against the total failure of production, and on the other it distributes the income over the year and tends to provide year round work for human as well as bullock-labour.

As a result of all the advantages described above a

1 Of about 1200 species of plants of weeds in U.S.A. less than 30 are sufficiently aggressive to be able to survive indefinitely on crop rotated land. Leighty, C.E., op.cit., p. 417.

2 Mollison, J., Text Book on Indian Agriculture, Vol. I, Bombay, 1901, p. 44.

rotation of crops not only tends to favour higher crop production but also insures better crop quality than continuous cropping. There are numerous cases on record to show the advantageous effects of rotating crops on yield and quality. The very fact that fertility of land is increased and the ravages of insect pests and of plant diseases are reduced in a crop-rotation system as compared with continuous cropping, insures for better yield and better quality of the crop.

Where three or more crops are included in a crop-rotation, the arrangement of the crop sequence has an important effect on the yields of certain crops.¹ The stubble and roots of certain plants and their breakdown are injurious to certain crops that follow. It has been found that the roots of jowar crop contain much sugar and when this is liberated into the soil after the harvest of the crop, it stimulates the growth of certain micro-organisms which compete with the succeeding crop for nitrogen and also for other elements.²

Some of the explanations³ offered for the effects of certain crops on the succeeding ones are: (1) the removal of large quantities of mineral elements tending to impoverish the soil; (2) the removal of large amounts of elements that are chemically basic with lesser amounts removed that are acidic,

1 Odland, T.E. and Smith, J.B., "The Effects of Certain Crops on Succeeding Crops," Journal of American Society, 1933.

2 Hughes, H.D. and Hension, E.R., op. cit., p. 111.

3 Ibid, p. 112.

creating in this way a greater degree of soil acidity; (3) creation of large amounts of residues relatively high in carbohydrates and low in nitrogen, the decomposition of which by micro-organisms are at the expense of soil nitrogen in this way decreasing the amount of nitrogen available to growing plants; (4) the excretion of organic toxins from the roots or the decomposition of plant residues which may have organic toxins in the soil temporarily.

The rotation experiments conducted during 1940-50 at the Research Station, Jalgaon, have revealed that in a three-year rotation of jowar, cotton and groundnut, the proper sequence which gives the highest yield from each of the crop, is G-C-J.¹

4.3. Crop-Rotations in the Dry Villages

Jowar, cotton and groundnut are the three major dry crops grown in the two dry villages. From these crops, three types of two-year rotations, G-J, G-C and C-J, are formed. These can be expanded into longer rotations of three, four or more years by adding a third crop or by repeating one of the two crops included in each of the three rotations. Thus, from these two-year rotations, two types of three-year rotations, G-C-J and G-J-C, can be formed. In these two rotations, the three crops included are the same but their sequence is different. The four-year rotations and the rotations having still longer period can be formed only by repeating one of the crops included in the two or three-year rotations. However, the four-year or longer rotations are

¹ World Seed Year, Maharashtra State, Department of Agriculture, Poona, 1961, p. 47.

rarely practised in the two dry villages. The most common rotations with the cultivators in these villages are the two and three-year rotations. In the following are discussed in brief each of the two and three-year rotations.

4.3.1. Two-Year Rotations

Groundnut-Jowar :- Both the crops included in this crop-rotation are grown in kharif season. Of the two, groundnut is comparatively of a short duration of 100 to 120 days. It is generally sown at the end of June and harvested in October. The second crop of the rotation, jowar, is comparatively a long duration crop which is sown by the end of June and harvested in November and December. The two crops included in the rotation, belong to two different plant families. Groundnut is from the Leguminosae family and jowar from the Gramineae. Because of this basic difference, their root systems, habits of growth, food intake from soil and their effects on the succeeding crop, are different. Both the crops are shallow rooted, but there is a difference in their respective root systems. Groundnut has a fairly well developed root system with a tap root penetrating slightly deep and many laterals spreading around it.¹ Its roots are normally concentrated between the depth of two to sixteen inches. The spread of the roots is confined to a radius of twelve to fourteen inches.² Jowar, on the other hand, has no tap

1 Seshadri, C. R., Groundnut, The Indian Central Oilseeds Committee, Himayatnagar, Hyderabad 1 (Deccan), 1962, p. 31.

2 Ibid, p. 32.

root. Its roots are more wiry and fibrous, and usually more abundant.¹ Most of its roots are confined to the upper layer of one and half feet of the soil, but are widely and thickly distributed.² The food nutrients required by the two crops are widely different. (See Table 4.1.) It is pointed out that under the normal system of cultivation, groundnut removes relatively large amounts of phosphorus and nitrogen than jowar. The after-effects of the two crops are also different. Groundnut being a leguminous crop, fixes atmospheric nitrogen in the soil, through the root nodules bacteria. It is, therefore, considered as a restorative crop, which conserves the fertility of soil. The quantity of

Table 4.1: Total Quantities of the Nutrients Removed from Soil by the Different Crops

Crop	Yield (mds. per acre)	Nutrients removed per acre		
		N (lbs.)	P (lbs.)	K (lbs.)
Jowar	12	46	16	77
Bajara	10	25	10	90
Wheat	25	52	26	60
Maize	30	102	42	93
Cotton (unginned)	5	72	18	78
Groundnut (unshelled)	21	70	20	40
Banana	1400	333	84	867

Source : Yawalkar, K.S. et al, Commercial Fertilizers in India (Some Recommendations for Efficient Use), Agricultural Publishing House, Nagpur, 1962, p. 13.

1 Dutt, C.P. and Pugh, B.M., Farm Science and Crop Production in India, Kitabistan, Allahabad, 1947, p. 116.

2 Ibid, p. 116.

the atmospheric nitrogen fixed by groundnut varies widely with the seasonal conditions and the characters of soil. However, it has been roughly measured that on an average the legume bacteria deposit about 80 lbs. of nitrogen per acre annually.¹ Jowar on the other hand, is considered as an exhausting crop as it impoverishes the soil. This is largely due to the fact that its root system is concentrated on the upper soil layers, thus resulting in the exhaustion of the surface soil of its available plant nutrients.² It exhausts particularly the nitrogen available, by the action of cellulose decomposing bacteria during the decay of its roots and stubbles.³ It has been pointed out that the depressing effect of jowar is temporary but most pronounced on the succeeding crop, if it is one of the cereals.⁴ It is least noticeable with legumes⁵ and hence it is always beneficial to rotate jowar along with groundnut.

This rotation is of a simple form wherein an exhausting crop is alternated with a restorative crop. It helps to maintain the fertility of soil at a higher level without any application of manure or fertilizers. This type of rotation, therefore, is largely practised by the small cultivators, whose resources are

1 Oswald, S., and Brown, B.E., "Soil Nitrogen," Soil and Men, U.S.D.A. Year Book, 1938.

2 Dutt, C.P. and Pugh, B.M., op. cit., p. 117.

3 Ibid, p. 117.

4 Ibid, p. 117.

5 Ibid, p. 117.

limited and who cannot manure their land very often. It is reported that in both the dry villages, this rotation is commonly practised on the lighter soil where groundnut grows better and where cotton cannot be satisfactorily taken.

The beneficial effects of raising the two crops in rotation have been pointed out by many agronomists. It has been conclusively shown that both the crops give higher yield when taken in rotation. The crop-rotation experiments carried out at the Agricultural Research Station, Jalgaon, have revealed that jowar taken after groundnut gives higher yield than jowar grown year after year with or without manure. (See Table 4.2.) Similarly, the crop-rotation experiments at the Tindivanam Station in Madras State, have also proved that groundnut taken after cereals gives an increased yield up to 12 per cent over groundnut following groundnut.¹ Similar results were reported by Badami² also. The crop-rotation experiments at Tindivanam have also pointed out that the cereals following groundnut record outstanding and significant increase in yields of 43 to 124 per cent over cereals grown continuously without any rotation.³

Continuous growing of both the crops year after year is considered very harmful in the sense that it results in exhaustion of the soil. Experiments carried out at the various centres

1 Seshadri, C.R., op. cit., pp. 158-159.

2 Badami, V.K., "Groundnut in Mysore," Jour. Mysore Agri. Exp. Union, XI, pp. 113-119.

3 Seshadri, C.R., op. cit., p. 158.

Table 4.2 : Per Acre Yield of the Crops Grown under Different Rotation Experiments at the Agricultural Research Station, Jalgaon

Rotation	1948-49					1949-50					1950-51				
	G	J	J (m)	C	C (m)	G	J	J (m)	C	C (m)	G	J	J (m)	C	C (m)
Groundnut-Jowar															
Groundnut in 1949	846	-	-	-	-	-	2,211	-	-	-	845	-	-	-	-
Jowar in 1949	-	1,789	-	-	-	784	-	-	-	-	-	1,534	-	-	-
Groundnut-Cotton															
Groundnut in 1949	819	-	-	-	-	-	-	-	705	-	813	-	-	-	-
Cotton in 1949	-	-	-	338	-	916	-	-	-	-	-	-	-	706	-
Cotton-Jowar															
Cotton in 1949	-	-	-	-	493	-	1,252	-	-	-	-	-	-	-	382
Jowar in 1949	-	1,670	-	-	-	-	-	-	-	575	-	1,129	-	-	-
Groundnut-Cotton-Jowar															
Groundnut in 1949	779	-	-	-	-	-	-	-	-	532	-	1,353	-	-	-
Cotton (m) in 1949	-	-	-	-	463	-	-	-	-	-	804	-	-	-	-
Jowar in 1949	-	1,853	-	-	-	820	-	-	-	-	-	-	-	-	626
Groundnut-Jowar-Cotton															
Groundnut in 1949	870	-	-	-	-	-	1,715	-	-	-	-	-	-	-	405
Jowar in 1949	-	1,694	-	-	-	-	-	-	-	772	953	-	-	-	-
Cotton (m) in 1949	-	-	-	-	472	869	-	-	-	-	-	1,082	-	-	-
Jowar (m)-Jowar															
Jowar (m) in 1949	-	-	1,717	-	-	-	1,282	-	-	-	-	-	1,143	-	-
Jowar in 1949	-	1,655	-	-	-	-	-	1,365	-	-	-	1,068	-	-	-
Jowar (m)-Jowar (m)															
	-	-	2,026	-	-	-	-	1,450	-	-	-	-	1,154	-	-
Cotton (m)-Cotton															
Cotton (m) in 1949	-	-	-	-	491	-	-	-	466	-	-	-	-	-	548
Cotton in 1949	-	-	-	397	-	-	-	-	-	430	-	-	-	616	-
Cotton (m)-Cotton (m)	-	-	-	-	528	-	-	-	-	523	-	-	-	-	617

(continued)

Table 4.2 : (continued)

Rotation	1951-52					1952-53					Average yield per acre				
	G	J	J (m)	C	C (m)	G	J	J (m)	C	C (m)	G	J	J (m)	C	C (m)
Groundnut-Jowar															
Groundnut in 1949	-	661	-	-	-	703	-	-	-	-	706	1,470	-	-	-
Jowar in 1949	350	-	-	-	-	-	1,156	-	-	-	-	-	-	-	-
Groundnut-Cotton															
Groundnut in 1949	-	-	-	470	-	891	-	-	-	-	760	-	-	589	-
Cotton in 1949	361	-	-	-	-	-	-	-	726	-	-	-	-	-	-
Cotton-Jowar															
Cotton in 1949	-	346	-	-	-	-	-	-	-	427	-	1,111	-	-	427
Jowar in 1949	-	-	-	-	247	-	1,157	-	-	-	-	-	-	-	-
Groundnut-Cotton-Jowar															
Groundnut in 1949	395	-	-	-	-	-	-	-	-	600	774	1,246	-	-	549
Cotton (m) in 1949	-	-	-	-	523	-	1,329	-	-	-	-	-	-	-	-
Jowar in 1949	-	434	-	-	-	1,071	-	-	-	-	-	-	-	-	-
Groundnut-Jowar-Cotton															
Groundnut in 1949	378	-	-	-	-	-	1,283	-	-	-	806	1,247	-	-	480
Jowar in 1949	-	462	-	-	-	-	-	-	-	465	-	-	-	-	-
Cotton (m) in 1949	-	-	-	-	285	960	-	-	-	-	-	-	-	-	-
Jowar (m)-Jowar															
Jowar (m) in 1949	-	442	-	-	-	-	-	985	-	-	-	1,089	1,152	-	-
Jowar in 1949	-	-	549	-	-	-	996	-	-	-	-	-	-	-	-
Jowar (m)-Jowar (m)															
	-	-	575	-	-	-	-	1,064	-	-	-	-	1,254	-	-
Cotton (m)-Cotton															
Cotton (m) in 1949	-	-	-	312	-	-	-	-	-	603	-	-	-	461	470
Cotton in 1949	-	-	-	-	278	-	-	-	513	-	-	-	-	-	499
Cotton(m)-Cotton(m)															
	-	-	-	-	276	-	-	-	-	553	-	-	-	-	-

Source : National Index of Agricultural Field Experiments, Vol. 8, Part I, Maharashtra, 1948-53; Indian Council of Agricultural Research, New Delhi, 1962, pp. 842-847.

in the United States have conclusively proved the harmful effect of continuous cropping with groundnut.¹ The results of a continuous cropping trial of groundnut, conducted in Georgia Plain Experiment Station, are presented in Table 4.3. These results evidently show that with all the fertilizer treatments there is a progressive decline in yields with each successive crop of groundnut. The yields of jowar also go down progressively, when it is repeated year after year.

Table 4.3 : Yield of Successive Crops of Groundnut Grown with and without Fertilizers - Georgia Coastal Experiment Station (1946)

Treatment	Yield of unshelled nuts per acre in pounds				
	1940	1941	1942	1943	1944
No fertilizer	1,407	1,259	804	663	488
0 - 8 - 8	1,645	1,585	1,169	1,088	1,037
3 - 0 - 8	1,744	1,647	1,303	1,125	1,106
3 - 8 - 0	1,628	1,410	1,013	910	531
3 - 8 - 8	1,701	1,603	1,272	1,150	1,075

Source: Seshadri, C.R., op. cit., p. 155.

The data regarding financial aspect of the rotations, experimented at the Jalgaon Research Station, are not available. However, at the Tindivanam Station, it was found that the rotation of groundnut-cholam (jowar) "is capable of giving the

1 Ibid, p. 155.

maximum returns to the farmer" at the wage rates and the prices prevailing in the experiment period.¹

Groundnut-Cotton :- Both the crops included in this rotation are kharif crops. Groundnut, as pointed out earlier, is a short duration crop. Cotton, on the other hand, is a crop of long duration. It is sown by the end of June and harvested in January and February of the following calendar year. The two crops in the rotation come from two different plant families, groundnut, from Leguminosae and cotton from Malvaceae or Mellow family.² The botanical details and the after-effects of groundnut have been already discussed. The root system of a cotton plant possesses a long tap root from which the laterals or feeding roots arise.³ The tap root goes three to four feet deep in the soil.⁴ The laterals, however, are only a few inches below the surface of the soil and branch out in all directions so as to create a network of roots.⁵ Cotton is a deep rooted plant and is, therefore, considered advantageous to rotate along with groundnut which is shallow rooted. One can, therefore, successfully tap all the different layers of the soil for food nutrients by growing these two crops in alternation. The total requirement of the major food nutrients of the two crops is different

1 Ibid, p. 158.

2 Dutt, C.P. and Pugh, B.M., op.cit., p. 87.

3 Ibid, p. 94.

4 Ibid, p. 95.

5 Sethi, B.L. et al, op. cit., p. 97.

particularly in the case of nitrogen (Table 4.1). Looking to the large amount of nutrients removed by cotton, it is considered as an exhausting crop. It is evident from the table that on an average, the cotton crop in an acre, removes 72 lbs. of nitrogen, 18 lbs. of phosphorus and 78 lbs. of potassium. Because of such a high requirement of food nutrients, cotton crop is usually supplied with farmyard manure. Of the two crops, groundnut is not manured, particularly in the medium-black soil. It is reported by the cultivators that if manure is applied to groundnut in such soil, it encourages vegetative growth of vines at the cost of pod development;¹ and thus the crop gives a considerably low yield. The general practice in the villages, is, therefore, to manure cotton and to grow groundnut after it.

In this type of rotation also, a restorative crop (groundnut) is alternated with an exhausting crop (cotton). The exhausting crop is generally manured. Another point to be noted is that both the crops included in this rotation are cash-crops. Because of these two factors, this crop-rotation is generally practised by the medium and the large cultivators whose resources are better, who can manure their land in alternate years, and who normally have additional land to grow food crops like jowar, wheat etc. to meet their food and fodder needs. It is reported by the villagers that this rotation is commonly followed on the medium-black soil, where both the crops--groundnut and cotton--can be grown satisfactorily.

1 Seshadri, C.R., op. cit., p. 141.

The beneficial effects of growing the two crops in rotation have been pointed out by the rotation experiments conducted at the different Research Stations. The experiments carried out at the Research Station, Jalgaon, have shown that the average yield of cotton, when it is taken after groundnut is as high as 589 lbs. of seed-cotton per acre (Table 4.2). The average yield of cotton, grown continuously on the same land, with or without manure, varies between 461 and 499 lbs. of seed cotton per acre. Similarly, at the Research Station, Akola, it has been revealed that, of the seven rotations experimented the two-year rotation of G-C is better and it gives the highest average yield of seed-cotton per acre (see Table 4.4). The increase in the yield of cotton grown according to this rotation is 135 per cent over the yield of cotton taken year after year.¹ Groundnut also gives a comparatively high yield when it is rotated with cotton. From the crop-rotation experiments conducted at the Research Station, Jalgaon, it can be seen that the groundnut crop alternated with jowar has yielded on an average a low produce (706 lbs. of pods per acre) than that of groundnut taken after cotton (760 lbs. of pods per acre). Continuous growing of the same crop, either of cotton or of groundnut is harmful to the soil and hence is not generally practised. The harmful effects of continuous cropping of groundnut have been already pointed out. The crop-rotation experiments at the Research Station, Akola, reveal that with

1 Mahta, D.N. and Janoria, D.L., "Groundnut as a rotation crop with cotton," Indian Journal of Agricultural Science, Vol. III (1933), p. 919.

Table 4.4 : Per Acre Yield of the Crops Grown under Different Rotation Experiments (1923-24 to 1930-31) at the Government Experimental Farm, Akola (in lbs.)

Rotation	1923-24			1924-25			1925-26			1926-27			1927-28		
	G	C	J	G	C	J	G	C	J	G	C	J	G	C	J
Groundnut-Cotton															
Cotton in 1923-24	-	318	-	1,590	-	-	-	506	-	1,000	-	-	-	758	-
Cotton-Jowar															
Cotton in 1924-25	-	-	-	-	374	-	-	-	1,910	-	390	-	-	-	1,258
Groundnut-Cotton-Jowar															
Cotton in 1924-25	-	-	-	-	554	-	-	-	1,566	1,190	-	-	-	900	-
Cotton-Cotton															
Cotton in 1923-24	-	238	-	-	254	-	-	190	-	-	228	-	-	554	-
Cotton-Cotton-Jowar															
Cotton in 1925-26	-	-	-	-	-	-	-	336	-	-	372	-	-	-	1,440
Cotton-Cotton-Groundnut															
Cotton in 1925-26	-	-	-	-	-	-	-	410	-	-	422	-	2,340	-	-
Cotton-Cotton-Jowar-Groundnut															
Cotton in 1925-26	-	-	-	-	-	-	-	438	-	-	323	-	-	-	1,680

(continued)

Table 4.4 : (continued)

Rotation	1928-29			1929-30			1930-31			Average yield per acre		
	G	C	J	G	C	J	G	C	J	G	C	J
Groundnut-Cotton												
Cotton in 1923-24	2,300	-	-	-	1,002	-	1,372	-	-	1,566	755	-
Cotton-Jowar												
Cotton in 1924-25	-	420	-	-	-	1,546	-	318	-	-	376	1,571
Groundnut-Cotton-Jowar												
Cotton in 1924-25	-	-	1,308	1,598	-	-	-	756	-	1,394	737	1,437
Cotton-Cotton												
Cotton in 1923-24	-	252	-	-	432	-	-	418	-	-	321	-
Cotton-Cotton-Jowar												
Cotton in 1925-26	-	370	-	-	806	-	-	-	1,446	-	471	1,442
Cotton-Cotton-Groundnut												
Cotton in 1925-26	-	902	-	-	430	-	1,706	-	-	2,023	585	-
Cotton-Cotton-Jowar-Groundnut												
Cotton in 1925-26	1,950	-	-	-	1,220	-	-	614	-	1,950	649	1,680

Source : Mahta, D.N. and Janoria, D.L., "Groundnut as a Rotation Crop with Cotton," Indian Journal of Agricultural Science, Vol.III, 1933, pp.924-925.

continuous growing of cotton, there is a continuous fall in the yield from year to year, owing to the depletion of the soil and increase in the incidence of fungoid and other diseases.¹

The financial aspects of the different crop-rotations were studied at the Research Station, Akola, way back in 1923-24 to 1930-31. The results of these experiments are available in published form.² Such a study pertaining to recent period, is not available for any of the Research Stations in the Maharashtra State. In the National Index of Agricultural Field Experiments in Maharashtra State, only the average yields of different crops in different crop-rotations are presented.³ The data as regards the financial aspects of these crop-rotations are not available. In such circumstances one may refer to the old study at Akola, even though it is outdated as the prices and the wage rates prevailing then have tremendously changed. However, a rough idea of the comparative profitability of different rotations can be had from the old study as both prices and wages have increased simultaneously since then. From the study at Akola, it has been concluded that the rotation of G-C, though it gives the highest average yield of seed cotton, from the financial point of view it cannot well compare with other rotations, particularly the three-year rotation of G-C-J. It has been pointed out that this is

1 Ibid, p. 920.

2 Ibid, pp. 920-923.

3 National Index of Agricultural Field Experiments, Vol. 8, Part I - Maharashtra (1948-53); I.C.A.R., New Delhi, 1962, pp. 842-847.

largely due to the high cost of groundnut cultivation and the absence from the rotation of jowar which gives valuable and readily marketable fodder.¹

Cotton-Jowar :- Both the crops included in this rotation are the kharif season crops of long duration. Between the two, cotton has a slightly longer duration than jowar. As stated earlier, jowar occupies the land till December while cotton, till February of the following calendar year. The details regarding the plant families of the two crops, their root system, food requirements and their after-effects on the succeeding crops have been presented earlier. The peculiarity of this crop-rotation is that both the crops included in it are exhausting. However, the food nutrients required by each of them differ to a large extent. Of the two, cotton removes larger quantities of the three major nutrients. (See Table 4.1.) This means cotton is more exhausting than jowar. It is reported by the cultivators that as both the crops are exhausting, manuring becomes more essential as far as this type of rotation is concerned. The cultivation of the two crops may not be continued for long without any application of manure, as it causes serious depletion in the fertility of soil and thereby in the yield of both the crops. Of the two crops, therefore, cotton is largely manured as it is a cash-crop and the returns from it are comparatively higher than that of jowar. Jowar is generally not manured, as manuring is likely to have an adverse effect on its yield. The cultivators

1 Mahta, D.N. and Janoria, D.L., op.cit., p. 921.

reported that manuring generally causes more vegetative growth in jowar at the cost of grain development.¹

This type of rotation is mostly practised on the deep-black soil. On such soils, groundnut cannot be grown satisfactorily as such soils tend to become hard during dry weather, thereby interfering with the penetration of pegs into the soil and also making its harvesting extremely difficult.² Of the three major dry crops, therefore, only cotton and jowar can be grown on such soil and hence the predominance of this rotation on it.

The crop-rotation experiments carried out at the Research Station, Jalgaon, point out that this rotation is comparatively less beneficial than the other two-year rotation of G-C and G-J. It has been shown that the average yield of cotton taken under this rotation is far less (427 lbs. of seed cotton per acre) than that of cotton grown after groundnut (589 lbs. of seed cotton per acre). Similarly the average yield of jowar, cultivated under this rotation is very low (1,111 lbs. per acre) than that of jowar grown after groundnut (1,470 lbs. per acre). It is important to note that yields of both cotton and jowar taken under this rotation are even lower than the average yields of the same two crops grown repeatedly year after year (see Table 4.2). The crop-rotation experiments at the Research

1 Similar observation is reported by the Mission which visited British African Territories. Report of the Sorghum Mission to Certain British African Territories, Colonial Advisory Council of Agriculture, Animal Health and Forestry; Publication No. 2; His Majesty's Stationery Service, London, 1951, p. 95.

2 Seshadri, C.R., op.cit., p. 132.

Station, Akola, have also revealed that the average yield of cotton grown according to this rotation is far lower than the yield of cotton taken under any other rotations (see Table 4.4).

From the old study of the financial aspects made at the Research Station, Akola, it appears that this rotation is more profitable than the two-year rotation of G-C.¹ This is largely because of the comparatively lower costs of cultivation of both the crops included in this rotation.

4.3.2. Three-Year Rotations

Groundnut-Cotton-Jowar :- Of the three crops included in this rotation, two are exhausting and one, restorative. The details about the root systems of these crops, their habits of growth, food nutrients required by them and their after-effects on the succeeding crop are already given. The sequence of the three crops in this rotation is reported to be more advantageous. The cultivation of cotton after groundnut is regarded as the most beneficial. This is firstly because, in such sequence the cotton crop usually gives higher yield; and secondly, as it is preceded by a leguminous crop, it need not be given a heavy dose of manure. In such a sequence, therefore, there can be slight reduction in the cost of manurial inputs. The sequence between cotton and jowar is also of advantage, as jowar which is an exhausting crop gets the residual benefits of the manure applied to cotton. The sequence between jowar and groundnut is also beneficial in the sense that the depressing effect of jowar is less harmful to the leguminous crop.

1 Mahta, D.N. and Janoria, D.L., op.cit., p. 921.

It is reported by the cultivators that this rotation is mostly followed on the medium-black soil, where all the three crops included in it can be satisfactorily grown. It cannot be practised on the lighter type of soil as it does not suit cotton cultivation. Nor can it be followed on the deep-black soil, as groundnut cannot be grown on it.

The crop-rotation experiments carried out at the Research Station, Jalgaon, have conclusively proved that the sequence followed in this rotation is the best of all the other rotations, as it gives higher yield of all the three crops included in it. The rotation experiments at the Research Station, Akola, also have proved the same. It is pointed out that, this rotation is the best, particularly because it includes jowar, which constitutes not only the principal food of the people in the region, but also provides dry fodder for their livestock.¹ It has been observed at the Research Station, Jalgaon, that the average yield of cotton and jowar grown according to this rotation is higher than that of cotton and jowar taken repeatedly year after year with or without manure. The average yield of groundnut is also higher than that of the groundnut crop grown under the two rotations of G-J and G-C. The average yields of cotton and jowar rotated according to this rotation are, however, lower than those of cotton and jowar grown under the rotations of G-C and G-J respectively (see Table 4.2).

The study of the financial aspects made at the Research

1 Ibid, p. 921.

Station, Akola, has revealed that this rotation is the most profitable of all. It has been pointed out that "with a comparatively low cost of production this rotation offers the largest gross profit per acre." ¹

Groundnut-Jowar-Cotton :- The crops included in this rotation are the same as in the previous one, but their sequence is different. The order of crops in this rotation is not regarded as of much advantage. Under this rotation, cotton is grown after jowar, which is an exhausting crop and which impoverishes the soil to a great extent. This sequence of crops, therefore, not only affects adversely the yield of cotton but also increases its cost of manurial inputs. It is reported by the cultivators that because of the depressing effect of jowar, the cotton grown after it gives lower yield. The cotton crop, as it is taken after jowar, has to be given higher dose of manure, to recoup the soil exhausted by jowar. The sequence between cotton and groundnut is also not advantageous. The cultivators pointed out that in such an order, the residuals of manure applied to cotton, encourages more of vegetative growth in the groundnut vines at the cost of pod development. The sequence between groundnut and jowar alone is regarded beneficial. The jowar crop as it is taken after a leguminous crop like groundnut, gives better yield.

This rotation is practised only on the medium-black soil, where all the three crops can be satisfactorily grown. This rotation, however, is not very common with the cultivators, as

¹ Ibid, p. 921.

the sequence of the three crops in it, is not advantageous.

The crop-rotation experiments at the Research Station, Jalgaon, have shown that the crops grown according to this rotation do not give high yield--particularly cotton and jowar. (See Table 4.2.) The average yield of cotton is lower than the yield of the manured cotton grown continuously year after year. The same is the case with jowar. The average yield of groundnut alone is comparatively higher. If the yields of the three crops grown according to this rotation are compared with those of the previous one, one finds that the previous type of rotation gives better results. (See Table 4.2.) Both the cash-crops grown according to the previous rotation give higher yields.

From the financial point of view also, this rotation is not as profitable as the previous one.

4.4. Crop-Rotations in the Irrigated Villages

In the two irrigated villages, banana is grown as the major irrigated crop, in addition to the dry crops like jowar, groundnut and cotton. In these villages banana is the main crop around which the major rotations are formed. Banana is largely rotated along with any of the three dry crops. The rotations in these irrigated villages, therefore, are of a peculiar type under which an irrigated crop is alternated with dry crop/s. The cultivators reported that this practice of mixed rotations is consciously followed in order to avoid the problems of water-logging. After taking banana, which is heavily irrigated, they prefer to put their lands under dry crops for a year or two. The rotations of the irrigated crops alone, such as Banana-Sugarcane, Banana-Paddy etc. are very rare.

From the four major crops--banana, jowar, groundnut and cotton--taken in these villages, three types of three-year rotations--NB-JB-C; NB-JB-J; and NB-JB-G, are formed. These are the three basic rotations, which, however, can be extended to longer rotations of four, five or more years, by adding the other dry crops to each of them. The four-year or longer rotations, however, are rarely practised in both the irrigated villages. The crop-rotations largely practised in these two villages are NB-JB-C and NB-JB-J. It was seen that of the total irrigable area of the sample cultivators in the two villages, more than 56 per cent was reported under these two crop-rotations (56.8 per cent in Waghode and 56.4 per cent in Rozode). Besides these two rotations, however, the rotations of the dry crops alone, which are discussed earlier, are also followed on the dry lands. In the following, we discuss in brief the two rotations, NB-JB-C and NB-JB-J, which were most commonly practised on the irrigated land in the two villages.

4.4.1. Three-Year Rotations

Banana-Cotton :- This is a mixed type of rotation in which an irrigated crop (banana) is alternated with a dry crop (cotton). Of the two crops, banana is of a longer duration, lasting for one and a half years. Comparatively, cotton is of a lesser duration occupying the land for nine months or half the period required for banana. In both the irrigated villages, banana is grown as a plant-crop. Its ratooning is never practised. The crop is planted in June and is harvested in October and November of the following year.

The botanical and other details about cotton are presented earlier. As for banana grown in these two villages, it is of "Dwarf Cavendish" or Basarai variety. Banana belongs to the family Musaceae which is a member of the order Scitamineae.¹ The banana plant is a giant herb.² Its stalk supporting the mass of leaves and the bunch of fruits is merely a compact cylinder of tightly rolled elongated sheaths. It has an extensive mass of roots.³ They mostly spring from the upper parts of the corm, a little below the bases of the outermost surviving leaves and spread laterally in upper layers of the soil.⁴ According to Fewcett the laterally spreading roots extend to some seventeen feet from the plant, descending commonly to a depth of two and half feet in the soil.⁵ Under all but the most favourable soil conditions, however, the majority of the roots are to be found in the top six inches. Banana is therefore considered as a surface feeder. It is an exhausting crop. As shown in Table 4.1, the crop removes the highest amount of all the three major nutrients from soil. Heavy doses of manure (35 to 40 cart-loads per acre) and fertilizers (600 to 750 lbs. per acre) are therefore

1 Simmonds, N.W., op. cit., p. 1.

2 Report of the Banana Mission, Inter-American Economic and Social Council, Special Committee on Bananas, Pan American Union, Washington, D.C., 1957, p. 34.

3 Summerville working on the 'Dwarf Cavendish' banana in Queensland found that a healthy corm bore 2-300 roots. Quoted by Simmonds, N.W., op. cit., p. 4.

4 Simmonds, N.W., op. cit., p. 4.

5 Ibid, p. 4.

applied to it. It is regarded as a good rotation crop, as the residuals of manure applied to it prove beneficial to the succeeding crop. As pointed out earlier, the banana crop requires heavy irrigation. The average rate of irrigation is about three inches per eight to ten days. The cultivators reported that seventy to seventy-five waterings are normally applied to it during its period of eighteen months. Because of such a heavy irrigation, the need of putting the land under dry crops after banana, is more felt.

The experiments of crop-rotations with banana as one of the crops, are not carried out at any of the Research Centres in the Maharashtra State. This is largely because except in the Jalgaon region, banana is taken as a perennial crop in other parts of the Maharashtra State. In the other States also, banana is grown as a perennial crop.¹ The practice of growing banana as plant-crop and rotating it with the other dry crops is unique and is confined to the Jalgaon region only. The Banana Research Station established at Savada in the Jalgaon region is started very recently² and hence there too, the crop-rotation experiments about banana are not yet undertaken. Thus, there is no scientific study available about the crop-rotations of banana. In such conditions, the experiences and the general

1 The oldest banana fields recorded are in Madras where, according to Cheema, Bhat and Naik, ages of one hundred years are known. Quoted by Simmonds, N.W., op. cit., p. 191.

2 The Banana Research Station at Savada, Jalgaon district, is established in 1960-61.

impressions reported by the cultivators in the two irrigated villages, may be relied upon.

It is reported that most of the cultivators in both the irrigated villages prefer to follow this rotation, NB-JB-C, on medium as well as deep-black land. This is evident from the data as well. The data clearly reveal that in both the villages a large proportion of the total irrigable land, both of medium and deep-black soil, was reported under this single rotation. In Waghode, about 27.3 per cent of the total medium-black land having irrigation, was reported under this rotation. Similar was the case in Rozode. About 39.2 per cent of the irrigable land of medium-black soil was under this rotation. This type of rotation is all the more preferred on the deep-black land as on such land jowar taken after banana generally does not give good results. In both the villages, therefore, the largest proportion of the deep-black land having irrigation facility (41.0 per cent in Waghode and 11.98 per cent of the total irrigable deep-black land in Rozode) was put under this single rotation.

It is reported by the cultivators that they prefer to rotate cotton along with banana on their irrigable lands, because of three main reasons: (1) By growing cotton in rotation with banana, the cultivators can maximise their income as both of these are cash-crops and give high returns than any of the other crops grown in the two villages. Most of the cultivators, having irrigation facility, therefore, prefer to rotate cotton along with banana as it gives higher returns at comparatively lower cost of cultivation. (2) It is pointed out that cotton

taken after banana grows better and gives high yield. The residuals of the manure applied to banana proves beneficial to this crop. Such is not the case with jowar and groundnut. The cultivators reported that because of the residual effects of the heavy doses of manure applied to banana, more of vegetative growth takes place in the case of both jowar and groundnut and these yield comparatively less produce. (3) It is believed that cotton taken after banana need not be given any fresh doses of manure. It can be grown well only on the residuals of the manure applied. The cultivation cost of cotton, therefore, remains low to that extent. This rotation is largely preferred by the medium and the large cultivators who have additional lands to grow jowar to meet their requirements of food and fodder. The cultivators who do not have such additional land are required to take jowar after banana, even though it does not give satisfactory yield.

Banana-Jowar :- This rotation is not commonly practised, as jowar grown after banana, generally gives lower yield. The cultivators reported that the residual of the heavy doses of manure applied to banana, causes more of vegetative growth in jowar plants at the cost of grain produce. The normal height of jowar plants grown on dry land according to the rotations of dry crops was about seven to eight feet. In Waghode, it was observed that the plants of jowar taken after banana grew to a height of eleven to twelve feet. It is reported that because of such height, the jowar crop suffers from lodging, which affects the yield still more adversely. However, some of the smaller

cultivators who do not have additional land to grow jowar to meet their food requirements, take jowar after banana, even though it gives low yields.

Some of the other cultivators held an altogether different view. They reported that though the yield of jowar taken after banana is low, the crop proves beneficial to the succeeding crop of banana. They pointed out that jowar crop is a very good moisture absorber and helps to a great extent in drying up the land which is put to heavy irrigation for nearly two years for the banana crop. They reported that banana gives better results when it is taken after jowar. These cultivators prefer to suffer some losses on account of jowar, in order to get better yield of the following banana crop. These are mainly the large cultivators, who concentrate more on the cultivation of banana crop. Thus, the rotation of NB-JB-J, is mainly practised by the small and the large cultivators on two different grounds.

It is reported that in both the irrigated villages, this rotation is largely practised on the medium-black land on which the vegetative growth in jowar plants can be comparatively less. It is generally not preferred on the deep-black soil. This can be seen from the data also. In Waghode about 29.6 per cent of the medium-black land having irrigation, was reported under this rotation. In Rozode also, the case was near about the same-- 35.6 per cent of the medium-black land being under it. In the case of the deep-black land, however, the proportion of the area reported under this rotation was considerably low. In Waghode about 15.9 per cent of the total irrigable deep-black land was

under this rotation. In Rozode, the respective proportion was still low--4.7 per cent of the total deep-black land having irrigation.

The cultivators reported that from the financial point of view, this rotation is not as profitable as the previous one because jowar does not give as high returns as cotton.

Summary

The three major dry crops grown in the two dry villages, are commonly rotated in the five different rotations, of which three are two-year rotations and two, three-year rotations. The cultivators reported that a given type of crop-rotation goes well with a particular type of soil. Thus, the two-year rotation of G-J, is better suited to the lighter type of soil; the three-year rotation of G-C-J, to the medium-black soil; and the two-year rotation of C-J, to the deep-black soil. The remaining two rotations, G-C and G-J-C, can be practised on the medium-black soil, but these are not as profitable as the three-year rotation of G-C-J. This has been conclusively proved by the crop-rotation experiments conducted at the Research Station, Jalgaon.

In the two irrigated villages, NB-JB-C and NB-JB-J are the two major crop-rotations practised on the irrigated land. Besides these, the usual rotations of the dry crops, are also practised on the dry land. The cultivators reported that the NB-JB-C rotation is more suited to both medium and deep-black soil. The NB-JB-J rotation, however, goes well with the medium-black soil alone. Of the two rotations, NB-JB-C is preferred by a large number of cultivators in both the irrigated villages.

CHAPTER V

CULTIVATORS AND CROP-ROTATIONS

As stated in the preceding chapter, the cultivators in the surveyed villages pointed out that a given type of rotation goes well with a particular type of soil. Thus, in the dry villages, the rotation of G-J is well adapted on the lighter soil; while the G-C-J rotation is better suited to the medium-black soil, and the C-J rotation, to the deep-black soil. In the irrigated villages the rotation of NB-JB-J is well suited to the medium-black soil, and NB-JB-C to the deep-black soil. However, soil alone does not determine the acceptance or rejection of a rotation, though it is one of the basic factors affecting the choice of rotations. Besides soil, the cultivator's size of holding, and his other resources and requirements naturally have a play in the selection of rotations. Thus, a rotation though suited to a particular type of soil, is not necessarily accepted at all times. The choice of different rotations is determined by the complex of factors. An attempt is made in this chapter to break away this complex and bring out the basic factors responsible for the acceptance of different rotations.

5.1. Cultivator

The chief factor in the agricultural production is always the cultivator himself. His importance in agriculture can hardly be exaggerated. "The soil represents wealth, that is

only potential; the extent to which this is converted into actual means of increasing human satisfaction depends upon him who tills it."¹ As Thorold Rogers puts it "..... what economists call fertility is not only that of the earth and the Sun, but of that acuteness, skill, foresight and deligence which constitutes the best qualities of a competent husbandman. Fertility is, and must be in the soil, but it is still more in the intelligence of the man who handles the soil. The former kind of fertility is and may remain a capacity only, the latter is an energy."² The cultivator is the man who decides what crop, where, and how much should be grown. He is the man who takes decisions about all these, acts to carry them out and accepts the final responsibility for the consequences of the decisions.

The responsibility of taking decisions and carrying them out with all the consequences differs mainly according to the status of a cultivator. Cultivators may have different status depending on their relation to the land. They may be either owner or tenant cultivators or a combination of both i.e. partly owner and partly tenant cultivator. Tenant cultivators may be of two types--cash-tenants and share-tenants. In general the cash-tenants assume more responsibility and risk than the share-tenants and are more independent of the landlord in formulating their farming plans, than are the share-tenants. Among the

1 Calvert, H., The Wealth and Welfare of the Punjab, Lahore (1922), p. 11.

2 Thorold Rogers, History of Agriculture and Prices, Vol.IV, Ch. XXVI.

cash-tenants also, important differences may exist. Some may have leased-in land for a period of years and can plan their farming operations much as an owner operator does. Others may have leased-in land for a year or two and may not be in a position to have a definite farming plan. Share-tenants lease-in land by giving the landlord a share--usually one-third to one-half--of the crops grown. In the case of such tenants, the farming plans are mostly given by the landlord and the tenants are only to carry these out. They usually do not have any right to formulate the cropping plans, independent of the landlord.

5.2. Attitude Towards Cultivation

Majority of the cultivators take to their occupation of cultivation as a way of life. They pursue their occupation as providing a living rather than as a means of making money which can be extended and developed. Their attitude towards cultivation, therefore, is basically of self-sufficiency. They farm for their living. The cultivation of cash-crops, which are meant mainly for the market, are, no doubt, undertaken but only after making a provision for the production of food and fodder. Production of food is given the prime importance in their whole farming plans. Many of the cultivators do not appreciate that it may be advantageous to grow more profitable crops for sale and to buy food and fodder from their proceeds. They traditionally prefer to live on the products of their holdings and not on the profits derived from it. As Calvert puts it "Agriculture has not yet become a business and the cultivators businessmen." ¹

¹ Calvert, H., op. cit., p. 192.

There are several reasons for this type of basic attitude. The physical and the climatic conditions, the small and the fragmented holdings, poor resources and the lack of technical knowledge are some of the major factors which have framed this type of attitude towards cultivation. As Mukerjee pointed out, "caprices of the seasons which make agriculture a gamble instead of an occupation, destroy his (cultivator's) thrift and generate an ardent belief in an inexorable fate. Here man's character becomes like climate and the soil, one of the unalterable factors in the agricultural situation."¹ A similar type of observation is made by Hailey who remarked that, "the whole agricultural system has in fact been adapted to meet the predominant feature of the climatic conditions viz. the uncertainty of the rainfall. This had led the agriculturists to aim at security rather than high results and to frame his annual crop programme so as to eliminate the chances of total failure. This attitude may be seen in every phase of his operation--in the growing of two crops, in the habit of sowing mixed crops, in his preference to hardy if low-yielding varieties and in the land system, in the distribution of the different classes of land so as to secure at least one crop in the year."²

In accordance with their basic attitude, the cultivators first aim at minimum security of food and only then try to

¹ Mukerjee, R., The Rural Economy of India, Longmans, Green and Co. Ltd., London, 1926, p. 6.

² Hailey, "Agricultural Holdings in the United Province," The Agricultural Journal of India, 1919.

maximise the cash-income. The production of food is regarded as "the elemental, the absolutely essential need." ¹ As Gadgil puts it, the productive activity in agriculture has to serve three broad purposes: "food for the family, fodder for livestock and surplus for sale." ² He further remarks that, "The small size of the productive unit and the differences in terms made by the wide margins at both sale and purchase make for an emphasis on domestic production, as far as possible, to serve the first two needs. Ordinarily, even with an increase of unit size and with almost complete commercialization, production for domestic needs; does not vanish, though its proportionate importance decreases rapidly."

A similar view is expressed by Mukerjee who writes that "the primary need of the cultivator is to produce food for himself and his family, and fodder for his cattle. It is his wants and circumstances, which determine his work. He concentrates his effort on the production of food for his family without caring to grow more profitable crops. He has not yet learnt to grow crops of commercial value and live on the money realized from their sale." ³ Mann, Keating and Howard A. and Howard G.L.C. have also made similar observations.

1 Calvert, H., op. cit., p. 1.

2 Gadgil, D.R., "Indian Economic Organization," Economic Growth : Brazil, India, Japan, Edited by Simon Kuznets and others, Durham, N.C., Duke University Press, 1955, p. 450.

3 Mukerjee, R., Fields and Farmers in Oudh, Longmans, Green & Co. Ltd., London, 1929, p. 153.

Also see : (1) Mann, H., Land and Labour in a Deccan Village, University of Bombay, Bombay, 1917.

(2) Keating, G., Rural Economy in the Bombay Deccan, Longmans, Green & Co. Ltd., London, 1912.

(3) Howard, A., and Howard, G.L.C., Indian Agriculture Oxford University Press, London, 1927.

Thus, the cultivators have a dual aim--minimum security of food for family and maximum cash-income. They first strive to secure food and fodder required to meet the needs of family and livestock, and only after securing this objective, they try to maximise their cash-income by growing cash-crops. No cultivator aims only at maximization of cash income from which he can make the purchases of food and fodder required.

The cultivators from the surveyed villages were in no way different. They tried to meet their food and fodder needs through home production only. Between the dry and the irrigated villages, however, there was a difference in the intensity of the need. It was comparatively low in the two irrigated villages. Otherwise, the basic approach of all the cultivators in the dry as well as the irrigated villages was the same. The food was regarded as one of the basic factors which each cultivator has to take into consideration while deciding upon the farming plans. Even the large cultivators felt that purchasing of food for family was below their dignity. The case of fodder requirement was slightly different. The fodder needs of livestock were generally met from the stalks of jowar and other crops mainly grown for food. If the fodder from such crops fell short of total annual requirement, the cultivators preferred to purchase it, rather than increasing the area under them.

5.3. Cultivators and Crop-Rotations

As pointed out earlier, maximization of income from land is the aim of the individual cultivator. Maximum income, however, does not mean for a year or for a short-run, but for a long

period. It has to be attained throughout the period of a long-run. Thus, the final aim of all the individual cultivators is to get the stable maximum income over years. They try to achieve this objective by formulating a judicious rotation-plan for themselves, so that they can secure a regular flow of stable maximum income over a period. They never aim at the highest production and profits for a year or for a short-term. Farming plans which are likely to give the highest income for a few years to the permanent detriment of soil fertility and future income are considered economically unsound and are not practised by any cultivator. ¹ The cultivators always prefer to have such a farming plan which will give them the stable maximum income and also keep their lands "at a profitable level of productivity over a long-run." ² The cultivators' aim of the stable maximum income, therefore, does not relate only to the utilization of available resources but to the conservation of them as well. They have to combine along with the resource use the conservation measures also. The lack of conservation measures may not show any effects in the short period, but these will certainly have very adverse effects in the long period. This only means that without any measures to conserve, the cultivators may get higher income in the initial period but this will not last for long. As it is not possible to replenish the lost

1 Blagburn, C.H., Farm Planning and Management, Longmans Green and Co. Ltd., London, 1961, p. 4.

2 Heady, E.O. and Jensen, H.R., Farm Management Economics, Prentice-Hall, Inc., Englewood Cliffs, 1957, p. 128.

fertility in soil, the income will certainly come down in the long period. However, with due measures for conservation right from the start, the fertility of land can be retained at its level for a very long period. So, the adequate use of resources along with the conservation measures can assure the individual cultivators the stable maximum income over years.

Theoretically, the best farming plans for a particular cultivator can be decided by the application of the economic principle which states that the best combination of crops has been reached when the transfer of a marginal amount of land, labour or capital from one crop to another would result in a reduction in the total income.¹ In practice, however, the cultivators' choice of crops is never completely free. It is limited by the physical characteristic of the land itself, its size and layout, its soil-type and climate, by the amount and quality of labour available, by the farmer's capital resources and by the capacity and preferences of the cultivator himself.

Cultivators are, thus, required to take two kinds of decisions. One involves the problem of choosing the best long-run cropping programme and the other a short-run or an annual task of implementing the programme chosen. In the long-run programme they have to decide upon the combination of crops or rotations which will keep up the regular flow of income stream over a period of years without impairing the fertility of land. Rotations, as pointed out in Chapter IV, maintain soil fertility

1 Blagburn, C.H., op. cit., p. 5.

and productivity at a higher level and thus give a maximum income over a long-period. Fertility of soil is maintained through a proper sequence of crops requiring different amount and proportion of nutrients. Productivity is indirectly increased through controlling the different types of diseases and pests. Rotations, thus, are perhaps the most efficient way of conserving the basic resource--land--and securing the maximum returns from it for a number of years. Experimental work in different countries has definitely proved that continuous cropping of a single crop causes its yields to decline to unprofitable levels over a period of time. In the long-run programme, therefore, the cultivators have to decide upon a proper rotation-plan which will keep stable the level of maximum income throughout the period without adversely affecting the soil fertility. Such a long-run programme provides them with a general goal, which is likely to give the greatest returns over a period of years. The prices and yields may change from year to year and the plan for two years may not remain the same; even then the cultivators need to have a long-run plan to give general direction to their farming operations. ¹

Once the long-run cropping programme is decided upon, there remains the short-run plan or an annual task of following the long-run plan. The short-run plan is made to fit the individual year. The long-run plan for a particular plot may be of G-C-J rotation, but due to insufficient rain or non-availability

1 Heady, E.O., and Jensen, H.R., op. cit., p. 94.

of manure in the second year, the cultivator might be required to break away from the original plan and repeat groundnut or take jowar instead of cotton which was due on it for that year. The second kind of decisions are also important as the cultivators are at times required to deviate from the accepted rotation-plan because of various factors. We will deal with these decisions and the factors responsible for them in the following two chapters. In this chapter the long-run decisions and the factors influencing them are considered.

The long-run programme or the rotation-plan should accomplish four objectives: (1) it should maximize the net income for the farm as a whole; (2) it should maintain the soil productivity at a profitable level--not the highest yield per acre but yields which give the greatest return for the farm as a whole; (3) it should consider the labour programme. One crop sequence may concentrate labour requirements at one time of the year and cause more hiring or labour at rates which are considerably high. The cropping programme must be so arranged that the labour requirements get spread more evenly throughout the year; and, (4) it should consider the ability of a cultivator to withstand risks and set-backs. A reliable crop, even if it does not return maximum income, may be desirable for some cultivators.¹

5.4. Factors Influencing the Long-Run Cropping Programmes or the Rotation-Plans

In the words of Heady and Jensen, the long-run cropping

¹ Ibid, p. 123.

programme, or the rotation-plan "must fit the circumstances of the individual farm not only in terms of soil types but also in respect to livestock, capital, leases and many other things." ¹ In the surveyed villages, it is seen that the rotation-plans are formulated by taking into consideration the overall position of resources and requirements. In resources, the availability of land, its soil composition, availability of irrigation and supply of manure are considered vital and have a considerable influence on the acceptance of rotations. Among requirements, the food supply for family is of prime importance and has a decisive influence on the cropping programme.

The basic attitude being of self-sufficiency, the cultivators first try to secure the minimum supply of food for family. This approach necessarily limits the field of choice of rotations, as they are required to select rotations with jowar--the staple food. The food requirement is, thus, the first major restraint which affects the choice of rotations to a considerable extent. While considering the requirement of food, the cultivators naturally take into account the quality of land, which constitutes a second limitation on the choice of rotations. Availability of irrigation facility and home-collected manure supply are the other two important factors which have to be considered in conjunction with the above two. Only after taking into consideration these four basic factors, the cultivators decide on accepting two or three-year rotations

¹ Ibid, p. 127.

or a convenient combination of the two, suited to their land-holdings. The land-holding may be considered as one more factor, but it has a comparatively minor role in determining the choice of rotations. The land-holding by itself does not appear to have much influence on the rotations as it has always to be considered along with one or more of the above four factors individually or collectively.

In the two dry villages where irrigation is not available, the supply of home-collected manure is considered as the third factor influencing the farming plans. In such villages, therefore, the four basic factors--food requirement, soil type, supply of home-collected manure, and size of holding--predominantly decide the long-run cropping programme of the individual cultivator. In the irrigated villages, however, availability of irrigation facility assumes greater importance and takes the third place. The supply of home-collected manure plays a comparatively minor role in these villages as the cultivators do not have adequate supplies of own farmyard manure. Banana, which requires heavy dose of manure, being their main irrigated crop, they are required to purchase manure from outside. Banana is the only crop to which a large proportion of the manure available is applied. It was seen that in the year 1962-63 the manure given to this crop was more than 75 per cent of the total quantity of manure utilized by the sample cultivators in both the villages. The remaining quantity of manure (25 per cent of the total) was applied to the other irrigated or dry crops. The dry crops are generally not given any manure or if given it is

usually in a negligible quantity. It is reported that the dry crops, as they are invariably taken after banana, which is heavily manured, do not require any fresh doses of manure. They can be satisfactorily grown on the residuals of the manure applied to banana. In the irrigated villages, therefore, supply of home-collected manure as a factor affecting the long-run decisions loses its importance to a considerable extent. The other three factors, however, remain equally effective in these villages too. Thus, in the irrigated villages, the four factors--availability of irrigation facility and the other three factors--decide the farming plans of the individual cultivators.

These basic factors have a composite effect on the long-run cropping programmes or the rotation-plans. One of them may be overwhelming in some cases. But none of them taken independent of others, can explain fully the choice of rotations. The food requirement, for example, is the predominant factor in most of the cases, but by itself it does not reveal a full explanation about the selection of different rotations. In order to meet the family food needs, the cultivators are required to give a definite place to jowar in their crop rotations. But jowar can be rotated along with cotton or groundnut or banana in their two, three or four-year rotations. Which rotation/s with jowar should be chosen cannot be determined on the basis of food requirement alone. The other factors like manure supply, soil composition of holdings and availability of irrigation will have to be taken into consideration to make a proper choice. On the land, the cultivators may rotate jowar along with cotton or/and

groundnut depending on the type of soil, the supply of home-collected manure and food requirement. If the land is of a better type, where manure can be profitably utilized, they will prefer to rotate jowar with cotton; otherwise, on the lighter soil, they will rotate it with groundnut. If the irrigation facility is available, they may as well prefer to rotate jowar with banana. The choice of rotations, thus, is determined by taking into consideration the composite effect of all the basic factors.

The same is the case with the other remaining factors as well. None of them taken independently, explains much about the acceptance of different rotations. Thus, the soil composition of holding, if considered separately, does not give full explanation of the choice of rotations. This is particularly true of the medium and deep-black soils, which are more adaptable and hence put under various types of rotations. Almost all the major crops of the villages, can be grown on these soils and therefore, all sorts of rotations are practised on them. These rotations cannot be fully explained on the basis of soil alone. The size of cultivated holding also, if considered independent of other factors, does not reveal much. The rotations practised by the small, medium and large cultivators, particularly the latter two, are not widely different. The crop rotation of G-J suited to the lighter soil, is accepted by the small as well as the large cultivators. This shows that the composite effect of all the four factors have to be considered, to get a clear and complete explanation of the rotations accepted by the different cultivators.

The composite effect of these factors is different for different cultivators. It must be recognized that no two farmers are exactly alike in respect to all the basic factors and other things.¹ They may be similar in some respects, but when the total effect of all the factors is concerned, they differ from one another. Even a minor difference as regards any one of the basic factors gets reflected in the total effect and thereby in the rotation-plans. Thus, the cultivators having near about the same requirement of food may differ as regards other factors and their composite effect and hence may be required to accept different rotation-plans. The rotations, therefore, cannot be explained in general terms for all the cultivators. They have to be considered on individual basis. There cannot be one best farming plan for all the cultivators. Each one has to choose his best plan suiting to his conditions and circumstances.

In the following sections, an attempt is made to explain on individual basis, the rotation-plans practised by some of the sample cultivators in both the dry and the irrigated villages. The rotations practised on a major portion of the land cultivated by the sample cultivators can be explained on the basis of composite effect of the four basic factors. However, in the case of some plots, which have some peculiarity, this approach does not hold good. In such cases, the cultivators are required to accept the rotations suiting to the peculiar characteristic of the individual plot. We will consider such cases later.

¹ Heady, E.O., and Jensen, H.R., op. cit., p. 9. Also see Blagburn, C.H., op. cit., p. 5.

5.5. Cultivators and Their Rotation-Plans in the Dry Villages

The composite effect of the four basic factors decided the long-run cropping programmes of the individual cultivators in both the dry villages. However, between the two villages, there was a slight difference between the character of one basic factor--land. In Khirode, as it was situated at the foots of the Satpuda hills, the land was mainly of medium-black and light soil, with an occasional patch of deep-black soil. Exactly opposite was the case of the other village--Vivare--where deep-black soil predominated. The quality of land determined the limits of crop-production; it specified the range of crops which could be grown. On the deep-black soil in Vivare, therefore, groundnut could not be successfully grown. Similarly, on the lighter soil in Khirode cotton did not prove much profitable. Thus, the difference in soil brought in the differences in the cropping patterns of the two villages. Groundnut was generally not taken in Vivare, while it was the predominant crop in Khirode. Cotton dominated in Vivare, while it was given a second place in Khirode. Groundnut, cotton and jowar were the three major crops which formulated the long-run programmes of individual cultivators in Khirode. As the land was of poor quality, none of these crops was generally repeated in any programme. In Vivare, however, cotton and jowar were the only two major crops. Cotton, being the only cash-crop, and the land being of good quality, was repeated twice or even thrice in the programmes of some of the cultivators.

Of the thirty sample cultivators in Khirode, eight were

small cultivators whose land-holdings were upto 5.00 acres; eighteen were medium cultivators whose land-holdings were between 5.01 and 15.00 acres; and the remaining four were large cultivators whose land-holdings were above 15.00 acres. In Vivare the number of small cultivators was relatively larger in the total sample. Of the thirty sample cultivators in this village, fifteen were small cultivators; eleven medium cultivators and the remaining four, large cultivators.

The total area cultivated by the sample cultivators in Khirode was 263.46 acres. About three-fourths of this (198.88 acres) was of medium-black soil, and the remaining (64.58 acres) of lighter soil. The deep-black soil was not reported by any of the sample cultivators in this village. (Table 5.1.) In Vivare, the total area cultivated by the sample cultivators was 231.55 acres. More than three-fourths of this (175.89 acres) was of deep-black soil. Of the remaining, a large proportion was of medium-black type. The lighter soil was almost negligible (Table 5.2). In Khirode, the proportion of lighter soil was comparatively higher with the small and the medium size cultivators (31 to 32 per cent of the total) than that with the large cultivators (14 per cent). In Vivare, the deep-black soil was predominant with all the cultivators. However, the proportion of lighter and medium-black soil was relatively high in the case of small and medium size cultivators.

In Khirode, out of the thirty sample cultivators, three had their holdings entirely of lighter soil; eleven, entirely of medium-black soil; and the remaining sixteen, had mixed type of

Table 5.1 : Soil-Composition of Land-Holdings Cultivated by the Small, Medium and Large Cultivators in Khirode

Cultivator	No. of cultivators	Area in Acres		
		Light soil	Medium-black soil	Total
Small cultivators	8	6.88	14.56	21.44
Medium cultivators	18	45.37	101.42	146.79
Large cultivators	4	12.33	82.90	95.23
Total	30	64.58	198.88	263.46

Table 5.2 : Soil-Composition of Land-Holdings Cultivated by the Small, Medium and Large Cultivators in Vivare

Cultivator	No. of cultivators	Area in Acres			Total
		Light soil	Medium-black soil	Deep-black soil	
Small cultivators	15	1.28	13.62	24.04	38.94
Medium cultivators	11	10.41	29.35	53.50	93.26
Large cultivators	4	-	1.00	98.35	99.35
Total	30	11.69	43.97	175.89	231.55

holdings, consisting partly of light and partly of medium-black soil. The three cultivators having their holdings entirely of lighter soil, had practically small land-holdings even though one of them had a holding slightly more than five acres (6.60 acres). Of the eleven cultivators having their entire holdings of medium-black soil, four were from the small size-group, five from the medium, and two from the large size-group. Among the cultivators having mixed type of holdings, majority (twelve out of sixteen) were from the medium size-group (see Table 5.3). In Vivare, thirteen of the sample cultivators had their holdings entirely of deep-black soil; four, entirely of medium-black soil; and the other remaining cultivators (thirteen) had a mixed type of holdings. Of these remaining cultivators, five had the holdings of medium and deep-black soil; two had the holdings of light and medium-black soil; and six had the holdings of light, medium and deep-black soil. Of the thirteen cultivators having their entire holdings of deep-black soil, seven were small cultivators, and three each, medium and large. Among the four cultivators having holdings entirely of medium-black soil, three cultivators were from the small size-group and one from the medium group. Majority of the cultivators having mixed type of holdings were from the medium size-group (see Table 5.4).

In order to study the total impact of the four basic factors on the long-run cropping programmes, the sample cultivators may be classified into two groups: (1) those following agriculture as the main occupation and depending mainly on their land for the family food requirements; and (2) those pursuing agriculture as a subsidiary occupation and not wholly depending

Table 5.3 : Distribution of the Cultivators in Khirode according to Soil-Composition of Their Land-holdings

Soil-composition of Land-holding	Small cultivators		Medium cultivators		Large cultivators		Total	
	No. of cultivators	Area in acres	No. of cultivators	Area in acres	No. of cultivators	Area in acres	No. of cultivators	Area in acres
Land-holdings wholly of light soil	2	4.70	1	6.60	-	-	3	11.30
Land-holdings wholly of medium-black soil	4	13.11	5	39.62	2	38.78	11	91.51
Land-holdings of light and medium-black soils	2	3.63	12	100.57	2	56.45	16	160.65
Total	8	21.44	18	146.79	4	95.23	30	263.46

Table 5.4 : Distribution of the Cultivators in Vivare according to Soil-Composition of Their Land-holdings

Soil-composition of Land-holding	Small cultivators		Medium cultivators		Large cultivators		Total	
	No.of culti-vators	Area in acres	No.of culti-vators	Area in acres	No.of culti-vators	Area in acres	No.of culti-vators	Area in acres
Land-holdings wholly of deep-black soil	7	17.66	3	19.42	3	84.05	13	121.13
Land-holdings wholly of medium-black soil	3	6.36	1	5.45	-	-	4	11.81
Land-holdings of medium and deep-black soils	3	9.43	1	14.64	1	15.30	5	39.37
Land-holdings of light and medium-black soils	1	3.08	1	7.17	-	-	2	10.25
Land-holdings of light, medium and deep-black soils	1	2.41	5	46.58	-	-	6	48.99
Total	15	38.94	11	93.26	4	99.35	30	231.55

on their land for the food needs. Of the sample cultivators, twenty-four from Khirode and twenty-five from Vivare were included in the first group; and the remaining (six in Khirode and five in Vivare) in the second group. Majority of the cultivators included in the second group were small, who could not make their living from the land they had. They were, therefore, more engaged in the other occupations than cultivation.

5.6. Cultivators Following Agriculture as the Main Occupation and Mainly Depending on Their Land for the Food Needs

In Tables 5.5 and 5.6 are given the rotation-plans formulated by such cultivators, grouped according to their reported annual food requirements¹ and the supply of manurial resources. The rotations accepted on the lands of different soil types are shown separately. The Tables clearly reveal the influence of jowar requirement on the choice of rotations. As the jowar requirement rises, the area allotment to jowar increases. The area allotment to jowar is almost the same in the case of the cultivators having more or less the same requirement of food. If we translate the accepted rotations into cropping, we find that in the case of majority of the cultivators in each requirement

1 Jowar is the staple food for the people in the dry as well as the irrigated villages. The cultivators, therefore, were asked to state the total quantity of jowar required for family consumption per year. It did not include the jowar which some of the cultivators paid as kind wages to the casual labourers. On an average, the annual requirement of jowar for consumption was about 4.5 maunds per person. Mann's estimate of the consumption of grain and pulse per person in the Bombay Presidency was near about the same (4.8 maunds). See Mann, H.H., Economic Progress of the Rural Areas of the Bombay Presidency, Government Central Press, Bombay, 1924, p. 54.

Table 5.5 : Rotation-plans of the Cultivators Following Agriculture as Main Occupation in Khirode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Supply of manure																	
			Light soil	Medium-black soil	Upto 5 cart-loads					6 to 10 cart-loads												
					Light soil		Medium-black soil			Light soil		Medium-black soil										
			G-J	G-C	G-J-C	G-J	G-J	G-C	G-C-J	G-J-C	C-C-C-J											
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area									
7 to 15 mds.	10	5.88	2.93	2.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	11	5.91	1.55	4.36	-	-	-	-	-	1	1.55	-	-	2	3.53	1	0.83	-	-	-	-	
	16	7.51	-	7.51	-	-	3	4.91	2	2.60	-	-	-	-	-	-	-	-	-	-	-	
	27	12.78	3.00	9.78	-	-	-	-	-	-	1	3.00	1	4.33	-	-	-	-	-	1	5.45	
16 to 25 mds.	5	2.88	-	2.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	7	3.90	3.90	-	-	-	-	-	-	3	3.90	-	-	-	-	-	-	-	-	-	-	
	8	4.50	-	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4.50	-	-	
	9	5.28	2.05	3.23	-	-	-	-	-	1	2.05	-	-	2	2.48	1	0.75	-	-	-	-	
	17	5.40	2.60	2.80	3	2.60	1	2.80	-	-	-	-	-	-	-	-	-	-	-	-	-	
	20	11.74	1.25	10.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
25	13.03	3.75	9.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
26 to 30 mds.	14	6.63	-	6.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	18	8.46	1.13	7.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	21	10.88	-	10.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	13	6.58	3.00	3.58	-	-	-	-	-	1	3.00	3	3.58	-	-	-	-	-	-	-	-	
	22	6.60	6.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	24	8.32	-	8.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	26	15.64	-	15.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	28	20.91	3.60	17.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	29	23.14	-	23.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	30	35.54	8.73	26.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Above 40 mds.	12	6.28	-	6.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	19	10.33	7.93	2.40	-	-	-	-	-	2	5.63	-	-	-	-	1	3.20	-	-	-	-	
	23	8.83	5.63	3.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	24	246.95	57.65	189.30	3	2.60	4	7.71	2	2.60	9	19.13	4	7.91	4	6.01	3	4.78	3	4.50	1	5.45

(continued)

Table 5.5 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Supply of manure											
					11 to 15 cart-loads											
			Light soil	Medium-black soil	Light soil					Medium-black soil						
					G-J		G-J		G-C		C-J		G-C-J		G-J-C	
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area			
7 to 15 mds.	10	5.88	2.93	2.95	-	-	-	-	-	-	-	-	-	-		
	11	5.91	1.55	4.36	-	-	-	-	-	-	-	-	-	-		
	16	7.51	-	7.51	-	-	-	-	-	-	-	-	-	-		
	27	12.78	3.00	9.78	-	-	-	-	-	-	-	-	-	-		
16 to 25 mds.	5	2.88	-	2.88	-	-	-	-	-	-	4	2.88	-	-		
	7	3.90	3.90	-	-	-	-	-	-	-	-	-	-	-		
	8	4.50	-	4.50	-	-	-	-	-	-	-	-	-	-		
	9	5.28	2.05	3.23	-	-	-	-	-	-	-	-	-	-		
	17	5.40	2.60	2.80	-	-	-	-	-	-	-	-	-	-		
	20	11.74	1.25	10.49	-	-	-	-	-	-	-	-	-	-		
25	13.03	3.75	9.28	2	3.75	-	-	3	5.85	1	1.00	1	2.43	-		
26 to 30 mds.	14	6.63	-	6.63	-	-	-	-	-	-	-	-	6	6.63		
	18	8.46	1.13	7.33	1	1.13	2	0.87	1	2.75	1	2.78	1	0.93		
	21	10.88	-	10.88	-	-	1	3.60	4	7.28	-	-	-	-		
31 to 40 mds.	13	6.58	3.00	3.58	-	-	-	-	-	-	-	-	-	-		
	22	6.60	6.60	-	-	-	-	-	-	-	-	-	-	-		
	24	8.32	-	8.32	-	-	1	1.15	2	3.41	1	0.98	-	2	2.78	
	26	15.64	-	15.64	-	-	-	-	-	-	-	-	-	-		
	28	20.91	3.60	17.31	-	-	-	-	-	-	-	-	-	-		
	29	23.14	-	23.14	-	-	-	-	-	-	-	-	-	-		
30	35.54	8.73	26.81	-	-	-	-	-	-	-	-	-	-			
Above 40 mds.	12	6.28	-	6.28	-	-	-	-	-	-	-	-	-	-		
	19	10.33	7.93	2.40	-	-	-	-	-	-	-	-	-	-		
	23	8.83	5.63	3.20	-	-	-	-	-	-	-	-	-	-		
Total	24	246.95	57.65	189.30	3	4.88	4	5.62	10	19.29	7	7.64	8	9.99	2	2.78

(continued)

Table 5.5 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Supply of manure												Total number of plots	Total area	Area under jowar averaged over rotation cycle														
					Above 15 cart-loads																												
			Light soil					Medium-black soil																									
			G-J	J-B	G-C-J	G-C-B	J-J-J	G-J	G-C	C-J	G-C-J	G-J-C	W-J	J-J-J	P-P-P																		
Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area																					
7 to 15 mds.	10	5.88	2.93	2.95	1	1.18	-	-	1	1.75	-	-	-	-	-	1	1.60	-	-	1	1.35	-	-	-	-	-	-	4	5.88	1.62			
	11	5.91	1.55	4.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5.91	1.05				
	16	7.51	-	7.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	7.51	0.87				
	27	12.78	3.00	9.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	12.78	5.02				
16 to 25 mds.	5	2.88	-	2.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2.88	1.44				
	7	3.90	3.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3.90	1.95				
	8	4.50	-	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4.50	1.50				
	9	5.28	2.05	3.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5.28	1.26				
	17	5.40	2.60	2.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5.40	1.30				
	20	11.74	1.25	10.49	1	1.25	-	-	-	-	-	-	-	-	-	1	3.45	-	-	4	7.04	-	-	-	-	-	-	6	11.74	2.97			
	25	13.03	3.75	9.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	13.03	3.19				
26 to 30 mds.	14	6.63	-	6.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6.63	2.21				
	18	8.46	1.13	7.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	8.46	2.26				
	21	10.88	-	10.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	10.88	1.80				
31 to 40 mds.	13	6.58	3.00	3.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	6.58	3.29				
	22	6.60	6.60	-	3	6.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6.60	3.30				
	24	8.32	-	8.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	8.32	1.99				
	26	15.64	-	15.64	-	-	-	-	-	-	-	2	7.48	1	4.50	2	3.66	-	-	-	-	-	-	-	-	-	-	5	15.64	5.57			
	28	20.91	3.60	17.31	-	-	-	-	3	3.60	-	-	-	-	4	17.31	-	-	-	-	-	-	-	-	-	-	7	20.91	5.77				
	29	23.14	-	23.14	-	-	-	-	-	-	-	1	9.60	2	6.05	1	4.55	-	-	-	-	-	-	-	-	-	8	23.14	5.86				
	30	35.54	8.73	26.81	-	-	2	6.50	-	-	-	1	2.23	-	-	3	16.41	1	5.40	-	1	5.00	-	1	0.38	1	0.93	8	35.54	9.84			
	Above 40 mds.	12	6.28	-	6.28	-	-	-	-	-	-	-	-	-	-	2	5.25	1	1.03	-	-	-	-	-	-	-	-	3	6.28	2.97			
19		10.33	7.93	2.40	3	6.83	-	-	-	-	1	1.10	-	-	-	-	1	2.40	-	-	-	-	-	-	-	-	5	10.33	5.33				
23		8.83	5.63	3.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	8.83	3.88					
Total	24	246.95	57.65	189.30	8	15.86	2	6.50	1	1.75	3	3.60	2	3.33	2	7.48	7	35.56	7	20.36	12	33.68	1	5.00	2	1.63	1	0.38	1	0.93	116	246.95	-

Table 5.6 : Rotation-plans of the Cultivators Following Agriculture as Main Occupation in Vivarane (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure																															
						Upto 5 cart-loads						6 to 10 cart-loads																									
			Light	Medium-black	Deep-black	Medium-black soil			Light soil	Medium-black soil					Deep-black soil				Chillies-Chillies																		
						C-J	C-J	C-C-J		G-J	C-J	G-C	G-C-J	C-C-J	C-J	C-W	J-W	C-J		G-J-C	C-C-W	C-C-C-J															
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area														
7 to 15 mds.	2	1.48	-	-	1.48	-	-	2	1.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	3	1.50	-	-	1.50	-	-	1	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	7	2.58	-	2.58	-	-	-	-	-	3	3.53	-	-	-	-	-	-	-	-	-	-	-	-	-													
	12	3.53	-	-	3.53	-	-	-	-	-	-	1	1.13	2	3.05	-	-	-	-	1	2.20	-	-	-													
	20	6.38	1.13	3.05	2.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
16 to 25 mds.	8	2.61	-	-	2.61	-	-	2	2.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	10	2.73	-	-	2.73	-	-	2	2.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	11	3.18	-	1.68	1.50	2	1.68	2	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	14	4.31	-	-	4.31	-	-	3	4.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	15	3.08	0.53	2.55	-	-	-	-	-	-	-	-	-	1	1.75	2	3.70	-	-	-	-	-	-	-													
	16	5.45	-	5.45	-	-	-	-	-	-	-	-	-	1	3.18	-	-	-	-	-	-	-	-	-													
	23	10.91	0.20	2.80	7.91	-	-	-	-	-	-	-	-	1	2.88	2	3.28	-	-	-	-	-	2	5.30													
	25	14.64	-	3.18	11.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
26 to 30 mds.	5	2.20	-	1.45	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	13	4.05	-	0.55	3.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.48	-	-	3	4.13												
	18	5.71	-	-	5.71	-	-	-	-	-	-	2	2.32	1	1.00	2	1.13	-	-	-	-	-	-	1	0.10												
	19	5.95	2.32	2.13	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	22	8.71	0.75	4.58	3.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	29	17.89	-	-	17.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	30	47.30	-	-	47.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
31 to 40 mds.	17	5.58	-	-	5.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
	21	8.13	-	-	8.13	-	-	-	-	-	-	2	3.00	-	-	-	-	-	-	2	4.00	-	-	2	1.90												
	24	14.63	3.00	4.00	7.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.85	2	1.50	1	1.20												
	26	15.30	-	1.00	14.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
Above 40 mds.	27	18.86	-	-	18.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
Total	25	216.69	7.93	35.00	173.76	2	1.68	12	14.13	3	3.53	5	6.45	3	4.05	2	1.13	4	8.93	2	3.70	6	8.46	7	6.63	2	1.50	1	1.20	3	4.13	1	1.18	2	5.30	1	0.10

(continued)

Table 5.6 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure 11 to 15 cart-loads															
			Light	Medium-black	Deep-black	Light soil		Medium-black soil				Deep-black soil									
						G-J	G-J	C-J	G-C-J	C-C-J	C-J	C-W	C-C-C-J								
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area					
7 to 15 mds.	2	1.48	-	-	1.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	3	1.50	-	-	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	7	2.58	-	2.58	-	-	-	-	-	-	3	2.58	-	-	-	-	-	-	-	-	
	12	3.53	-	-	3.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	20	6.38	1.13	3.05	2.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
16 to 25 mds.	8	2.61	-	-	2.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10	2.73	-	-	2.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	11	3.18	-	1.68	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	14	4.31	-	-	4.31	-	-	-	-	-	-	-	2	2.55	-	-	-	-	-	-	
	15	3.08	0.53	2.55	-	1	0.53	-	-	-	-	-	-	-	-	-	-	-	-	-	
	16	5.45	-	5.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	23	10.91	0.20	2.80	7.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	25	14.64	-	3.18	11.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
26 to 30 mds.	5	2.20	-	1.45	0.75	-	-	-	2	1.45	-	-	-	-	1	0.75	-	-	-	-	
	13	4.05	-	0.55	3.50	-	-	2	0.55	-	-	-	-	3	3.50	-	-	-	-	-	
	18	5.71	-	-	5.71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	19	5.95	2.32	2.13	1.50	-	-	-	-	-	-	-	1	2.05	-	-	-	-	4	3.38	
	22	8.71	0.75	4.58	3.38	1	0.75	-	2	2.53	-	-	-	-	-	-	4	9.98	3	7.91	
	29	17.89	-	-	17.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	30	47.30	-	-	47.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	17	5.58	-	-	5.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	21	8.13	-	-	8.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	24	14.63	3.00	4.00	7.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	26	15.30	-	1.00	14.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Above 40 mds.	27	18.86	-	-	18.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	25	216.69	7.93	35.00	173.76	2	1.28	2	0.55	4	3.98	3	2.58	3	4.60	4	4.25	4	9.98	7	11.29

(continued)

Table 5.6 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure												Total number of plots	Total area	Area under jowar averaged over rotation cycle										
			Light	Medium-black	Deep-black	Above 15 cart-loads																								
						Light soil		Medium-black soil			Deep-black soil																			
						J-J-J		G-C	G-C-J	C-J	G-C	C-W	C-J-W	C-C-J	C-C-J-W	C-C-C-J	J-J-J													
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area													
7 to 15 mds.	2	1.48	-	-	1.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.48	0.74				
	3	1.50	-	-	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.50	0.75				
	7	2.58	-	2.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2.58	0.86				
	12	3.53	-	-	3.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3.53	1.18				
	20	6.38	1.13	3.05	2.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	6.38	2.64				
16 to 25 mds.	8	2.61	-	-	2.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2.61	1.30				
	10	2.73	-	-	2.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2.73	1.37				
	11	3.18	-	1.68	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3.18	1.59				
	14	4.31	-	-	4.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4.31	2.15				
	15	3.08	0.53	2.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3.08	1.11				
	16	5.45	-	5.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5.45	1.82				
	23	10.91	0.20	2.80	7.91	1	0.20	3	2.80	-	-	2	3.68	-	-	3	4.23	-	-	-	-	-	-	9	10.91	2.04				
	25	14.64	-	3.18	11.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	14.64	3.85				
26 to 30 mds.	5	2.20	-	1.45	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2.20	1.10				
	13	4.05	-	0.55	3.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	4.05	2.03				
	18	5.71	-	-	5.71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	5.71	2.12				
	19	5.95	2.32	2.13	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	5.95	1.66				
	22	8.71	0.75	4.58	3.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	8.71	3.17				
	29	17.89	-	-	17.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	17.89	1.98				
	30	47.30	-	-	47.30	-	-	-	-	-	-	-	-	-	3	12.71	-	-	7	34.59	-	-	-	10	47.30	12.89				
31 to 40 mds.	17	5.58	-	-	5.58	-	-	-	-	-	4	5.08	1	0.50	-	-	-	-	-	-	-	-	-	5	5.58	2.54				
	21	8.13	-	-	8.13	-	-	-	-	-	7	8.13	-	-	-	-	-	-	-	-	-	-	-	7	8.13	4.06				
	24	14.63	3.00	4.00	7.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	14.63	4.93				
	26	15.30	-	1.00	14.30	-	-	-	-	1	1.00	-	-	-	4	10.40	-	-	-	-	1	3.90	-	6	15.30	4.77				
Above 40 mds.	27	18.86	-	-	18.86	-	-	-	-	-	-	-	-	-	-	-	3	4.60	5	12.73	-	-	1	1.53	9	18.86	6.25			
Total	25	216.69	7.93	35.00	173.76	1	0.20	3	2.80	1	1.00	13	16.89	1	0.50	3	4.23	7	23.11	3	4.60	12	47.32	1	3.90	1	1.53	131	216.69	-

group the area allotment to jowar remains near about the same averaged over the rotation cycle.

In Khirode, for example, in the requirement group of 16 to 25 maunds, the area allotment to jowar, derived from the accepted rotations was more or less the same in the case of the five cultivators (Case Studies K 5, K 7, K 8, K 9, and K 17).¹ It varied within a narrow range of 1.27 to 2.00 acres. The average per acre yield of jowar, reported by the villagers was 12 maunds. The area allotted to jowar by the five cultivators was, therefore, enough or just enough to meet their annual requirement of food. In the case of the remaining cultivators in the group, the area allotment to jowar was comparatively higher--about three acres (Case Studies K 20 and K 25). It was larger than the area required to meet their food needs. This was due to the overwhelming influence of the other factors like soil composition of land-holding and manure supply.

In Vivare also the area allotment to jowar made in the rotation-plans of most of the cultivators in the requirement group of 16 to 25 maunds was near about the same (Case Studies V 8, V 10, V 11, V 14, V 15, V 16 and V 23). It moved in between 1.11 and 2.15 acres. In the case of only one cultivator it was relatively higher--3.82 acres (Case Study V 25). Looking to the average per acre yield of jowar (16 maunds), it appears that the area allotted to jowar by all the cultivators except one,

¹ In the Case Study numbers the first letter of each village is used to indicate the name of that village. Thus, K refers to Khirode village; V to Vivare; W to Waghode; and R to Rozode.

was more or less sufficient to meet their annual food needs. In the exceptional case, the area under jowar was higher due to greater impact of the other factors. In both the dry villages, the cultivators in the other requirement groups as well, had arranged their long-run programmes in a similar fashion. In the majority of their cases, the area allotment to jowar was enough or just enough to meet their annual food requirement. In each requirement group, the area allotment to jowar was near about the same between different cultivators.

The cultivators in each group, though had near about the same requirement of food, were different as regards the other basic factors. The composite effect of the requirement of food and other factors, therefore, was different for different cultivators in all the groups. Hence the cultivators in one and the same requirement group were required to accept different rotations or different combination of rotations. We may take one requirement group having the maximum number of cultivators and discuss in detail their rotation-plans on the individual basis. In both the dry villages such a group consisted of the cultivators whose requirements of jowar were between 16 and 25 maunds. In Khirode, for example, all the seven cultivators in this group accepted different rotations though their annual requirement of jowar was more or less the same. Apart from jowar requirement, these cultivators were all distinctly different in respect of the soil composition of their land-holding, the supply of manure and the size of holding. Five of these were small and the other two were medium cultivators. Of the five small cultivators, three had land-holdings below 5.00 acres, and the

remaining two, slightly above 5.00 acres. The land-holdings of the two medium cultivators were between 11.00 and 13.00 acres. Among the three small cultivators having their land-holdings below 5.00 acres, two had their entire holdings of medium-black land; and the remaining one, entirely of lighter soil. The land-holdings of the other two small and the medium cultivators were of mixed type--partly of medium-black and partly of lighter soil. As regards their supply of manure also, some of these cultivators were widely apart. Three of them had a supply of 6 to 10 cart-loads; two, 11 to 16 cart-loads and one each, up to 5 cart-loads and above 15 cart-loads (see Table 5.5).

It can be seen from the Table that the two small cultivators, even though their entire land-holdings were of the same soil type--medium-black--had accepted two distinct rotations (Case Studies K 5 and K 8). These cultivators though similar in the soil-composition of their land-holdings and in their requirements of jowar, were different as regards their supply of manure and the size of holdings. One of them had a small holding (2.88 acres) and a comparatively large supply of manure (15 cart-loads). Hence he preferred to^{practise} the two-year rotation of C-J. Besides the manure supply etc., his land-holding suffers from locational disadvantages, because of which he could not grow groundnut on any of his plots and was required to practise the C-J rotation on his entire land (Case Study K 5). Considering the four basic factors and the peculiar situation of his land-holding this rotation appeared to be the most suited to him. By accepting it he could utilize profitably the

available supply of the home-collected manure, and take the cash-crop--cotton--which yields comparatively higher returns. The other cultivator had a relatively larger land-holding (4.50 acres), but his supply of manure was small (6 cart-loads). He was, therefore, required to adopt the long duration rotation of G-J-C (Case Study K 8). His supply of the home-collected manure was just adequate for one-third portion of his holding. Hence, he divided his land every year into three plots and followed the three-year rotation on them. The third small cultivator whose land-holding was below five acres, though similar to both the above cultivators in his requirement of jowar, the size of land-holding and the supply of manure, was totally different from them as regards the soil composition. His land-holding was entirely of lighter soil and hence was required to practise the two-year rotation of G-J (Case Study K 7). Cotton could not be successfully grown on the lighter type of land. In this case the soil type of land-holding was an overwhelming factor, because of which the composite effect was different and the cultivator was required to accept the rotation, distinct from those adopted by the above two cultivators. Thus, the three small cultivators, though similar in some respects, were different in the composite effect of the four basic factors and they were, therefore, required to accept the three different rotations.

The two cultivators having holdings slightly more than 5.00 acres, were similar to each other in many respects (Case Studies K 9 and K 17). They were more or less the same as regards their size of land-holdings, the soil composition and

the requirement of jowar. The only difference between the two was about the supply of manure. One of them had no supply of manure. However, he could grow cotton, even without manure, on one of his fragment where the land though of medium-black type, was of better quality (Case Study K 17). The annual supply of manure in the case of the other cultivator was about six cart-loads (Case Study K 9). The composite effect of the four factors was similar in the case of these two cultivators and hence the rotation-plans formulated by them were similar on the large portion of their land-holdings. Both of them accepted the two-year rotations of G-J and G-C on the major portion of their land-holdings. Both adopted the G-J rotation on their fragments of lighter soil, and the G-C rotation on the fragments of medium-black soil. As jowar taken on the fragments of lighter soil was more or less sufficient to meet their food requirements, they concentrated on the two cash-crops on the fragments of the medium-black soil. There was a difference in the accepted rotations of the two on a minor area of 0.75 acre only. On this area, the cultivator having a supply of manure, accepted the three-year rotation of G-C-J. The rotation-plans of the two cultivators, thus, were different only to the extent of the difference in the manurial resources. The case of these two cultivators showed that if there was much similarity as regards the major factors, the cultivators formulated more or less the same rotation-plans.

The two remaining cultivators in the group had near about the same size of land-holdings and the same requirement of jowar (Case Studies K 20 and K 25). But the soil composition of their

holdings was different. Both of them had mixed type of land-holdings of light and medium-black soil, but their proportions were different. In the case of one, the lighter type of land was proportionately minor (Case Study K 20); while in the other, it was comparatively large (Case Study K 25). The manurial resources of the two were also different. The former cultivator had a larger supply of it (22 cart-loads); while the latter, comparatively small (14 cart-loads). Because of these differences they were required to accept different rotation-plans. On their fragments of lighter soil, however, both accepted the same rotation of G-J. On the medium-black land, one had a clear preference for the three-year rotation of G-C-J (Case Study K 20); while the other, for the two-year rotation of G-C (Case Study K 25). In the case of the former cultivator, jowar taken on the lighter soil, was not enough to meet his family food needs. He had to devote some of his medium-black land to jowar. He, therefore, preferred to accept the G-C-J rotation on the larger fragment of medium-black land. The other fragment of 3.45 acres, which had relatively better soil, was put under the two-year rotation of the two cash-crops--G-C. In the case of the latter cultivator, jowar taken on the lighter type of land (3.75 acres), was enough to meet his family food needs. He could, therefore, devote a major portion of his land-holding (5.85 acres) to the cash-crops alone, under the two-year rotation of G-C. On the other two plots, however, he accepted two other rotations with jowar. On one plot (1.00 acre) where the land was nearer to the deep-black type, he was required to accept the two-year rotation

of C-J. He could not profitably grow groundnut on it. On the other plot (2.43 acres), he accepted the long duration rotation of G-C-J to reduce the pressure on manure supply which was comparatively short. Because of the restraint of the manure supply, he was required to devote larger area to jowar than the area required to meet the annual food needs of the family.

Thus, the seven cultivators in the requirement group, though similar to one another in some respects, were different in the composite effect and hence were required to adopt different rotation-plans. In the other requirement groups as well, the total impact of the four factors differed from cultivator to cultivator in more or less the same way and those cultivators also had to accept different rotations or their different combinations.

The same was true about the cultivators in Vivare. The total effect of the basic factors differed for different cultivators in this village also, and they were required to adopt different rotations or different combinations of rotations. Thus, in the requirement group of 16 to 25 maunds, there were eight cultivators who, though similar in some respects were different in their composite effect and were required to accept different combinations of rotations. Of these eight cultivators, five were small, having their land-holdings less than 5.00 acres, and three medium, having holdings between 5.45 acres and 14.64 acres. Three of the small cultivators had holdings entirely of deep-black soil. The remaining two had mixed type of holdings; one consisting of medium and deep-black soil and the other of light and medium-black soil. Among the three medium cultivators,

one had his land-holding entirely of medium-black soil, and the remaining two, mixed type--one of them having all the three types of soil in his holding and the other, only medium and deep-black soil (see Table 5.6).

The three small cultivators having land-holdings entirely of deep-black soil were similar to one another in many respects. Two of them had almost the same size of land-holdings, the same soil composition and nearly the same requirement of jowar (Case Studies V 8 and V 10). They differed only as regards the supply of manure. One of them had a small supply of home-collected manure (4 cart-loads); while the other did not have it at all. But as the land was of deep-black type, the other cultivator could grow cotton without applying any manure to it. Because of the deep-black soil, manure supply was not regarded as a major constraint. Both these cultivators, therefore, being alike in all the other factors, followed the same rotation of C-J. The third cultivator, except his relatively larger size of land-holding, was also similar to the above two. His requirement of jowar, the soil composition of land-holding and the manure supply were similar to those of the above two cultivators (Case Study V 14). Therefore, he also accepted the same rotation of C-J on his entire land. He had a small supply of home-collected manure (3 cart-loads) which he utilized in his owned land (0.68 acre). The other portion of his land-holding was leased-in, where he was not applying any manure and practising the same rotation.

The medium cultivator having the land-holding entirely of medium-black soil was different from the above three cultivators

in many respects. He had comparatively bigger land-holding (5.45 acres), larger supply of manure (8 cart-loads) and totally different soil composition (Case Study V 16). He, therefore, accepted a different rotation-plan. On one of his fragments he adopted the three-year rotation of G-C-J, better suited to the medium-black soil. On other fragment, however, he could not follow the same rotation, though the land was also of medium-black type. It was reported that because of the peculiar situation of the fragment, he could not grow groundnut on it. He, therefore, followed the three-year rotation of C-C-J on this fragment. Cotton grown in the second year was not manured. Because of his limited supply of manure, he was required to adopt a relatively long duration rotation on the two plots of this fragment. His annual supply of manure was sufficient for about 1.5 to 2 acres of land. Had he chosen the two-year rotation of C-J on this fragment, he would have been required to manure 3.60 acres of land every third year, for which his annual home-collected manure was not sufficient. Thus, mainly because of the restraint from the manure supply the cultivator was required to adopt two different three-year rotations on his two fragments.

The two cultivators having mixed holdings of medium and deep-black soil were widely different in many respects--size of holding, soil-composition and manure supply (Case Studies V 11 and V 25). The total impact of these basic factors, therefore, was different on both of them and they were required to accept different rotation-plans. The small cultivator adopted the

two-year rotation of C-J on both of his fragments. As his manure supply was fair in comparison with his land-holding, he preferred the C-J rotation on his fragment of medium-black soil as well. From the home-collected supply of manure (6 cart-loads) he could manure about 1.5 acres of land every year. And more or less the same was the area becoming due for cotton every year under the C-J rotation followed on both the fragments. Looking to the size of land-holding, its soil composition and the manure supply, it appears that C-J rotation was the most suited to this cultivator. The other cultivator, having medium size of holding, accepted four different rotations on four of his fragments. This case provided a good example of how a cultivator, after taking a general view of requirements and resources, selects different rotations to suit the characteristics of different fragments (Case Study V 25). On the fragment of medium-black soil (3.18 acres) he adopted the three-year rotation of G-C-J, most suited to the soil-type. On the second fragment of 5.30 acres, of deep-black soil, he adopted the four-year rotation of C-C-C-J. He reported that this fragment was generally manured every year as it was convenient and advantageous than the other fragments. Because of yearly manuring, the land was rich and hence he preferred to grow cotton continuously for three years and jowar for the fourth year. The third fragment of 3.28 acres is situated on the low lying area where rain water accumulates. It was most suited to wheat, which is sown in September, by which time the land gets free from the accumulated rain water. On this fragment, therefore, he preferred the

two-year rotation of C-W. He preferred cotton to rotate along with wheat firstly, because it was more profitable than jowar, and secondly, jowar taken in other rotations was more than enough to meet his annual food needs. On the fourth fragment, which was in the neighbouring village (Nandurkhed), he accepted the two-year rotation of C-J. As the land was of deep-black soil, he could continue this rotation even without applying any manure. Manuring of this fragment was rarely done, as it was far from the native village. In the case of this cultivator, the supply of home-collected manure was small (10 cart-loads), in relation to his land-holding and it was a major restraint affecting his choice of rotations. Because of this restraint and other basic factors, he was required to allot more area to jowar, even though he did not require that much, to meet the food needs of his family.

The remaining two cultivators having mixed holdings of light, medium, and deep-black soil, were also different from each other in many respects. They, therefore, accepted totally different rotations (Case Studies V 15 and V 23). The cultivator having the land-holding of light and medium-black soil, adopted two rotations--G-J and C-C-J--on his two fragments (Case Study V 15). On the fragment of light soil, the rotation of G-J was chosen as it suited most to the soil type. Jowar taken in this rotation was not enough to meet his family requirement as the fragment was too small in area. He had to devote some additional area to jowar from the second fragment. His annual supply of manure was fairly large (14 cart-loads) in

relation to his land-holding. Considering these two factors--the jowar requirement and the manure supply--he preferred the three-year rotation of C-C-J on the second fragment of medium-black soil. On such type of soil, the common rotation practised in the dry villages was G-C-J. He could have chosen that rotation, but as he had a fairly large supply of manure, which could be used profitably on the second fragment only, he preferred to grow cotton continuously for two years instead of groundnut in the first year and cotton in the second. The composite effect of all the four factors could be clearly seen in this case. The other cultivator had a land-holding predominantly of deep-black soil (Case Study V 23). The land having light and medium-black soil was comparatively minor. He divided his area of land-holding into plots having different types of soil. On the plot of light soil (0.20 acre) he could not adopt any rotation because of its peculiar situation and very poor soil. He, therefore, grew jowar on it continuously, as a fodder crop. On the three plots of medium-black land (2.80 acres) he chose the two-year rotation of G-C. He could have followed on these plots the usual three-year rotation of G-C-J suited to the medium-black soil. But as jowar taken on the deep-black land was sufficient to meet his requirement, he preferred to concentrate on the two cash-crops, by accepting the two-year rotation of G-C. He divided deep-black land almost equally, and followed two types of rotations--C-J and C-W. On his two plots (3.68 acres) he accepted the C-J rotation and on the other three plots (4.23 acres), the C-W rotation. Jowar taken in the C-J rotation on the

first two plots was enough to meet his food requirement and hence on the remaining area of his deep-black land he preferred the C-W rotation. His annual supply of manure being sufficiently large (20 cart-loads) he could manure about five to six acres of land every year, and put it under cotton. As his holding was also fairly large, he could utilize all the manure every year without repeating cotton in any rotation.

Thus, the eight cultivators in the requirement group of 16 to 25 maunds, though similar to one another as regards some factors, were different in the composite effect and they were required to accept different rotations or different combinations of rotations. The same was true about the cultivators in the other requirement groups as well. In both the villages, therefore, the total effect of the four basic factors differed from cultivator to cultivator and they were all different in their acceptance of rotations. This basic argument holds good in both the dry villages. However, there was a marked difference in the rotations accepted by the cultivators in the two villages. In Khirode, the major rotations accepted were G-J, G-C and G-C-J, groundnut being the main crop. In Vivare, on the other hand the rotation of C-J with its combinations such as C-C-J and C-C-C-J was predominant. These differences in the two villages emanated from the basic difference in the quality of land available in the two villages.

5.7. Area Allotment to Jowar

As pointed out earlier, in both the dry villages, the area allotment of jowar, in the majority of the cases, was mainly

based on the requirement of food for family. Majority of the cultivators allotted to jowar only that much area which would get them jowar, enough or just enough to meet their annual food requirements. This was true for almost all the small and the medium cultivators (see Tables 5.7, 5.8, 5.10 and 5.11). In the case of the large cultivators, however, the area allotment to jowar was not much related to their food requirements. In their cases, the restraints from manure supply and soil composition, made them allocate to jowar, far more area than necessary to meet the annual food needs of their families (see Tables 5.9 and 5.12). These Tables reveal that almost all the large cultivators in both the dry villages were required to put larger area under jowar. The only exception was that of one large cultivator in Vivare (Case Study V 29). When there was a restraint from manure supply, the cultivator was required to adopt either the two-year rotations like G-J, B-J, and W-J etc. which could be practised without any manure; or the long duration rotations like G-C-J, G-J-C, C-C-J and C-C-C-J. The soil type brought in serious restraints when a land-holding was predominantly of light and/or deep-black land. When a land-holding was largely of light soil, the two-year rotation of G-J predominated (Case Study K 19) and when it was of deep-black land, the two-year rotation of C-J and its combinations (Case Study V 30). In any case, the area allotted to jowar always remained more than wanted. Such cultivators kept more of milch and working cattle, as they got a large quantity of fodder from jowar (Case Study K 19).

Table 5.7 : Rotation-plans of the Small Cultivators in Khirode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Supply of manure						Total number of plots	Total area	Area under jowar averaged over rotation cycle
			Light	Medium-black	6 to 10 cart-loads		11 to 15 cart-loads		Medium-black soil	Medium-black soil			
					Light soil	Medium-black soil	Plots	Area					
			Plots	Area	Plots	Area	Plots	Area					
16 to 25 mds.	5	2.88	-	2.88	-	-	-	-	4	2.88	4	2.88	1.44
	7	3.90	3.90	-	3	3.90	-	-	-	-	3	3.90	1.95
	8	4.50	-	4.50	-	-	3	4.50	-	-	3	4.50	1.50
Total	3	11.28	3.90	7.38	3	3.90	3	4.50	4	2.88	10	11.28	-

Table 5.8 : Rotation-plans of the Medium Cultivators in Khirode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land- holding	Soil-composition of land- holding		Supply of manure															
			Light	Medium- black	Upto 5 cart-loads				6 to 10 cart-loads											
					Light soil		Medium-black soil		Light soil		Medium-black soil									
			G-J	G-C	G-J-C	G-J	G-C	G-J	G-C	G-J	G-C-J	C-C-C-J								
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area							
7 to 15 mds.	10	5.88	2.93	2.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11	5.91	1.55	4.36	-	-	-	-	-	-	1	1.55	2	3.53	-	-	1	0.83	-	-
	16	7.51	-	7.51	-	-	3	4.91	2	2.60	-	-	-	-	-	-	-	-	-	-
	27	12.78	3.00	9.78	-	-	-	-	-	-	1	3.00	-	-	1	4.33	-	-	1	5.45
16 to 25 mds.	9	5.28	2.05	3.23	-	-	-	-	-	-	1	2.05	2	2.48	-	-	1	0.75	-	-
	17	5.40	2.60	2.80	3	2.60	1	2.80	-	-	-	-	-	-	-	-	-	-	-	-
	20	11.74	1.25	10.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25	13.03	3.75	9.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26 to 30 mds.	14	6.63	-	6.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	18	8.46	1.13	7.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	21	10.88	-	10.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31 to 40 mds.	13	6.58	3.00	3.58	-	-	-	-	-	-	1	3.00	-	-	3	3.58	-	-	-	-
	22	6.60	6.60	-	-	-	-	-	-	-	3	6.60	-	-	-	-	-	-	-	-
	24	8.32	-	8.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Above 40 mds.	12	6.28	-	6.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	19	10.33	7.93	2.40	-	-	-	-	-	-	2	5.63	-	-	-	-	1	3.20	-	-
	23	8.83	5.63	3.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	17	140.44	41.42	99.02	3	2.60	4	7.71	2	2.60	9	21.83	4	6.01	4	7.91	3	4.78	1	5.45

(continued)

Table 5.8 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Supply of manure												Total number of plots	Total area	Area under jowar averaged over rotation cycle		
			Light	Medium-black	Above 15 cart-loads																
					Light soil				Medium-black soil												
			G-J		G-C-J		J-J-J		G-C		C-J		G-C-J								
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area					
7 to 15 mds.	10	5.88	2.93	2.95	1	1.18	1	1.75	-	-	1	1.60	-	-	1	1.35	4	5.88	1.62		
	11	5.91	1.55	4.36	-	-	-	-	-	-	-	-	-	-	-	-	4	5.91	1.05		
	16	7.51	-	7.51	-	-	-	-	-	-	-	-	-	-	-	-	5	7.51	0.87		
	27	12.78	3.00	9.78	-	-	-	-	-	-	-	-	-	-	-	-	3	12.78	5.02		
16 to 25 mds.	9	5.28	2.05	3.23	-	-	-	-	-	-	-	-	-	-	-	-	4	5.28	1.26		
	17	5.40	2.60	2.80	-	-	-	-	-	-	-	-	-	-	-	-	4	5.40	1.30		
	20	11.74	1.25	10.49	1	1.25	-	-	-	-	1	3.45	-	-	4	7.04	6	11.74	2.97		
	25	13.03	3.75	9.28	-	-	-	-	-	-	-	-	-	-	-	-	7	13.03	3.19		
26 to 30 mds.	14	6.63	-	6.63	-	-	-	-	-	-	-	-	-	-	-	-	6	6.63	2.21		
	18	8.46	1.13	7.33	1	1.13	-	-	-	-	3	3.62	1	2.78	1	0.93	6	8.46	2.26		
	21	10.88	-	10.88	-	-	-	-	-	-	-	-	-	-	-	-	5	10.88	1.80		
31 to 40 mds.	13	6.58	3.00	3.58	-	-	-	-	-	-	-	-	-	-	-	-	4	6.58	3.29		
	22	6.60	6.60	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6.60	3.30		
	24	8.32	-	8.32	-	-	-	-	-	-	-	-	-	-	-	-	6	8.32	1.99		
Above 40 mds.	12	6.28	-	6.28	-	-	-	-	-	-	-	-	2	5.25	1	1.03	3	6.28	2.97		
	19	10.33	7.93	2.40	3	6.83	-	-	1	1.10	-	-	-	-	1	2.40	5	10.33	5.33		
	23	8.83	5.63	3.20	-	-	-	-	-	-	-	-	-	-	-	-	3	8.83	3.88		
Total	17	140.44	41.42	99.02	6	10.39	1	1.75	1	1.10	5	8.67	3	8.03	8	12.75	78	140.44	-		

Table 5.9 : Rotation-plans of the Large Cultivators in Khirode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Supply of manure														Total number of plots	Total area	Area under jowar averaged over rotation cycle								
			Light	Medium-black	Above 15 cart-loads																								
					Light soil				Medium-black soil																				
					J-B		G-C-B		J-J-J		G-J		G-C		C-J		W-J					G-C-J		G-J-C		J-J-J		P-P-P	
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area								
31 to 40 mds.	26	15.64	-	15.64	-	-	-	-	-	-	-	2	7.48	1	4.50	2	3.66	-	-	-	-	-	-	-	-	5	15.64	5.57	
	28	20.91	3.60	17.31	-	-	3	3.60	-	-	-	-	-	-	-	-	-	4	17.31	-	-	-	-	-	-	7	20.91	5.77	
	29	23.14	-	23.14	-	-	-	-	-	-	-	1	9.60	2	6.05	2	1.63	1	4.55	-	-	1	0.38	1	0.93	8	23.14	5.75	
	30	35.54	8.73	26.81	2	6.50	-	-	1	2.23	-	-	3	16.41	1	5.40	-	-	-	-	1	5.00	-	-	-	8	35.54	9.84	
Total	4	95.23	12.33	82.90	2	6.50	3	3.60	1	2.23	2	7.48	5	30.51	5	15.11	2	1.63	5	21.86	1	5.00	1	0.38	1	0.93	28	95.23	-

Table 5.10 : Rotation-plans of the Small Cultivators in Vivare (Area in Acres)

Annual requirement of jowar	Case study No.	Size of land- holding	Soil-composition of land-holding			Supply of manure									
			Light	Medium- black	Deep- black	Upto 5 cart-loads				6 to 10 cart-loads					
						Medium-black		Deep-black soil		Light soil		Medium-black			
						C-J		C-J	C-C-J	G-J	C-C-J				
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area						
7 to 15 maunds	2	1.48	-	-	1.48	-	-	1	1.48	-	-	-	-	-	-
	3	1.50	-	-	1.50	-	-	1	1.50	-	-	-	-	-	-
	7	2.58	-	2.58	-	-	-	-	-	-	-	-	-	-	-
	12	3.53	-	-	3.53	-	-	-	-	3	3.53	-	-	-	-
16 to 25 maunds	8	2.61	-	-	2.61	-	-	2	2.61	-	-	-	-	-	-
	10	2.73	-	-	2.73	-	-	2	2.73	-	-	-	-	-	-
	11	3.18	-	1.68	1.50	2	1.68	2	1.50	-	-	-	-	-	-
	14	4.31	-	-	4.31	-	-	3	4.31	-	-	-	-	-	-
	15	3.08	0.53	2.55	-	-	-	-	-	-	-	1	0.53	2	2.55
26 to 30 maunds	5	2.20	-	1.45	0.75	-	-	-	-	-	-	-	-	-	-
	13	4.05	-	0.55	3.50	-	-	-	-	-	-	-	-	-	-
Total	11	31.25	0.53	8.81	21.91	2	1.68	11	14.13	3	3.53	1	0.53	2	2.55

(continued)

Table 5.10 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure								Total number of plots	Total area	Area under jowar averaged over rotation cycle
			Light	Medium-black	Deep-black	11 to 15 cart-loads										
						Medium-black soil				Deep-black						
						C-J		C-J		G-C-J		C-J				
						Plots	Area	Plots	Area	Plots	Area	Plots	Area			
7 to 15 maunds	2	1.48	-	-	1.48	-	-	-	-	-	-	-	-	1	1.48	0.74
	3	1.50	-	-	1.50	-	-	-	-	-	-	-	-	1	1.50	0.75
	7	2.58	-	2.58	-	-	-	-	-	3	2.58	-	-	3	2.58	0.86
	12	3.53	-	-	3.53	-	-	-	-	-	-	-	-	3	3.53	1.18
16 to 25 maunds	8	2.61	-	-	2.61	-	-	-	-	-	-	-	-	2	2.61	1.30
	10	2.73	-	-	2.73	-	-	-	-	-	-	-	-	2	2.73	1.37
	11	3.18	-	1.68	1.50	-	-	-	-	-	-	-	-	4	3.18	1.59
	14	4.31	-	-	4.31	-	-	-	-	-	-	-	-	3	4.31	2.15
	15	3.08	0.53	2.55	-	-	-	-	-	-	-	-	-	3	3.08	1.11
26 to 30 maunds	5	2.20	-	1.45	0.75	-	-	2	1.45	-	-	1	0.75	3	2.20	1.10
	13	4.05	-	0.55	3.50	2	0.55	-	-	-	-	3	3.50	5	4.05	2.03
Total	11	31.25	0.53	8.81	21.91	2	0.55	2	1.45	3	2.58	4	4.25	30	31.25	

Table 5.11 : Rotation-plans of the Medium Cultivators in Vivare (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure															Chillies-Chillies										
						6 to 10 cart-loads																									
			Light soil		Medium-black soil				Deep-black soil																						
			Light	Medium-black	Deep-black	G-J	C-J	G-C-J	C-C-J	G-C	C-J	C-W	J-W	C-G-J	G-J-C	C-C-W	C-C-C-J	Plots	Area												
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area														
7 to 15 mds.	20	6.38	1.13	3.05	2.20	1	1.13	2	3.05	-	-	-	-	-	-	1	2.20	-	-	-	-	-	-	-	-	-	-	-	-	-	
16 to 25 mds.	16	5.45	-	5.45	-	-	-	-	-	1	1.75	2	3.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	23	10.91	0.20	2.80	7.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	25	14.64	-	3.18	11.46	-	-	-	-	1	3.18	-	-	-	-	1	2.88	3	3.28	-	-	-	-	-	-	-	2	5.30	-	-	
26 to 30 mds.	18	5.71	-	-	5.71	-	-	-	-	-	-	-	-	-	-	2	1.48	-	-	-	-	-	3	4.13	-	-	-	-	1	0.10	
	19	5.95	2.32	2.13	1.50	2	2.32	1	1.00	-	-	-	-	2	1.13	-	-	3	1.50	-	-	-	-	-	-	-	-	-	-	-	
	22	8.71	0.75	4.58	3.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	17	5.58	-	-	5.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	21	8.13	-	-	8.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	24	14.63	3.00	4.00	7.63	2	3.00	-	-	2	4.00	-	-	-	-	2	1.90	2	1.85	2	1.50	1	1.20	-	-	1	1.18	-	-	-	
Total	10	86.09	7.40	25.19	53.50	5	6.45	3	4.05	4	8.93	2	3.70	2	1.13	6	8.46	8	6.63	2	1.50	1	1.20	3	4.13	1	1.18	2	5.30	1	0.10

(continued)

Table 5.11 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure							
			Light	Medium-black	Deep-black	11 to 15 cart-loads							
						Light soil		Medium-black soil		Deep-black soil			
						G-J		C-J		C-C-J			
Plots	Area	Plots	Area	Plots	Area	Plots	Area						
7 to 15 mds.	20	6.38	1.13	3.05	2.20	-	-	-	-	-	-	-	-
16 to 25 mds.	16	5.45	-	5.45	-	-	-	-	-	-	-	-	-
	23	10.91	0.20	2.80	7.91	-	-	-	-	-	-	-	-
	25	14.64	-	3.18	11.46	-	-	-	-	-	-	-	-
26 to 30 mds.	18	5.71	-	-	5.71	-	-	-	-	-	-	-	-
	19	5.95	2.32	2.13	1.50	-	-	-	-	-	-	-	-
	22	8.71	0.75	4.58	3.38	1	0.75	2	2.53	1	2.05	4	3.38
31 to 40 mds.	17	5.58	-	-	5.58	-	-	-	-	-	-	-	-
	21	8.13	-	-	8.13	-	-	-	-	-	-	-	-
	24	14.63	3.00	4.00	7.63	-	-	-	-	-	-	-	-
Total	10	86.09	7.40	25.19	53.50	1	0.75	2	2.53	1	2.05	4	3.38

(continued)

Table 5.11 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure										Total number of plots	Total area	Area under jowar averaged over rotation cycle
			Light	Medium-black	Deep-black	Above 15 cart-loads												
						Light soil	Medium-black soil		Deep-black soil									
			J-J-J	G-C			G-C		C-J		C-W							
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area							
7 to 15 mds.	20	6.38	1.13	3.05	2.20	-	-	-	-	-	-	-	-	-	-	4	6.38	2.64
16 to 25 mds.	16	5.45	-	5.45	-	-	-	-	-	-	-	-	-	-	-	3	5.45	1.82
	23	10.91	0.20	2.80	7.91	1	0.20	3	2.80	-	-	2	3.68	3	4.23	9	10.91	2.04
	25	14.64	-	3.18	11.46	-	-	-	-	-	-	-	-	-	-	7	14.64	3.85
26 to 30 mds.	18	5.71	-	-	5.71	-	-	-	-	-	-	-	-	-	-	6	5.71	2.12
	19	5.95	2.32	2.13	1.50	-	-	-	-	-	-	-	-	-	-	8	5.95	1.66
	22	8.71	0.75	4.58	3.38	-	-	-	-	-	-	-	-	-	-	8	8.71	3.17
31 to 40 mds.	17	5.58	-	-	5.58	-	-	-	-	1	0.50	4	5.08	-	-	5	5.58	2.54
	21	8.13	-	-	8.13	-	-	-	-	-	-	7	8.13	-	-	7	8.13	4.06
	24	14.63	3.00	4.00	7.63	-	-	-	-	-	-	-	-	-	-	12	14.63	4.93
Total	10	86.09	7.40	25.19	53.50	1	0.20	3	2.80	1	0.50	13	16.89	3	4.23	69	86.09	-

Table 5.12 : Rotation-plans of the Large Cultivators in Vivare (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure								Total number of plots	Total area	Area under jowar averaged over rotation cycle								
			Light	Medium-black	Deep-black	11 to 15 cart-loads				Above 15 cart-loads														
						Deep-black soil		Medium-black		Deep-black soil														
			C-W	C-C-C-J	G-C-J	C-C-J	C-J-W	C-C-C-J	C-C-J-W	J-J-J														
											Plots	Area	Plots				Area	Plots	Area	Plots	Area			
26 to 30 mds.	29	17.89	-	-	17.89	4	9.98	3	7.91	-	-	-	-	-	-	-	-	-	-	7	17.89	1.98		
	30	47.30	-	-	47.30	-	-	-	-	-	-	3	12.71	-	-	7	34.59	-	-	10	47.30	12.88		
31 to 40 mds.	26	15.30	-	1.00	14.30	-	-	-	-	1	1.00	-	-	4	10.40	1	3.90	-	-	6	15.30	3.79		
Above 40 mds.	27	18.86	-	-	18.86	-	-	-	-	-	-	3	4.60	-	-	-	-	5	12.73	1	1.53	9	18.86	7.39
Total	4	99.35	-	1.00	98.35	4	9.98	3	7.91	1	1.00	3	4.60	7	23.11	1	3.90	12	47.32	1	1.53	32	99.35	-

5.8. Soil-Composition of the Land-Holdings and the Rotation-Plans

The soil restraint was severe in the case of lighter soil. This type of land had the least adaptability and it almost dictated the rotation of G-J. The other two soil types were comparatively much adaptable. The medium-black land, as pointed out earlier, was suited to all the three major crops and hence a number of rotations formed of these crops could be practised on it. On the deep-black soil, cotton and jowar were the two major crops grown, but repetition of any of these crops was possible on it and therefore the various combinations of the G-J rotation could be adopted on it. The differences in the adaptability of the three types of soil can be seen from Tables 5.13 to 5.20, wherein, the cultivators and the rotations accepted by them according to the soil composition of their land-holdings, have been classified. In Khirode, for example, the two cultivators having land-holdings entirely of light soil, accepted the G-J rotation on their entire land, in spite of the differences in their requirement of food, manure supply and size of land-holding (see Table 5.13). In the case of such land, the soil type had an overwhelming effect. In fact it was the deciding factor. Thus, almost all the cultivators in both the villages having light soil in their land-holdings, invariably accepted the two-year rotation of G-J on it. In the case of the medium and the deep-black land, however, the soil factor did not dominate to such an extent. The other factors came in to play and they along with soil determined the rotations for every individual cultivator. Soil became one of the basic factors

Table 5.13 : Rotation-plans of the Cultivators in Khirode having Land-holdings Wholly of Light Soil (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Supply of manure				Total number of plots	Total area
			6 to 10 cartloads		Above 15 cart-loads			
			G-J		G-J			
			Plots	Area	Plots	Area		
16 to 25 mds.	7	3.90	3	3.90	-	-	3	3.90
31 to 40 mds.	22	6.60	-	-	3	6.60	3	6.60
Total	2	10.50	3	3.90	3	6.60	6	10.50

Table 5.14 : Rotation-plans of the Cultivators in Khirode Having Land-holdings Wholly of Medium-black Soil (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Supply of manure															
			Upto 5 cart-loads				6 to 10 cart-loads		11 to 15 cart-loads									
			G-C		G-J-C		G-J-C		G-J		G-C		C-J		G-C-J		G-J-C	
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area
7 to 15 mds.	16	7.51	3	4.91	2	2.60	-	-	-	-	-	-	-	-	-	-	-	
16 to 25 mds.	5	2.88	-	-	-	-	-	-	-	-	-	4	2.88	-	-	-	-	
	8	4.50	-	-	-	-	3	4.50	-	-	-	-	-	-	-	-	-	
26 to 30 mds.	14	6.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6.63
	21	10.88	-	-	-	-	-	-	1	3.60	4	7.28	-	-	-	-	-	-
31 to 40 mds.	24	8.32	-	-	-	-	-	-	1	1.15	2	3.41	1	0.98	-	-	2	2.78
	26	15.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	29	23.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Above 40 mds.	12	6.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	9	85.78	3	4.91	2	2.60	3	4.50	2	4.75	6	10.69	5	3.86	-	-	8	9.41

(continued)

Table 5.14 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Supply of manure														Total number of plots	Total area
			Above 15 cart-loads															
			G-J		G-C		C-J		G-C-J		W-J		J-J-J		P-P-P			
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area		
7 to 15 mds.	16	7.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	7.51
16 to 25 mds.	5	2.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2.88
	8	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4.50
26 to 30 mds.	14	6.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6.63
	21	10.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	10.88
31 to 40 mds.	24	8.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	8.32
	26	15.64	2	7.48	1	4.50	2	3.66	-	-	-	-	-	-	-	-	5	15.64
	29	23.14	-	-	1	9.60	2	6.05	1	4.55	2	1.63	1	0.38	1	0.93	8	23.14
Above 40 mds.	12	6.28	-	-	-	-	2	5.25	1	1.03	-	-	-	-	-	-	3	6.28
							-	-	-	-	-	-	-	-	-	-	-	-
Total	9	85.78	2	7.48	2	14.10	6	14.96	2	5.58	2	1.63	1	0.38	1	0.93	45	85.78

Table 5.15 : Rotation-plans of the Cultivators in Khirode Having Land-holdings of Light and Medium-black Soils (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Supply of manure													
			Light	Medium-black	Upto 5 cart-loads				6 to 10 cart-loads									
					Light soil		Medium-black soil		Light soil		Medium-black soil							
			G-J		G-C		G-J		G-J		G-C		G-C-J		C-C-C-J			
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area					
7 to 15 mds.	10	5.88	2.93	2.95	-	-	-	-	-	-	-	-	-	-	-	-	-	
	11	5.91	1.55	4.36	-	-	-	-	1	1.55	-	-	2	3.53	1	0.83	-	-
	27	12.78	3.00	9.78	-	-	-	-	1	3.00	1	4.33	-	-	-	-	1	5.45
16 to 25 mds.	9	5.28	2.05	3.23	-	-	-	-	1	2.05	-	-	2	2.48	1	0.75	-	-
	17	5.40	2.60	2.80	3	2.60	1	2.80	-	-	-	-	-	-	-	-	-	-
	20	11.74	1.25	10.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25	13.03	3.75	9.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26 to 30 mds.	18	8.46	1.13	7.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31 to 40 mds.	13	6.58	3.00	3.58	-	-	-	-	1	3.00	3	3.58	-	-	-	-	-	-
	28	20.91	3.60	17.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30	35.54	8.73	26.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Above 40 mds.	19	10.33	7.93	2.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	23	8.83	5.63	3.20	-	-	-	-	2	5.63	-	-	-	-	1	3.20	-	-
Total	13	150.67	47.15	103.52	3	2.60	1	2.80	6	15.23	4	7.91	4	6.01	3	4.78	1	5.45

(continued)

Table 5.15 : (continued)

Annual requirement of jowar	Case Study No.	Size of land- holding	Soil-composition of land-holding		Supply of manure																	Total number of plots	Total area													
					11 to 15 cart-loads								Above 15 cart-loads																							
			Light	Medium- black	Light soil				Medium-black soil					Light soil				Medium-black soil																		
					G-J	G-C	C-J	G-C-J	J	J-B	G-C-J	G-C-B	J-J-J	G-C	C-J	G-C-J	G-J-C																			
					Plots	Area	Plots	Area	Plots	Area	Plots	Area	J	Plots	Area	Plots	Area	Plots	Area	Plots	Area			Plots	Area	Plots	Area									
7 to 15 mds.	10	5.88	2.93	2.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
	11	5.91	1.55	4.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5.88							
	27	12.78	3.00	9.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5.91						
					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	12.78						
16 to 25 mds.	9	5.28	2.05	3.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5.28				
	17	5.40	2.60	2.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5.40				
	20	11.74	1.25	10.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5.40				
	25	13.03	3.75	9.28	2	3.75	3	5.85	1	1.00	1	2.43	1.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	11.74				
					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	13.03				
26 to 30 mds.	18	8.46	1.13	7.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	8.46		
					-	-	-	-	-	-	-	-	1.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3.62		
					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2.78		
					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.93		
31 to 40 mds.	13	6.58	3.00	3.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	6.58	
	28	20.91	3.60	17.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	6.58	
	30	35.54	8.73	26.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	20.91	
					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	17.31
					-	-	-	-	-	-	-	-	-	2	6.50	-	-	-	-	1	2.23	3	16.41	1	5.40	-	-	1	5.00	-	-	-	-	8	35.54	
Above 40 mds.	19	10.33	7.93	2.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	10.33
	23	8.83	5.63	3.20	-	-	-	-	-	-	-	-	6.83	-	-	-	-	-	-	1	1.10	-	-	-	-	1	2.40	-	-	-	-	-	-	5	10.33	
					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	8.83	
Total	13	150.67	47.15	103.52	2	3.75	3	5.85	1	1.00	1	2.43	10.39	2	6.50	1	1.75	3	3.60	2	3.33	8	25.08	2	8.18	11	29.03	1	5.00	65	150.67					

Table 5.16 : Rotation-plans of the Cultivators in Vivare having Land-holdings Wholly of Medium-Black Soil (Area in Acres)

Annual requirement of Jowar	Case Study No.	Size of land-holding	Supply of manure						Total number of Plots	Total area
			6 to 10 cart-loads			11 to 15 cart-loads				
			G-C-J		C-C-J		G-C-J			
			Plots	Area	Plots	Area	Plots	Area		
7 to 15 mds.	7	2.58	-	-	-	-	3	2.58	3	2.58
16 to 25 mds.	16	5.45	1	1.75	2	3.70	-	-	3	5.45
Total	2	8.03	1	1.75	2	3.70	3	2.58	6	8.03

Table 5.17 : Rotation-plans of the Cultivators in Vivare Having Land-holdings Wholly of Deep-black Soil (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Supply of manure													
			Upto 5 cart-loads				6 to 10 cart-loads				11 to 15 cart-loads					
			C-J		C-C-J		C-J		G-J-C		Chillies-Chillies		C-W		C-C-C-J	
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area
7 to 15 mds.	2	1.48	2	1.48	-	-	-	-	-	-	-	-	-	-	-	
	3	1.50	1	1.50	-	-	-	-	-	-	-	-	-	-	-	
	12	3.53	-	-	3	3.53	-	-	-	-	-	-	-	-	-	
16 to 25 mds.	8	2.61	2	2.61	-	-	-	-	-	-	-	-	-	-	-	
	10	2.73	2	2.73	-	-	-	-	-	-	-	-	-	-	-	
	14	4.31	3	4.31	-	-	-	-	-	-	-	-	-	-	-	
26 to 30 mds.	18	5.71	-	-	-	-	2	1.48	3	4.13	1	0.10	-	-	-	
	29	17.89	-	-	-	-	-	-	-	-	-	4	9.98	3	7.91	
	30	47.30	-	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	17	5.58	-	-	-	-	-	-	-	-	-	-	-	-	-	
	21	8.13	-	-	-	-	-	-	-	-	-	-	-	-	-	
Above 40 mds.	27	18.86	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	12	119.63	10	12.63	3	3.53	2	1.48	3	4.13	1	0.10	4	9.98	3	7.91

(continued)

Table 5.17 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Supply of manure												Total number of plots	Total area
			Above 15 cart-loads													
			C-J		G-C		C-C-J		C-J-W		C-C-J-W		J-J-J			
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area		
7 to 15 mds.	2	1.48	-	-	-	-	-	-	-	-	-	-	-	2	1.48	
	3	1.50	-	-	-	-	-	-	-	-	-	-	-	1	1.50	
	12	3.53	-	-	-	-	-	-	-	-	-	-	-	3	3.53	
16 to 25 mds.	8	2.61	-	-	-	-	-	-	-	-	-	-	-	2	2.61	
	10	2.73	-	-	-	-	-	-	-	-	-	-	-	2	2.73	
	14	4.31	-	-	-	-	-	-	-	-	-	-	-	3	4.31	
26 to 30 mds.	18	5.71	-	-	-	-	-	-	-	-	-	-	-	6	5.71	
	29	17.89	-	-	-	-	-	-	-	-	-	-	-	7	17.89	
	30	47.30	-	-	-	-	-	3	12.71	7	34.59	-	-	10	47.30	
31 to 40 mds.	17	5.58	4	5.08	1	0.50	-	-	-	-	-	-	-	5	5.58	
	21	8.13	7	8.13	-	-	-	-	-	-	-	-	-	7	8.13	
Above 40 mds.	27	18.86	-	-	-	-	3	4.60	-	-	5	12.73	1	1.53	9	18.86
Total	12	119.63	11	13.21	1	0.50	3	4.60	3	12.71	12	47.32	1	1.53	57	119.63

Table 5.18 : Rotation-plan of the Cultivator in Vivare having Land-holding of Light and Medium-Black Soils (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Supply of manure				Total number of Plots	Total area
			Light	Medium-black	6 to 10 cart-loads		Plots	Area		
					Light soil	Medium-black soil				
			Plots	Area	Plots	Area				
16 to 25 mds.	15	3.08	0.53	2.55	1	0.53	2	2.55	3	3.08

Table 5.19 : Rotation-plans of the Cultivators in Vivare Having Land-holdings of Medium and Deep-black Soils (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Supply of manure											
			Medium-black	Deep-black	Upto 5 cart-loads				6 to 10 cart-loads							
					Medium-black soil		Deep-black soil		Medium-black soil		Deep-black soil					
			C-J		C-J		G-C-J		C-J		C-W		C-C-C-J			
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area		
16 to 25 mds.	11	3.18	1.68	1.50	2	1.68	2	1.50	-	-	-	-	-	-	-	-
	25	14.64	3.18	11.46	-	-	-	-	1	3.18	1	2.88	2	3.28	2	5.30
26 to 30 mds.	5	2.20	1.45	0.75	-	-	-	-	-	-	-	-	-	-	-	-
	13	4.05	0.55	3.50	-	-	-	-	-	-	-	-	-	-	-	-
31 to 40 mds.	26	15.30	1.00	14.30	-	-	-	-	-	-	-	-	-	-	-	-
Total	5	39.37	7.86	31.51	2	1.68	2	1.50	1	3.18	1	2.88	2	3.28	2	5.30

(continued)

Table 5.19 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Supply of manure										Total number of plots	Total area		
			Medium-black	Deep-black	11 to 15 cart-loads				Above 15 cart-loads									
					Medium-black soil		Deep-black soil		Medium-black soil		Deep-black soil							
			C-J		G-J		C-J		G-C-J		C-J-W		C-C-C-J					
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area				
16 to 25 mds.	11	3.18	1.68	1.50	-	-	-	-	-	-	-	-	-	-	-	-	4	3.18
	25	14.64	3.18	11.46	-	-	-	-	-	-	-	-	-	-	-	-	6	14.64
26 to 30 mds.	5	2.20	1.45	0.75	2	1.45	-	-	1	0.75	-	-	-	-	-	-	3	2.20
	13	4.05	0.55	3.50	-	-	2	0.55	3	3.50	-	-	-	-	-	-	5	4.05
31 to 40 mds.	26	15.30	1.00	14.30	-	-	-	-	-	-	1	1.00	4	10.40	1	3.90	6	15.30
Total	5	39.37	7.86	31.51	2	1.45	2	0.55	4	4.25	1	1.00	4	10.40	1	3.90	24	39.37

Table 5.20 : Rotation-plans of the Cultivators in Vivare Haing Land-holdings of Light, Medium and Deep-black Soils (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure															
			Light	Medium-black	Deep-black	6 to 10 cart-loads															
						Light soil		Medium-black soil				Deep-black soil									
			G-J	C-J	G-C	G-C-J	C-J	C-W	J-W	C-G-J	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	
7 to 15 mds.	20	6.38	1.13	3.05	2.20	1	1.13	2	3.05	-	-	-	-	1	2.20	-	-	-	-	-	-
16 to 25 mds.	23	10.91	0.20	2.80	7.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26 to 30 mds.	19	5.95	2.32	2.13	1.50	2	2.32	1	1.00	2	1.13	-	-	-	-	3	1.50	-	-	-	-
	22	8.71	0.75	4.58	3.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31 to 40 mds.	24	14.63	3.00	4.00	7.63	2	3.00	-	-	-	-	2	4.00	2	1.90	2	1.85	2	1.50	2	2.38
Total	5	46.58	7.40	16.56	22.62	5	6.45	3	4.05	2	1.13	2	4.00	3	4.10	5	3.35	2	1.50	2	2.38

(continued)

Table 5.20 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure								Total number of plots	Total area								
			Light	Medium-black	Deep-black	11 to 15 cart-loads				Above 15 cart-loads													
						Light soil		Medium-black soil		Deep-black-soil		Light soil				Medium-black soil		Deep-black soil					
			G-J	C-J	C-C-J	C-C-C-J	J-J-J	G-C	C-J	C-W	Plots	Area	Plots			Area	Plots	Area	Plots	Area			
7 to 15 mds.	20	6.38	1.13	3.05	2.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	6.38	
16 to 25 mds.	23	10.91	0.20	2.80	7.91	-	-	-	-	-	-	-	1	0.20	3	2.80	2	3.68	3	4.23	9	10.91	
26 to 30 mds.	19	5.95	2.32	2.13	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	5.95	
	22	8.71	0.75	4.58	3.38	1	0.75	2	2.53	1	2.05	4	3.38	-	-	-	-	-	-	-	8	8.71	
31 to 40 mds.	24	14.63	3.00	4.00	7.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	14.63	
Total	5	46.58	7.40	16.56	22.62	1	0.75	2	2.53	1	2.05	4	3.38	1	0.20	3	2.80	2	3.68	3	4.23	41	46.58

which decided the rotations. Therefore, the cultivators, even though they had similar land-holdings of medium and/or deep-black land, still differed from one another in their acceptance of rotations or the combinations of rotations.

5.9. Cultivators Following Agriculture as a Subsidiary Occupation and Not Wholly Depending on Their Land for Family Food Needs

As pointed out earlier, the cultivators of this type were six in Khirode and five in Vivare. In both the villages, all of them were practically small cultivators though one each in Khirode and Vivare had land-holdings slightly more than 5.00 acres. In most of these cases the cultivators could not allocate every year the required area to jowar, as their land-holdings were small and in relation to their land-holdings, the requirements of jowar were considerably large. They, therefore, could not depend for food wholly on their land. However, while making the choice of rotations, the requirement of jowar was not lost sight of. The general attitude in their case as well was the same. They too, first tried to get jowar, whatever possible on their land, as a minimum base to meet the total family food needs. In Tables 5.21 and 5.22, are given the rotations accepted by these cultivators, grouping them according to their requirements and manure supply.

In both the villages, all the cultivators of this type followed cultivation as a subsidiary occupation. Their main occupations were different. In Khirode, three of them had agricultural labour as their main occupation; one, tailoring services and the remaining two, had tea-stalls. In Vivare, four of such

Table 5.21 : Rotation-plans of the Cultivators Following Agriculture as Subsidiary Occupation in Khirode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land- hold- ing	Soil-composition of land-holding		Supply of manure										Total number of plots	Total area						
			Light soil	Medium- black soil	Upto 5 cart-loads				6 to 10 cart-loads				11 to 15 cart-loads									
					Light soil	Medium-black soil			Light soil	Medium- black soil	Light soil	Medium- black soil										
			G-J	G-C	G-J-C		G-J	J-J-J	G-J		G-J	G-J										
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area			Plots	Area				
7 to 15 mds.	3	1.98	-	1.98	-	-	1	1.98	-	-	-	-	-	-	-	-	-	-	-	1	1.98	
16 to 25 mds.	1	0.80	0.80	-	1	0.80	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.80	
	4	2.03	1.18	0.85	-	-	-	-	-	-	-	-	-	-	1	1.18	1	0.85	2	2.03		
26 to 30 mds.	2	1.60	1.00	0.60	-	-	-	-	-	1	1.00	-	-	1	0.60	-	-	-	-	2	1.60	
	6	3.75	-	3.75	-	-	-	-	1	3.75	-	-	-	-	-	-	-	-	-	1	3.75	
Above 40 mds.	15	6.35	3.95	2.40	-	-	-	-	-	-	1	3.15	1	0.80	1	2.40	-	-	-	3	6.35	
Total	6	16.51	6.93	9.58	1	0.80	1	1.98	1	3.75	2	4.15	1	0.80	2	3.00	1	1.18	1	0.85	10	16.51

Table 5.22 : Rotation-plans of the Cultivators Following Agriculture as Subsidiary Occupation in Vivare (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Supply of manure												Total number of plots	Total area						
			Light	Medium-black	Deep-black	Upto 5 cart-loads				11 to 15 cart-loads				Above 15 cart-loads											
			Deep-black soil	Light soil	Medium-black soil	Deep-black soil		Light soil		Medium-black soil		Deep-black soil		Light soil		Medium-black soil									
			C-J	G-J	C-J	J-J-J	C-J	J-J-J	C-J	J-J-J	C-J	G-C-J	J-J-J	C-J	G-C-J	J-J-J									
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots			Area	Plots	Area			
16 to 25 mds.	4	1.50	-	-	1.50	1	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.50	
26 to 30 mds.	6	2.41	0.75	1.03	0.63	-	-	1	0.75	1	1.03	-	-	1	0.63	-	-	-	-	-	-	-	-	3	2.41
31 to 40 mds.	9	2.65	-	2.65	-	-	-	-	-	3	2.60	1	0.05	-	-	-	-	-	-	-	-	-	-	4	2.65
Above 40 mds.	1	1.13	-	1.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.13	1	1.13
	28	7.17	3.01	4.16	-	-	-	-	-	-	-	-	-	-	-	2	3.01	3	3.33	1	0.83	-	-	6	7.17
Total	5	14.86	3.76	8.97	2.13	1	1.50	1	0.75	4	3.63	1	0.05	1	0.63	2	3.01	3	3.33	1	0.83	1	1.13	15	14.86

cultivators had agricultural labour as their main occupation and the remaining one, was mainly a vendor dealing in spices and condiments. In Khirode, all the three cultivators having agricultural labour as their main occupation accepted the same rotation of G-J on their entire land-holding, even though there were differences in their requirements of jowar, the size of holdings, the soil composition and the manure supply (Case Studies K 1, K 2 and K 4). Two of them accepted this rotation even on their medium-black land (Case Studies K 2 and K 4). The economic condition of these cultivators was such (their total annual incomes were Rs.900 and Rs.950), that they could not adopt other rotations with cotton, even though they had medium-black land and manure supply. They regarded cotton as the most risky crop, as it was susceptible to various diseases and pests and often likely to fail. One of these cultivators reported that such a loss of crop failure in any year could not be sustained by the small cultivators like him. They considered groundnut as less risky in comparison with cotton. And hence they preferred groundnut to rotate along with jowar, which they had to grow, to get jowar, whatever possible, to meet the family food needs. The rotation of G-J was preferred for its other advantages also. Firstly, it could be continued for several years without any application of manure to land, as groundnut being a leguminous crop retained fertility of land at a higher level. Secondly, as both the crops in the rotation yield fodder, they could keep livestock as an additional source of income.

The case of the fourth cultivator pursuing tailoring as his main occupation was almost the same as that of above

cultivators. He had a comparatively larger holding (6.35 acres), but his economic condition was such that he was required to accept the same rotation of G-J on his entire land (Case Study K 15). Besides, his requirement of jowar was considerably large (50 maunds) and he had to devote a large area to jowar every year. He, therefore, accepted the same rotation on his medium-black land as well.

The remaining two cultivators in Khirode, who had tea-stalls as their main profession, were widely different from the above four cultivators and presented a contrasting picture. Both of them were financially better (their total annual incomes were Rs.1,650 and Rs.1,800) and were in a position to take the risk of cotton cultivation. Both of them, therefore, accepted the rotations with cotton. One adopted the two-year rotation of G-C (Case Study K 3); while the other, the three-year rotation of G-J-C (Case Study K 6). The accepted rotations were different, largely due to the differences in their requirements of jowar. The former cultivator had a very small requirement of food (9 maunds) and hence he could concentrate on the two cash-crops by accepting the two-year rotation of G-C. He preferred to purchase jowar to meet his family needs. The latter cultivator, however, had a comparatively larger requirement of food (30 maunds) and hence he was required to accept the three-year rotation of G-J-C.

In Vivare, the cultivators of this type behaved in a widely different way. All of them adopted the rotations with cotton, even though they had small land-holdings and were economically

poor. This was largely because of the soil type of their land-holdings. The medium-black soil in their land-holdings was also of better quality. It was nearer to the deep-black soil and hence groundnut could not be profitably grown on it. They were, therefore, forced to rotate cotton along with jowar on their medium as well as deep-black land. On the light soil, however, they either accepted the rotation of G-J or repeated jowar continuously.

Of the four cultivators having agricultural labour as their main occupation, two accepted the two-year rotation of C-J on a major portion of their land having medium and deep-black soil (Case Studies V 6 and V 9). One of them had a plot of light soil (0.75 acre) on which he adopted the rotation of G-J. The other one had a very small plot of 0.05 acre, where he was required to grow jowar continuously because of its peculiar situation. Both these cultivators had a satisfactory supply of manure and hence could accept the rotation of C-J on a large portion of their holdings. Of the remaining two cultivators, one could not adopt any rotation because of his small holding and considerably large requirement of food and fodder. He was required to grow jowar continuously, so as to get food and fodder, whatever possible on his land, as a minimum base to meet the total annual requirements (Case Study V 1). The fourth cultivator provided a very peculiar case. His land-holding was as large as 24.19 acres, but the area which could be put under cultivation was very limited, measuring only 7.16 acres (Case Study V 28). His fragments of land-holdings were so situated that a large portion of

them suffered from continuous erosion and could not be brought under cultivation. A major portion of the cultivated area was also of light soil. He could not accept any rotation on this land as it was very poor in fertility. It was, therefore, continuously put under jowar. The rest of the area of his land-holding was of medium-black soil, where he accepted the rotations of C-J and G-C-J.

The case of the vendor was similar to those of the two cultivators having agricultural labour as the main occupation (Case Study V 4). His entire land-holding was of deep-black soil where groundnut could not be profitably grown. He was, therefore, required to rotate cotton along with jowar. He had no supply of manure. Even then he accepted the C-J rotation on his entire land as it was of deep-black soil.

Thus, in Khirode, the choice of rotations in the case of such cultivators was largely determined by their general attitude and the economic conditions. The four factors and their composite effect had a minor play in such cases. In Vivare, however, the soil composition of the land was a vital factor, having considerable influence over the acceptance of rotations. In both the villages, the requirement of jowar was the basic factor in such cases also, and it influenced the choice of rotations in majority of the cases.

5.10. Plots with Peculiar Characteristics

The choice of rotations on a major portion of the land cultivated by the sample cultivators, could be explained on the basis of the composite effect of the four basic factors or on the

general attitude and the economic conditions of the cultivators. But there still remained some area where these factors were not decisive. Such area comprised of plots with peculiar characteristics. In the case of such plots, the cultivators were required to accept the rotations suiting to the peculiar characteristics of the individual plot. The total area of such plots was 9.95 acres in Khirode and 8.07 acres in Vivare. In both the villages, the proportion of such area to the total cultivated land was very minor--3.4 per cent in Khirode and 3.5 per cent in Vivare.

In the case of the sample cultivators in the two villages, four types of peculiarities--situation, topography of land, land under groves and availability of irrigation facility--were reported. The irrigation facility might be treated as a peculiarity, when it was not a general feature of the village. In Khirode seven cultivators reported eleven plots (9.95 acres) of peculiar characteristics. Eight of these plots were peculiar in their situation; one in its topography of land and the remaining two in having irrigation facility. In Vivare, five cultivators had six such plots, having an area of 8.07 acres. Three of them were peculiar in their situation, one in the topography of land and two in having the groves.

In Khirode, of the eight plots with peculiar situation, three (4.13 acres) were situated on the bank of streams and the remaining five (3.26 acres) near the village and the village secondary school. The three plots situated on the bank of streams were of lighter soil; while the others, of medium-black soil. The three plots situated on the bank of streams were

subject to constant erosion. Because of continuous erosion the soil in these plots had become so poor that except jowar no other crop could be grown (Case Studies K 15, K 19 and K 30). The three cultivators were, therefore, forced to grow jowar year after year on all the three plots. They could not adopt any rotation on these. Two of them who had larger land-holdings and livestock, used jowar crop grown on such plots, as green fodder (Case Studies K 19 and K 30). The other cultivator, however, took jowar to get grains as his family was of larger size (12 members) requiring 50 maunds of jowar per year for consumption (Case Study K 15).

In the case of the remaining five plots, because of their proximity to the village, cultivation of groundnut was not practicable. On four of these the cultivator was required to accept the two-year rotation of C-J (Case Study K 5). The case of this cultivator was interesting as his entire holding of four plots suffered from the locational disadvantage. One of his fragment (0.35 acre) was situated adjacent to the village, only a 'kuccha' road running between the two; and the other fragment (2.53 acres) near the village secondary school. On none of the four plots of his two fragments, he could accept the three-year rotation of G-C-J, suited to the medium-black soil. He was thus forced to accept the C-J rotation on his entire land-holding. The fifth plot situated near the village was owned by a large cultivator (Case Study K 29). This plot (0.38 acre), besides its proximity to the village, was a crematory ground for the Leva-Patidar caste. On this plot, cotton could not be taken,

firstly because it was very small in size and secondly because it was a crematory ground, where females were reported to be rather afraid of going for picking. In the circumstances, the cultivator was required to take continuous cropping of jowar on it.

Topography of land as a peculiar factor was reported in the case of one plot in Khirode (Case Study K 29). This plot (0.93 acre) was situated in the low lying area where the rain water from the neighbouring fields accumulated. Because of this factor, the cultivator was not able to grow any of the major kharif crops on it. He could not follow any of the usual rotations on it. To utilize the peculiar situation of the plot to his advantage, he preferred to put this plot under continuous cropping of paddy.

Availability of irrigation facility as a peculiar factor was reported in the case of two plots in Khirode (Case Study K 29). The two plots were from the same fragment, which had irrigation facility from a jointly owned well. The water supply in the well, however, was limited and only the crops requiring light irrigation could be grown. The cultivation of heavily irrigated crop like banana was not possible. Considering the limitation of water and his share in the ownership of the well, the cultivator preferred to accept the two-year rotation of W-J.

In Vivare, three plots having an area of 3.06 acres, suffered from situational disadvantages. Two of them (3.01 acres) were situated on the bank of streams (Case Study V 28), and the remaining one on the road side (Case Study V 9). In the case of

the first two plots, because of constant erosion the land had become so inferior that the cultivator had to grow only jowar on it year after year. No other crop could be profitably grown on these and the cultivator could not follow any rotation. Much of the jowar crop taken was usually used as green fodder (Case Study V 28). The case of the third plot was totally different. It was very small in size (0.05 acre), and was situated on the side of the Yawal-Raver main road where many of the villagers brought their cattle for rearing. These animals spoiled the crops taken in the neighbouring fields as well. Because of this menace and also because of the small size of the plot, the cultivator preferred to grow jowar on it continuously. Considering the size and the situation of the plot, he did not find economical to grow the other major crops like cotton and groundnut.

Two plots having an area of 1.73 acres were under groves. One of them was under mango trees (Case Study V 27); and the other under 'Neem' trees (Case Study V 23). It was reported that under the shade of the trees crops could not be profitably grown. Because of the thick shade the crops remained stunted in growth and gave a very low yield. In such cases, therefore, the cultivators preferred to grow jowar every year as it could be used as green fodder. In the case of the above two plots also, the cultivators preferred to put the land under jowar continuously. They could not practise any rotation on these plots.

The remaining plot (3.28 acres) suffered from a peculiar

topography of land. It was situated on the low lying area where rain water from the neighbouring fields accumulated (Case Study V 25). The cultivator found this plot most suited to grow wheat, which was sown in September by which time the land got free from the accumulated water. To rotate along with wheat, he found cotton more convenient and profitable than jowar. He reported that jowar turned pale because of much water, got stunted and did not give proper yield. Cotton also did not grow properly, but it being a cash-crop was preferred to jowar even though it gave low yield. On this plot, therefore, the cultivator was required to accept the two-year rotation of C-W.

Thus, in both the dry villages, there were some peculiar plots, on which no rotation could be practised. On such area the cultivators were required to follow the continuous cropping of one crop like jowar, which was cheaper to cultivate and which could be used as green fodder. On other peculiar plots, rotations could be followed, but those were all chosen mainly on the basis of the peculiar characteristic of each individual plot. In the case of such plots, the cultivators had a very limited freedom to make their choice of rotations. They were forced to accept the rotation suited to the peculiarity of each plot.

5.11. Cultivators and Their Rotation-Plans in the Irrigated Villages

As pointed out earlier, the general attitude of the cultivators in the irrigated villages also, was basically the same as that of the cultivators in the dry villages. Thus, in the irrigated villages as well, the cultivators aimed first at the

minimum supply of food and only then tried to maximise the cash-income. However, between the cultivators in the dry and the irrigated villages, there was a slight difference about the intensity of food needs felt and the way of maximizing the cash-income. The basic attitude in both the cases was the same but its implementation was slightly different. In the irrigated villages, the family food needs were comparatively less intensive than in the dry villages. In the case of some cultivators in the irrigated villages, the cash-crops might dominate to such an extent that they were required to make purchases of food and fodder needed. The importance attached to the minimum security of food, therefore, decreased to some extent but it did not totally disappear. The cultivators in the irrigated villages also, always preferred to produce food for their own families. Thus, the production pattern contained a core of self-sufficiency as regards food in the dry as well as the irrigated villages. As regards the maximization of cash-income also, there was difference in the sense that irrigation being available, the cultivators got a wider field to make their choice of better paying cash-crops and they could maximize their cash-income in a better way than in the dry villages.

Between the two irrigated villages there was difference as regards the extent of irrigation available. It was comparatively more abundant in Rozode than in Waghode. The total irrigated area was substantially high in Rozode (65.9 per cent of the gross cultivated area), than in Waghode (49.4 per cent). The total area of the village land, however, was quite small in

Rozode (1,423.80 acres) in comparison with that in Waghode (2,287.25 acres). Because of these two factors--small area of village land and higher proportion of it under irrigation--the cultivators in this village had to purchase land outside the village. Almost all the sample cultivators in this village had dry lands in the neighbouring villages at the foot of the Satpuda hill range. They grew dry crops like jowar and groundnut in these lands and concentrated on the irrigated crop like banana on the lands in the village. Thus, almost all the sample cultivators in this village depended on the outside lands for their basic requirement of food and fodder. In Waghode, the conditions were different. The irrigated area in this village was proportionately less and hence the cultivation of dry crops as well, was largely done on the village land itself. It was reported that in this village only a few cultivators had lands outside.

Of the sample cultivators in Waghode, 11 were small cultivators, whose land-holdings were upto 5.00 acres; 14 were medium cultivators, whose land-holdings were between 5.01 and 15.00 acres; and 7 were large cultivators whose land-holdings were above 15.00 acres. In Rozode the classification of the sample cultivators in the three groups was almost the same. Of the thirty sample cultivators in this village, eleven were small; fifteen medium and the remaining four large.

The total area cultivated by the sample cultivators in Waghode was 354.24 acres. Of this, 186.73 acres or 52.72 per cent had irrigation facilities and the rest, 167.51 acres or 47.28 per cent, was dry. The proportion of irrigated area to

the total was quite low in the case of the small and the medium cultivators, while it was considerably high in the case of the large cultivators (see Table 5.23). In the other irrigated village, Rozode, the total land cultivated by the sample cultivators was 247.95 acres. Of this, 96.75 acres or 39.01 per cent was irrigated and the remaining 151.20 acres or 66.99 per cent was dry. In this village also the proportion of irrigated area to the total, was low in the case of the small and the medium cultivators; and quite high in the case of the large cultivators (see Table 5.24).

In both the irrigated villages, a large proportion of the land cultivated by the sample cultivators, was of medium-black soil--64.12 per cent in Waghode and 64.85 per cent in Rozode. Next to medium-black, there was deep-black soil in both the villages. It was about one-third of the total land in Waghode and less than one-fourth of the total area in Rozode. The lighter type of soil was almost negligible in Waghode. In Rozode, however, it was about 16.40 per cent of the total cultivated land. In both the villages, the medium-black soil was predominant with all the sample cultivators--small, medium and large. In Waghode, the lighter type of soil was reported only by the large cultivators; while in Rozode, it was reported only by the small and the medium cultivators (see Tables 5.23 and 5.24).

In Waghode one of the sample cultivators, sold his entire land (3.45 acres) in 1963-64 and took to the occupation of running a flour-mill in the village (Case Study W 5). This

Table 5.23 : Soil-Composition of Land-holdings cultivated by the Small, Medium and Large Cultivators in Waghode

Cultivator	No. of cultivators	Light soil	Medium-black soil		Deep-black soil		Total		Total area in acres	
		Dry area	Irrigable area	Dry area	Irrigable area	Dry area	Irrigable area	Irrigable area		Dry area
		Acres	Acres	Acres	Acres	Acres	Acres	Acres		Acres
Small cultivators	10	-	11.07	15.46	3.25	3.63	14.32	19.09	33.41	
Medium cultivators	14	1.70	33.22	47.17	17.15	20.09	50.37	68.96	119.33	
Large cultivators	7	5.56	75.38	44.85	46.66	29.05	122.04	79.46	201.50	
Total	31	7.26	119.67	107.48	67.06	52.77	186.73	167.51	354.24	

Table 5.24 : Soil-composition of Land-holdings Cultivated by the Small, Medium and Large Cultivators in Rozode

Cultivator	No. of cultivators	Light soil	Medium-black soil		Deep-black soil		Total		Total area in acres
		Dry area	Irri-gable area	Dry area	Irri-gable area	Dry area	Irri-gable area	Dry area	
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	
Small cultivators	11	9.04	5.51	13.29	3.74	1.00	9.25	23.33	32.58
Medium cultivators	15	7.20	32.22	61.70	12.49	9.08	44.71	77.98	122.69
Large cultivators	4	24.43	24.16	23.93	18.63	1.53	42.79	49.89	92.68
Total	30	40.67	61.89	98.92	34.86	11.61	96.75	151.20	247.95

cultivator is not considered here for the purpose of analysis. Thus, in Waghode, out of the remaining 31 cultivators, 13 had their land-holdings entirely of medium-black soil; two entirely of deep-black soil; and the remaining 16 had mixed type of land-holdings. Of these sixteen, fourteen had holdings consisting partly of medium and partly of deep-black soil; and two had all the three types of soil. Majority of the cultivators having land-holdings entirely of medium or of deep-black soil, were from the small and medium size groups. Of the fourteen cultivators having mixed land-holdings of medium and deep-black soil, two were from the small and four from the large size groups and the remaining eight from the medium size group. Of the two cultivators having all the three types of soil in their land-holdings, one belonged to the medium size group and the other to the large (see Table 5.25). In Rozode, out of the thirty sample cultivators, eleven had their land-holdings entirely of medium-black soil; and all the rest, had mixed type of land-holdings. Of the nineteen cultivators having mixed land-holdings, ten had holdings partly of medium and partly of deep-black soil; five had partly of light and medium-black soil and the remaining four had holdings consisting of all the three types of soil. All the cultivators having entire land-holdings of medium-black soil were from the small and the medium size groups. Majority of the cultivators having land-holdings of medium and deep-black soil were also from the small and the medium size groups. Of the five cultivators having land-holdings of light and medium-black soil, three were from the

Table 5.25 : Distribution of the Cultivators in Waghode according to Soil-Composition of Their Land-holdings

Soil-composition of land-holding	Small cultivators		Medium cultivators		Large cultivators		Total	
	No. of culti-vators	Area in acres	No. of culti-vators	Area in acres	No. of culti-vators	Area in acres	No. of culti-vators	Area in acres
Land-holdings wholly of medium-black soil	7	21.37	5	40.60	1	17.51	13	79.48
Land-holdings wholly of deep-black soil	1	3.20	-	-	1	16.86	2	20.06
Land-holdings of medium and deep-black soils	2	8.84	8	72.45	4	140.76	14	222.05
Land-holdings of light, medium and deep-black soils	-	-	1	6.28	1	26.37	2	32.65
Total	10	33.41	14	119.33	7	201.50	31	354.24

small size group and the remaining two from the large size group. The four cultivators having land-holdings of all the three types of soil were from the small and the medium size groups (see Table 5.26).

For the purpose of analysis, the sample cultivators from both the irrigated villages may be classified into three broad groups: (1) the cultivators who grow banana; (2) the cultivators who lease-out their lands specifically for banana cultivation; and (3) the cultivators who pursue agriculture as a subsidiary occupation and are not wholly depending on their lands for the food needs. Of the sample cultivators in Waghode, fourteen each were in the first and the second groups, and the remaining three in the third group. In Rozode, eleven were in the first group; fifteen in the second, and the remaining four in the third group.

The cultivators in the second group did not have sufficient water supply of their own. In majority of their cases, the wells were under plural ownership and were neglected to a large extent. The water supply in such wells being inadequate and their share in the ownership of the wells being minor, such cultivators could not grow the heavily irrigated crop like banana on their lands. However, many of them could lease-out their lands specifically for banana cultivation, to the neighbouring cultivators who had sufficient water supply and other resources. This practice of leasing-out land for banana crop was very common with the small and the medium cultivators in both the irrigated villages. However, these cultivators could not give a definite place for banana in their rotation programme

Table 5.26 : Distribution of the Cultivators in Rozode according to Soil-Composition of Their Land-holdings

Soil-composition of land-holding	Small cultivators		Medium cultivators		Large cultivators		Total	
	No. of culti-vators	Area in acres	No. of culti-vators	Area in acres	No. of culti-vators	Area in acres	No. of culti-vators	Area in acres
Land-holdings wholly of medium-black soil	4	10.74	7	61.36	-	-	11	72.10
Land-holdings of medium and deep-black soils	2	4.28	6	45.28	2	56.51	10	106.07
Land-holdings of light and medium-black soils	3	8.51	-	-	2	36.17	5	44.68
Land-holdings of light, medium and deep-black soils	2	9.05	2	16.05	-	-	4	25.10
Total	11	32.58	15	122.69	4	92.68	30	247.95

as they were required to depend for irrigation on others. These cultivators, therefore, kept their rotation-plans flexible so that whenever irrigation was made available, they could lease-out their lands for banana cultivation. It was observed that these cultivators basically followed the rotations of dry crops which they themselves could grow on their lands. Whenever irrigation was made available they broke the basic rotation of dry crops and switched over to another rotation with banana as one of the crops. Thus, in the case of such cultivators, there was a dualism as regards the acceptance of rotations.

In the following sections, the rotation-plans practised by some of the sample cultivators in each of the three groups, are discussed on individual basis.

5.12. Cultivators Growing Banana

In Tables 5.27 and 5.28, are given the rotation-plans of the cultivators, who cultivated banana on their lands. They are grouped according to their annual food requirement and the supply of home-collected manure. The rotations adopted by them are shown separately for the irrigable and the dry land and also for different soil types. The Tables clearly point out that the cultivators in the irrigated villages as well, had the same basic attitude towards cultivation as their counterparts in the dry villages. They too formulated their rotation-plans, making due provision for jowar, in order to meet the annual food needs of the family. In some of the cases, however, cash-crops might be predominant to such an extent that the cultivators were required to make some purchase of food and fodder. But such

Table 5.27 : Rotation-plans of the Cultivators Growing Banana in Waghode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area																					
			Irrigable area		Dry area			Irrigable area				Dry area																	
			2.1 to 3 acres					3.1 to 5 acres																					
			Medium-black soil		Medium-black soil			Deep-black soil		Light soil		Medium-black soil		Deep-black soil															
			NB-JB-C	NB-JB-C-J	G-C-J	NB-JB-C	NB-JB-J	NB-JB-C	G-J	NB-JB-C	G-C-J or NB-JB-C	J-J-J	C-C-C																
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area						
16 to 25 mds.	22	10.30	6.00	-	-	4.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
26 to 30 mds.	15	8.43	4.70	1.45	-	2.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	20	6.23	-	5.35	-	0.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	23	20.57	-	4.20	-	10.54	5.83	-	-	-	-	-	-	-	-	1	4.20	-	-	1	4.98	1	3.68	1	1.88	1	5.83		
31 to 40 mds.	13	5.00	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	19	9.01	5.43	-	-	3.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	24	10.90	2.95	2.95	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Above 40 mds.	26	6.28	2.43	2.15	1.70	-	-	-	-	-	-	-	-	-	1	2.43	1	2.15	1	1.70	-	-	-	-	-				
	27	12.18	2.58	-	-	5.40	4.20	1	0.18	2	2.40	3	5.40	2	4.20	-	-	-	-	-	-	-	-	-	-				
	28	17.51	16.08	-	-	1.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	29	21.41	-	8.23	-	13.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	30	26.20	10.33	5.75	-	5.64	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	31	26.37	13.38	4.30	5.56	0.98	2.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	32	72.58	35.59	17.43	-	13.08	6.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Total	14	252.97	104.47	51.81	7.26	66.29	23.14	1	0.18	2	2.40	3	5.40	2	4.20	1	2.43	2	6.35	1	1.70	1	4.98	1	3.68	1	1.88	1	5.83

(continued)

Table 5.27 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area																															
			Irrigable area		Dry area			Irrigable area 5.1 to 7 acres							Dry area							Irrigable area 7.1 to 10 acres		Dry area															
			Medium-black	Deep-black	Light	Medium-black	Deep-black	Medium-black soil				Deep-black soil			Medium-black soil				Deep-black soil		Medium-black soil																		
								NB-JB-C		NB-JB-J		NB-JB-G		NB-JB-C-G		C-J	NB-JB-C		NB-JB-C		W-J or NB-JB-J		G-C-J or NB-JB-C		C-J	C-C-C-J		NB-JB-J		Orchard		NB-JB-C-C		J-J-J					
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area					
16 to 25 mds.	22	10.30	6.00	-	-	4.30	-	-	1	2.00	2	4.00	-	-	-	-	-	-	-	-	-	-	-	-	1	0.30	1	4.00	-	-	-	-	-	-	-				
26 to 30 mds.	15	8.43	4.70	1.45	-	2.28	-	2	1.75	1	0.65	-	-	-	-	1	2.30	1	1.45	-	-	-	-	-	2	2.28	-	-	-	-	-	-	-	-	-				
	20	6.23	-	5.35	-	0.88	-	-	-	-	-	-	-	-	-	-	-	2	5.35	-	-	1	0.88	-	-	-	-	-	-	-	-	-	-	-	-				
	23	20.57	-	4.20	-	10.54	5.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
31 to 40 mds.	13	5.00	5.00	-	-	-	-	1	2.50	2	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	19	9.01	5.43	-	-	3.58	-	-	3	2.55	-	-	3	2.88	-	-	-	-	-	1	1.38	-	-	1	2.20	-	-	-	-	-	-	-	-	-	-				
	24	10.90	2.95	2.95	-	5.00	-	1	1.15	-	-	-	-	-	1	1.80	2	2.95	1	2.00	-	-	1	3.00	-	-	-	-	-	-	-	-	-	-	-				
Above 40 mds.	26	6.28	2.43	2.15	1.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	27	12.18	2.58	-	-	5.40	4.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	28	17.51	16.08	-	-	1.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	29	21.41	-	8.23	-	13.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	30	26.20	10.33	5.75	-	5.64	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	31	26.37	13.38	4.30	5.56	0.98	2.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	32	72.58	35.59	17.43	-	13.08	6.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Total	14	252.97	104.47	51.81	7.26	66.29	23.14	4	5.40	7	7.70	2	4.00	3	2.88	2	4.10	5	9.75	2	3.38	1	0.88	1	2.20	1	3.00	3	2.58	1	4.00	2	3.73	1	4.50	6	11.35	1	1.83

(continued)

Table 5.27 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding																									Total number of plots	Total area	Area under jowar averaged over rotation cycle																								
			Irrigable area															Dry area																																				
			Irrigable area					Dry area																																														
			Above 10 acres															Light Soil					Medium-black soil								Deep-black soil																							
			Medium-black soil					Deep-black soil																																														
Medium-black		Deep-black		Light	Medium-black		Deep-black		NB-JB-C		NB-JB-J		NB-JB-C-C		NB-JB-C-J		NB-JB-W-J		Orchards		NB-JB-C		NB-JB-J		C-C-C-J		G-J		NB-JB-C		NB-JB-J		NB-JB-C-J		G-J or NB-JB-J		C-J		G-C-J		W-C-J		J-J-J		Lucerne		C-J		NB-JB-C		NB-JB-C-J			
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area									
16 to 25 mds.	22	10.30	6.00	-	-	4.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	10.30	1.82						
26 to 30 mds.	15	8.43	4.70	1.45	-	2.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	8.43	2.51							
	20	6.23	-	5.35	-	0.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6.23	0.29								
	23	20.57	-	4.20	-	10.54	5.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	20.57	1.88 or 3.11									
31 to 40 mds.	13	5.00	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5.00	0.83								
	19	9.01	5.43	-	-	3.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	9.01	1.58 or 1.95									
	24	10.90	2.95	2.95	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	10.90	0.90 or 1.90									
Above 40 mds.	26	6.28	2.43	2.15	1.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6.28	1.66								
	27	12.18	2.58	-	-	5.40	4.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	12.18	2.40								
	28	17.51	16.08	-	-	1.43	-	5	6.38	6	9.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	17.51	3.68 or 3.90								
	29	21.41	-	8.23	-	13.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	21.41	3.07								
	30	26.20	10.33	5.75	-	5.64	4.48	4	5.00	2	5.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	26.20	7.26									
	31	26.37	13.38	4.30	5.56	0.98	2.15	2	4.50	2	3.38	-	-	3	5.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	26.37	8.04									
	32	72.58	35.59	17.43	-	13.08	6.48	2	4.91	1	3.10	1	6.33	-	1	6.50	3	14.25	1	2.20	1	2.10	-	-	1	5.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	26.37	8.04								
							2	4.91	1	3.10	1	6.33	-	1	6.50	3	14.25	3	17.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	72.58	8.75								
Total	14	252.97	104.47	51.81	7.26	66.29	23.14	13	20.79	11	21.51	1	6.33	3	5.50	1	6.50	3	14.25	4	19.63	1	2.10	1	5.75	2	5.56	1	2.43	1	1.27	2	1.21	2	1.43	2	2.13	1	0.80	1	7.28	5	4.58	1	0.50	1	2.15	1	4.48	2	6.48	118	252.97	-

Table 5.28 : Rotation-plans of the Cultivators Growing Banana in Rozode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area									
			Irrigable area		Dry area			Irrigable area		Dry area							
			Medium-black	Deep-black	Light	Medium-black	Deep-black	2.1 to 3 acres		Medium-black soil							
								Medium-black soil									
								NB-JB-C-J		Nb-JB-J		C-J or NB-JB-C		G-J		G-C-J	
					Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area			
16 to 25 mds.	16	5.75	4.20	-	-	1.55	-	-	-	-	-	-	-	-	-	-	
26 to 30 mds.	19	6.48	2.00	1.10	-	2.63	0.75	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	21	9.61	2.81	2.80	-	4.80	-	-	-	-	-	-	-	-	-	-	
	25	12.64	2.50	-	-	10.14	-	2	2.50	1	2.90	1	1.18	2	4.56	1	1.50
	26	15.66	3.61	-	10.55	1.50	-	-	-	-	-	-	-	-	-	-	
	29	22.21	1.48	9.20	-	10.00	1.53	-	-	-	-	-	-	-	-	-	
Above 40 mds.	20	8.25	2.45	1.80	4.00	-	-	-	-	-	-	-	-	-	-	-	
	22	9.36	-	3.36	-	6.00	-	-	-	-	-	-	-	-	-	-	
	24	6.33	1.63	3.05	-	1.65	-	-	-	-	-	-	-	-	-	-	
	28	12.00	5.60	-	-	6.40	-	-	-	-	-	-	-	-	-	-	
	30	34.30	15.44	9.43	-	9.43	-	-	-	-	-	-	-	-	-	-	
Total	11	142.59	41.72	29.94	14.55	54.10	2.28	2	2.50	1	2.90	1	1.18	2	4.56	1	1.50

(continued)

Table 5.28 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area																															
			Irrigable area		Dry area			Irrigable area						Dry area																									
			Medium-black	Deep-black	Light	Medium-black	Deep-black	3.1 to 5 acres																															
			Medium-black soil			Deep-black soil			Light soil	Medium-black soil				Deep-black soil																									
			NB-JB-C	NB-JB-J	NB-JB-G	NB-JB-W	G-J or NB-JB-J	NB-JB-C	NB-JB-C-J	W-J	G-J	NB-JB-C	NB-JB-G	G-J	G-C	G-J-C	NB-JB-C	W-J																					
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area												
16 to 25 mds.	16	5.75	4.20	-	-	1.55	-	-	-	2	1.73	2	2.47	-	-	-	-	-	-	-	-	-	-	-	-	1	0.95	1	0.60	-	-	-	-	-	-				
26 to 30 mds.	19	6.48	2.00	1.10	-	2.63	0.75	3	2.00	-	-	-	-	-	-	-	-	-	-	1	1.10	-	-	1	0.95	-	-	-	-	-	-	-	1	1.68	1	0.75			
31 to 40 mds.	21	9.61	2.81	2.00	-	4.80	-	-	-	3	1.78	-	-	1	1.03	-	-	1	2.00	-	-	-	-	2	4.80	-	-	-	-	-	-	-	-	-					
	25	12.64	2.50	-	-	10.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	26	15.66	3.61	-	10.55	1.50	-	1	0.83	1	2.78	-	-	-	-	-	-	-	-	-	-	-	3	10.55	-	-	-	-	1	1.50	-	-	-	-	-				
	29	22.21	1.48	9.20	-	10.00	1.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Above 40 mds.	20	8.25	2.45	1.80	4.00	-	-	-	-	2	2.45	-	-	-	-	-	2	1.80	-	-	-	-	2	4.00	-	-	-	-	-	-	-	-	-	-	-				
	22	9.36	-	3.36	-	6.00	-	-	-	-	-	-	-	-	-	-	1	1.63	2	1.73	-	-	-	-	-	-	2	6.00	-	-	-	-	-	-	-				
	24	6.33	1.63	3.05	-	1.65	-	-	-	-	-	-	-	-	-	1	1.63	3	3.05	-	-	-	-	-	-	-	-	-	-	1	1.65	-	-	-	-				
	28	12.00	5.60	-	-	6.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	30	34.30	15.44	9.43	-	9.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Total	11	142.59	41.72	29.94	14.55	54.10	2.28	4	2.83	8	8.74	2	2.47	1	1.03	1	1.63	7	8.48	2	1.73	1	1.10	5	14.55	1	0.95	1	0.95	5	11.40	1	1.50	1	1.65	1	1.68	1	0.75

(continued)

Table 5.28 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Irrigable and dry area																										Total number of plots	Total area	Area under jowar averaged over rotation cycle					
			Soil-composition of land-holding							Irrigable area																						Dry area				
			Irrigable area		Dry area					Above 10 acres																										
			Medium-black	Deep-black	Light	Medium-black	Deep-black	5.1 to 7 acres	Irrigable area																											
			Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Medium-black soil					Deep-black soil					Medium-black soil					Deep-black soil												
NB-JB-J		G-J					NB-JB-C		NB-JB-J		NB-JB-C		NB-JB-J		NB-JB-J-C		NB-JB-C-W		NB-JB-M-B		NB-JB-M-C		G-C-J		G-J		W-J									
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area							
16 to 25 mds.	16	5.75	4.20	-	-	1.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	5.75	0.88					
26 to 30 mds.	19	6.48	2.00	1.10	-	2.63	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	6.48	0.92						
31 to 40 mds.	21	9.61	2.81	2.00	-	4.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	9.61	2.99						
	25	12.64	2.50	-	-	10.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	12.64	4.37 or 4.96						
	26	15.66	3.61	-	10.55	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	15.66	6.20						
	29	22.21	1.48	9.20	-	10.00	1.53	-	-	-	-	-	1	1.48	-	-	1	2.10	1	2.50	2	4.60	-	-	-	-	2	10.00	1	1.53	8	22.21	7.59			
Above 40 mds.	20	8.25	2.45	1.80	4.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	8.25	2.82						
	22	9.36	-	3.36	-	6.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	9.36	3.43						
	24	6.33	1.63	3.05	-	1.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	6.33	1.09 or 1.36							
	28	12.00	5.60	-	-	6.40	-	2	5.60	1	6.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	12.00	5.06							
	30	34.30	15.44	9.43	-	9.43	-	-	-	-	-	4	15.44	-	-	1	2.80	-	-	-	-	-	1	4.48	1	2.15	3	9.43	-	-	10	34.30	3.14			
Total	11	142.59	41.72	29.94	14.55	54.10	2.28	2	5.60	1	6.40	4	15.44	1	1.48	1	2.80	1	2.10	1	2.50	2	4.60	1	4.48	1	2.15	3	9.43	2	10.00	1	1.53	70	142.59	-

cases were a few, and so it could not be said that the cultivators in the irrigated villages were unmindful of their food requirements and concentrated only on high production and high income. At the most they might be less mindful in meeting their domestic food needs.

Thus, the cultivators in the irrigated villages also, invariably devoted a portion of their land to jowar, to meet their food requirements. The average per acre yield of jowar, reported by the villagers, was about 16 maunds in both the irrigated villages. If the accepted rotations are translated into cropping, it is found that in majority of these cultivators, the area allotment to jowar had a fairly definite relationship with their respective requirements of food. In some cases, however, this did not happen; mainly because these cultivators largely took jowar as a mixed crop along with cotton and put a comparatively small area under jowar grown as the main crop. In Waghode particularly, this practice of growing jowar as a mixed crop along with cotton was very prevalent among the small and the medium cultivators, who had limited land-holdings and hence found difficult to put special area under jowar. The large cultivators did not follow this practice, firstly because they had bigger holdings and secondly they considered it as disadvantageous. According to them jowar taken along with cotton affected the cotton crop adversely.

It can be seen from Table 5.27 that in Waghode, the area allotment to jowar, derived from the accepted rotations of the cultivators in all the requirement groups, was enough or just

enough to meet their respective food needs (Case Studies W 15, W 22, W 23, W 27 and W 29 etc.). The exceptions to this were of those cultivators who grew jowar as a mixed crop along with cotton (Case Studies W 20, W 13 and W 24) and of the large cultivators who were necessarily required to put larger area under jowar because of financial and irrigation restraints (Case Studies W 28, W 30, W 31 and W 32). The same was true about the cultivators in Rozode. In majority of the cases of the cultivators in the different requirement groups, the area allotted to jowar was sufficient to meet their food requirements (Case Studies R 20, R 21, and R 22 etc.). Exceptional cases of both the types were present in this village as well (Case Studies R 19, R 16, R 28 and R 30). As stated earlier, many of the cultivators from this village, had dry lands outside the village, where they could grow only jowar and groundnut. The land was such that they could not take any other crop. In the case of these cultivators, therefore, the jowar area was comparatively larger than required to meet their annual food needs (Case Studies R 25, R 26 and R 27).

The cultivators included in each requirement group had near about the same requirement of food, but were all different as regards many of the other basic factors. The composite effect of the food requirement and the other factors was, therefore, different for different cultivators in one and the same requirement group and they were required to practise different rotations or different combination of rotations. We may take one group in which the maximum number of cultivators are included

and explain in detail the acceptance of rotations on individual basis. In both the villages, such a group is that of the cultivators whose requirements of jowar were above 40 maunds. In Waghode, out of the fourteen cultivators growing banana, seven were reported in this group; and in Rozode, out of eleven, five. Of the seven cultivators included in this group at Waghode, two were from the medium size group and the rest from the large group. Of these cultivators, two had an irrigable area below 5.00 acres each; one, below 10 acres; and the remaining four, above 10 acres each. One of them was a big cultivator, having an irrigable area as large as 53.02 acres (see Table 5.27).

The two medium cultivators in this group were similar only in having near about the same requirement of food. Barring this point, they were totally different in all other matters such as the size of land-holding, its soil-composition and the extent of irrigable land etc. One of them had a land-holding having slightly more than 5.00 acres of area (Case Study W 26); while the other had a comparatively larger land-holding of 12.18 acres (Case Study W 27). The irrigable area was comparatively larger in the case of the small cultivator (4.58 acres out of the total area of 6.28 acres), than that of the other (2.58 acres out of the total land of 12.18 acres). Because of these differences the total impact of all the basic factors was different on both of them and they were required to practise different rotation-plans.

The smaller cultivator had irrigation facility on two of his fragments--one of deep-black land and the other of medium-black.

On the fragment of deep-black land he adopted the rotation of NB-JB-C as on such soil only cotton could be profitably taken after banana. Jowar taken after banana on such soil did not usually give good results. On the fragment of medium-black soil, he followed the rotation of NB-JB-J. On the third fragment, he was required to accept the two-year rotation of G-J as the land was of lighter type. As jowar taken on this dry land was not enough to meet his food needs (45 maunds), he was required to take jowar in rotation with banana on the fragment of medium-black land. He could have, otherwise, taken cotton on this fragment as well. Even this much area under jowar taken under the two rotations (G-J and NB-JB-J) was not enough to give him the required production of jowar. He was, therefore, required to grow jowar as a mixed crop along with cotton. In his case the area under banana, averaged over the rotation cycle, was about 3.05 acres every year.

The other cultivator adopted a different combination of rotations (Case Study W 27). His irrigated area (2.58 acres) was entirely of medium-black land. Of this, a small plot of 0.18 acre was of soil nearer to deep-black. On this small plot, therefore, he followed the rotation of NB-JB-C and on the remaining portion, the four-year rotation of NB-JB-C-J. He could have adopted the same rotation of NB-JB-C on this portion as well, but jowar taken on the dry land was not enough to meet his food requirement and hence he was required to grow jowar on the irrigable land as well. Of the two fragments of dry land, on one he adopted the three-year rotation of G-C-J as the land in

this fragment was of medium-black soil and was best suited to the rotation. On the other fragment, however, he could accept the rotation of NB-JB-C by leasing-out the land specifically for banana cultivation to one of his neighbouring cultivators. The cropping programme on this fragment was so adjusted that after every cotton crop taken by him, he could lease-out the land for banana to the neighbouring cultivator. A definite type of relationship was established between them and hence he could give a definite place for banana in the rotation. The rotation programme in the case of this cultivator was so arranged as to have the area of his land-holding well distributed every year under different cash-crops, providing at the same time the required area for jowar. It was seen that the average area over the rotation cycle was 3.86 acres under cotton; 2.06 acres each under 'Nawati' and 'Junar' banana; 1.80 acres under groundnut and 2.40 acres under jowar every year. The area allocated to jowar was just enough to meet his annual food requirement (40 maunds).

The five large cultivators in the group were also widely different from one another as regards the basic factors. Of these, the cultivator having an irrigable area of 8.23 acres, provided a peculiar case, in the sense that more than half of his irrigable land or about one-third of his total land-holding was locked under the groves of oranges and mangoes (Case Study W 29). The remaining portion of his irrigable land (3.73 acres) was put under the three-year rotation of NB-JB-J, even though the land was of deep-black soil. He was required to follow that

rotation with jowar as there was no other convenient land where he could grow jowar for his domestic food needs. On the major portion of his dry land (11.35 acres) he accepted the four-year rotation of NB-JB-C-C by leasing-out the entire area for banana cultivation to his neighbouring cultivator. After banana, he preferred to take cotton on it continuously for two years, to adjust its cropping pattern with that of the neighbouring cultivator. On this land he could have grown jowar in one of the two years, but as the fragment was quite large in area, he did not prefer to put it under jowar. Jowar on such a large area would have been more than required. Instead, he preferred to grow jowar as mixed crop along with cotton. The other fragment of the dry land (1.83 acres) was under the mango trees, because of which no crop could be profitably grown on it. However, he grew jowar continuously on it as a fodder crop. The area allotted to jowar under the NB-JB-J rotation was not enough to meet his entire food needs (45 maunds) and hence he was required to take jowar as a mixed crop along with cotton. It was seen that on an average, he could put about 8.16 acres under banana. It was comparatively high as he could lease-out the major portion of his dry land for this crop.

Of the remaining four large cultivators, three had almost the same area of irrigable land--varying between 16.08 and 17.68 acres (Case Studies W 28, W 30 and W 31). Of these three, one cultivator had his land-holding entirely of medium-black land and was different from the other two to a considerable extent (Case Study W 28). In his case, most of the area of his land-

holding was irrigable--16.08 out of 17.51 acres. Only 1.43 acres of his land did not have any irrigation facility of his own. On the entire irrigable land, he practised two types of rotations--NB-JB-C and NB-JB-J. Though the entire irrigable land was of medium-black land, he had divided it into two parts on the basis of minor differences in quality of soil and on the better quality land which was nearer to deep-black soil, he followed the NB-JB-C rotation. On the remaining part of the land, he adopted the other rotation of NB-JB-J. On the dry land of 1.43 acres, he was required to follow dual rotations as he leased-out the land for banana cultivation. His basic rotation on this land, however, was of G-J; but whenever irrigation was made available, he shifted to the rotation of NB-JB-J. On an average, the area devoted to jowar through the two rotations, NB-JB-J and G-J, was about 3.68 to 3.90 acres and was enough to meet his annual requirement of food (54 maunds). It can be seen that as his irrigable area was large, he could put proportionately more area under banana every year--varying between 5.37 and 5.82 acres. His combination of rotations chosen, was such that he could devote a larger proportion of his irrigable area to banana.

The other two cultivators having near about the same area of irrigable land (16.08 to 17.68 acres) were similar to each other in some other respects as well. Their total requirements of food were near about the same. They had almost the same size of land-holdings also (26.20 and 26.37 acres). The soil-composition of their land-holdings, however, was different. One

had a holding of medium and deep-black land (Case Study W 30); while the other had all the three types of land in his holding (Case Study W 31). The rotation-plans practised by them were different to a considerable extent, but both of them had an equal emphasis on banana cultivation. One of them (Case Study W 30), however, was required to grow more cotton, as a major portion of his irrigable land (5.75 acres) was more alkaline and hence could not be put under banana. On this land he was required to accept the rotation of dry crops alone. As the land was of deep-black soil, he put it under the four-year rotation of C-C-C-J. In his case, therefore, the area allotted to cotton in the rotation programme, was comparatively large. On an average, he allotted 8.80 acres, to cotton every year and 9.88 acres to banana. The other cultivator concentrated on banana alone (Case Study W 31). In his case the rotation programme was so arranged that on an average, he could take banana on 10.86 acres and cotton on 4.68 acres every year. In order to keep the area under banana constantly at 10.00 to 11.00 acres, he was required to accept the four-year rotation of NB-JB-C-J on one of his fragment of 5.50 acres. Because of the financial and the irrigation restraints he could not increase the area under banana any more. In the case of both the cultivators, the area under jowar was quite large (7.26 and 8.04 acres). It was more than they required to meet their food requirements. This necessarily happened with the large cultivators who were required to grow more of jowar because of the restraints from manure, finance and irrigation.

The remaining cultivator in the group was exceptionally big (72.58 acres) and was widely different from all other cultivators (Case Study W 32). His holding was of mixed type, having both medium and deep-black land. Of the total land-holding, the irrigable area was as large as 53.02 acres or 73.05 per cent. Out of this irrigable land, about 14.75 acres were put under the orchards of oranges and lemons and under lucerne. On the rest of the irrigable area, he practised different types of rotations with banana as one of the crops. Among these the three-year rotation of NB-JB-C was predominant, particularly on the deep-black land. It is interesting to note that on his dry land also, he followed the rotations with banana, by leasing-in the neighbouring areas of the other cultivators having irrigation facility. From the water supply available in the leased-in land he could irrigate his own area as well and practise on it the rotations with banana. However, ^{on} 7.28 acres of his dry land, around which no irrigation facility was available, he was required to practise the rotation of dry crops alone (W-C-J). In his case, the whole rotation programme was so arranged that on an average about 29.26 acres were devoted to banana; 15.77 acres to cotton; and 8.75 acres to jowar every year. In the case of this cultivator, it is interesting to see how he maintained the area balance between different crops through various rotations. On an average, he grew banana on more than two-thirds of his total irrigable land. As he was a banana trader himself, he could grow banana on such a large area every year. However, he could not increase it any more, mainly because

of the restraints from irrigation and finance. He was required to follow the four-year rotations of NB-JB-C-J and NB-JB-W-J on a small portion of his irrigable land, to keep the area under 'Nawati' banana at the level of 14.00 to 15.00 acres every year. In the case of this cultivator also, the area under jowar was large, as it was necessarily the case with all the large cultivators. It was much larger (8.76 acres) than required to meet the food needs (50 maunds) of his family.

Thus, the seven cultivators in the requirement group of above 40 maunds, though similar to one another in some respects, were widely different as regards other basic factors. The composite effect of the four factors, therefore, was totally different for each of them and they were all required to accept different rotation-plans. In the other requirement groups as well, the total effect of the four factors differed from cultivator to cultivator in more or less the same way and they also were required to practise different rotations or their different combinations.

The same was the case of the cultivators in Rozode as well. The composite effect of the basic factors was different to different cultivators in this village also and they all were required to follow different rotation-plans. The rotation-programme of each was different from the other cultivators. For example, in the requirement group of above 40 maunds, there were five cultivators who were similar to one another in some respects but were different in the composite effect and, therefore, each adopted a different rotation-programme for himself. Of these

five cultivators, four were medium, having land-holdings between 6.33 and 12.00 acres and the remaining one was large (34.30 acres). The irrigable area of the four medium cultivators varied between 3.36 and 5.60 acres. In the case of the large cultivator, the irrigable area was as large as 24.87 acres or 72.51 per cent of his total land (see Table 5.28).

Of the four medium cultivators, two were similar to each other in some respects (Case Studies R 20 and R 22). Both of them had near about the same size of land-holdings (8.25 and 9.36 acres). The irrigable portion of their holdings was also near about the same--4.25 and 3.36 acres. The soil-composition of their holdings, however, was different. One of them had the holding of all the three types of land (Case Study R 20); while the other had the holding only of medium and deep-black land (Case Study R 22). The former cultivator had irrigable land both of medium and deep-black soil; while the latter had his entire irrigable land only of deep-black soil. Because of these differences, the total impact of the four basic factors was different and they were required to practise different rotation-programmes to that extent. The cultivator having irrigable land of both medium and deep-black soil followed two different rotations suited to the two soil types. He followed the three-year rotation of NB-JB-J on the fragment of medium-black land; and the rotation of NB-JB-C on the deep-black land. The dry portion of his land-holding was of lighter type of land and hence he was required to adopt the two-year rotation of G-J on it. It was seen that he allotted through these rotations about 2.84 acres

to banana every year; 2.00 acres to groundnut; 0.60 acre to cotton; and 2.82 acres to jowar. The area allotted to jowar was just enough to meet his annual requirement of food.

The other cultivator also accepted two different rotations on his irrigable land which was all of deep-black soil. He adopted the NB-JB-C rotation on one plot of 1.63 acres and the NB-JB-C-J rotation on the other two plots having a total area of 1.73 acres. He would have adopted the same rotation of NB-JB-C on his entire irrigable land, but as the jowar grown on his dry land was not enough to meet his annual requirement of food, he was required to grow jowar on the irrigable land also. As the irrigable land was of deep-black soil, he could grow jowar profitably only after cotton, following the rotation of NB-JB-C-J. He did not follow the three-year rotation of NB-JB-J on this land as jowar taken after banana does not give good yield on the deep-black soil. This cultivator also practised the G-J rotation on his entire dry land even though it was of medium-black soil. He reported that his fragment of dry land was in the neighbouring village (Chichati) and hence not very convenient to grow cotton on it, as the tribal people (Bhils and Tadavi-Muslims) residing in and around the village, generally steal cotton produce to a large extent. It can be seen that the cultivator arranged his rotations in such a way that he could allot about 1.95 acres of land to banana every year; 3.00 acres to groundnut; 0.98 acre to cotton and 3.43 acres to jowar. He was required to allocate larger area to jowar to meet the annual food needs (50 maunds) of his family.

The remaining two cultivators of medium size were widely different from each other in almost all respects (Case Studies R 24 and R 28). One of them was comparatively a smaller cultivator having 6.33 acres of land-holding (Case Study R 24). The other cultivator had a land-holding of 12.00 acres. The soil-composition of their land-holdings was also different. The former had a mixed holding of medium and deep-black land; while the latter had his holding entirely of medium-black land. The irrigable land was near about the same with both of them. However, the proportion of irrigable area to the total land was higher with the former cultivator. Because of these and other differences the composite effect of the four basic factors was different on both of them and they practised different rotation-plans for themselves.

The smaller cultivator had his irrigable land both of medium and deep-black soil. He adopted the rotation of NB-JB-C on his entire fragment of deep-black soil. In the case of the other fragment, however, he was required to follow dual rotation of G-J or NB-JB-J. He reported that as the area of this fragment was small (1.63 acres), he did not find economical for himself to grow banana on it. He could not lease-in any of the neighbouring lands as all of them belonged to the cultivators having irrigation facilities and who could grow banana. He, therefore, basically accepted on this fragment the rotation of dry crops alone (G-J), and shifted to the rotation of NB-JB-J by leasing-out the land, for banana cultivation to one of the neighbouring cultivators whenever such a demand was made. The

dry portion of his holding (1.65 acres) was of land leased-in for a long period on the basis of share-rent. He followed on it the rotation of G-C-J, recommended by the landlord. He had no right to formulate any rotation to practise on this land, independent of the landlord. In the case of this cultivator the area allotted to jowar was far less than required to meet his food needs. This was mainly because he grew jowar as a mixed crop along with cotton. Even then he was generally faced with the shortage of jowar produce to meet his food needs and was required to purchase it almost every year to some extent.

The other cultivator adopted the NB-JB-J rotation on his entire irrigable land (5.60 acres). He reported that the land in this fragment though of medium-black type was comparatively inferior and was not well suited to grow cotton. He, therefore, did not grow cotton on it. He followed the G-J rotation on his entire dry land though it was of medium-black soil. He reported that this fragment was in the nearby village (Lohara) and was not convenient to grow cotton, because of the tribal people residing in that area. Thus, the cultivator practised only two rotations on his entire land-holding because of the restraints from soil and the situation of the fragment. It was seen that through these two rotations he allocated 3.74 acres of land to banana every year; 3.20 acres to groundnut; and 5.06 acres to jowar. The area allocated to jowar was comparatively large as he had a big family of 14 members, requiring about 60 maunds of jowar per year. It may be seen that the rotation-plan of this cultivator is much influenced by the food requirement factor.

He, thus, followed the rotations with jowar on the entire area of his land-holding.

The remaining cultivator in the group was large, having a land-holding of 34.30 acres (Case Study R 30). He had a mixed holding of medium and deep-black land. More than three-fourths of his land-holding was irrigable--24.87 acres out of the total land. He adopted the NB-JB-C rotation on a major portion of his irrigable land (18.23 acres). On the remaining area of the irrigable land (6.63 acres) he accepted altogether different rotations, such as, NB-JB-M-C and NB-JB-M-B which were not very common in the village. The dry portion of his land-holding was entirely of medium-black land. He, therefore, followed on it the three-year rotation of G-C-J which was most suited to this type of land. Thus, the rotation-programme on the entire land was so planned that he could allot, on an average, about 15.47 acres to banana every year; 9.47 acres to cotton; 3.14 acres to jowar and 2.78 acres to other crops like maize and bajara. He could put nearly two-thirds of his irrigable land under banana. He could not increase his area under banana any more as it would then cause its repetition on the same land. It may be noted that he was not required to put more area under jowar as was the usual case with the large cultivators. This was largely because he was sufficiently rich and had no restraints from finance nor from irrigation. In his case, therefore, the area allotted to jowar was more related to his food need and was just enough to meet it.

Thus, the five cultivators in the requirement group of

of above 40 maunds, were largely different from one another and they were required to practise different rotation-programmes for themselves. The same was true about the cultivators included in other requirement groups as well. In both the irrigated villages, no two cultivators were alike as regards the four basic factors and other details. They all were similar in some respects, but were widely different in other matters and hence each of them was required to adopt a different rotation-programme for himself. Each of them, however, was conscious of his food needs and invariably made its provision in the rotation-programme. Many of the cultivators arranged their rotation-programmes in such a way that they could allocate to jowar the area required to meet their annual food needs. Some of the cultivators, concentrated mainly on the cash crops and grew jowar only as a mixed crop along with cotton to meet their yearly food requirements. However, none of the cultivators had entirely devoted his land-holding to the cash-crops alone and preferred to purchase jowar required to meet the annual food needs.

5.13. Cultivators Leasing-Out Their Lands for Banana Cultivation

In Tables 5.29 and 5.30 are presented the rotation-plans practised by the second group of sample cultivators who leased-out their land for banana cultivation. As pointed out earlier, these cultivators did not have sufficient water supply of their own and hence could not grow banana themselves. They were, therefore, required to follow the practice of leasing-out their lands specifically for banana cultivation to the neighbouring cultivators having sufficient water supply and other resources.

Table 6.29 : Rotation-plans of the Cultivators Leasing-out Land for Banana Cultivation in Waghode (Area in Acres)

Annual requirement of power	Case Study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry area														
			Irrigable area		Dry area														
			Upto 1 acre		Medium-black soil				Deep-black soil										
			Medium-black	Deep-black	Light	Medium-black	Deep-black	Medium-black soil		Deep-black soil									
			black	black		black	black	NB-JB-C	C-J or NB-JB-C	NB-JB-C	C-J	C-J or NB-JB-C	C-J or NB-JB-J						
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area								
7 to 15 mds.	4	4.33	-	1.20	-	3.13	-	-	-	-	-	-	-	-	-	-	-	-	
16 to 25 mds.	7	3.20	-	0.95	-	-	2.25	-	-	1	0.95	-	-	-	-	1	1.00	1	1.25
	10	4.50	2.50	-	-	2.00	-	-	-	-	-	-	-	-	-	-	-	-	
	11	6.61	-	1.25	-	4.61	0.75	-	-	-	-	-	-	-	-	-	-	-	
	12	4.51	-	1.10	-	2.03	1.38	-	-	-	-	-	-	-	-	-	-	-	
	16	13.11	-	2.50	-	0.75	9.86	-	-	-	-	-	-	-	-	-	-	-	
25	6.00	1.50	-	-	4.50	-	-	-	-	-	-	-	-	-	-	-	-		
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	9	4.18	0.81	-	-	3.37	-	1	0.81	-	-	1	0.82	2	2.55	-	-	-	
	14	5.96	-	1.50	-	2.96	1.50	-	-	-	-	-	-	-	-	-	-	-	
	21	16.86	-	6.75	-	-	10.11	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	8	6.50	1.05	-	-	5.45	-	-	-	-	-	-	-	-	-	-	-	-	
	17	9.03	5.25	-	-	-	3.78	-	-	-	-	-	-	-	-	-	-	-	
Above 40 mds.	18	8.79	1.33	-	-	7.46	-	-	-	-	-	-	-	-	-	-	-	-	
Total	14	95.51	14.37	15.25	-	36.26	29.63	1	0.81	1	0.95	1	0.82	2	2.55	1	1.00	1	1.25

(continued)

Table 5.29 : (continued)

Annual requirement of jowar	Case Study No.	Size of land holding	Soil-composition of land-holding					Irrigable and dry area																																					
			Irrigable area		Dry area			Irrigable area																																					
			1.1 to 2 acres															Dry area																											
			Medium-black soil						Deep-black soil									Medium-black soil									Deep-black soil																		
			C-J or NB-JB-C		C-J or NB-JB-J		G-C or NB-JB-C		C-J or NB-JB-C			NB-JB-C			NB-JB-J			C-J or NB-JB-C			NB-JB-C			C-J or NB-JB-C			NB-JB-C			NB-JB-J			C-J or NB-JB-C												
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area								
7 to 15 mds.	4	4.33	-	1.20	-	3.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
16 to 25 mds.	7	3.20	-	0.95	-	-	2.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
	10	4.50	2.50	-	-	2.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
	11	6.61	-	1.25	-	4.61	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
	12	4.51	-	1.10	-	2.03	1.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
	16	13.11	-	2.50	-	0.75	9.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
	25	6.00	1.50	-	-	4.50	-	-	-	1	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	1	1.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
	9	4.18	0.81	-	-	3.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
	14	5.96	-	1.50	-	2.96	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
	21	16.86	-	6.75	-	-	10.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
31 to 40 mds.	8	6.50	1.05	-	-	5.45	-	-	-	-	-	1	1.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
	17	9.03	5.25	-	-	-	3.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Above 40 mds.	18	8.79	1.33	-	-	7.46	-	1	1.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Total	14	95.51	14.37	15.25	-	36.26	29.63	1	1.33	1	1.93	1	1.50	1	1.05	2	2.60	1	1.20	1	1.25	3	4.05	2	2.16	2	3.13	1	4.50	2	4.36	3	3.61	1	1.45	3	6.13	1	0.75	1	1.38	1	1.50	1	0.75

(continued)

Table 5.29 : (continued)

Annual require- ment of jowar	Case Study No.	Size of land- holding	Soil-composition of land-holding					Irrigable and dry area											
			Irrigable area		Dry area			Irrigable area 2.1 to 3 acres						Dry area					
			Medium- black	Deep- black	Light	Medium- black	Deep- black	Medium-black soil		Deep- black soil		Medium-black soil		Deep-black soil					
			C-J	G-J	NB-JB-C	C-J	NB-JB-C	C-J	G-J	NB-JB-C	C-J	NB-JB-C	C-J	NB-JB-C	NB-JB-C				
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area			
7 to 15 mds.	4	4.33	-	1.20	-	3.13	-	-	-	-	-	-	-	-	-	-	-	-	-
16 to 25 mds.	7	3.20	-	0.95	-	-	2.25	-	-	-	-	-	-	-	-	-	-	-	-
	10	4.50	2.50	-	-	2.00	-	1	2.25	1	0.25	-	-	-	-	1	2.00	-	-
	11	6.61	-	1.25	-	4.61	0.75	-	-	-	-	-	-	-	-	-	-	-	-
	12	4.51	-	1.10	-	2.03	1.38	-	-	-	-	-	-	-	-	-	-	-	-
	16	13.11	-	2.50	-	0.75	9.86	-	-	-	-	1	2.50	1	0.75	-	-	3	9.86
	25	6.00	1.50	-	-	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9	4.18	0.81	-	-	3.37	-	-	-	-	-	-	-	-	-	-	-	-	-
	14	5.96	-	1.50	-	2.96	1.50	-	-	-	-	-	-	-	-	-	-	-	-
	21	16.86	-	6.75	-	-	10.11	-	-	-	-	-	-	-	-	-	-	-	-
31 to 40 mds.	8	6.50	1.05	-	-	5.45	-	-	-	-	-	-	-	-	-	-	-	-	-
	17	9.03	5.25	-	-	-	3.78	-	-	-	-	-	-	-	-	-	-	-	-
Above 40 mds.	18	8.79	1.33	-	-	7.46	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	14	95.51	14.37	15.25	-	36.26	29.63	1	2.25	1	0.25	1	2.50	1	0.75	1	2.00	3	9.86

(continued)

Table 5.29 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding				Irrigable and dry area										Total number of plots	Total area	Area under jowar averaged over rotation cycle					
			Irrigable area		Dry area		Irrigable area					Dry area												
			5.1 to 7 acres				Medium-black soil		Deep-black soil		Deep-black soil													
							NB-JB-C		NB-JB-J		NB-JB-C		NB-JB-J		G-C or NB-JB-C					C-J				
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area				Plots	Area			
7 to 15 mds.	4	4.33	-	1.20	-	3.13	-	-	-	-	-	-	-	-	-	-	-	-	3	4.33	1.44 or 1.96			
16 to 25 mds.	7	3.20	-	0.95	-	-	2.25	-	-	-	-	-	-	-	-	-	-	-	3	3.20	0.63 or 1.40			
	10	4.50	2.50	-	-	2.00	-	-	-	-	-	-	-	-	-	-	-	-	3	4.50	1.25			
	11	6.61	-	1.25	-	4.61	0.75	-	-	-	-	-	-	-	-	-	-	-	5	6.61	1.13 or 1.58			
	12	4.51	-	1.10	-	2.03	1.38	-	-	-	-	-	-	-	-	-	-	-	3	4.51	1.02			
	16	13.11	-	2.50	-	0.75	9.86	-	-	-	-	-	-	-	-	-	-	-	5	13.11	0.38			
	25	6.00	1.50	-	-	4.50	-	-	-	-	-	-	-	-	-	-	-	-	2	6.00	-			
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.93	0.64 or 0.96			
	9	4.18	0.81	-	-	3.37	-	-	-	-	-	-	-	-	-	-	-	-	4	4.18	1.27			
	14	5.96	-	1.50	-	2.96	1.50	-	-	-	-	-	-	-	-	-	-	-	5	5.96	0.75 or 1.08			
	21	16.86	-	6.75	-	-	10.11	-	-	-	4	6.75	1	0.93	2	4.58	2	4.60	9	16.86	1.53			
31 to 40 mds.	8	6.50	1.05	-	-	5.45	-	-	-	-	-	-	-	-	-	-	-	-	5	6.50	1.48 or 1.83			
	17	9.03	5.25	-	-	-	3.78	1	3.45	1	1.80	-	-	2	3.68	-	-	-	1	0.10	0.65			
Above 40 mds.	18	8.79	1.33	-	-	7.46	-	-	-	-	-	-	-	-	-	-	-	-	5	8.79	2.71 or 3.37			
Total	14	95.51	14.37	15.25	-	36.26	29.63	1	3.45	1	1.80	4	6.75	3	4.61	2	4.58	2	4.60	1	0.10	58	95.51	

Table 5.30 : Rotation-plans of the Cultivators Leasing-out Their Land for Banana Cultivation in Rozode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry area																														
					Irrigable area								Dry area																						
			Irrigable area		Dry area		Upto 1 acre				Medium-black soil				Deep-black soil				Light soil		Medium-black soil				Deep-black soil										
			Medium-black	Deep-black	Light	Medium-black	Deep-black	J-J-J or NB-JB-J	G-J or NB-JB-J	C-J or NB-JB-J	NB-JB-C	NB-JB-J-C	G-J or NB-JB-J	Chillies or NB-JB-J	G-J	C-J or NB-JB-J	C-J or NB-JB-C	G-J	J-J-J	NB-JB-C	NB-JB-J-C														
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area									
7 to 15 mds.	1	0.50	0.37	-	-	0.13	-	1	0.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.13	-	-	-	-			
16 to 25 mds.	2	1.88	-	1.13	-	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	4	5.23	1.00	-	-	4.23	-	-	-	1	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2.63	1	1.60	-	-	-	-		
	6	6.93	1.50	-	-	5.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	10	5.68	1.13	-	-	1.40	3.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
26 to 30 mds.	5	4.93	1.33	-	-	3.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.00		
	11	4.78	-	0.58	1.60	1.60	1.00	-	-	-	-	-	1	0.58	-	-	-	-	1	1.60	-	-	-	-	1	1.60	-	-	-	-	-	-	-		
	14	3.83	0.50	-	-	3.33	-	-	-	-	1	0.50	-	-	-	-	-	-	-	-	4	3.33	-	-	-	-	-	-	-	-	-	-	-		
	15	7.82	2.86	0.48	-	-	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	17	2.40	-	1.25	-	1.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
31 to 40 mds.	12	4.27	-	0.78	0.76	2.73	-	-	-	-	-	-	-	-	1	0.50	1	0.28	2	0.76	-	-	-	-	2	2.73	-	-	-	-	-	-	-		
	18	7.80	-	0.70	3.20	3.20	0.70	-	-	-	-	-	1	0.70	-	-	-	-	1	3.20	-	-	-	-	1	3.20	-	-	-	-	-	-	-	-	
Above 40 mds.	13	6.56	2.81	-	-	3.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	23	12.25	1.73	-	-	10.52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	27	20.51	3.63	-	13.88	3.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	15	95.37	16.86	4.92	19.44	44.82	9.33	1	0.37	1	1.00	1	0.50	1	0.70	1	0.58	1	0.50	1	0.28	4	5.56	4	3.33	1	2.63	5	9.13	1	0.13	1	0.70	1	1.00

(continued)

Table 5.30 : (continued)

Annual requirement of jowar	Case study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry area																												
					Irrigable area								Dry area																				
			Irrigable area		Dry area		1.1 to 2 acres				Medium-black soil				Deep-black soil				Medium-black soil				Deep-black soil		Irrigable area 2.1 to 3 acres		Dry area Medium-black soil						
			Medium-black	Deep-black	Light	Medium-black	Deep-black	Medium-black soil		Deep-black soil		Medium-black soil				Deep-black soil		Irrigable area 2.1 to 3 acres		Dry area Medium-black soil													
			NB-JB-C	C-J or NB-JB-C	NB-JB-J	C-J or NB-JB-J	NB-JB-C	NB-JB-J	C-J or NB-JB-C	C-J	G-J	G-C	C-J	NB-JB-J		G-J																	
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area										
7 to 15 mds.	1	0.50	0.37	-	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
16 to 25 mds.	2	1.88	-	1.13	-	0.75	-	-	-	-	-	1	1.13	-	-	-	-	-	1	0.75	-	-	-	-	-	-							
	4	5.23	1.00	-	-	4.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	6	6.93	1.50	-	-	5.43	-	1	0.50	1	1.00	-	-	-	-	-	-	3	1.78	2	3.65	-	-	-	-								
	10	5.68	1.13	-	-	1.40	3.15	-	-	1	1.13	-	-	-	-	-	1	1.40	-	-	-	-	1	3.15	-								
26 to 30 mds.	5	4.93	1.33	-	-	3.60	-	1	1.33	-	-	-	-	1	1.40	1	0.60	-	-	-	-	1	1.60	-	-								
	11	4.78	-	0.58	1.60	1.60	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	14	3.83	0.50	-	-	3.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	15	7.82	2.86	0.48	-	-	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	17	2.40	-	1.25	-	1.15	-	-	-	-	-	1	1.25	-	-	-	-	-	-	-	1	1.15	-	-	-								
31 to 40 mds.	12	4.27	-	0.78	0.76	2.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	18	7.80	-	0.70	3.20	3.20	0.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
Above 40 mds.	13	6.56	2.81	-	-	3.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2.81								
	23	12.25	1.73	-	-	10.52	-	2	1.73	-	-	-	-	-	-	1	0.98	-	1	1.30	3	5.23	2	3.01	-								
	27	20.51	3.63	-	13.88	3.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
Total	15	95.37	16.86	4.92	19.44	44.82	9.33	4	3.56	2	2.13	1	1.25	1	1.13	1	1.40	2	1.58	1	1.40	5	3.83	7	11.63	2	3.01	1	3.15	2	2.81	1	3.75

(continued)

Table 5.30 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry area												Total number of plots	Total area	Area under jowar averaged over rotation cycle									
			Irrigable area		Irrigable area						Dry area																	
			3.1 to 5 acres		Medium-black soil			Deep-black soil		Light soil		Medium-black soil		Deep-black soil														
			Medium-black	Deep-black	Light	Medium-black	Deep-black	NB-JB-C		NB-JB-J		NB-JB-C-W		W-J		G-J				G-C-J		NB-JB-C		NB-JB-J		W-J		
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area				Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots
7 to 15 mds.	1	0.50	0.37	-	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.50	0.25 or 0.50	
16 to 25 mds.	2	1.88	-	1.13	-	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.88	0.74 or 0.94	
	4	5.23	1.00	-	-	4.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5.23	1.30 or 2.45	
	6	6.93	1.50	-	-	5.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	6.93	2.71 or 3.21	
	10	5.68	1.13	-	-	1.40	3.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5.68	1.57 or 2.84	
26 to 30 mds.	5	4.93	1.33	-	-	3.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.93	1.00	
	11	4.78	-	0.58	1.60	1.60	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.78	1.99	
	14	3.83	0.50	-	-	3.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	3.83	1.27 or 1.91	
	15	7.82	2.86	0.48	-	-	4.48	1	0.95	4	1.91	-	-	1	0.48	-	-	-	-	2	2.08	2	1.93	1	0.47	11	7.82	1.75
	17	2.40	-	1.25	-	1.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2.40	0.98	
30 to 40 mds.	12	4.27	-	0.78	0.76	2.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	4.27	1.84 or 2.05	
	18	7.80	-	0.70	3.20	3.20	0.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	7.80	3.20	
Above 40 mds.	13	6.56	2.81	-	-	3.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6.56	2.80	
	23	12.25	1.73	-	-	10.52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	12.25	3.60	
	27	20.51	3.63	-	13.88	3.00	-	1	1.20	-	-	1	2.43	-	-	3	13.88	1	3.00	-	-	-	-	-	6	20.51	7.94	
Total	15	95.37	16.86	4.92	19.44	44.82	9.33	2	2.15	4	1.91	1	2.43	1	0.48	3	13.88	1	3.00	2	2.08	2	1.93	1	0.47	71	95.37	-

Some of them could establish a definite type of relationship with their tenant cultivators and could give a definite place for banana in their rotation-programmes. They adjusted their cropping plan on their lands with that of the tenant cultivators, so that both could put their lands under banana in one and the same year. In the case of the other cultivators, however, such a relationship was not yet established and they could not give any definite place for banana in their rotation-programme. They were required to keep their cropping flexible by following dual rotation--one of dry crops alone which they could grow themselves and the other with banana as one of the crops. Whenever irrigation was made available, they broke the basic rotation of dry crops and shifted to the rotation of banana.

In both the irrigated villages almost all these cultivators were from the small and the medium size groups. In Waghode, of the fourteen cultivators reported in this group, six were small; and the remaining eight, medium. In Rozode, out of the fifteen cultivators included in the group, seven each were small and medium and the remaining one was large. The case of the large cultivator was peculiar in the sense that the major portion of his land-holding was of dry land. The irrigable land was only 3.63 acres out of 20.51 acres of land. Besides, the water supply in the wells in the two fragments of irrigable land was also not sufficient to grow the heavily irrigated crop: like banana. He was, therefore, required to lease-out his land for banana cultivation to his neighbouring cultivator (Case Study R 27).

We may take up one requirement group in which the maximum

number of such cultivators are included and discuss in brief the acceptance of different rotation-plans and the dualism in them on individual basis. In Waghode, such a requirement group was of 16 to 25 maunds, wherein six cultivators were reported. Of these six, three each were from the small and the medium size group. Four of them had their irrigable area below 1.50 acres and the remaining two, 2.50 acres each (see Table 5.29). In Rozode, the requirement group including the maximum number of cultivators was of 26 to 30 maunds. Five cultivators were reported in it. Of these, four were from the small size group; and one from the medium group. Four of them had an irrigable area below 1.50 acres and the remaining one, 3.34 acres (see Table 5.30).

In Waghode, of the six cultivators reported in the group of 16 to 25 maunds, three were required to practise dual rotations in their cropping programmes. The remaining three did not have any dual rotations in their rotation programmes. The three cultivators following dual rotations had not developed a definite type of relationship with their neighbouring cultivators to whom they leased-out their land for banana and hence the dualism in their programmes. They were required to keep their rotations flexible so that whenever irrigation was made available they could shift to the rotations with banana. Out of these three cultivators one was small (Case Study W 7); and the remaining two were medium cultivators (Case Studies W 11 and W 25). The small cultivator had his land-holding entirely of deep-black land. He, therefore, basically accepted the C-J rotation on his

entire holding. However, whenever he could lease-out the land for banana cultivation, he switched over to the rotation of NB-JB-C on one fragment (1.95 acres) and to the rotation of NB-JB-J on the other (1.25 acres). He could have followed the NB-JB-C rotation on the second fragment as well, particularly when the land was of deep-black soil. But in view of his food needs, he was required to practise the NB-JB-J rotation, at least on one fragment, even though the land was not most suited to it. Because of the dual rotations, his area allotment to jowar varied between 0.63 acre and 1.40 acres. This area was not enough to meet his total food needs and hence he was required to grow jowar as a mixed crop along with cotton.

The other two cultivators following dual rotations had almost the same size of holdings--6.61 and 6.00 acres (Case Studies W 11 and W 25). One of them had a mixed land-holding of medium and deep-black land (Case Study W 11); and the other had his land-holding entirely of medium-black land (Case Study W 25). The cultivator having mixed land-holding basically accepted the C-J rotation on the fragment of deep-black land; and the G-C-J rotation on the two fragments of the medium-black land. As an alternate rotation he adopted the three-year rotation of NB-JB-C on all the three fragments of medium as well as deep-black soil. Whenever irrigation was made available he shifted to this rotation on any of the three fragments. Thus, on the deep-black land there was a dualism between C-J and NB-JB-C rotations and on the medium-black land between G-C-J and NB-JB-C rotations. He reported that generally he leased-out these fragments

alternately so that in any year he had at least one fragment under his personal cultivation particularly to grow jowar for his family food needs. He arranged his rotation-programme in such a way that the area allotted to jowar, over the rotation cycle, varied between 1.13 and 1.58 acres. This much area under jowar was enough to meet his annual food needs. The case of the other cultivator having the entire land-holding of medium-black land was slightly different from the above two. He adopted the two-year rotation of G-C as the basic rotation on his entire land-holding. Whenever irrigation facility was made available he changed over to the three-year rotation of NB-JB-C on both the fragments of his holding. It may be noted that both the rotations followed by him were of the cash-crops only. He could do this as he had other dry land, leased-in on the basis of cash-rent. By accepting these dual rotations he concentrated only on the cash-crops on his own land and depended for food requirements on the leased-in land (11.05 acres) which was under his cultivation till 1962-63. In 1963-64, however, he had to return the leased-in land to its owner who wanted it for self-cultivation. In this year, therefore, he was required to make provision for jowar on his own land by deviating from the basic rotation. As the leased-in land was all dry and was of comparatively large size, the area allotted to jowar was as high as 4.83 acres per year till 1962-63. In 1963-64, however, he could put only 1.50 acres under jowar to meet his family food needs.

As pointed out earlier, the remaining three cultivators in the group had a definite rotation programmes even though they leased-out their lands for banana cultivation. They had established

a definite relationship with their tenants and hence could accept the rotations of banana with fair certainty. Their cropping pattern on the land was adjusted with those of the tenants so that both could grow banana on their lands in one and the same year. Of these three cultivators one was medium (Case Study W 16); and the other two were small (Case Studies W 10 and W 12). The cultivator from the medium size-group had the holding of 13.11 acres both of medium and deep-black land. However, deep-black land was predominant in his holding--12.36 acres out of the total area of 13.11 acres. He divided his deep-black land into four plots and followed the three-year rotation of NB-JB-C on all of these. The plot of the medium-black land was small in size (0.75 acre) and was situated on the bank of a big stream and hence not convenient to lease-out for banana. He, therefore, kept it always under his own cultivation and practised the C-J rotation on it. By accepting the NB-JB-C rotation on the deep-black land he had adjusted his crop-pattern on it with that of the tenant cultivator and could lease-out the four plots alternately for banana cultivation. The adjustment was done in such a way that generally he had at least one plot of deep-black land under his own cultivation every year to grow cotton himself. As the land was of deep-black soil and as his total requirement of food was small, he did not prefer to rotate jowar along with banana on any of the four plots. The area allocated to jowar was, therefore, very small (0.38 acre) in his case. It was not at all enough to meet his total food needs. However, he grew jowar every year as a mixed crop along with cotton taken in all

the plots of deep-black land. He reported that jowar thus taken gave him sufficient produce to meet his family consumption needs. It was seen that he arranged his rotations in such a way that, on an average, he could allot 8.24 acres to banana every year; 4.49 acres to cotton; and 0.38 acre to jowar.

The other two cultivators had almost the same size of land-holdings (Case Studies W 10 and W 12). The soil-composition of their holdings, however, was different. One of them had a mixed holding of medium and deep-black land (Case Study W 12); while the other had his holding entirely of medium-black land (Case Study W 10). The former cultivator having a mixed holding had one fragment of medium-black land (2.03 acres) and two fragments of deep-black land (1.10 and 1.38 acres). The fragment of medium-black land was in a nearby village (Kumbhar-Khed) and was completely of dry land--irrigation being not available on it, nor on the lands of the neighbouring cultivators. He, therefore, adopted on it the rotation of C-J. He divided the fragment into two equal plots so that he could grow jowar every year by alternating the two plots. The soil type of the fragment was in fact more suited to the G-C-J rotation, but he could not follow it as the land was far off from the native village and hence not convenient to grow groundnut. Moreover, by following the C-J rotation, he could allot, on an average, larger area to jowar to meet his total food needs. Had he accepted the G-C-J rotation, the average area under jowar would have been inadequate to meet his annual consumption needs. Having made the provision for food on this dry land, he preferred to concentrate on the

cash-crops on both the fragments of the deep-black land cultivated in the village. He, therefore, adopted the three-year rotation of NB-JB-C on both the fragments of deep-black soil. He reported that, generally he leased-out these two fragments alternately for banana cultivation. His rotation programme was so arranged that he could allot about 1.65 acres to banana every year; 1.84 acres to cotton and 1.02 acres to jowar. The other cultivator having a holding entirely of medium-black land presented a different case, though he had almost the same size of holding (Case Study W 10). In one of his fragments (2.50 acres) the land was more alkaline and hence not suited to the cultivation of banana. He reported that the banana plants grown on such land got stunted and did not give good yield. He was, therefore, required to grow only the dry crops on it. He adopted the C-J rotation on the major portion of this fragment (2.25 acres) and on the remaining area, where the land was of inferior quality, the rotation of G-J (0.25 acre). The land in the second fragment, however, was suited for banana cultivation. He could, therefore, adopt the three-year rotation of NB-JB-C on it by leasing-out the land for banana cultivation to the neighbouring cultivator. He accepted this rotation even though the land was of medium-black soil and better suited to NB-JB-J rotation. He reported that as the jowar crop taken under the two rotations on the first fragment was enough to meet his food needs, he preferred the NB-JB-C rotation to the rotation of NB-JB-J. In his case the area under jowar, averaged over the rotation cycle, came to 1.25 acres and it was enough to meet the

annual consumption needs of his family. The average area allotted to banana every year, was about 1.35 acres; to cotton about 1.79 acres and to groundnut, about 0.12 acre.

Thus, the six cultivators in the requirement group of 16 to 25 maunds at Waghode, were different in their conditions and responded to them differently. Three of them had established definite relationship with their tenant cultivators and could accept the rotations of banana with fair certainty, almost as the banana cultivators did. The other three cultivators, however, had not established this type of relationship and hence suffered from an element of uncertainty as far as the rotations of banana were concerned. They were, therefore, required to follow dualism in their rotation-programmes. However, all the six cultivators in the group accepted different rotation-programmes formulated on the basis of the four basic factors and other conditions. It has to be noted that none of them overlooked his food needs, even while shifting from the dry crop rotations to the rotations of banana. The same was true about the cultivators reported in the other requirement groups and the rotation-programmes accepted by them as well, differed from cultivator to cultivator.

Similar was the case of such cultivators in Rozode also. The rotation-programme accepted by each of them was different because of the different composite effect of the four basic factors and the other conditions. Thus, in the requirement group of 26 to 30 maunds, wherein the maximum number of the cultivators were reported, all the cultivators were different from one another

and accepted different rotation-programmes. Of these five cultivators in the group, one was required to adopt dual rotations in his programme (Case Study R 14). The remaining four cultivators, however, had established a definite type of relationship with their tenants and could give a definite place for banana in their rotation-programmes.

The cultivator following dual rotations in his cropping programme was from the small size group having a land-holding of 3.83 acres (Case Study R 14). The entire land of his holding was of medium-black soil. He had irrigation from an old well jointly owned by him and his cousin brothers. His share in the ownership of the well was only one-eighth. Because of the small share in the ownership of the well and because of the limited water supply in it, his irrigable area was as small as 0.50 acre. He, therefore, did not utilize the irrigation facility to grow any irrigated crops. He preferred to grow only the dry crops on his entire land. He basically practised the rotation of C-J on all the plots of his land-holding. However, when water supply was made available by the neighbouring cultivator, he changed over to the three-year rotation of NB-JB-J by leasing-out the land for banana cultivation. Generally he leased-out his three plots alternately so that in any year he had at least one plot under his own cultivation to grow jowar for self consumption. He reported that he could not adopt the rotation of NB-JB-C on any of his plots, firstly because his requirement of jowar was comparatively large in relation to his land-holding and secondly, the soil type of his land was not

much suited to it. He, therefore, preferred NB-JB-J as an alternate rotation. Because of the dual rotations practised by him, the area allotted to jowar varied between 1.27 and 1.91 acres. It was enough to meet his annual food needs.

The remaining four cultivators in the group, as pointed out earlier, could give a definite place for banana in their rotations, even though they leased-out their land for banana cultivation. Of these four cultivators, three were small, and one, medium. Among the three small cultivators, two had almost the same size of land-holdings--4.93 and 4.78 acres (Case Studies R 5 and R 11); and the third, 2.40 acres (Case Study R 17). Of the two cultivators having almost the same size of holdings, one had a holding entirely of medium-black land (Case Study R 5); while the other had a mixed holding of all the three types of land (Case Study R 11). The land-holding of the former cultivator comprised of two fragments--one situated in the village and the other in the nearby village (Savkhed). The fragment situated in the village had irrigation facility from a jointly owned well. The water supply was also adequate to grow even the heavily irrigated crops; but the cultivator could not grow any of the irrigated crops, as he had no equipments of irrigation, not even a bullock-drawn water lift. His financial resources were also limited and he was not in a position to bear all the expenses of banana cultivation. He, therefore, preferred to lease-out his land for banana cultivation to the neighbour cultivator who had all the resources. He had adjusted the cropping on his land with that of his neighbouring cultivator

and hence could practise the rotations of banana with fair certainty. He adopted the three-year rotation of NB-JB-C on the major portion of this fragment (2.73 acres). On the remaining portion (0.60 acre) he followed the rotation of NB-JB-J. He could have practised the same rotation of NB-JB-C on the entire fragment, but as jowar taken on the second fragment of dry land was not enough to meet his annual food needs he was required to rotate jowar along with banana on some portion of this fragment. On the second fragment in the Savkhed village, he was required to adopt the two-year rotation of G-J, even though the land was of medium-black soil. In fact, the rotation of G-C-J was more suited to the land in this fragment, but he could not accept it as he could not grow cotton on this land. He reported that it was difficult to protect the produce of cotton crop from the tribal people residing in and around the Savkhed village. In his case the area allotted to jowar was about one acre. It was not enough to meet his annual food requirements. He, therefore, grew jowar as a mixed crop along with cotton. He arranged his rotations on different plots in such a way that he could allot, on an average, 2.22 acres to banana every year; 0.91 acre to cotton; 0.80 acre to groundnut and 1.00 acre to jowar.

The other cultivator, though similar to the above cultivator in some respects, presented on the whole a different case (Case Study R 11). His land-holding also comprised of two fragments--one situated in the village and the other in the same neighbouring village (Savkhed). The fragment situated outside the village was, however, larger in size (3.20 acres) and had no

irrigation available on it. The cultivator had to practise on it the rotation of dry crops alone. He generally divided the fragment into two equal plots on the basis of soil type and followed the two-year rotation of G-J on both. Cultivation of cotton was not undertaken, firstly, because of the inferior type of land (particularly on one plot of lighter soil); and secondly, because of the nuisance from the tribal people. The fragment situated in the village was small (1.58 acres). Irrigation from a jointly owned well was available on it but his share in the ownership of the well was so minor (one-eighth) that it was not possible for him to grow any of the major irrigated crops on it. He, therefore, preferred to lease-out his land for banana cultivation to his neighbour cultivator who had a major share in the ownership of the well and also had the resources required for irrigation and the cultivation of banana. He had made definite arrangements with his tenant cultivator and hence practised the four-year rotation of NB-JB-J-C. He was required to follow the four-year rotation in order to adjust the period of banana cultivation with that of the neighbour. His basic rotation, however, was of NB-JB-J which suited better to the type of land available in the fragment. But to extend the period of rotation by one more year, he introduced cotton in it. It was seen that the area allotted to jowar, on an average over the rotation cycle, was 1.99 acres. It was enough to give him adequate jowar produce to meet his family food needs.

The case of the third cultivator was also different from the above two. He had a small land-holding (2.40 acres) of two

fragments. Of these, one was in the village (1.25 acres) and the other in the neighbouring village (1.15 acres). The fragment situated in the village had irrigation facility from a jointly owned well. His share in the ownership of the well was fairly large (one-fourth) so that he could grow banana himself. But because of the financial limitations and the lack of any equipments to lift water, he could not grow any irrigated crop himself. However, he leased-out the fragment for banana cultivation to his neighbour cultivator. He practised the three-year rotation of NB-JB-J on it, even though the land was of deep-black soil. He reported that he was required to follow such a rotation, because of his jowar requirements and the small holding. The second fragment in the neighbouring village was dry. He, therefore, followed on it the two-year rotation of G-J. Even though the land in this fragment was of medium-black soil, he could not grow cotton as the tribal people generally steal its produce. Through these two rotations practised on his land-holding, he allotted, on an average, about an acre of land to jowar. It was, however, not enough to meet his annual requirements of food. He was, therefore, required to purchase some quantity of jowar or lease-in, if possible, some land every year to grow jowar for himself. He generally followed the second method.

The case of the remaining medium cultivator in the group was peculiar in the sense that his land-holding (7.82 acres) consisted of several fragments (five), but nowhere it was possible for him to grow banana himself even though irrigation

was available on some of the fragments (Case Study R 15). He had fairly large area of irrigable land in his holding (3.34 acres) but it was spread out in three fragments at three different places and hence at no place it was economical for him to grow banana, as the area was very small. He had irrigation facilities from the jointly owned wells on all the three fragments but those were inadequate to irrigate all the area of his fragments. Only a minor area of about an acre could be irrigated. He, therefore, could not grow banana himself on any of his fragments. He preferred to lease-out the land for banana cultivation to his neighbour cultivators, who had sufficient irrigation facilities and other resources. He followed the rotation of NB-JB-J on the major portion of his land-holding (3.84 acres) in order to meet his food needs. On the remaining portion of 3.03 acres he adopted the NB-JB-C rotation. He could not lease-out one of his fragments (0.95 acre) for banana cultivation as its land was more alkaline and hence not suited to the banana crop. He practised on it the two-year rotation of W-J as the land was of deep-black soil and was most suited to wheat. It was seen that the area allocated to jowar, averaged over the rotation cycle, came to 1.75 acres in his case and it was just enough to meet his annual requirements of food. He arranged his rotation-programme in such a way that he could allot, on an average, 4.58 acres of his land, to banana every year; 1.49 acres to cotton; 1.75 acres to jowar; and 0.48 acre to wheat.

Thus, the five cultivators in 26 to 30 maunds requirement

group at Rozode, though similar to one another in some respects, were widely different when the total impact of the four factors and other conditions were considered; and they were all required to practise different rotation-programmes. Four of them had established definite type of relationship with their tenant cultivators and hence could adopt the rotations of banana with fair certainty. The remaining cultivator had not developed such relationship with his neighbour cultivator and was, therefore, required to follow dualism in his rotation-programme. Another important point to be noted was that all the five cultivators in the group, were conscious of their food needs and invariably made provision for it in their rotation-programmes. Similar was the case with the other cultivators included in the other requirement groups as well, and the rotation-plans practised by each of them could be argued in the same way.

In both the irrigated villages, therefore, the cultivators leasing-out their lands for banana cultivation, ^{were} different from one another in their basic factors and other conditions. None of them was similar to other cultivator as regards the composite effect of the basic factors. The rotation-programmes followed by them, therefore, differed from cultivator to cultivator. Each of them, however, was conscious of the basic factor of food needs and made its provision in his rotation-plan. Every one of them arranged his rotations in such a way that he could take jowar every year on the area required to meet his annual food needs. It is important to note that none of them overlooked this basic factor, even while attempting to maximize their

income by switching over from the rotations of the dry crops to the rotations of banana. Every one of them, irrespective of their size of land-holdings, aimed first to secure food for family consumption by allotting the required area to jowar and then tried to maximize cash-income by growing different cash-crops.

5.14. Manure Supply and the Cultivators Leasing-Out Their Lands for Banana Cultivation

In the case of the cultivators leasing-out their lands for banana cultivation, it was interesting to see whether the supply of the home-collected manure had any effect on their choice of rotations, particularly the basic rotations. In Tables 5.31 and 5.32, are presented the rotations practised by such cultivators in the two irrigated villages, grouped according to their requirements of food and the manure supply. It can be seen from these Tables that the cultivators who had established a definite type of relationship with their tenant cultivators, had given a definite place for banana in their rotation-programme and were not affected by the home-collected manure supply in any way. The supply of home-collected manure was generally very short of the total requirement of manure for the banana crop and hence not at all effective in influencing the choice of rotations. In the case of the crops grown after banana, the question of manure supply did not arise at all. They were all grown just on the residuals of manure applied to banana and were not given any fresh doses of manure. Thus, in the case of both the crops, banana and the other dry crops, the

Table 5.31 : Rotation-plans of the Cultivators Leasing-out Land for Banana Cultivation in Waghode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding				Supply of manure																		
			Irrigable area		Dry area		Upto 5 Cart-loads								Dry area										
			Medium-black	Deep-black	Light	Medium-black	Medium-black soil				Deep-black soil				Medium-black soil		Deep-black soil								
							NB-JB-C	NB-JB-J	NB-JB-J	C-J or NB-JB-C	C-J or NB-JB-J	NB-JB-C	C-J or NB-JB-C	C-J or NB-JB-J	C-J										
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area							
7 to 15 mds.	4	4.33	-	1.20	-	3.13	-	-	-	-	1	1.20	-	-	2	3.13	-	-	-	-	-	-			
16 to 25 mds.	7	3.20	-	0.95	-	-	2.25	-	-	-	-	-	1	0.95	-	-	-	-	1	1.00	1	1.25	-	-	
	10	4.50	2.50	-	-	2.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	11	6.61	-	1.25	-	4.61	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	12	4.51	-	1.10	-	2.03	1.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	16	13.11	-	2.50	-	0.75	9.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	25	6.00	1.50	-	-	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	9	4.18	0.81	-	-	3.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	14	5.96	-	1.50	-	2.96	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	21	16.86	-	6.75	-	-	10.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
31 to 40 mds.	8	6.50	1.05	-	-	5.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	17	9.03	5.25	-	-	3.78	3.78	1	3.45	1	1.80	-	-	-	-	-	2	3.68	-	-	-	-	1	0.10	
Above 40 mds.	18	8.79	1.33	-	-	7.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total	14	95.51	14.37	15.25	-	36.26	29.63	1	3.45	1	1.80	1	1.20	1	0.95	2	3.13	2	3.68	1	1.00	1	1.25	1	0.10

(continued)

Table 5.31 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding				Supply of manure																						
			Irrigable area		Dry area		6 to 10 cart-loads						11 to 15 cart-loads																
			Medium-black	Deep-black	Light	Medium-black	Deep-black	Irrigable area			Dry area			Irrigable area			Dry area												
								Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil														
			C-J or NB-JB-J		NB-JB-C		NB-JB-C		C-J		NB-JB-C		C-J		G-C or NB-JB-C		G-J		G-C or NB-JB-C		NB-JB-C								
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area								
7 to 15 mds.	4	4.33	-	1.20	-	3.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
16 to 25 mds.	7	3.20	-	0.95	-	-	2.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
	10	4.50	2.50	-	-	2.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
	11	6.61	-	1.25	-	4.61	0.75	-	-	-	-	-	-	-	-	-	-	1	2.25	-	-	1	0.25						
	12	4.51	-	1.10	-	2.03	1.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
	16	13.11	-	2.50	-	0.75	9.86	-	-	-	-	1	2.50	-	-	1	0.75	3	9.86	-	-	-	-						
	25	6.00	1.50	-	-	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	1	1.93	-	-	-	-	-	-	-	-	-	-	-	-						
	9	4.18	0.81	-	-	3.37	-	1	0.81	-	-	-	-	1	0.82	2	2.55	-	-	-	-	-	-						
	14	5.96	-	1.50	-	2.96	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
	21	16.86	-	6.75	-	-	10.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
31 to 40 mds.	8	6.50	1.05	-	-	5.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
	17	9.03	5.25	-	-	-	3.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Above 40 mds.	18	8.79	1.33	-	-	7.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Total	14	95.51	14.37	15.25	-	36.26	29.63	1	0.81	1	1.93	1	2.50	1	0.82	3	3.30	3	9.86	1	2.25	1	1.50	1	0.25	1	4.50	1	2.00

(continued)

Table 5.32 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Supply of manure 11 to 15 cart-loads											
			Irrigable area		Dry area			Irrigable area		Dry area									
			Medium-black	Deep-black	Light	Medium-black	Deep-black	Deep-black soil	Light soil	Medium-black soil	Deep-black soil								
								NB-JB-C	NB-JB-J-C	G-J	G-J	NB-JB-C	NB-JB-J-C						
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area					
7 to 15 mds.	1	0.50	0.37	-	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	
16 to 25 mds.	2	1.88	-	1.13	-	0.75	-	-	-	-	-	-	-	-	-	-	-	-	
	4	5.23	1.00	-	-	4.23	-	-	-	-	-	-	-	-	-	-	-	-	
	6	6.93	1.50	-	-	5.43	-	-	-	-	-	-	-	-	-	-	-	-	
	10	5.68	1.13	-	-	1.40	3.15	-	-	-	-	-	-	-	-	-	-	-	
26 to 30 mds.	5	4.93	1.33	-	-	3.60	-	-	-	-	-	-	-	-	-	-	-	-	
	11	4.78	-	0.58	1.60	1.60	1.00	-	-	1	0.58	1	1.60	1	1.60	-	-	1	1.00
	14	3.83	0.50	-	-	3.33	-	-	-	-	-	-	-	-	-	-	-	-	
	15	7.82	2.86	0.48	-	-	4.48	-	-	-	-	-	-	-	-	-	-	-	
	17	2.40	-	1.25	-	1.15	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	12	4.27	-	0.78	0.76	2.73	-	-	-	-	-	-	-	-	-	-	-	-	
	18	7.80	-	0.70	3.20	3.20	0.70	1	0.70	-	-	1	3.20	1	3.20	1	0.70	-	-
Above 40 mds.	13	6.56	2.81	-	-	3.75	-	-	-	-	-	-	-	-	-	-	-	-	
	23	12.25	1.73	-	-	10.52	-	-	-	-	-	-	-	-	-	-	-	-	
	27	20.51	3.63	-	13.88	3.00	-	-	-	-	-	-	-	-	-	-	-	-	
Total	15	95.37	16.86	4.92	19.44	44.82	9.33	1	0.70	1	0.58	2	4.80	2	4.80	1	0.70	1	1.00

(continued)

Table 5.32 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding															Supply of manure										Total number of plots	Total area																					
			Irrigable area					Dry area					Irrigable area					Above 15 cart-loads																																
			Medium-black		Deep-black			Light		Medium-black soil			Deep-black soil			Dry area					Light soil					Medium-black soil					Deep-black soil																			
			Medium-black	Deep-black	Light	Medium-black	Deep-black	Medium-black soil	Deep-black soil	Chillies or	W-J	C-J or	Chillies or	Light soil	Medium-black soil	Deep-black soil	Light soil	Medium-black soil	Deep-black soil	Light soil	Medium-black soil	Deep-black soil	Light soil	Medium-black soil	Deep-black soil	Light soil	Medium-black soil			Deep-black soil																				
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots			Area	Plots	Area																		
7 to 15 mds.	1	0.50	0.37	-	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.50																				
16 to 25 mds.	2	1.88	-	1.13	-	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.88																				
	4	5.23	1.00	-	-	4.23	-	-	-	-	-	1	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5.23																				
	6	6.93	1.50	-	-	5.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	6.93																				
	10	5.68	1.13	-	-	1.40	3.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5.68																				
26 to 30 mds.	5	4.93	1.33	-	-	3.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.93																				
	11	4.78	-	0.58	1.60	1.60	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.78																				
	14	3.83	0.50	-	-	3.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	3.83																				
	15	7.82	2.86	0.48	-	-	4.48	1	0.95	4	1.91	-	-	-	1	0.48	-	-	-	-	-	-	-	-	-	-	-	2	2.08	2	1.93	1	0.47	11	7.82															
	17	2.40	-	1.25	-	1.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2.40																				
31 to 40 mds.	12	4.27	-	0.78	0.76	2.73	-	-	-	-	-	-	-	-	-	1	0.50	1	0.28	-	-	-	-	-	-	-	-	-	-	6	4.27																			
	18	7.80	-	0.70	3.20	3.20	0.70	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.76	-	-	-	-	-	-	4	7.80																				
Above 40 mds.	13	6.56	2.81	-	-	3.75	-	-	2	2.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6.56																				
	23	12.25	1.73	-	-	10.52	-	2	1.73	-	-	-	-	-	-	-	-	-	-	-	1	3.75	-	-	-	-	-	-	9	12.25																				
	27	20.51	3.63	-	13.88	3.00	-	1	1.20	-	-	1	2.43	-	-	-	-	-	-	-	1	0.98	-	-	1	1.30	2	3.01	3	5.23	-	-	6	20.51																
Total	15	95.37	16.86	4.92	19.44	44.82	9.33	4	3.88	6	4.72	1	2.43	1	1.00	1	0.48	1	0.50	1	0.28	-	-	-	-	-	-	-	5	14.64	1	0.98	1	2.63	1	1.30	2	3.01	7	13.31	1	3.00	2	2.08	2	1.93	1	0.47	71	95.37

manure supply had no effective influence. More than manure supply, cropping pattern of the tenant cultivator, soil type and food requirement had a decisive influence on the choice of rotations of such cultivators.

Similar was the case of the cultivators who had not developed any definite relation with the tenant cultivators and were required to follow dual rotations in their programmes. Even the basic rotations accepted by these cultivators were not much affected by the supply of home-collected manure. It may be seen from the Tables that in both the villages, majority of these cultivators practised the C-J rotation as their basic rotation, irrespective of the differences in their manure supply. In the case of these cultivators the alternate rotations of banana followed by them, indirectly affected their basic rotations. These cultivators reported that after banana grown under the alternate rotations, they could not take groundnut for a fairly long period as it did not give satisfactory yield; and hence they were required to practise the C-J rotation on a large portion of their land. They followed the same rotation of C-J even on their medium-black land.

The area under the rotations of dry crops alone was quite minor in the case of such cultivators in Waghode. However, the rotations practised on this area as well, were not much influenced by the supply of home-collected manure. A major portion of this area was of the plots having peculiar characteristics which largely determined the rotations on them. The supply of manure as such, had a very little influence on the rotations

practised on such area. In Rozode, most of the area under the rotations of dry crops alone, was outside the village, where the cultivators were required to follow the G-J rotation, because of the nuisance from the tribal people. In such cases also, the supply of home-collected manure had very little influence in determining the choice of rotations.

Thus, it appears that in both the irrigated villages the supply of home-collected manure, was not an effective factor, in the case of the cultivators leasing-out their lands for banana cultivation.

5.15. Area Allotment to Jowar

As regards the area allotment to jowar the cultivators in the irrigated villages as well, behaved in more or less the same way as their counterparts in the dry villages. In the irrigated villages also the basic attitude of the cultivators towards cultivation, was of self-sufficiency. Thus, in majority of the cultivators in both the irrigated villages, the area allocated to jowar was directly related with the yearly food needs of family. They devoted to jowar only that much area which would give them the produce, enough or just enough, to meet their annual consumption requirements. This was true, particularly in the case of all the small and the medium cultivators in both the irrigated villages (see Tables 5.33, 5.34, 5.36 and 5.37). The large cultivators, however, were exceptions to this. In their case, the area allocated to jowar was not so much based on their annual food requirements. They were

Table 5.33 : Rotation-plans of the Small Cultivators in Waghode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding				Irrigable and dry area											
			Irrigable area		Dry area		Irrigable area				Dry area							
			Medium-black	Dee-black	Medium-black	Deep-black	Upto 1 acre											
			Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil				
			NB-JB-C	C-J or NB-JB-C	NB-JB-C	C-J or NB-JB-C	NB-JB-C	C-J	C-J or NB-JB-C	C-J or NB-JB-C	C-J or NB-JB-C	C-J or NB-JB-C	C-J or NB-JB-C	C-J or NB-JB-C				
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area					
7 to 15 mds.	4	4.33	-	1.20	3.13	-	-	-	-	-	-	-	-	-	-	-	-	
16 to 25 mds.	7	3.20	-	0.95	-	2.25	-	-	1	0.95	-	-	-	-	1	1.00	1	1.25
	10	4.50	2.50	-	2.00	-	-	-	-	-	-	-	-	-	-	-	-	-
	12	4.51	-	1.10	2.03	1.38	-	-	-	-	-	-	-	-	-	-	-	-
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9	4.18	0.81	-	3.37	-	1	0.81	-	-	1	0.82	2	2.55	-	-	-	-
31 to 40 mds.	13	5.00	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	7	27.65	10.24	3.25	10.53	3.63	1	0.81	1	0.95	1	0.82	2	2.55	1	1.00	1	1.25

(continued)

Table 5.33 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding				Irrigable and dry area											
			Irrigable area		Dry area		Irrigable area					Dry area						
			Medium-black	Deep-black	Medium-black	Deep-black	1.1 to 2 acres											
							Medium-black soil		Deep-black soil			Medium-black soil			Deep-black soil			
							C-J or NB-JB-J		NB-JB-C		NB-JB-J		C-J or NB-JB-J		C-J		NB-JB-C	
							Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area
7 to 15 mds.	4	4.33	-	1.20	3.13	-	-	-	-	1	1.20	2	3.13	-	-	-	-	
16 to 25 mds.	7	3.20	-	0.95	-	2.25	-	-	-	-	-	-	-	-	-	-	-	
	10	4.50	2.50	-	2.00	-	-	-	-	-	-	-	-	-	-	-	-	
	12	4.51	-	1.10	2.03	1.38	-	-	1	1.10	-	-	-	-	1	2.03	1	1.38
26 to 30 mds.	6	1.93	1.93	-	-	-	1	1.93	-	-	-	-	-	-	-	-	-	
	9	4.18	0.81	-	3.37	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	13	5.00	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	7	27.65	10.24	3.25	10.53	3.63	1	1.93	1	1.10	1	1.20	2	3.13	1	2.03	1	1.38

(continued)

Table 5.33 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding				Irrigable and dry area								Total number of plots	Total area	Area under jowar averaged over rotation cycle		
			Irrigable		Dry area		Irrigable area				Dry area								
			2.1 to 3 acres		5.1 to 7 acres		Medium-black soil				Medium-black soil								
			Medium-black	Deep-black	Medium-black	Deep-black	C-J		G-J		NB-JB-C		NB-JB-J						
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area					
7 to 15 mds.	4	4.33	-	1.20	3.13	-	-	-	-	-	-	-	-	-	-	-	3	4.33	1.44 or 1.96
16 to 25 mds.	7	3.20	-	0.95	-	2.25	-	-	-	-	-	-	-	-	-	-	3	3.20	0.63 or 1.40
	10	4.50	2.50	-	2.00	-	1	2.25	1	0.25	1	2.00	-	-	-	-	3	4.50	1.25
	12	4.51	-	1.10	2.03	1.38	-	-	-	-	-	-	-	-	-	-	3	4.51	1.02
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.93	0.64 or 0.96
	9	4.18	0.81	-	3.37	-	-	-	-	-	-	-	-	-	-	-	4	4.18	1.27
31 to 40 mds.	13	5.00	5.00	-	-	-	-	-	-	-	-	-	1	2.50	2	2.50	3	5.00	0.83
Total	7	27.65	10.24	3.25	10.53	3.63	1	2.25	1	0.25	1	2.00	1	2.50	2	2.50	20	27.65	-

Table 5.34 : Rotation-plans of the Medium Cultivators in Waghode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry area																																											
			Irrigable area		Irrigable area 1.1 to 2 acres									Dry area																																		
					Medium-black soil			Deep-black soil			Medium-black soil						Deep-black soil																															
			Medium-black	Deep-black	Light	Medium-black	Deep-black	G-J or NB-JB-C	G-C or NB-JB-C	G-C-J or NB-JB-C	NB-JB-C	G-J or NB-JB-C	NB-JB-C	G-J or NB-JB-C	G-C or NB-JB-C	G-C-J or NB-JB-C	C-J	G-J	G-C-J	J-J-J	NB-JB-J	C-J or NB-JB-C																										
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area																								
16 to 25 mds.	11	6.61	-	1.25	-	4.61	0.75	-	-	-	-	-	-	1	1.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	16	13.11	-	2.50	-	0.75	9.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4.36	1	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.75				
	22	10.30	6.00	-	-	4.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	25	6.00	1.50	-	-	4.50	-	-	1	1.50	-	-	-	-	-	-	-	-	1	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
26 to 30 mds.	14	5.96	-	1.50	-	2.96	1.50	-	-	-	-	-	1	1.50	-	-	1	0.80	2	2.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	15	8.43	4.70	1.45	-	2.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	20	6.23	-	5.35	-	0.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
31 to 40 mds.	8	6.50	1.05	-	-	5.45	-	-	-	-	1	1.05	-	-	-	-	2	3.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	17	9.03	5.25	-	-	-	3.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.45	-	-	-	-	1	0.75	-	-	-	-	-	-	-	-	-				
	19	9.01	5.43	-	-	3.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	24	10.90	2.95	2.95	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Above 40 mds.	18	8.79	1.33	-	-	7.46	-	1	1.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	26	6.28	2.43	2.15	1.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.33	-	-	3	6.13	-	-	-	-	-	-	-	-	-	-	-	-				
	27	12.18	2.58	-	-	5.40	4.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Total	14	119.33	33.22	17.15	1.70	47.17	20.09	1	1.33	1	1.50	1	1.05	1	1.50	1	1.25	3	4.05	2	2.16	1	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

(continued)

Table 5.34 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area																	
			Irrigable area		Dry area			Irrigable area					Dry area												
			2.1 to 3 acres					3.1 to 5 acres					Dry area												
			Medium-black soil	Deep-black soil	Light	Medium-black	Deep-black	Medium-black soil	Deep-black soil	Light soil	Medium-black soil	Deep-black soil	Light soil	Medium-black soil	Deep-black soil	Light soil									
			NB-JB-C	NB-JB-C-J	NB-JB-C	C-J	G-C-J	NB-JB-C	NB-JB-J	NB-JB-C	G-J														
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area										
16 to 25 mds.	11	6.61	-	1.25	-	4.61	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	16	13.11	-	2.50	-	0.75	9.86	-	-	-	-	1	2.50	1	0.75	-	-	3	9.86	-	-	-	-	-	
	22	10.30	6.00	-	-	4.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	25	6.00	1.50	-	-	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
26 to 30 mds.	14	5.96	-	1.50	-	2.96	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	15	8.43	4.70	1.45	-	2.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	20	6.23	-	5.35	-	0.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	8	6.50	1.05	-	-	5.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	17	9.03	5.25	-	-	-	3.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	19	9.01	5.43	-	-	3.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	24	10.90	2.95	2.95	-	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Above 40 mds.	18	8.79	1.33	-	-	7.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	26	6.28	2.43	2.15	1.70	-	-	-	-	-	-	-	-	-	-	-	-	1	2.43	1	2.15	1	1.70	-	
	27	12.18	2.58	-	-	5.40	4.20	1	0.18	2	2.40	-	-	-	-	3	5.40	2	4.20	-	-	-	-	-	
Total	14	119.33	33.22	17.15	1.70	47.17	20.09	1	0.18	2	2.40	1	2.50	1	0.75	3	5.40	5	14.06	1	2.43	1	2.15	1	1.70

(continued)

Table 5.35 : Rotation-plans of the Large Cultivators in Waghode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding						Irrigable and dry area																								
			Irrigable area		Dry area				Irrigable area		Dry area		Irrigable area				Dry area																
			Medium-black	Deep-black	Light	Medium-black	Deep-black	3.1 to 5 acres	Medium-black soil			Deep-black soil	5.1 to 7 acres	Deep-black soil	Deep-black soil		7.4 to 10 acres		Dry area														
									NB-JB-C	NB-JB-C	G-C-J or NB-JB-C				J-J-J	C-C-C	NB-JB-C	NB-JB-C	NB-JB-J	G-C or NB-JB-C	NB-JB-J	Orchard	NB-JB-C-C	J-J-J									
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots				Area	Plots	Area											Plots	Area	Plots	Area					
16 to 25 mds.	21	16.86	-	6.75	-	-	10.11	-	-	-	-	-	-	-	-	-	4	6.75	1	0.93	2	4.58	2	4.60	-	-	-	-	-	-	-	-	
26 to 30 mds.	23	20.57	-	4.20	-	10.54	5.83	1	4.20	1	4.98	1	3.68	1	1.88	1	5.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Above 40 mds.	28	17.51	16.08	-	-	1.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	29	21.41	-	8.23	-	13.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3.73	1	4.50	6	11.35	1	1.83	
	30	26.20	10.33	5.75	-	5.64	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	31	26.37	13.38	4.30	5.56	0.98	2.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	32	72.58	35.59	17.43	-	13.08	6.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total	7	201.50	75.38	46.66	5.56	44.85	29.05	1	4.20	1	4.98	1	3.68	1	1.88	1	5.83	4	6.75	1	0.93	2	4.58	2	4.60	2	3.73	1	4.50	6	11.35	1	1.83

(continued)

Table 5.35 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding															Irrigable and dry area												Total Number of Plots	Total area	Area under jowar averaged over rotation cycle			
			Irrigable area			Dry area			Irrigable area									D r y a r e a																	
			Above 10 acres						Medium-black soil						Deep-black soil			Medium-black soil															Deep-black soil		
			Medium-black	Deep-black	Light black	Medium-black	Deep-black	Light black	Medium-black soil			Deep-black soil			Medium-black soil												Deep-black soil								
									NB-JB-C	NB-JB-J	NB-JB-C-C	NB-JB-C-J	NB-JB-W-J	Orchards	NB-JB-C	NB-JB-J	C-C-C-J	C-J	NB-JB-C	MB-JB-J	NB-JB-C-J	G-J or NB-JB-J	C-J	G-C-J	W-C-J	J-J-J	Lucerne	C-J	NB-JB-C				NB-JB-C-J		
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area					
16 to 25 mds.	21	16.86	-	6.75	-	-	10.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	16.86	1.53		
26 to 30 mds.	23	20.57	-	4.20	-	10.54	5.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	20.57	1.88 or 3.11		
Above 40 mds.	28	17.51	16.08	-	-	1.43	-	5	6.38	6	9.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	17.51	3.68 or 3.90		
	29	21.41	-	8.23	-	13.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	21.41	3.07		
	30	26.20	10.33	5.75	-	5.64	4.48	4	5.00	2	5.33	-	-	-	-	-	-	-	-	-	2	2.13	1	0.80	-	-	2	2.71	-	-	1	4.48	13	26.40	7.26
	31	26.37	13.38	4.30	5.56	0.98	2.15	2	4.50	2	3.38	-	-	3	5.50	-	-	-	-	-	-	-	-	-	-	-	1	2.15	-	-	-	13	26.37	8.04	
	32	72.58	35.59	17.43	-	13.08	6.48	2	4.91	1	3.10	1	6.33	-	-	1	6.50	3	14.25	3	17.43	-	-	-	-	-	-	-	-	-	2	6.48	21	72.58	8.75
Total	7	201.50	75.38	46.66	5.56	44.85	29.05	13	20.79	11	21.51	1	6.33	3	5.50	1	6.50	3	14.25	4	19.63	1	2.10	1	5.75	-	-	-	-	-	84	201.50	-		

Table 5.36 : Rotation-plans of the Small Cultivators in Rozode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area																			
			Irrigable area			Dry area		Irrigable area						Dry area													
			Upto 1 acre					Medium-black soil			Deep-black soil			Light soil		Medium-black soil			Deep-black soil								
			C-J or NB-JB-J		J-J-J or NB-JB-J	NB-JB-J-C	C-J or NB-JB-J		Chillies or NB-JB-J		G-J		C-J or NB-JB-J		G-J		J-J-J		NB-JB-J-C								
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area							
7 to 15 mds.	1	0.50	0.37	-	-	0.13	-	-	-	1	0.37	-	-	-	-	-	-	-	-	-	-	1	0.13	-	-		
16 to 25 mds.	2	1.88	-	1.13	-	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
26 to 30 mds.	5	4.93	1.33	-	-	3.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	11	4.78	-	0.58	1.60	1.60	1.00	-	-	-	-	1	0.58	-	-	-	-	1	1.60	-	-	1	1.60	-	-	1	1.00
	14	3.83	0.50	-	-	3.33	-	1	0.50	-	-	-	-	-	-	-	-	-	-	4	3.33	-	-	-	-	-	-
	17	2.40	-	1.25	-	1.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	12	4.27	-	0.78	0.76	2.73	-	-	-	-	-	-	1	0.50	1	0.28	2	0.76	-	-	2	2.73	-	-	-	-	
Total	7	22.59	2.20	3.74	2.36	13.29	1.00	1	0.50	1	0.37	1	0.58	1	0.50	1	0.28	3	2.36	4	3.33	3	4.33	1	0.13	1	1.00

(continued)

Table 5.36 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area										Total number of plots	Total area	Area under jowar averaged over rotation cycle			
			Irrigable area			Dry area		Irrigable area					Dry area										
			1.1 to 2 acres																				
			Medium-black soil		Deep-black soil			Medium-black soil															
			NB-JB-C	NB-JB-J	C-J or NB-JB-J	NB-JB-C	NB-JB-J	C-J	G-J	NB-JB-C	NB-JB-J	C-J	G-J	NB-JB-C	NB-JB-J	C-J	G-J						
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots							
7 to 15 mds.	1	0.50	0.37	-	-	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.50	0.25 or 0.50	
16 to 25 mds.	2	1.88	-	1.13	-	0.75	-	-	-	-	1	1.13	-	-	-	-	1	0.75	-	2	1.88	0.74 or 0.94	
26 to 30 mds.	5	4.93	1.33	-	-	3.60	-	1	1.33	-	-	-	-	1	1.40	1	0.60	-	-	1	4	4.93	1.00
	11	4.78	-	0.58	1.60	1.60	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.78	1.99
	14	3.83	0.50	-	-	3.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	3.83	1.27 or 1.91
	17	2.40	-	1.25	-	1.15	-	-	-	1	1.25	-	-	-	-	-	-	-	-	1	2	2.40	0.98
31 to 40 mds.	12	4.27	-	0.78	0.76	2.73	-	-	-	-	-	-	-	-	-	-	-	-	-	6	4.27	1.84 or 2.05	
Total	7	22.59	2.20	3.74	2.36	13.29	1.00	1	1.33	1	1.25	1	1.13	1	1.40	1	0.60	1	0.75	2	25	22.59	-

Table 5.37 : Rotation-plans of the Medium Cultivators in Rozode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area											
			Irrigable area			Dry area		Irrigable area				Dry area							
			Upto 1 acre						Upto 1 acre										
			Medium-black soil	Deep-black soil	Light soil	Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Light soil	Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Light soil	Medium-black soil	Deep-black soil		
			G-J or NB-JB-J	NB-JB-C	G-J or NB-JB-C	G-J	NB-JB-C	G-J or NB-JB-C	G-J	NB-JB-C	G-J or NB-JB-C	G-J	NB-JB-C	G-J or NB-JB-C	G-J	NB-JB-C	G-J or NB-JB-C		
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area				
16 to 25 mds.	4	5.23	1.00	-	-	4.23	-	1	1.00	-	-	-	-	1	2.63	1	1.60	-	-
	6	6.93	1.50	-	-	5.43	-	-	-	-	-	-	-	-	-	-	-	-	-
	10	5.68	1.13	-	-	1.40	3.15	-	-	-	-	-	-	-	-	-	-	-	-
	16	5.75	4.20	-	-	1.55	-	-	-	-	-	-	-	-	-	-	-	-	-
26 to 30 mds.	15	7.82	2.86	0.48	-	-	4.48	-	-	-	-	-	-	-	-	-	-	-	-
	19	6.48	2.00	1.10	-	2.63	0.75	-	-	-	-	-	-	-	-	-	-	-	-
31 to 40 mds.	18	7.80	-	0.70	3.20	3.20	0.70	-	-	1	0.70	1	3.20	-	-	1	3.20	1	0.70
	21	9.61	2.81	2.00	-	4.80	-	-	-	-	-	-	-	-	-	-	-	-	-
	25	12.64	2.50	-	-	10.14	-	-	-	-	-	-	-	-	-	-	-	-	-
Above 40 mds.	13	6.56	2.81	-	-	3.75	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	8.25	2.45	1.80	4.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	22	9.36	-	3.36	-	6.00	-	-	-	-	-	-	-	-	-	-	-	-	-
	23	12.25	1.73	-	-	10.52	-	-	-	-	-	-	-	-	-	-	-	-	-
	24	6.33	1.63	3.05	-	1.65	-	-	-	-	-	-	-	-	-	-	-	-	-
	28	12.00	5.60	-	-	6.40	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	15	122.69	32.22	12.49	7.20	61.70	9.08	1	1.00	1	0.70	1	3.20	1	2.63	2	4.80	1	0.70

(continued)

Table 5.37 : (continued)

Annual requirement of power	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area															
			Irrigable area		Dry area			Irrigable area				Dry area											
			1.1 to 2 acres																				
			Medium-black soil					Medium-black soil				Deep-black soil											
			Medium-black	Deep-black	Light	Medium-black	Deep-black	NB-JB-C	C-J or NB-JB-C	NB-JB-J	C-J or NB-JB-C	C-J	G-J	G-C	C-J								
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area										
16 to 25 mds.	4	5.23	1.00	-	-	4.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	6	6.93	1.50	-	-	5.43	-	1	0.50	1	1.00	-	-	-	3	1.78	2	3.65	-	-	-		
	10	5.68	1.13	-	-	1.40	3.15	-	-	1	1.13	-	-	1	1.40	-	-	-	-	-	1	3.15	
	16	5.75	4.20	-	-	1.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
26 to 30 mds.	15	7.82	2.86	0.48	-	-	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	19	6.48	2.00	1.10	-	2.63	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
31 to 40 mds.	18	7.80	-	0.70	3.20	3.20	0.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	21	9.61	2.81	2.00	-	4.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	25	12.64	2.50	-	-	10.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Above 40 mds.	13	6.56	2.81	-	-	3.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	20	8.25	2.45	1.80	4.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	22	9.36	-	3.36	-	6.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	23	12.25	1.73	-	-	10.52	-	2	1.73	-	-	1	0.98	-	1	1.30	3	5.23	2	3.01	-		
	24	6.33	1.63	3.05	-	1.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	28	12.00	5.60	-	-	6.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total	15	122.69	32.22	12.49	7.20	61.70	9.08	3	2.23	2	2.13	1	0.98	1	1.40	4	3.08	5	8.88	2	3.01	1	3.15

(continued)

Table 5.37 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area											
			Irrigable area			Dry area		Irrigable area				Dry area							
			2.1 to 3 acres					2.1 to 3 acres											
			Medium-black soil					Medium-black soil											
			Medium-black	Deep-black		Light	Medium-black	Deep-black											
NB-JB-J		NB-JB-C-J		NB-JB-J		C-J or NB-JB-C		G-J		G-C-J									
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area		
16 to 25 mds.	4	5.23	1.00	-	-	4.23	-	-	-	-	-	-	-	-	-	-	-		
	6	6.93	1.50	-	-	5.43	-	-	-	-	-	-	-	-	-	-	-		
	10	5.68	1.13	-	-	1.40	3.15	-	-	-	-	-	-	-	-	-	-		
	16	5.75	4.20	-	-	1.55	-	-	-	-	-	-	-	-	-	-	-		
26 to 30 mds.	15	7.82	2.86	0.48	-	-	4.48	-	-	-	-	-	-	-	-	-	-		
	19	6.48	2.00	1.10	-	2.63	0.75	-	-	-	-	-	-	-	-	-	-		
31 to 40 mds.	18	7.80	-	0.70	3.20	3.20	0.70	-	-	-	-	-	-	-	-	-	-		
	21	9.61	2.81	2.00	-	4.80	-	-	-	-	-	-	-	-	-	-	-		
	25	12.64	2.50	-	-	10.14	-	-	2	2.50	1	2.90	1	1.18	2	4.56	1	1.50	
Above 40 mds.	13	6.56	2.81	-	-	3.75	-	2	2.81	-	-	-	-	-	1	3.75	-	-	
	20	8.25	2.45	1.80	4.00	-	-	-	-	-	-	-	-	-	-	-	-		
	22	9.36	-	3.36	-	6.00	-	-	-	-	-	-	-	-	-	-	-		
	23	12.25	1.73	-	-	10.52	-	-	-	-	-	-	-	-	-	-	-		
	24	6.33	1.63	3.05	-	1.65	-	-	-	-	-	-	-	-	-	-	-		
	28	12.00	5.60	-	-	6.40	-	-	-	-	-	-	-	-	-	-	-		
Total	15	122.69	32.22	12.49	7.20	61.70	9.08	2	2.81	2	2.50	1	2.90	2	1.18	3	8.31	1	1.50

(continued)

Table 5.38 : Rotation-plans of the Large Cultivators in Rozode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area												
			Irrigable area			Dry area		Irrigable area				Dry area								
			3.1 to 5 acres					Medium-black soil				Light soil		Medium-black soil						
			Medium-	Deep-		Light	Medium-	Deep-	NB-JB-C		NB-JB-J		NB-JB-C-W		G-J		G-C		G-C-J	
			black	black		black	black	black	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area
31 to 40 mds.	26	15.66	3.61	-	10.55	1.50	-	1	0.83	1	2.78	-	-	3	10.55	1	1.50	-	-	
	29	22.21	1.48	9.20	-	10.00	1.53	-	-	-	-	-	-	-	-	-	-	-	-	
Above 40 mds.	27	20.51	3.63	-	13.88	3.00	-	1	1.20	-	-	1	2.43	3	13.88	-	-	1	3.00	
	30	34.30	15.44	9.43	-	9.43	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	4	92.68	24.16	18.63	24.43	23.93	1.53	2	2.03	1	2.78	1	2.43	6	24.43	1	1.50	1	3.00	

(continued)

Table 5.38 : . (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry area														Total number of plots	Total area	Area under jowar averaged over rotation cycle											
			Irrigable area		Dry area		Irrigable area								Dry area																	
			Irrigable area		Dry area		Above 10 acres				Medium-black soil				Deep-black soil							Medium-black soil			Deep-black soil							
			Medium-black	Deep-black	Light	Medium-black	Deep-black	Medium-black soil		Deep-black soil		Medium-black soil		Deep-black soil		Medium-black soil		Deep-black soil														
			NB-JB-C	NB-JB-J	NB-JB-C	NB-JB-J	NB-JB-J-C	NB-JB-C-W	NB-JB-M-B	NB-JB-M-C	G-C-J	G-J	W-J																			
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area															
31 to 40 mds.	26	15.66	3.61	-	10.55	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	15.66	6.20					
	29	22.21	1.48	9.20	-	10.00	1.53	-	-	1	1.48	-	-	1	2.10	1	2.50	2	4.60	-	-	-	-	2	10.00	1	1.53	8	22.21	7.59		
Above 40 mds.	27	20.51	3.63	-	13.88	3.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	20.51	7.94					
	30	34.30	15.44	9.43	-	9.43	-	4	15.44	-	-	1	2.80	-	-	-	-	-	-	1	4.48	1	2.15	3	9.43	-	-	10	34.30	3.14		
Total	4	92.68	24.16	18.63	24.43	23.93	1.53	4	15.44	1	1.48	1	2.80	1	2.10	1	2.50	2	4.60	1	4.48	1	2.15	3	9.43	2	10.00	1	1.53	30	92.68	-

necessarily required to put more area under it, because of the major constraints of irrigation, finance, and manure supply. In their cases the area devoted to jowar was far more than required to meet their yearly food needs (see Tables 5.35 and 5.38). It can be seen from these Tables that majority of the large cultivators had to put larger area under jowar (Case Studies W 30, W 31 and W 32; R 26, R 27 and R 29). The only exception to this was that of the large cultivator in Rozode, who could formulate his rotation-plan in such a way that only that much area required to meet his family consumption needs was allocated to jowar (Case Study # 30). The other cultivators reported in the large size group at Waghode, were in fact nearer to the medium cultivators and hence their area allotted to jowar was not very large (Case Studies W 21, W 23, W 28 and W 29). It was reported that because of the constraints from irrigation, finance, and manure the large cultivators were required to bring down the area under banana by practising the long duration rotations such as NB-JB-C-J and NB-JB-W-J etc., or the rotations of dry crops like C-J and W-J, even on the irrigable land (Case Studies W 31 and W 32). In order to limit the area under banana to a certain level, they were required to allocate more area to jowar in their rotation-plans. In the case of some large cultivators, the soil restraint was also mainly responsible for the larger area under jowar (Case Studies R 26 and R 27). These cultivators were required to grow more jowar, as a fairly large portion of their land-holdings was of lighter soil. As stated earlier, the land of this type was least adaptable and only the

rotation of G-J could be practised on it. In such cases, therefore, the area under jowar was necessarily higher than required to meet the annual food needs.

5.16. Soil-Composition of Land-Holdings and the Rotation-Plans

In Tables 5.39 to 5.46, the rotation-programmes formulated by the irrigated cultivators in both the villages, grouped according to the soil-composition of their land-holdings are presented. The Tables clearly show that even the cultivators having more or less the same soil-composition of land-holdings, were required to practise different rotation-programmes. This was largely because the cultivators though similar in respect of soil-composition of their land-holdings, were different as regards other factors and conditions. In many cases, the holdings even though broadly alike, were different in respect of the proportions of different soil types and the proportions of irrigable and dry land. The cultivators were, therefore, required to follow different rotation-programmes for themselves. Another point to be noted was that the medium and deep-black land which formed the major portion of land-holdings of most of the cultivators, was comparatively more adaptable. The cultivators, therefore, could practise on such lands, different rotations suiting to their conditions. On the lighter soil, however, such was not the case. The cultivators were required to adopt the rotation of G-J on it, as no other crop could be profitably grown on such land. Therefore, as far as the lighter type of land was concerned, the rotation practised by the different cultivators was the same.

Table 5.39 : Rotation-plans of the Cultivators in Waghode Having Land-holdings Wholly of Medium-black Soil (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Irrigable area	Dry area	Irrigable and dry area																									
					Irrigable area				Dry area				Irrigable area								Dry area									
					Upto 1 acre								1.1 to 2 acres																	
					NB-JB-C		NB-JB-C		C-J		C-J or NB-JB-C		C-J or NB-JB-J		G-C or NB-JB-C		G-C-J or NB-JB-C		NB-JB-C		G-C or NB-JB-C		C-J		G-J		G-C-J		J-J-J	
					Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area
16 to 25 mds.	10	4.50	2.50	2.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	22	10.30	6.00	4.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	25	6.00	1.50	4.50	-	-	-	-	-	-	-	-	-	1	1.50	-	-	-	-	1	4.50	-	-	-	-	-	-			
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	-	-	1	1.93	-	-	-	-	-	-	-	-	-	-	-	-	-				
	9	4.18	0.81	3.37	1	0.81	1	0.82	2	2.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
31 to 40 mds.	8	6.50	1.05	5.45	-	-	-	-	-	-	-	-	-	-	-	1	1.05	2	3.25	-	-	-	-	1	1.45	-	-	1	0.75	
	13	5.00	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	19	9.01	5.43	3.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Above 40 mds.	18	8.79	1.33	7.46	-	-	-	-	-	-	1	1.33	-	-	-	-	-	-	-	-	-	1	1.33	-	-	3	6.13	-	-	
	28	17.51	16.08	1.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total	10	73.72	41.63	32.09	1	0.81	1	0.82	2	2.55	1	1.33	1	1.93	1	1.50	1	1.05	2	3.25	1	4.50	1	1.33	1	1.45	3	6.13	1	0.75

(continued)

Table 5.39 : (continued)

Annual Requirement of jowar	Case Study No.	Size of land-holding	Irrigable area	Dry area	Irrigable and dry area									
					Irrigable area				Dry area		Irrigable area			
					2.1 to 3 acres						3.1 to 5 acres			
					C-J		G-J		NB-JB-C		NB-JB-C	NB-JB-J		
					Plots	Area	Plots	Area	Plots	Area	Plots	Area		
16 to 25 mds.	10	4.50	2.50	2.00	1	2.25	1	0.25	1	2.00	-	-	-	-
	22	10.30	6.00	4.30	-	-	-	-	-	-	-	-	-	-
	25	6.00	1.50	4.50	-	-	-	-	-	-	-	-	-	-
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	-	-	-	-	-
	9	4.18	0.81	3.37	-	-	-	-	-	-	-	-	-	-
31 to 40 mds.	8	6.50	1.05	5.45	-	-	-	-	-	-	-	-	-	-
	13	5.00	5.00	-	-	-	-	-	-	-	1	2.50	2	2.50
	19	9.01	5.43	3.58	-	-	-	-	-	-	-	-	-	-
Above 40 mds.	18	8.79	1.33	7.46	-	-	-	-	-	-	-	-	-	-
	28	17.51	16.08	1.43	-	-	-	-	-	-	-	-	-	-
Total	10	73.72	41.63	32.09	1	2.25	1	0.25	1	2.00	1	2.50	2	2.50

(continued)

Table 5.39 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Irrigable area	Dry area	Irrigable and dry area																Total number of plots	Total area				
					Irrigable area						Dry area						Irrigable area						Dry area			
					5.1 to 7 acres												Above 10 acres									
					NB-JB-J		NB-JB-G		NB-JB-C-G		NB-JB-C		W-J or NB-JB-J		C-J		C-C-C-J		NB-JB-C				NB-JB-J		G-J or NB-JB-J	
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area					
16 to 25 mds.	10	4.50	2.50	2.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4.50		
	22	10.30	6.00	4.30	1	2.00	2	4.00	-	-	-	-	1	0.30	1	4.00	-	-	-	-	-	-	-	5	10.30	
	25	6.00	1.50	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	6.00		
26 to 30 mds.	6	1.93	1.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.93		
	9	4.18	0.81	3.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4.18		
31 to 40 mds.	8	6.50	1.05	5.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	6.50		
	13	5.00	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5.00		
	19	9.01	5.43	3.58	3	2.55	-	-	3	2.88	1	1.38	1	2.20	-	-	-	-	-	-	-	-	8	9.01		
Above 40 mds.	18	8.79	1.33	7.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	8.79		
	28	17.51	16.08	1.43	-	-	-	-	-	-	-	-	-	-	-	-	5	6.38	6	9.70	2	1.43	13	17.51		
Total	10	73.72	41.63	32.09	4	4.55	2	4.00	3	2.88	1	1.38	1	2.20	1	0.30	1	4.00	5	6.38	6	9.70	2	1.43	49	73.72

Table 5.40 : Rotation-plans of the Cultivators in Waghode having Land-holdings Wholly of Deep-black Soil. (Area in Acres)

Annual requirement of Jowar	Case Study No.	Size of land-holding	Irrigable area	Dry area	Irrigable and dry area												Total number of Plots	Total area				
					Irrigable area				Dry area				Irrigable area						Dry area			
					Upto 1 acre				5.1 to 7 acres													
					C-J or NB-JB-C		C-J or NB-JB-C		C-J or NB-JB-J		NB-JB-C		NB-JB-C		NB-JB-J				G-C or NB-JB-C			
					Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area			Plots	Area		
16 to 25 mds.	7	3.20	0.95	2.25	1	0.95	1	1.00	1	1.25	-	-	-	-	-	-	-	3	3.20			
26 to 30 mds.	21	16.86	6.75	10.11	-	-	-	-	-	-	4	6.75	1	0.93	2	4.58	2	4.60	9	16.86		
Total	2	20.06	7.70	12.36	1	0.95	1	1.00	1	1.25	4	6.75	1	0.93	2	4.58	2	4.60	12	20.06		

Table 5.41 : Rotation-plans of the Cultivators in Waghode Having Land-holdings of Medium and Deep-black Soils (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry area																							
			Irrigable area		Irrigable area						Dry area																	
			1.1 to 2 acres		Deep-black soil			Medium-black soil			Deep-black soil																	
			Medium-black	Deep-black	Medium-black	Deep-black	C-J or NB-JB-C	NB-JB-C	NB-JB-J	C-J or NB-JB-C	C-J or NB-JB-J	G-C-J or NB-JB-C	C-J	NB-JB-C	NB-JB-J	C-J or NB-JB-C												
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area										
7 to 15 mds.	4	4.33	-	1.20	3.13	-	-	1	1.20	-	-	-	-	2	3.13	-	-	-	-	-	-	-	-	-				
16 to 25 mds.	11	6.61	-	1.25	4.61	0.75	-	-	-	-	1	1.25	-	-	-	-	2	4.36	1	0.25	-	-	-	-	1	0.75		
	12	4.51	-	1.10	2.03	1.38	1	1.10	-	-	-	-	-	-	-	-	-	-	1	2.03	1	1.38	-	-	-	-		
	16	13.11	-	2.50	0.75	9.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
26 to 30 mds.	14	5.96	-	1.50	2.96	1.50	1	1.50	-	-	-	-	1	0.80	2	2.16	-	-	-	-	-	-	-	1	1.50	-	-	
	15	8.43	4.70	1.45	2.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	20	6.23	-	5.35	0.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	23	20.57	-	4.20	10.54	5.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	17	9.03	5.25	-	-	3.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	24	10.90	2.95	2.95	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Above 40 mds.	27	12.18	2.58	-	5.40	4.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	29	21.41	-	8.23	13.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	30	26.20	10.33	5.75	5.64	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	32	72.58	35.59	17.43	13.08	6.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	14	222.05	61.40	52.91	69.48	38.26	2	2.60	1	1.20	1	1.25	1	0.80	2	2.16	2	3.13	2	4.36	2	2.28	1	1.38	1	1.50	1	0.75

(continued)

Table 5.41 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry area																							
			Irrigable area		Irrigable area						Dry area																	
			2.1 to 3 acres		3.1 to 5 acres			Dry area			Dry area																	
			Medium-black	Deep-black	Medium-black soil		Deep-black soil		Medium-black soil		Deep-black soil		Medium-black soil		Deep-black soil													
			Plots	Area	NB-JB-C	NB-JB-C-J	NB-JB-C	C-J	G-C-J	NB-JB-C	NB-JB-C	NB-JB-C	G-C-J or NB-JB-C	J-J-J	C-C-C													
7 to 15 mds.	4	4.33	-	1.20	3.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
16 to 25 mds.	11	6.61	-	1.25	4.61	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	12	4.51	-	1.10	2.03	1.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	16	13.11	-	2.50	0.75	9.86	-	-	-	1	2.50	1	0.75	-	-	3	9.86	-	-	-	-	-	-	-				
26 to 30 mds.	14	5.96	-	1.50	2.96	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	15	8.43	4.70	1.45	2.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	20	6.23	-	5.35	0.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	23	20.57	-	4.20	10.54	5.83	-	-	-	-	-	-	-	-	-	1	4.20	1	4.98	1	3.68	1	1.88	1	5.83			
31 to 40 mds.	17	9.03	5.25	-	-	3.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	24	10.90	2.95	2.95	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Above 40 mds.	27	12.18	2.58	-	5.40	4.20	1	0.18	2	2.40	-	-	-	-	3	5.40	2	4.20	-	-	-	-	-	-	-			
	29	21.41	-	8.23	13.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	30	26.20	10.33	5.75	5.64	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	32	72.58	35.59	17.43	13.08	6.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Total	14	222.05	61.40	52.91	69.48	38.26	1	0.18	2	2.40	1	2.50	1	0.75	3	5.40	5	14.06	1	4.20	1	4.98	1	3.68	1	1.88	1	5.83

(continued)

Table 5.41 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding				Irrigable and dry area																											
			Irrigable area		Dry area		Irrigable area							Dry area																				
			5.1 to 7 acres				7.1 to 10 acres																											
			Medium-black	Deep-black	Medium-black	Deep-black	Deep-black soil		Medium-black soil		Deep-black soil		Medium-black soil		Deep-black soil		Medium-black soil																	
			NB-JB-C	NB-JB-J	C-J	NB-JB-C	NB-JB-C	NB-JB-J	G-C-J or NB-JB-C	C-J	NB-JB-C	C-J	NB-JB-J	Orchard	NB-JB-C-C	J-J-J																		
Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area																					
7 to 15 mds.	4	4.33	-	1.20	3.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
16 to 25 mds.	11	6.61	-	1.25	4.61	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
	12	4.51	-	1.10	2.03	1.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
	16	13.11	-	2.50	0.75	9.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
26 to 30 mds.	14	5.96	-	1.50	2.96	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
	15	8.43	4.70	1.45	2.28	-	2	1.75	1	0.65	1	2.30	1	1.45	-	-	-	-	-	-	-	-	-	-	-									
	20	6.23	-	5.35	0.88	-	-	-	-	-	-	-	2	5.35	-	-	2	2.28	-	-	-	-	-	-	-									
	23	20.57	-	4.20	10.54	5.83	-	-	-	-	-	-	1	0.88	-	-	-	-	-	-	-	-	-	-	-									
31 to 40 mds.	17	9.03	5.25	-	-	3.78	1	3.45	1	1.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
	24	10.90	2.95	2.95	5.00	-	1	1.15	-	-	1	1.80	2	2.95	1	2.00	-	-	1	3.00	-	-	2	3.68	1	0.10								
Above 40 mds.	27	12.18	2.58	-	5.40	4.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
	29	21.41	-	8.23	13.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
	30	26.20	10.33	5.75	5.64	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3.73	1	4.50	6	11.35	1	1.83					
	32	72.58	35.59	17.43	13.08	6.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
Total	14	222.05	61.40	52.91	69.48	38.26	4	6.35	2	2.45	2	4.10	5	9.75	1	2.00	1	0.88	1	3.00	2	2.28	2	3.68	1	0.10	2	3.73	1	4.50	6	11.35	1	1.83

(continued)

Table 5.41 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry area.																Total number of Plots	Total area																					
			Irrigable area		D r y a r e a																																						
			Irrigable area	Dry area	Above 10 acres																																						
					Medium-black soil					Deep-black soil		Medium-black soil					Deep-black soil																										
			Medium-black	Deep-black	NB-JB-C	NB-JB-J	NB-JB-C-C	NB-JB-W-C	Orchards	NB-JB-C	C-C-C-J	NB-JB-C	NB-JB-J	NB-JB-C-J	W-C-J	C-J	G-C-J	J-J-J	Lucerne	NB-JB-C			NB-JB-C-J																				
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area																								
7 to 15 mds.	4	4.33	-	1.20	3.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4.33									
16 to 25 mds.	11	6.61	-	1.25	4.61	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	6.61									
	12	4.51	-	1.10	2.03	1.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4.51										
	16	13.11	-	2.50	0.75	9.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	13.11										
26 to 30 mds.	14	5.96	-	1.50	2.96	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5.96										
	15	8.43	4.70	1.45	2.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	8.43										
	20	6.23	-	5.35	0.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6.23										
	23	20.57	-	4.20	10.54	5.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	20.57										
31 to 40 mds.	17	9.03	5.25	-	-	3.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	9.03										
	24	10.90	2.95	2.95	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	10.90										
Above 40 mds.	27	12.18	2.58	-	5.40	4.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	12.18										
	29	21.41	-	8.23	13.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	21.41										
	30	26.20	10.33	5.75	5.64	4.48	4	5.00	2	5.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	26.20										
	32	72.58	35.59	17.43	13.08	6.48	2	4.91	1	3.10	1	6.33	1	6.50	3	14.25	3	17.43	-	-	1	2.43	1	1.27	2	1.21	1	7.28	2	2.13	1	0.80	2	2.71	-	-	1	4.48	-	-	2	6.48	21
Total	14	222.05	61.40	52.91	69.48	38.26	6	9.91	3	8.43	1	6.33	1	6.50	3	14.25	3	17.43	1	5.75	1	2.43	1	1.27	2	1.21	1	7.28	2	2.13	1	0.80	4	3.60	1	0.50	1	4.48	2	6.48	99	222.05	

Table 5.42 : Rotation-plans of the Cultivators in Waghode Having Land-holdings of Light, Medium and Deep-black Soils (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding														Total number of plots	Total area													
			Irrigable area		Dry area		Irrigable area 3.1 to 5 acres			Dry area			Irrigable and dry area Above 10 acres																		
			Medium-black	Deep-black	Light	Medium-black	Deep-black	Medium-black soil	Deep-black soil	Light soil	Medium-black soil		Deep-black soil		Light soil	Medium-black soil			Deep-black soil												
Above 40 mds.	26	6.28	2.43	2.15	1.70	-	-	1	2.43	1	2.15	1	1.70	-	-	-	-	-	-	-	-	-	-	-	-	3	6.28				
	31	26.37	13.38	4.30	5.56	0.98	2.15	-	-	-	-	-	-	2	4.50	2	3.38	3	5.50	1	2.20	1	2.10	2	5.56	1	0.98	1	2.15	13	26.37
Total	2	32.65	15.81	6.45	7.26	0.98	2.15	1	2.43	1	2.15	1	1.70	2	4.50	2	3.38	3	5.50	1	2.20	1	2.10	2	5.56	1	0.98	1	2.15	16	32.65

Table 5.43 : Rotation-plans of the Cultivators in Rozode Having Land-holdings Wholly of Medium-black Soil (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Irrigable area	Dry area	Irrigable and dry area													
					Irrigable area						Dry area							
					Upto 1 acre													
					C-J or NB-JB-J		G-J or NB-JB-J		J-J-J or NB-JB-J		C-J or NB-JB-C		C-J or NB-JB-J		G-J		J-J-J	
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area					
7 to 15 mds.	1	0.50	0.37	0.13	-	-	-	-	1	0.37	-	-	-	-	-	-	1	0.13
16 to 25 mds.	4	5.23	1.00	4.23	-	-	1	1.00	-	-	1	2.63	-	-	1	1.60	-	-
	6	6.93	1.50	5.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16	5.75	4.20	1.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25 to 30 mds.	5	4.93	1.33	3.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	14	3.83	0.50	3.33	1	0.50	-	-	-	-	-	-	4	3.33	-	-	-	-
31 to 40 mds.	25	12.64	2.50	10.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Above 40 mds.	13	6.56	2.81	3.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	23	12.25	1.73	10.52	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28	12.00	5.60	6.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	10	70.62	21.54	49.08	1	0.50	1	1.00	1	0.37	1	2.63	4	3.33	1	1.60	1	0.13

(continued)

Table 5.43 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Irrigable area	Dry area	Irrigable and dry area													
					Irrigable area				Dry area									
					1.1 to 2 acres				NB-JB-C		NB-JB-J		C-J		G-J		G-C	
					Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area
7 to 15 mds.	1	0.50	0.37	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-	
16 to 25 mds.	4	5.23	1.00	4.23	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6	6.93	1.50	5.43	1	0.50	1	1.00	-	-	-	-	3	1.78	2	3.65	-	-
	16	5.75	4.20	1.55	-	-	-	-	-	-	-	-	-	-	-	-	-	
25 to 30 mds.	5	4.93	1.33	3.60	1	1.33	-	-	1	1.40	1	0.60	-	-	1	1.60	-	-
	14	3.83	0.50	3.33	-	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	25	12.64	2.50	10.14	-	-	-	-	-	-	-	-	-	-	-	-	-	
Above 40 mds.	13	6.56	2.81	3.75	-	-	-	-	-	-	-	-	-	-	-	-	-	
	23	12.25	1.73	10.52	2	1.73	-	-	-	-	1	0.98	1	1.30	3	5.23	2	3.01
	28	12.00	5.60	6.40	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	10	70.62	21.54	49.08	4	3.56	1	1.00	1	1.40	2	1.58	4	3.08	6	10.48	2	3.01

(continued)

Table 5.43 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Irrigable area	Dry area	Irrigable and dry area											
					Irrigable area				Dry area							
					2.1 to 3 acres											
					NB-JB-J		NB-JB-C-J		NB-JB-J		C-J or NB-JB-C		G-J		G-C-J	
					Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area
7 to 15 mds.	1	0.50	0.37	0.13	-	-	-	-	-	-	-	-	-	-	-	-
16 to 25 mds.	4	5.23	1.00	4.23	-	-	-	-	-	-	-	-	-	-	-	-
	6	6.93	1.50	5.43	-	-	-	-	-	-	-	-	-	-	-	-
	16	5.75	4.20	1.55	-	-	-	-	-	-	-	-	-	-	-	-
25 to 30 mds.	5	4.93	1.33	3.60	-	-	-	-	-	-	-	-	-	-	-	-
	14	3.83	0.50	3.33	-	-	-	-	-	-	-	-	-	-	-	-
31 to 40 mds.	25	12.64	2.50	10.14	-	-	2	2.50	1	2.90	1	1.18	2	4.56	1	1.50
													1	3.75	-	-
Above 40 mds.	13	6.56	2.81	3.75	2	2.81	-	-	-	-	-	-	-	-	-	-
	23	12.25	1.73	10.52	-	-	-	-	-	-	-	-	-	-	-	-
	28	12.00	5.60	6.40	-	-	-	-	-	-	-	-	-	-	-	-
Total	10	70.62	21.54	49.08	2	2.81	2	2.50	1	2.90	1	1.18	3	8.31	1	1.50

(continued)

Table 5.43 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Irrigable area	Dry area	Irrigable and dry area												Total number of plots	Total area
					Irrigable area				Dry area				Irrigable area		Dry area			
					3.1 to 5 acres								5.1 to 7 acres					
					NB-JB-J		NB-JB-G		NB-JB-G		G-J		NB-JB-J		G-J			
					Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area		
7 to 15 mds.	1	0.50	0.37	0.13	-	-	-	-	-	-	-	-	-	-	-	2	0.50	
16 to 25 mds.	4	5.23	1.00	4.23	-	-	-	-	-	-	-	-	-	-	-	3	5.23	
	6	6.93	1.50	5.43	-	-	-	-	-	-	-	-	-	-	-	7	6.93	
	16	5.75	4.20	1.55	2	1.73	2	2.47	1	0.95	1	0.60	-	-	-	6	5.75	
25 to 30 mds.	5	4.93	1.33	3.60	-	-	-	-	-	-	-	-	-	-	-	4	4.93	
	14	3.83	0.50	3.33	-	-	-	-	-	-	-	-	-	-	-	5	3.83	
31 to 40 mds.	25	12.64	2.50	10.14	-	-	-	-	-	-	-	-	-	-	-	7	12.64	
	13	6.56	2.81	3.75	-	-	-	-	-	-	-	-	-	-	-	3	6.56	
Above 40 mds.	23	12.25	1.73	10.52	-	-	-	-	-	-	-	-	-	-	-	9	12.25	
	28	12.00	5.60	6.40	-	-	-	-	-	-	-	2	5.60	1	6.40	3	12.00	
Total	10	70.62	21.54	49.08	2	1.73	2	2.47	1	0.95	1	0.60	2	5.60	1	6.40	49	70.62

Table 5.44 : Rotation-plans of the Cultivators in Rozode Having Land-holdings of Light and Medium-black Soils (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding			Irrigable and dry area								Total number of plots	Total area				
			Irrigable area	Dry area		Irrigable area				Dry area									
				3.1 to 5 acres						Light soil		Medium-black soil							
			Medium-black	Light	Medium-black	Medium-black soil			G-J	Medium-black soil									
						NB-JB-C	NB-JB-J	NB-JB-C-W		G-C	G-C-J								
			Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots			Area			
31 to 40 mds.	26	15.66	3.61	10.55	1.50	1	0.83	1	2.78	-	-	3	10.55	1	1.50	-	-	6	15.66
Above 40 mds.	27	20.51	3.63	13.88	3.00	1	1.20	-	-	1	2.43	3	13.88	-	-	1	3.00	6	20.51
Total	2	36.17	7.24	24.43	4.50	2	2.03	1	2.78	1	2.43	6	24.43	1	1.50	1	3.00	12	36.17

Table 5.45 : Rotation-plans of the Cultivators in Rozode Having Land-holdings of Medium and Deep-black Soils (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding				Irrigable and dry area													
			Irrigable area		Dry area		Irrigable area				Dry area									
			1.1 to 2 acres																	
			Medium-black soil	Deep-black soil	Medium-black soil	Deep-black soil	Medium-black soil		Deep-black soil		Medium-black soil		Deep-black soil							
			C-J or NB-JB-C	NB-JB-J	C-J or NB-JB-J		C-J or NB-JB-C	C-J	G-J	C-J		C-J								
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area							
16 to 25 mds.	2	1.88	-	1.13	0.75	-	-	-	-	1	1.13	-	-	1	0.75	-	-	-	-	
	10	5.68	1.13	-	1.40	3.15	1	1.13	-	-	-	-	1	1.40	-	-	-	-	1	3.15
26 to 30 mds.	15	7.82	2.86	0.48	-	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	
	17	2.40	-	1.25	1.15	-	-	-	1	1.25	-	-	-	-	-	1	1.15	-	-	
	19	6.48	2.00	1.10	2.63	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	
31 to 40 mds.	21	9.61	2.81	2.00	4.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	29	22.21	1.48	9.20	10.00	1.53	-	-	-	-	-	-	-	-	-	-	-	-	-	
Above 40 mds.	22	9.36	-	3.36	6.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	24	6.33	1.63	3.05	1.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	30	34.30	15.44	9.43	9.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	10	106.07	27.35	31.00	37.81	9.91	1	1.13	1	1.25	1	1.13	1	1.40	1	0.75	1	1.15	1	3.15

(continued)

Table 5.45 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding				Irrigable and dry area																									
			Irrigable area		Dry area		Irrigable area									Dry area																
			3.1 to 5 acres				Medium-black soil				Deep-black soil					Medium-black soil				Deep-black soil												
			Medium-black	Deep-black	Medium-black	Deep-black	Medium-black soil		Deep-black soil			Medium-black soil		Deep-black soil		Medium-black soil		Deep-black soil														
			NB-JB-C	NB-JB-J	NB-JB-W	C-J or NB-JB-J	NB-JB-C	NB-JB-C-J	W-J	NB-JB-C	G-J	G-C-J	NB-JB-C	NB-JB-J	W-J																	
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area							
16 to 25 mds.	2	1.88	-	1.13	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	10	5.68	1.13	-	1.40	3.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
26 to 30 mds.	15	7.82	2.86	0.48	-	4.48	1	0.95	4	1.91	-	-	-	-	-	-	1	0.48	-	-	-	-	-	2	2.08	2	1.93	1	0.47			
	17	2.40	-	1.25	1.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	19	6.48	2.00	1.10	2.63	0.75	3	2.00	-	-	-	-	-	-	-	-	1	1.10	1	0.95	-	-	-	1	1.68	-	-	1	0.75			
31 to 40 mds.	21	9.61	2.81	2.00	4.80	-	-	-	3	1.78	1	1.03	-	-	1	2.00	-	-	-	-	-	2	4.80	-	-	-	-	-	-			
	29	22.21	1.48	9.20	10.00	1.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Above 40 mds.	22	9.36	-	3.36	6.00	-	-	-	-	-	-	-	-	1	1.63	2	1.73	-	-	-	-	2	6.00	-	-	-	-	-	-			
	24	6.33	1.63	3.05	1.65	-	-	-	-	-	-	-	1	1.63	3	3.05	-	-	-	-	-	-	-	1	1.65	-	-	-	-			
	30	34.30	15.44	9.43	9.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Total	10	106.07	27.35	31.00	37.81	9.91	4	2.95	7	3.69	1	1.03	1	1.63	5	6.68	2	1.73	2	1.58	1	0.95	4	10.80	1	1.65	3	3.76	2	1.93	2	1.22

(continued)

Table 5.45 : (continued)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry area																		Total number of plots	Total area						
					Irrigable area									Dry area																
			Irrigable area		Dry area		Above 10 acres																							
			Medium-black soil		Deep-black soil		Medium-black soil									Deep-black soil														
			Medium-black	Deep-black	Medium-black	Deep-black	NB-JB-C	NB-JB-J	NB-JB-C	NB-JB-J	NB-JB-J-C	NB-JB-C-W	NB-JB-M-B	NB-JB-M-C	G-C-J	G-J	W-J													
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area													
16 to 25 mds.	2	1.88	-	1.13	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.88				
	10	5.68	1.13	-	1.40	3.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5.68				
26 to 30 mds.	15	7.82	2.86	0.48	-	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	7.82				
	17	2.40	-	1.25	1.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2.40				
	19	6.48	2.00	1.10	2.63	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	6.48				
31 to 40 mds.	21	9.61	2.81	2.00	4.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	9.61				
	29	22.21	1.48	9.20	10.00	1.53	-	-	1	1.48	-	-	1	2.10	1	2.50	2	4.60	-	-	-	-	2	10.00	1	1.53	8	22.21		
Above 40 mds.	22	9.36	-	3.36	6.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	9.36				
	24	6.33	1.63	3.05	1.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	6.33				
	30	34.30	15.44	9.43	9.43	-	4	15.44	-	-	1	2.80	-	-	-	-	-	1	4.48	1	2.15	3	9.43	-	-	10	34.30			
Total	10	106.07	27.35	31.00	37.81	9.91	4	15.44	1	1.48	1	2.80	1	2.10	1	2.50	2	4.60	1	4.48	1	2.15	3	9.43	2	10.00	1	1.53	60	106.07

Table 5.46 : Rotation-plans of the Cultivators in Rozode Having Land-holdings of Light, Medium and Deep-black Soils (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable and dry area															
			Irrigable area		Dry area			Irrigable area				Dry area											
			Medium-black	Deep-black	Light	Medium-black	Deep-black	Upto 1 acre															
			black	black		black	black	Deep-black soil				Light soil	Medium-black soil	Deep-black soil									
								Chillies															
								NB-JB-C	NB-JB-J-C	G-J or NB-JB-J	or NB-JB-J	G-J	G-J	NB-JB-C	NB-JB-J-C								
					Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area	Plots Area										
26 to 30 mds.	11	4.78	-	0.58	1.60	1.60	1.00	-	-	1	0.58	-	-	-	-	1	1.60	1	1.60	-	-	1	1.00
31 to 40 mds.	12	4.27	-	0.78	0.76	2.73	-	-	-	-	1	0.50	1	0.28	2	0.76	2	2.73	-	-	-	-	
	18	7.80	-	0.70	3.20	3.20	0.70	1	0.70	-	-	-	-	-	1	3.20	1	3.20	1	0.70	-	-	
Above 40 mds.	20	8.25	2.45	1.80	4.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	4	25.10	2.45	3.86	9.56	7.53	1.70	1	0.70	1	0.58	1	0.50	1	0.28	4	5.56	4	7.53	1	0.70	1	1.00

(continued)

Table 5.46 : (continued)

Annual requirement of Jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding					Irrigable area						Total number of plots	Total area	
			Irrigable area			Dry area			3.1 to 5 acres							
			Medium-black	Deep-black	Light	Medium-black	Deep-black	Light soil	Medium-black soil		Deep-black soil		G-J			
									NB-JB-J		NB-JB-C		G-J			
									Plots	Area	Plots	Area	Plots			Area
26 to 30 mds.	11	4.78	-	0.58	1.60	1.60	1.00	-	-	-	-	-	-	4	4.78	
31 to 40 mds.	12	4.27	-	0.78	0.76	2.73	-	-	-	-	-	-	-	6	4.27	
	18	7.80	-	0.70	3.20	3.20	0.70	-	-	-	-	-	-	4	7.80	
Above 40 mds.	20	8.25	2.45	1.80	4.00	-	-	2	2.45	2	1.80	2	4.00	6	8.25	
Total	4	25.10	2.45	3.86	9.56	7.53	1.70	2	2.45	2	1.80	2	4.00	20	25.10	

5.17. Cultivators Following Agriculture as a
Subsidiary Occupation, and Not Wholly
Depending on Their Lands for Family
Food Needs

The cultivators of this type were three in Waghode and four in Rozode. All of them in both the villages were small cultivators having land-holdings below 3.15 acres. Because of their small land-holdings they could not allocate every year the required area to jowar to meet their total annual food needs. They, therefore, could not wholly depend on their land for their staple food. However, the general attitude towards cultivation in their case also was to get jowar, whatever possible from their lands, as a minimum security to meet the total family food needs. They were, therefore, very particular about giving a definite place for jowar in their rotation-programmes. Some of them did not follow any rotation even, and preferred to grow jowar continuously year after year.

In Tables 5.47 and 5.48, are presented the rotations practised by these cultivators in the two villages, grouped according to their requirements of food. All these cultivators in both the villages followed cultivation of their lands as a subsidiary occupation, the main occupation pursued by them being agricultural labour. All of them had irrigation facility available on their lands from the jointly owned wells; but their share in the ownership of the wells was so minor (one-eighth to one-sixteenth) and their financial conditions so poor, that it was not possible for them to grow banana. They were, therefore, required to lease-out their lands for banana whenever the

Table 5.47 : Rotation-plans of the Cultivators Following Agriculture as Subsidiary Occupation in Waghode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land-holding	Soil-composition of land-holding		Irrigable and dry land										Total number of plots	Total area	Area under jowar averaged over rotation cycle				
			Irrigable land	Dry land	Irrigable area					Dry land											
					Upto 1 acre					Medium-black Soil											
			Medium-black	Medium-black	G-J or NB-JB-J		C-J or NB-JB-C		G-J or NB-JB-J		C-J or NB-JB-C		NB-JB-J					J-J-J			
					Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area				Plots	Area		
			26 to 30 mds.	2	1.33	0.33	1.00	1	0.33	-	-	-	-	1				1.00	-	-	-
	3	3.05	0.30	2.75	-	-	1	0.30	-	-	-	-	2	2.20	-	-	1	0.55	4	3.05	0.55 or 1.80
Above 40 mds.	1	1.38	0.20	1.18	-	-	-	-	1	0.20	-	-	-	-	2	1.05	1	0.13	4	1.38	0.55 or 1.38
Total	3	5.76	0.83	4.93	1	0.33	1	0.30	1	0.20	1	1.00	2	2.20	2	1.05	2	0.68	10	5.76	-

Table 5.48 : Rotation-plans of the Cultivators Following Agriculture as Subsidiary Occupation in Rozode (Area in Acres)

Annual requirement of jowar	Case Study No.	Size of land- holding	Soil-composition of land-holding				Irrigable and dry area								Total Number of Plots	Total Area	Area under jowar averaged over rotation cycle
			Irrigable area		Dry area		Irrigable area				Dry area						
			Medium- black	Deep- black	Light	Upto 1 acre				Light soil							
						Medium-black soil				G-J							
							C-J or NB-JB-J		W-J or NB-JB-C				C-J or NB-JB-J				
Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area	Plots	Area						
16 to 25 mds.	8	2.51	0.63	-	1.88	1	0.63	-	-	2	1.88	-	-	3	2.51	0.94 or 1.25	
26 to 30 mds.	3	1.48	1.48	-	-	-	-	-	-	-	-	2	1.48	2	1.48	0.74	
	7	3.15	0.75	-	2.40	-	-	1	0.75	2	2.40	-	-	3	3.15	1.20 or 1.57	
	9	2.85	0.45	-	2.40	1	0.45	-	-	2	2.40	-	-	3	2.85	1.35 or 1.43	
Total	4	9.99	3.31	-	6.68	2	1.08	1	0.75	6	6.68	2	1.48	11	9.99	-	

neighbouring cultivators were willing to lease-in for banana cultivation. However, they could not establish any definite type of relationship with their tenant cultivators, as their land was very small in area. Hence, they were required to follow dualism in their rotation-programmes. All these cultivators in both the villages, therefore, practised dual rotations --one of the dry crops which they could grow themselves, and the other with banana as one of the crops which they could follow by leasing-out the land for banana whenever possible.

In Waghode, of the three cultivators two had almost the same size of holdings--1.38 and 1.33 acres (Case Studies W 1 and W 2). The soil composition of their holdings was also the same. Both of them had their land-holdings entirely of medium-black soil. But they differed to a considerable extent in their total food requirements. In the case of one, the total annual food requirement was about 30 maunds of jowar (Case Study W 2); while the other had a considerably large food requirement of 50 maunds (Case Study W 1). The former cultivator basically practised the crop-rotation of G-J as his counterparts in the dry villages. He preferred this rotation even though his entire land was of medium-black soil, where cotton could be profitably grown. He had satisfactory supply of home-collected manure as well (10 cart-loads). But his economic condition was so poor (total income Rs.1,600) that he did not prefer to grow cotton which was considered by such cultivators as comparatively more risky crop. The rotation of G-J was more acceptable to such cultivators as it could be continued for years without any

application of manure to the land. The other cultivator could not follow any rotation as such. His requirement of food was so large and pressing that he preferred to grow jowar continuously to get jowar, whatever possible from the land every year. As an alternate rotation, both of them followed the rotation of NB-JB-J and shifted to it whenever irrigation was made available. In the case of both the cultivators the area allotted to jowar was very small (0.55 to 1.38 acres and 0.44 to 0.66 acre) and it was not at all enough to meet their annual food needs. They were, therefore, required to depend largely on their earnings from the main occupation to purchase jowar to meet their food needs.

The third cultivator in the group was slightly different from the above two (Case Study W 3). His land-holding was also entirely of medium-black soil. The supply of home-collected manure in his case, was fairly large (14 cart-loads). As his land was nearer to deep-black, and as he had sufficiently large supply of manure, he preferred to follow the C-J rotation as the basic rotation on the major portion of his holding (2.50 acres). Whenever irrigation was made available, he switched over from the C-J rotation to the rotation of NB-JB-C. The remaining area of his land-holding (0.55 acre) was under mango grove and hence he could not follow any rotation on it. However, he grew jowar continuously on it as a fodder crop. In his case also the average area allocated to jowar was relatively low than required to meet his total annual food requirement. Whenever the rotation of banana was practised, he did not devote

any area to jowar crop as such. He grew it as a mixed crop along with cotton. Jowar grown under both the rotations was not enough to meet his yearly food needs.

The rotation pattern followed by such cultivators in Rozode was slightly different as most of them had dry lands outside the village. Three of the four cultivators of this type had such lands situated in the nearby villages (Case Studies R 7, R 8 and R 9). They could take the risk of growing cotton on the village land as those plots were of small area and as they had additional dry land outside which formed the major portion of their holdings. Two of them, therefore, practised the C-J rotation as their basic rotation on their irrigable lands in the village. Whenever irrigation was made available they switched over to the NB-JB-J rotation (Case Studies R 8 and R 9). The third cultivator followed the two-year rotation of W-J as his basic rotation and the NB-JB-C rotation as his alternate rotation (Case Study R 7). On the dry portion of their holdings, they all adopted the two-year rotation of G-J as the land was of lighter soil. In the case of these three cultivators the average area allotted to jowar was fairly large because of the G-J rotation accepted on the dry land outside. But as the major portion of the area allotted to jowar was from the lighter type of land, they could not get sufficient jowar produce to meet their yearly food requirements. They all were required to purchase jowar to a considerable extent to meet their annual food needs.

The fourth cultivator in the group had a small land-holding situated in the village itself (Case Study R 3). He did not have

any land outside. As he generally leased-out his entire land for banana cultivation, he was required to follow dual rotations. He followed the two-year rotation of C-J as the basic rotation, and the NB-JB-J rotation as the alternate rotation. Whenever irrigation was made available, he changed over from the basic rotation of C-J to the rotation of NB-JB-J. In his case the average area allocated to jowar through the two accepted rotations was very small (0.49 to 0.74 acre). It was not at all enough to meet his total needs of food. He was, therefore, required to purchase jowar to a considerable extent.

Thus, in both the irrigated villages, the rotation-plans of these cultivators were influenced by the basic factor of food requirement. All of them invariably practised the rotations with jowar, even though they could not allocate the required area to it, to meet their yearly food needs. The four basic factors and their composite effect appeared to have a minor influence in such cases. //

5.18. Plots with Peculiar Characteristics

In the case of the sample cultivators in the two irrigated villages, two types of peculiar plots were reported--one having peculiar situation and the other having mango groves. In Waghode, nine of the total sample cultivators reported equal number of plots, having these two types of peculiar characteristics. The total area of such plots was 10.44 acres. In Rozode, however, only one cultivator reported a plot of this type, having a small area of 0.13 acre only. In both the villages, the proportion of area of such plots to the total cultivated area was very minor.

In Waghode, it was only 2.98 per cent. In Rozode it was almost negligible--0.05 per cent.

In Waghode, three of the eight cultivators reported an equal number of plots (3.54 acres) having peculiar situation (Case Studies W 1, W 23 and W 32). One of the three plots (0.13 acre) was situated on the right bank of the Suki river, which flows east-west to the northern boundary of the village land (Case Study W 1). The land in the plot suffered from constant erosion from the flood water and had become so poor that except jowar no other crop could be grown on it. The cultivator, therefore, could not accept any rotation on the plot and was required to grow jowar continuously. The remaining two plots having a total area of 3.41 acres were situated adjacent to the village (Case Studies W 23 and W 32). Because of their proximity to the village, the cultivators could not grow crops like groundnut and cotton on such plots. They were required to grow jowar continuously. Two of these cultivators who had larger land-holdings grew jowar only as a fodder crop (Case Studies W 23 and W 32). The remaining third cultivator took it to get grains as his total land-holding was very small and the requirement of food considerably large (Case Study W 1).

The remaining cultivators reported six plots (6.90 acres) under mango groves (Case Studies W 3, W 8, W 19, W 29, W 30 and W 31). It was pointed out by these cultivators that under the thick shade of the mango trees, no crop could be properly grown. The crops taken on such lands got stunted and did not give satisfactory yields. In such cases, therefore, the cultivators preferred to follow a continuous cropping of jowar for fodder.

In all the six plots at Waghode the cultivators grew jowar continuously as fodder crop. They could not follow any crop-rotation on such plots.

In Rozode, the only plot of this type, reported by a cultivator, was situated on the bank of a big stream (Case Study R 1). It was subjected to continuous erosion and hence its land was very poor in quality. It was not suited to any crop except jowar. The cultivator, therefore, was required to grow jowar on this plot (0.13 acre) continuously year after year. The other reason was that he was a small cultivator, having a land-holding of 0.50 acre only.

Thus, in both the irrigated villages, the peculiar plots were such that no cultivator could follow any crop rotation on them. They were all required to grow jowar continuously year after year.

Summary

The basic approach of the cultivators--both in the dry as well as the irrigated villages--was subsistence oriented. They first aimed at the minimum security of food and then tried to maximize their cash-income. Requirement of food, therefore, had a considerable influence on their rotation-plans. However, requirement of food alone did not determine the entire rotation-programme. Along with requirement of food, the other factors like soil-composition of land-holding, irrigation facilities, supply of home-collected manure and size of holding, were taken into consideration. In fact the composite effect of these factors determined the rotation-programmes of majority of the

cultivators. The composite effect of the basic factors was different for different cultivators. No two cultivators were exactly alike in respect of all the basic factors and other things. The accepted rotation-programmes, therefore, differed from cultivator to cultivator according to the composite effect of the basic factors. This was true for all the cultivators who pursued cultivation as the main occupation and depended for their food requirements mainly on their lands. In the case of the cultivators following agriculture as the subsidiary occupation and not wholly depending on their lands for food, the composite effect of the basic factors appeared to have a minor play in determining their rotation-programmes. In such cases, the rotation-programmes were largely determined by the general economic conditions of the cultivators.

CHAPTER VI

THE CULTIVATORS, CROP-ROTATIONS, AND DEVIATIONS

As seen earlier, the cultivators are required to decide upon the rotation-plan and its implementation into year to year cropping. In the preceding chapter, it is observed that the rotations are determined, after taking into consideration the various factors, such as food requirement, soil composition, manure and water supply and size of land-holding etc. Once the rotation-plan is determined, the cultivators try to adhere to it, to the extent possible, in their annual cropping. The annual cropping programmes, however, are affected by many and varied factors, over which, an individual cultivator may or may not have any control. In some years, therefore, situations may and do arise that the cultivators cannot adhere to the cropping due as per the accepted rotations and are required to deviate. Deviation, thus, can be defined as a break in the rotation, brought about by growing some other crop in the place of the due crop.

The factors causing deviations may be classified into two broad groups:

- (1) The factors inherent in the rotation-plan itself; and
- (2) The factors external to the rotation-plan.

It is observed that in certain years, the accepted rotation-plan itself, develops an area imbalance between different crops and causes deviations. It is observed in the preceding chapter

that the cultivator allocates his land to different crops through the accepted rotations and tries to secure the stable maximum income over years. He makes the selection of rotations in such a way that the required area balance between the cash and food-crops and also between different cash or different food-crops is kept over most of the years of the rotation cycle. However, in some years, because of the various types of the rotations accepted and the sequence of different crops in each of these, the area balance between different crops gets disturbed. In the course of rotation cycle, a large proportion of the area may become due under the cash-crops alone at the cost of the food-crops or vice versa. A similar type of area imbalance may occur between different cash or different food-crops as well. In such situations, the cultivator is required to deviate to correct the imbalance. The cultivators reported that such deviations are foreseen and planned along with the accepted rotations. These are, therefore, inherent in the rotation-plan itself, thought over for a period of several years.

The external factors causing deviations are obvious. These may be of varied types, concerning climate, resources, requirements and prices etc. The deviations caused by such external factors will be discussed in the following chapter. In the present chapter, the deviations caused by the rotation-plan itself are dealt with.

As seen earlier, the basic approach of the cultivators is to secure minimum food for family and maximum cash-income. This aim constitutes the main basis of formulating the rotation-plan.

Almost all the cultivators choose the rotations, keeping this dual aim in view. The same aim continues to dictate the deviations as well, caused by both the inherent and the external factors. However, the deviations caused by the external factors are different from the deviations occurring as a result of rotation-plans. The difference lies in the resource position of the cultivators. In respect of the deviations caused by the rotation-plans, the resource position of the cultivators does not change and the deviations are made to correct the imbalances in the cropping dictated by the rotation-plans. In respect of the deviations caused by the external factors, on the other hand, the resource position itself changes, and the deviations are undertaken to bring about a balance between the resources and thereby to attain the maximum level of income. If the changes in the resource position happen to be of a long term nature, the cultivators are likely to think of rotation-plans afresh, rather than of annual cropping. On the other hand, if the changes are of short-term the cultivators may not disturb the long-term rotation-plans, but make the required changes in the annual cropping through deviations and attain the maximum level of income in the changed circumstances. Thus, it may be said that the deviations caused by the inherent factors are complementary to the rotation-plans; and the deviations caused by the external factors are complementary to the resources.

6.1. Total Deviated Area

The total deviated area in each year at the dry and the irrigated villages is given in Table 6.1. It can be seen from

Table 6.1 : Total Deviated Area in the Dry and the Irrigated Villages in the Four Years (1960-61 to 1963-64)

Village	Area in Acres			
	1960-61	1961-62	1962-63	1963-64
Dry Villages:				
Khirode	6.66	16.97	14.98	52.10
Vivare	9.86	24.81	27.79	64.42
Irrigated Villages:				
Waghode	28.80	54.79	48.22	74.48
Rozode	4.41	33.97	26.26	31.13

the Table that the deviated area was comparatively more in the irrigated villages, particularly in Waghode, than that in the dry villages. The area deviated due to the rotation-plan itself and its proportion to the total deviated area in each year are given in Table 6.2. The area deviated because of the rotation-plans was also higher in the irrigated villages. This might be largely because the rotations accepted in the irrigated villages were of varied types than those in the dry villages.

6.2. Deviations Caused by the Rotation-Plans

It appears paradoxical that the accepted rotation-plan itself causes deviations in certain years. But it is found to be a fact reported by the cultivators in both the dry and the irrigated villages. It is observed from the data that the rotation-plan necessitates deviations in two ways:

- (1) by developing an area imbalance between food and

Table 6.2 : Total Deviated Area and the Area Deviated Due to Imbalance Caused by the Rotation-plans of the Cultivators in the Dry and the Irrigated Villages (1960-61 to 1963-64) (Area in Acres)

Village	1960-61			1961-62			1962-63			1963-64		
	Total deviated area	Area deviated due to rotations	Pro-portion of 2 to 1	Total deviated area	Area deviated due to rotations	Pro-portion of 2 to 1	Total deviated area	Area deviated due to rotations	Pro-portion of 2 to 1	Total deviated area	Area deviated due to rotations	Pro-portion of 2 to 1
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Dry villages :												
Khirode	6.66	3.25	48.80	16.97	7.21	42.49	14.98	4.80	32.04	52.10	5.15	9.88
Vivare	9.86	2.30	23.32	24.81	3.51	14.15	27.79	12.70	45.70	64.42	13.32	20.68
Irrigated villages:												
Waghode	28.80	10.11	35.10	54.79	20.64	37.67	48.22	20.03	41.54	74.48	0.88	1.18
Rozode	4.41	-	-	33.97	18.07	53.20	26.26	4.55	17.33	31.13	1.25	4.02

cash-crops, or between different food-crops and different cash-crops; and

(2) by giving a preference in area allotment to one of the crops included in the accepted rotations.

Of the two, the first type of deviations were more common and claimed a large proportion of the total area deviated because of the rotation-plans.

6.2.1. Imbalance in Area Allotment

As stated earlier, the accepted rotations when followed year after year, develop an area imbalance between different crops and the cultivators are required to break away from them to set correct the balance. Such situations largely occur with the medium and the large cultivators, who follow a combination of various types of rotations on their land-holdings. The problem of such deviations usually does not arise in the case of the small cultivators, who practise a single rotation on their entire land-holding. Similar is the case with the cultivators following two-year rotations, each including a cash and a food-crop. In all other cases, such situations do occur in certain years of the rotation period, and the cultivators are required to deviate.

The imbalance developed by the rotation-plans may be in favour of either cash or food-crops, or one of the different food or cash-crops included in the accepted rotations. The deviations caused by such imbalance, therefore, may be of four types:

- (1) deviation from food to cash-crop;
- (2) deviation from cash to food-crop;

(3) deviation from one food-crop to another; and

(4) deviation from one cash-crop to another.

We discuss below, each of these types of deviations, separately for the dry and the irrigated villages.

6.2.2. Deviations Necessitated by the Rotation-Plans in the Dry Villages

In Table 6.3, are presented the details of the area deviated on account of the imbalance developed due to rotation-plans, in the two dry villages. It was observed from the data that during the four-year period, six cultivators from Khirode, were required to deviate on this account. Of these, one each deviated in 1960-61, and 1962-63, and two each, in 1961-62 and 1963-64. Of the six cultivators, three had to deviate from food to cash-crops (Case Studies K 10, K 19, and K 27); two, from cash to food-crops (Case Studies K 9 and K 23); and one, from one food-crop to another (Case Study K 29).

In Vivare, no deviation of this type was reported in the first two years--1960-61 and 1961-62. In the remaining two years, however, three cultivators reported such deviations on five of their plots. Two of them deviated in both the years (1962-63 and 1963-64). The total area deviated was 8.13 acres in 1962-63 and 7.40 acres in 1963-64 (see Table 6.3). Of the two cultivators deviating in the last two years, one deviated from food to cash-crops in both the years (Case Study V 26); while the other, from food to cash-crop in one year (1962-63), and from cash to food-crop, in another year (1963-64) (Case Study V 30). The remaining cultivator deviated from cash to

Table 6.3 : Deviations Caused by the Rotation-plans of the Cultivators in the Dry Villages (1960-61 to 1963-64)

Village	1960-61				1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Khirode	1	1.50	Jowar	Groundnut	1	4.33	Jowar	Cotton	1	2.80	Groundnut	Jowar	1	1.30	Wheat	Jowar
	-	-	-	-	1	1.18	Jowar	Groundnut	-	-	-	-	1	1.48	Cotton	Jowar
Total	1	1.50	-	-	2	5.51	-	-	1	2.80	-	-	2	2.78	-	-
Vivare	-	-	-	-	-	-	-	-	2	6.05	Wheat	Cotton	2	3.50	Cotton	Jowar
	-	-	-	-	-	-	-	-	1	2.08	Jowar	Wheat	1	3.90	Jowar	Cotton
Total	-	-	-	-	-	-	-	-	3	8.13	-	-	3	7.40	-	-

food-crop in 1963-64 (Case Study V 15). One of these three cultivators was also required to deviate from one food-crop to another in 1962-63 (Case Study V 30). It may be noted that in either of the two dry villages, no case of deviation from one cash-crop to another was reported. In the following, each type of these deviations is illustrated by referring to one of the cases in detail.

Deviations from Food to Cash-Crops :- Of the cultivators reporting such deviations, one cultivator from Khirode, who was required to deviate from jowar to cotton in 1961-62, provided a good example (Case Study K 27). He had accepted two and four-year rotations on three plots of his land-holding. On his two plots (3.00 and 4.33 acres) he followed the G-J rotation, and on the third plot (5.45 acres), the C-C-C-J rotation. The average area under the three crops, over the period of rotation cycle, came to 5.02 acres under jowar, 4.09 acres under cotton and 3.67 acres under groundnut. This means, he devoted every year about half of his total land to jowar and about one-fourth, each to cotton and groundnut. In the course of rotations, however, this balance of area between the three crops got disturbed--more than three-fourths of the land (9.78 acres) becoming due for jowar alone. This happens in every fourth year, when jowar becomes due on two of his plots (4.33 and 5.45 acres) according to the accepted rotation-plan.¹ Such was the case in

1	Plot	Rotation	Years				
			1st	2nd	3rd	4th	5th etc.
	3.00	G-J	J	G	J	G	J
	4.33	G-J	G	J	G	J	G
	5.45	C-C-C-J	C	C	C	J	C

1961-62. Jowar was due on the plot of 4.33 acres according to the G-J rotation and on the plot of 5.45 acres, according to the C-C-C-J rotation. The cultivator reported that, this much area under jowar was far in excess of the area required by him, to meet the annual food and fodder needs. He was, therefore, required to deviate from jowar on one of the plots. He preferred to break the two-year rotation on 4.33 acre plot and took cotton on it instead of jowar. He deviated to cotton so as to maintain the usual balance between the three crops. Similar were the cases of the other cultivators who deviated from food to cash-crops in different years. (Case Studies K 10, K 19, V 26 and V 30.) They all had an excessive area under the food-crops like jowar and wheat and hence deviated to the cash-crops like cotton and groundnut.

Deviations from Cash to Food-Crops :- Two cultivators, each from Khirode and Vivare, reported such deviations. Of these, the cultivator from Khirode, who was required to deviate in 1962-63, provided a good case for illustration (Case Study K 23). He owned a land-holding of 14.16 acres, divided into five plots. On two of his plots of 1.83 and 3.20 acres, he followed the G-C-J rotation; on one plot of 3.50 acres, the G-J-C rotation; and on the remaining two plots of 2.80 and 2.83 acres, the G-J rotation. In each of the rotation accepted by him, jowar was one of the crops. He selected such rotations mainly because his family was quite big (twelve members), and his annual food requirement was as large as 50 maunds of jowar. He was, therefore, required to devote large area for the food-

crop. The average area under jowar, over the period of the rotation cycle, came to 5.66 acres per year. However, in some years during the course of the accepted rotation-plan, the area under jowar falls short and the cultivator is required to deviate. In the case of this cultivator, such a situation arises twice in the six-year period of the rotation cycle, when jowar becomes due only on one plot of 2.80 or 2.83 acres. Such a situation occurred in 1962-63, when jowar was due only on one plot having an area of 2.83 acres. The cultivator reported that this much area was not adequate to meet his annual food needs. He was, therefore, required to deviate on one of his other plots to grow more jowar. He deviated on the plot of 2.80 acres and took jowar instead of groundnut which was due on it. He, thus, took jowar on 5.63 acres in 1962-63, to meet the food needs of the family. The cases of the other cultivators reporting such deviations, were similar to this. They were also faced with a similar situation and were required to deviate from the cash-crops like cotton and groundnut to jowar (Case Studies K 9, V 15, and V 30).

Deviations from One Food-Crop to Another :- Two cultivators, one each from Khirode and Vivare, reported this type of deviations (Case Studies K 29 and V 30). Of the two, the cultivator from Vivare provided an interesting case. He was a big cultivator, having a land-holding of 47.30 acres, divided into ten plots. He practised two types of rotations--the W-C-J rotation on three of his plots and the W-C-C-J rotation, on the remaining seven plots. The areas under the three crops averaged

over the period of rotation cycle, came to about 12.90 acres each under jowar and wheat and 21.23 acres under cotton. Thus, through the two accepted rotations, the cultivator allocated his land to the three crops in such a way that every year about one-fourth of the land went each to jowar and wheat, and the remaining one-half, to cotton. He tried to maintain this balance in area allotment as far as possible. In 1962-63, however, the area balance was slightly disturbed--the area under jowar and wheat coming in excess at the cost of cotton. To set correct this imbalance, the cultivator was required to deviate on two plots, from wheat to cotton on one plot and from jowar to wheat on another. It is interesting to see how he restored the usual balance between the three crops through these deviations. By deviating from wheat to cotton on the plot of 4.55 acres, he brought the area under cotton to its usual level of 22 to 23 acres. And by deviating from jowar to wheat on the plot of 2.08 acres, he could bring the areas under jowar and wheat to their usual level of 12 to 13 acres.

The case of the cultivator in Khirode was slightly different. In his case, the area due for jowar in 1963-64 was not adequate to meet his food and fodder needs. He, therefore, deviated on the plot of 1.30 acres and took jowar in the place of wheat which was due on it. He preferred to deviate on this particular plot as it had irrigation facility and was convenient to irrigate the jowar crop whenever needed. In 1963-64 particularly, because of the scanty rainfall during the sowing season, he felt

that such a need might arise. As a safety measure, therefore, he preferred to deviate from wheat to jowar on this particular plot.

Cultivators Not Deviating In Spite of the Need :- It is likely that some of the cultivators may not deviate, even though the need for such deviations has arisen because of the accepted rotation-plans. They may do this either by continuing with the imbalance developed or may correct it by other ways than resorting to deviations. At least one case of such type was reported in Khirode (Case Study K 24). This cultivator would have deviated in two years (1961-62 and 1962-63), but for the leased-in land. The accepted rotations and the deviations in them during the previous years, had developed an imbalance in his crop-pattern and deviations on some area were almost forced. In 1961-62, there was an excess of area under food-crops and shortage in the area of groundnut. Deviations on some of the plots to put larger area under groundnut were inevitable but he averted those, as he, in a joint venture with his two cultivator friends, could lease-in 17.00 acres of land, auctioned by the Village Grampanchayat. The entire area of the leased-in land was put to groundnut and hence he was not required to deviate on his own land to grow more groundnut. Similar was the case in 1962-63 as well. In this year all the area of his land-holding was due for the cash-crops--cotton and groundnut--and there was no plot left to take jowar. But in this year also, he along with the same cultivator friends, leased-in the same land and devoted a major portion of it to jowar. In both the years,

deviations were forced on him but he did not deviate as he could grow the required crops on the leased-in land. In both the villages there was no case of a cultivator who preferred to continue with the imbalance developed due to the rotation-plans.

6.2.3. Deviations Necessitated by the Rotation-Plan in the Irrigated Villages

In Table 6.4, are given the details of the area deviated because of the imbalance developed due to the rotation-plans in the two irrigated villages. It can be seen from the Table that more deviations of this type occurred in Waghode. During the four-year period, ten cultivators from this village reported such deviations. The area deviated was about 10.11 acres in 1960-61, 20.64 acres in 1961-62, 20.03 acres in 1962-63 and 0.88 acre in 1963-64. Four of these ten cultivators were required to deviate continuously for two or three years (Case Studies W 20, W 27, W 29 and W 32). The remaining six cultivators, however, deviated only for one year (Case Studies W 9, W 12, W 19, W 21, W 24 and W 31). Most of these cultivators deviated from cash to food-crops. The area under such deviations was about 6.38 acres in 1960-61, 17.24 acres in 1961-62, 5.20 acres in 1962-63, and 0.88 acre in 1963-64. The area under other types of deviations such as from food to cash-crops and from one food-crop to another was comparatively very small. The area under the deviations from one cash-crop to another was relatively large in 1962-63.

In Rozode, no cultivator reported this type of deviation in 1960-61. In the remaining three years, however, seven cultivators reported such deviations on eleven of their plots. The

Table 6.4 : Deviations Caused by the Rotation-plans of the Cultivators in the Irrigated Villages (1960-61 to 1963-64)

Village	1960-61				1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Waghode	1	1.95	Cotton	Jowar	1	1.30	Cotton	Jowar	1	1.00	Jowar	Groundnut	1	0.88	'Nawati' banana	Jowar
	3	4.43	Cotton	Wheat	2	3.38	Cotton	Jowar	3	9.83	'Nawati' banana	Cotton	-	-	-	-
	2	2.73	Jowar	Wheat	2	2.00	Cotton	Wheat	3	5.20	Cotton	Jowar	-	-	-	-
	1	1.00	Jowar	Groundnut	1	2.20	Jowar	Groundnut	3	4.00	Cotton	Groundnut	-	-	-	-
	-	-	-	-	1	2.20	Groundnut	Cotton	-	-	-	-	-	-	-	-
	-	-	-	-	4	7.36	'Nawati' banana	Jowar	-	-	-	-	-	-	-	-
	-	-	-	-	1	2.20	'Nawati' banana OR Wheat	Jowar	-	-	-	-	-	-	-	-
Total	7	10.11	-	-	12	20.64	-	-	10	20.03	-	-	1	0.88	-	-
Rozode	-	-	-	-	1	1.40	'Nawati' banana OR Jowar	Cotton	2	4.55	Jowar	Groundnut	1	1.25	Jowar	'Nawati' banana
	-	-	-	-	1	1.23	Groundnut	Jowar	-	-	-	-	-	-	-	-
	-	-	-	-	1	1.65	Groundnut	Cotton	-	-	-	-	-	-	-	-
	-	-	-	-	1	6.40	Jowar	Groundnut	-	-	-	-	-	-	-	-
	-	-	-	-	3	6.26	Jowar	Cotton	-	-	-	-	-	-	-	-
	-	-	-	-	1	1.13	Jowar	Wheat	-	-	-	-	-	-	-	-
Total	-	-	-	-	8	18.07	-	-	2	4.55	-	-	1	1.25	-	-

area deviated was about 18.07 acres in 1961-62, 4.55 acres in 1962-63 and 1.25 acres in 1963-64. Two of these seven cultivators were required to deviate continuously for two years (Case Studies R 24 and R 25). The remaining cultivators deviated in one year only, 1961-62 (Case Studies R 10, R 14, R 23, R 28 and R 30). In this village, the deviations from food to cash-crops claimed larger areas than the other types of deviations. Thus, the area under such deviations was 12.66 acres in 1961-62; 4.55 acres in 1962-63 and 1.25 acres in 1963-64. The area under other types of deviations was comparatively small in each year. In the following, each type of these deviations is discussed by referring to one of the cases in detail.

Deviations from Food to Cash-Crops :- Seven cultivators, two from Waghode and five from Rozode, reported such deviations. One of the cultivators in Rozode, provided a good example of this type of deviation (Case Study R 28). This cultivator had a landholding of 12 acres, divided into three plots. On two of these (3.00 and 2.60 acres), he followed the three-year rotation of NB-JB-J; and on the remaining plot (6.40 acres), the two-year rotation of G-J. Through these rotations, the cultivator allocated his land to the three crops, keeping the required area balance between them. Thus, the averaged area over the rotation period was about 5.06 acres under jowar; 3.74 acres under banana; and 3.20 acres under groundnut. In the course of the rotation-plan, however, the area balance between the crops gets disturbed--food-crops getting the area far in excess than that of the cash-crops. This happens in two years in the six-year

period of the rotation-cycle, when jowar becomes due on two of his plots. Such a situation occurred in 1961-62, when jowar was due on the plot of 6.40 acres and also on the plot of 3.00 acres. The cultivator reported that this much area under jowar (9.48 acres) was in excess of the land required to meet his annual requirements of food and fodder. He, therefore, had to deviate on one of the two plots. He preferred to deviate on the plot of 6.40 acres and took groundnut instead of jowar, which was due. He deviated on this plot as it had no irrigation facility and was of lighter soil. He did not prefer to deviate and disturb the rotation of NB-JB-J, practised on the other plot of irrigated land. It was observed that the cultivators in the irrigated villages generally deviated on dry land and did not prefer to disturb the crop-rotations on irrigated area.

The other cultivators reporting this type of deviations were also faced with more or less similar situations and were required to deviate from the food-crop, jowar, to the cash-crops like cotton, groundnut, and banana (Case Studies W 27, W 31, R 14, R 24 and R 30).

Deviations from Cash to Food-Crops :- As pointed out earlier, the area under such deviations was comparatively large in Waghode. In Rozode, however, the area under such deviations was very small--1.23 acres reported by only one cultivator in 1961-62. In all, eleven cultivators, ten from Waghode and one from Rozode, reported such deviations. A good illustration of this type of deviation was found in Case Study W 9. This was a small cultivator, having a land-holding of 4.18 acres, distributed

into three plots. Of these, one plot of 1.63 acres had irrigation facility and hence he followed on it the three-year rotation of NB-JB-C. The remaining two plots were of dry land. He followed the two-year rotation of C-J, on both of them. These rotations and the deviations in them during the preceding years developed such a situation in 1961-62, that no plot of his land-holding was due for jowar. The entire holding was to go under the cash-crops--1.63 acres under banana, and the other two plots under cotton. In 1961-62, therefore, the cultivator had to deviate on one of the plots to grow jowar, to meet the family food needs. In the circumstances, he deviated on the plot of 1.30 acres and took jowar instead of cotton which was due. He preferred to deviate on this plot as it had relatively inferior quality of land than that in the other plot of dry land. He did not disturb the rotation practised on the plot of the irrigated land.

More or less similar were the cases of the other cultivators who were required to deviate from cash-crops like cotton, groundnut and banana to the food-crops like jowar and wheat. (Case Studies W 12, W 19, W 20, W 21, W 24, W 27, W 29, W 31, W 32 and R 23.) They all had an excessive area under the cash-crops and no or inadequate area under the food-crops. In order to meet the food requirements of the family, they were required to deviate from the cash-crops and grow jowar or wheat.

Deviations from One Food-Crop to Another :- Such deviations played a comparatively minor role in both the irrigated villages. Three cultivators, two from Waghode and one from Rozode, reported

this type of deviations in 1960-61 and 1961-62 respectively (Case Studies W 31, W 32 and R 10). All the three cultivators deviated from jowar to wheat on three of their plots. The deviated area was 2.73 acres in Waghode and 1.13 acres in Rozode. The case of the cultivator in Rozode was a good illustration of this type of deviation (Case Study R 10). This was a small cultivator, having a land-holding of 5.68 acres, divided into three plots. He practised the dual rotations of C-J or NB-JB-C on two of his plots (1.40 and 1.30 acres), and the two-year rotation of C-J, on the remaining plot (3.15 acres) of his land-holding. Because of the dualism in the accepted rotation-plan, the situation so developed in 1961-62, that all the three plots of his land-holding, were due for jowar alone. In the preceding year, all the area was due for cotton. But the cultivator did not deviate on any plot as he could grow jowar as a mixed crop along with cotton, to meet his family consumption needs. The situation in 1961-62, however, was different. He had to deviate to maintain the usual level of his total income from the land. He deviated on two of his plots--on one (1.40 acres) from jowar to cotton and on the other (1.13 acres) from jowar to wheat. He could not deviate to cotton on both the plots because of the constraint from manure supply. He did not have sufficient manure to apply to both the plots and put them under cotton. He, therefore, preferred to manure one plot of 1.40 acres, and repeated cotton on it instead of jowar. On the other plot (1.13 acres) he preferred to deviate to wheat, mainly because it had deep-black soil, much suited to wheat. He could not deviate to

groundnut on it as it was ^{of}/deep-black land, nor could he keep it under the due crop, jowar, as in that case the area under jowar would have remained very large. He, therefore, deviated to wheat and practised double cropping--growing mug as a catch crop in the kharif season.

The other two cultivators reporting such deviations were faced with similar situations and were required to deviate from jowar to wheat (Case Studies W 31 and W 32).

Deviations from One Cash-Crop to Another :- Such deviations were reported in both the irrigated villages. Five cultivators, four from Waghode and one from Rozode, were required to resort to this type of deviation in different years (Case Studies W 20, W 27, W 29, W 32 and R 24). A good illustration of such deviations was found in Case Study W 32. This was a big cultivator, having a land-holding of more than 70 acres. The area balance between different crops, maintained through the accepted crop-rotations, got disturbed in 1962-63, when the area due for 'Nawati' banana came much in excess at the cost of cotton. The area due under 'Nawati' banana for this year was 17.08 acres. The area due for banana as such, taking both 'Nawati' and 'Junar' banana together, was as high as 32.11 acres in this year. As against this, the area due for cotton came as low as 7.31 acres only. In order to correct the imbalance between the cash-crops, he was required to deviate. Moreover, it was not possible for him to take banana on all the area due for it, because of its high cost of cultivation and manure requirement. He had to reduce the area under banana. He, therefore, deviated on two

plots (3.43 and 3.05 acres) and grew cotton instead of banana which was due on them. Through these deviations he brought down the area under 'Nawati' banana to 11.60 acres and pushed up the area under cotton to 13.79 acres. The area under banana, both 'Nawati' and 'Junar' banana taken together, was brought down to 26.63 acres. He preferred to deviate on these two plots, mainly because the rotations practised on these, were already disturbed in the preceding year.

The other cultivators reporting such deviations were also faced with similar situations and were required to deviate from one cash-crop to another. Thus, two of these other cultivators were required to deviate from groundnut to cotton, and one each from cotton to groundnut and from banana to cotton.

Thus, in the case of some cultivators, the accepted rotation-plan itself was responsible for deviations in both the dry and the irrigated villages. In the dry villages, the cultivators largely resorted to deviations on the inferior type of land. In the irrigated villages, on the other hand, they mostly deviated on the dry land. They did not prefer to disturb the rotations on the irrigated land, as far as possible. The general tendency observed in all the villages was to attain the usual level of maximum income from the land with minimum disturbance.

6.2.4. Deviations Necessitated Because of Preference for a Crop

Some of the cultivators accept rotations with reservations, in the form of giving a preference in area allotment to one of the crops included in it. They try to allot more area every year to the preferred crop, over other crops included in the accepted

rotation. This causes deviations in the form of cross-cropping and the interplay of the other unaccepted rotations. This mainly happens with the small and the medium cultivators who have limited land-holdings of one or two fragments, and who divide it into several plots to grow different crops. The preferential treatment given to one of the crops in the rotation causes unequal division of the fragment every year. The size of plots cannot be kept equal and the same every year. It has to be changed from year to year, in order to make provision for the larger area to the preferred crop and to keep on the rotation cycle. The accepted rotation, though practised every year, never covers the entire area of the fragment. On some portion of it, deviations become inevitable.

Such deviations were reported in the dry villages only. In the irrigated villages, no cultivator reported this type of deviations. Even in the dry villages, only seven cultivators--three in Khirode (Case Studies K 5, K 14 and K 18); and four in Vivare (Case Studies V 7, V 12, V 13 and V 19)--reported such deviations. In Table 6.5 is shown the deviated area of these cultivators in each of the four years. It may be seen that in both the villages the area deviated was small and formed a very low proportion of the total deviated area. In the following, this type of deviations are illustrated by referring to one of the cases.

A good example of such deviations is provided in Case Study K 14. This cultivator had a land-holding of only one fragment, measuring 6.63 acres. He divided this fragment into three plots

Table 6.5 : Deviations Caused by Preferential Treatment Given to a Crop in the Rotation-plans of the Cultivators in the Dry Villages (1960-61 to 1963-64)

Village	1960-61				1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Khirode	2	0.30	Groundnut	Jowar	1	0.70	Jowar	Groundnut	3	1.00	Jowar	Groundnut	3	1.72	Jowar	Cotton
	1	0.45	Jowar	Groundnut	1	1.00	Jowar	Cotton	1	1.00	Jowar	Cotton	2	0.65	Jowar	Groundnut
	1	1.00	Jowar	Cotton	-	-	-	-	-	-	-	-	-	-	-	-
Total	4	1.75	-	-	2	1.70	-	-	4	2.00	-	-	5	2.37	-	-
Vivare	1	2.00	Jowar	Cotton	2	0.48	Jowar	Groundnut	1	0.72	Groundnut	Cotton	2	0.90	Cotton	Jowar
	1	0.30	Jowar	Groundnut	2	0.90	Groundnut	Cotton	3	2.55	Jowar	Cotton	2	0.90	Groundnut	Jowar
	-	-	-	-	1	0.13	Cotton	Groundnut	1	0.13	Cotton	Jowar	1	1.00	Cotton	Wheat
	-	-	-	-	1	2.00	Jowar	Cotton	2	0.37	Jowar	Groundnut	2	0.37	Jowar	Groundnut
	-	-	-	-	-	-	-	-	1	0.05	Wheat	Jowar	1	0.75	Wheat	Cotton
	-	-	-	-	-	-	-	-	1	0.75	Jowar	Wheat	1	2.00	Jowar	Cotton
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	2	2.30	-	-	6	3.51	-	-	9	4.57	-	-	9	5.92	-	-

every year, to grow three different crops--jowar, groundnut and cotton--according to the accepted three-year rotation of G-C-J. Of the three crops included in the rotation he had a clear preference for groundnut. He maintained that "groundnut is a less risky crop and offers a steadier flow of income from the land." Cotton he did not prefer much, firstly, "because it is relatively more risky than groundnut; and secondly, it requires manure, the supply of which is limited in my case." He, therefore, preferred to devote more of his land to groundnut every year. The crops grown and the area devoted to each of them in the four years, were as follows:

1960-61		1961-62		1962-63		1963-64	
Groundnut	3.20	Cotton	2.00	Jowar	2.20	Groundnut	2.63
Cotton	1.70	Jowar	2.00	Groundnut	3.00	Cotton	2.00
Jowar	1.73	Groundnut	2.63	Cotton	1.43	Jowar	2.00

The area devoted to groundnut was larger than that of the other two crops in all the four years. According to the accepted rotation, the area under jowar in 1960-61 (1.73 acres) was the only area due for groundnut in the following year. But in 1961-62, he devoted 2.63 acres to groundnut, 0.90 acre more than what was due to it according to the rotation. The area of 0.90 acre was taken from jowar which was due on it according to the rotation. On this area of 0.90 acre, therefore, there occurred a deviation from the accepted rotation. Similarly, the whole area under groundnut in 1960-61 was due for cotton in the next

year. But in 1961-62 he took cotton on 2.00 acres only. The remaining area (1.20 acres) was put to jowar, thus, causing a deviation from the rotation. Similar were the deviations in the remaining two years as well. These will be more clear from the following table wherein his fragment of land is divided into several plots according to the sequence of crops followed on them in the four-year period.

1960-61	1961-62	1962-63	1963-64
Groundnut 3.20	Cotton 2.00	Jowar 2.00	Groundnut 2.00
	Jowar 1.20	Jowar 0.20	Groundnut 0.20
		Groundnut 1.00	Groundnut 0.43
			Cotton 0.57
Cotton 1.70	Jowar 0.80	Groundnut 0.80	Cotton 0.80
	Groundnut 0.90	Groundnut 0.90	Cotton 0.63
			Jowar 0.27
Jowar 1.73	Groundnut 1.73	Groundnut 0.30	Jowar 0.30
		Cotton 1.43	Jowar 1.43

It can be seen that the accepted rotation of G-C-J, was followed on about 4.23 acres of the land-holding. The remaining area of 2.40 acres was subjected to deviations, both of cross-cropping and the interplay of other unaccepted rotations.

The cases of the other cultivators in Khirode and Vivare were similar. All the deviations reported by them during the four years were caused by the preferential treatment given to one of the crops included in the accepted rotations.

In the case of some cultivators the preferential treatment given to one crop may lead to continuous cropping of it on some portion of the land-holding. This happened in the case of two cultivators, one each in Khirode and Vivare (Case Studies K 5 and V 13). The case of the cultivator in Khirode may serve as a good illustration of this type. He had a land-holding of two fragments. Both the fragments suffered from locational disadvantages, because of which he was required to accept the C-J rotation on them. He could not grow groundnut on both of them and hence had to give a marked preference to cotton--the only cash-crop which he could grow. He divided his larger fragment of 2.53 acres into two plots every year. But the division was not the same every year as he devoted larger area to cotton. The crops grown on this fragment and the area devoted to each of them in the four years were as follows:

1960-61		1961-62		1962-63		1963-64	
Cotton	1.40	Jowar	0.40	Cotton	1.40	Jowar	0.40
Jowar	1.13	Cotton	2.13	Jowar	1.13	Cotton	2.13

The area put under cotton was larger than jowar in every year. According to the accepted rotation the area under jowar in 1960-61 (1.13 acres) was the only area due for cotton in the following year. But he devoted 2.13 acres to cotton in 1961-62, thus deviating on the area of 1.00 acre. He took cotton on this area, instead of jowar which was due on it according to the accepted rotation. The cotton crop thus got repeated on this

area. The same was the case in other years as well. As a result, cotton got repeated on an area of 1.00 acre in all the four years. This may be explained by dividing the fragment into plots according to the sequence of crops followed on them.

1960-61		1961-62		1962-63		1963-64	
Cotton	0.40	Jowar	0.40	Cotton	0.40	Jowar	0.40
Cotton	1.00	Cotton	1.00	Cotton	1.00	Cotton	1.00
Jowar	1.13	Cotton	1.13	Jowar	1.13	Cotton	1.13

It can be seen that on the area of one acre, cotton was repeated throughout the period of four years. On the remaining area of the fragment (1.53 acres), however, the accepted rotation was followed in all the four years.

The case of the cultivator in Vivare (Case Study V 13) was more or less similar. In his case also, cotton was continuously repeated on about 2.00 acres of his land and groundnut on about 0.30 acre.

Thus, a preferential treatment given to one of the crops in the rotation leads to deviations and/or continuous cropping of it on some portion of the area. However, the cultivators reporting such cases were a few in both the dry villages. The area deviated because of such crop-rotations was also comparatively very small in both the villages. In the irrigated villages no cultivator reported such type of deviations.

Summary

The cultivators are required to decide upon the rotation-

plan and its implementation into annual cropping. Once the rotation-plan is determined, they adhere to it, to the extent possible, in the year to year cropping. In some years, however, situations so arise that the cultivators cannot adhere to the cropping in the accepted rotation-plans and are required to deviate. In some cases the accepted rotation-plans themselves develop such situations and cause deviations. The rotation-plans necessitate deviations in two ways: (a) by developing an area imbalance between food and cash-crops or between different food-crops and different cash-crops; and (b) by giving a preference in area allotment to one of the crops included in the accepted crop-rotations. Of the two, the first kind of deviations were more common and claimed a large proportion of the total deviated area in the dry as well as the irrigated villages.

CHAPTER VII

THE CULTIVATORS AND DEVIATIONS

The deviations resulting from the rotation-plans of the cultivators are discussed in the preceding chapter. Those deviations are essentially corrective measures undertaken to set right the area imbalances developed because of the rotations themselves or to meet the area requirement under a preferred crop. Those deviations, thus, are inherent in the rotation-plans themselves. In the present chapter we deal with the deviations caused by the other factors, external to the rotation-programmes. These deviations also are corrective measures, but these are not so much related to the rotation-plans as such. These are undertaken to make the necessary adjustments in the annual cropping, in order to overcome the peculiar circumstances and situations, arising in a given year, because of the external factors.

The external factors causing such deviations may be broadly classified into five groups: (1) climatic changes--mainly rainfall; (2) changes in resource position--land, manure and water supply etc.; (3) changes in requirements such as food, fodder and cash; (4) changes in prices; and (5) others.

(1) In a particular year, the rainfall may be excessive or scanty, particularly in the sowing season, and may force the cultivators to adjust their annual cropping accordingly. In

such conditions, it does not remain feasible for the cultivators to follow the usual cropping of the rotation-plans and to attain the normal level of income through it. They are required to deviate in order to grow the crops more suited to the peculiar rainfall conditions of the year. It is the only alternative left for them to minimise the losses, which they may otherwise suffer. In such conditions, therefore, the cultivators behave in a peculiar way. They try to maximise their income by minimising the losses.

(2) The resource position of the cultivators may change in certain years. The land resource, for example, changes because of leasing-in and leasing-out and/or purchase and sale of land. The total area of land-holding increases because of leasing-in and purchase of land. The increase brought about by the purchases of land is of permanent nature and hence may affect the rotation-plan itself which have to be re-casted. The increase in land area due to leasing-in has to be differentiated on the basis of terms of lease. If the land is leased-in on long-term basis, it will have almost an identical effect like the purchases of land. On the other hand, if the land is leased-in for a short-term, of an year or two, the increase in total area will be temporary and it may not affect the rotation-plans as such. Nevertheless, it will cause deviations, which the cultivators will be required to resort to attain the maximum income on a level, higher than the previous.

Similar is the case when the total area of land-holding decreases as a result of leasing-out or sale of land. If the

land is sold or leased-out on long-term basis, it will cause changes in the rotation-programme itself; and if it is leased-out for a short-term, it will cause deviations required to make the adjustments in the annual cropping, so as to attain the maximum income on the level lower than the previous. The changes in the rotation-plans that may occur because of sale and purchase and leasing-in and leasing-out of land for the long-term, are not dealt with here, as the present data pertain to a short period of four years.

The changes in the other resources such as manure and water supply etc. are likely to be of temporary nature, and cause deviations, only in the annual cropping.

(3) The cultivators' requirements, particularly of cash, may change in certain years. They may require more cash-income in a particular year to meet some extra needs, such as marriage expenses, repayment of loans, medical expenses etc. In such circumstances they do deviate from their usual rotation-programmes, to put larger areas under cash-crops. The requirements of food and fodder, however, do not change much in the short term period, and hence the deviations reported on account of these are rare.

(4) The prices of different crops may fluctuate in certain years and affect the cropping of some cultivators. If the rise in price of a crop is considerable in a certain year, it may induce some of the cultivators to devote larger area to that particular crop, by deviating from the usual rotation-programmes. Such deviations, however, are rare both in the dry

and the irrigated villages.

(5) The last group consisting of other factors which cannot be covered in any of the above headings. It mainly includes the deviations caused by interactions of deviations, and other stray factors.

7.1. Area Deviated by the External Factors

The total area deviated by the external factors in each year, at the dry and the irrigated villages is given in Table 7.1. The proportions of such areas to the total deviated areas are also shown in the same Table. It can be seen from the Table, that in the first three years, 1960-61 to 1962-63, the area deviated by the external factors was comparatively small and formed a low proportion to the total deviated area. In 1963-64, however, the total area deviated by the external factors was considerably large in all the four villages. In this year, the total deviated area was large mainly because of the deviations caused by the external factors. Thus, in the three villages--Khirode, Waghode and Rozode--the proportion of such areas to the total deviated areas was more than 90 per cent. In Vivare alone, it was relatively low--about 79.32 per cent of the total deviated area.

In the following sections we take each of the external factors separately and discuss in detail the deviations caused by them.

7.2. Deviations Caused by the Climatic Factors

The climatic factors include three factors--temperature, humidity and rainfall. Of these, the first two are of less

Table 7.1 : Total Deviated Area and the Area Deviated due to External Factors in the Dry and the Irrigated Villages (1960-61 to 1963-64) (Area in Acres)

Village	1960-61			1961-62			1962-63			1963-64		
	Total deviated area (1)	Area deviated due to external factors (2)	Pro-portion of 2 to 1 (3)	Total deviated area (1)	Area deviated due to external factors (2)	Pro-portion of 2 to 1 (3)	Total deviated area (1)	Area deviated due to external factors (2)	Pro-portion of 2 to 1 (3)	Total deviated area (1)	Area deviated due to external factors (2)	Pro-portion of 2 to 1 (3)
Dry villages:												
Khirode	6.66	3.41	51.20	16.97	9.76	57.51	14.98	10.18	67.96	52.10	46.95	90.12
Vivare	9.86	7.56	76.68	24.81	21.30	85.85	27.79	15.09	54.30	64.42	51.10	79.32
Irrigated villages:												
Waghode	28.80	18.69	64.90	54.79	34.15	62.33	48.22	28.19	58.46	74.48	73.60	98.82
Rozode	4.41	4.41	100.00	33.97	15.90	46.80	26.26	21.71	82.67	31.13	29.88	95.98

importance as these do not change much from year to year and do not affect the decisions of cropping as such. These two factors, therefore, are not dealt with here. The third factor, (rainfall), however, is of vital importance for cropping, particularly in the dry areas. The vagaries of monsoon and its effects on cropping are widely known. The rainfall condition during the sowing season in particular, is of much importance as it affects the final choice of the crops to be grown. At times, the cultivators are required to deviate from their rotation-plans and grow other crops suited to the rainfall conditions of the year. This happens all the more with the two cash-crops--cotton and groundnut--which have to be sown earlier, at the beginning of the monsoon season only, to get better yield.

The cultivators reported that cotton when sown in the period of 'Mrug' constellation i.e. between 7th and 22nd June, gives comparatively higher yield. If it is sown later in the 'Aradra' and 'Punarvasu' constellations i.e. during the period between 23rd June and 15th July, it gives relatively low yield. It is pointed out that flowering of the late sown crop occurs in the period of 'Hasta' and 'Chitra' constellations i.e. in October and November, and is largely damaged by the heavy rains generally received during that period. This affects the yield of the crop much adversely. The experiments carried out at the different Research Stations in the Maharashtra State, to determine the optimum date for sowing cotton have also revealed that "early sowing of the crop, usually increases the yield

and sowing later than the normal season, reduces it."¹ It is reported that "early sowing has often been found to improve the quality of the produce also."² In the case of groundnut also the cultivators regarded early sowing more beneficial. If groundnut is sown in the 'Aradra' constellation i.e. at the end of June, it gives better yield. As regards groundnut, Sheshadri states that "from the experience of growers in most of the States, it is found that sowing of the rain-fed groundnut, when done early in the season, is most conducive for proper growth and yield."³ The case of jowar is rather different from these two cash-crops. It can be sown as late as the end of 'Punarvasu' constellation, i.e. the end of July. The order of sowing followed by the cultivators, therefore, is, first, cotton; second, groundnut; and third, jowar. In many of the cases, the cultivators are found to deviate from cotton or groundnut to jowar when the rains are not adequate during the early period of the sowing season. Banana, even though irrigated is also planted in the early period of the sowing season.

The rainfall was fairly normal in the first three years (1960-61 to 1962-63) of the four-year period covered by the study. In the last year (1963-64), however, it was far below normal (see Table 7.2). In this year, it was also inadequately distributed in the season. This can be seen from Table 7.3

1 Dastur, R. H., op. cit., p. 109.

2 Ibid, p. 109.

3 Seshadri, C.R., op. cit., p. 135.

Table 7.2 : Rainfall Received in the Raver Taluka during the Four Years (1960-61 to 1963-64)(in mms.)

Month	1960-61			1961-62			1962-63			1963-64		
	No.of rainy days	Total rain-fall	Normal rain-fall	No.of rainy days	Total rain-fall	Normal rain-fall	No.of rainy days	Total rain-fall	Normal rain-fall	No.of rainy days	Total rain-fall	Normal rain-fall
June	12	192.4	142.0	8	94.3	142.0	1	7.0	142.0	6	79.0	142.0
July	7	181.4	194.1	14	237.3	194.1	13	181.4	194.1	8	142.5	194.1
August	11	166.8	137.4	11	87.6	137.4	10	152.8	137.4	14	154.7	137.4
September	8	120.0	150.1	13	188.0	150.1	13	263.2	150.1	5	60.4	150.1
October	5	80.2	38.6	4	160.0	38.6	-	-	38.6	3	58.0	38.6
November	-	-	23.0	-	-	23.0	3	40.0	23.0	2	43.0	23.0
December	-	-	8.9	-	3.8	8.9	2	52.0	8.9	-	-	8.9
January	-	0.6	10.7	-	-	10.7	-	-	10.7	-	-	10.7
February	-	-	5.3	-	-	5.3	2	10.5	5.3	-	-	5.3
March	-	-	3.3	-	-	3.3	1	43.0	3.3	1	23.0	3.3
April	-	-	2.3	-	-	2.3	-	-	2.3	-	-	2.3
May	-	-	12.2	-	1.0	12.2	1	10.0	12.2	-	2.0	12.2
Total	43	741.4	727.9	50	772.0	727.9	46	759.9	727.9	39	562.6	727.9

Table 7.3 : Daily Rainfall Received in the Raver Taluka During 1963-64 (in mms.)

Date	Month											
	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
1	-	-	1.2	0.5	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	2.0	-	-	10.4	-	-	-	-	-	-	-	-
5	26.0	-	3.3	0.5	-	-	-	-	-	-	-	-
6	4.0	-	8.5	23.5	-	-	-	-	-	-	-	-
7	21.0	-	14.0	4.0	-	-	-	-	-	-	-	-
8	-	9.0	8.5	-	-	-	-	-	-	-	-	-
9	-	5.0	2.2	-	-	-	-	-	-	-	-	-
10	-	3.5	5.7	1.0	-	-	-	-	-	-	-	-
11	1.5	1.3	7.7	-	-	-	-	-	-	-	-	-
12	-	1.5	12.0	-	-	-	-	-	-	-	-	-
13	-	-	-	-	12.0	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	8.0	5.5	40.0	-	-	-	-	-	-	-
16	-	-	-	-	6.0	-	-	-	-	-	-	2.0
17	-	-	46.0	-	-	-	-	-	-	-	-	-
18	-	-	1.8	15.0	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	0.2	2.5	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	4.0	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	2.5	-	-	-	-	-	-	-	-	-
25	-	7.0	-	-	-	-	-	-	-	-	-	-
26	-	-	3.0	-	-	39.0	-	-	-	-	-	-
27	4.5	27.0	9.0	-	-	-	-	-	-	-	-	-
28	4.0	35.0	18.5	-	-	-	-	-	-	-	-	-
29	16.0	44.0	0.3	-	-	-	-	-	-	22.0	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-
31	-	9.0	-	-	-	-	-	-	-	1.0	-	-
Total rainfall	79.0	142.5	154.7	60.4	58.0	43.0	-	-	-	23.0	-	2.0

wherein the daily rainfall for the year is presented. The Table evidently reveals that the monsoon was much feeble and weak in the beginning i.e. in June and July, and gathered some strength only in the month of August. As a result, there was inadequate rainfall, particularly in the sowing period. In June it rained only in the first and the last week, leaving a wide dry spell of twenty days in between. The rains received in these two weeks were also meagre--53 and 21 mms. in the first and the last week respectively. In the month of July also the condition was not much different, though the rains were slightly better. The real monsoon appeared to have started from the middle of the first week of August when the rains gathered strength and were almost continuous. The inadequate rainfall in the sowing season of the year affected cropping of all the cultivators to a large extent. Many of the cultivators, particularly in Vivare, were required to re-sow their lands.

The cultivators are generally hesitant to undertake re-sowing as it involves additional cost, and the loss in the ultimate yield because of delay. They undertake it, only as a last resort when the crops sown have totally failed. The insufficient rainfall, particularly in the sowing season affects all the crops, but its severity may differ according to the type of soil and the situation of plots. If the land is of lighter soil, the crops taken on it may be severely hit and may wither away in a short period as the moisture retention in such soil is very low. The condition of the crops will not be so bad on the medium-black soil, which can retain moisture for a fairly

long period. In the case of the deep-black soil, the condition will be comparatively better. The crops taken on it will not be much affected for a long period as the moisture retentive capacity of such soil is quite high. The condition of crops may depend on the situation of plots as well. If the plot is situated in the low lying area where rain water accumulates, the crops grown on it may not be severely hit. The opposite will be the case on the plots situated on sloping lands. Thus, the condition of crops depends on these three factors--rainfall, type of soil and situation of plot. If the condition of the crops taken is very bad amounting to their total failure, the cultivators undertake re-sowing. If the crops are not so badly affected, they prefer to retain them, hoping that the rains may improve later and the crops will ultimately give satisfactory yield.

The insufficient rainfall during the sowing season of 1963-64 affected all the dry crops, but not very severely, particularly in Khirode, Waghode and Rozode. The condition of crops in these villages was not so bad as to necessitate the cultivators to re-sow a major portion of their lands. Some of the cultivators, however, were required to re-sow some portion of their land-holdings, but such area formed a minor proportion. In Khirode, ten cultivators had to re-sow, the total area re-sown being only 29.02 acres or about 11.1 per cent of the total land (see Table 7.4). It was reported by the cultivators that the crops in this village particularly, were not much affected because of its peculiar situation. As it is situated at the

Table 7.4 : Total Area under Second and Third Turns of Sowing Undertaken by the Cultivators in the Dry and the Irrigated Villages in 1963-64 (Area in Acres)

Village	Total area	Total area sown in 1963-64	Turns of sowings					
			Second sowing			Third sowing		
			No. of plots	Area	Proportion to the total sown area	No. of plots	Area	Proportion to the total sown area
Dry villages :								
Khirode	263.46	263.46	14	29.02	11.01	-	-	-
Vivare	231.55	231.55	113	161.23	69.63	16	19.42	8.39
Irrigated villages:								
Waghode	354.24	274.03	32	65.19	23.79	1	1.88	0.69
Rozode	247.95	216.75	38	65.99	30.45	2	0.65	0.30

foots of the Satpuda hills it received relatively better rains and hence the cultivators could retain the initially sown crops on the major portion of their lands. In the case of the irrigated villages also the conditions were not that precarious for the obvious reason. Some of the dry crops were severely affected and the cultivators had to repeat sowings, but such area was comparatively small in both the villages. In Waghode, thirteen cultivators were required to re-sow about 65 acres of land, its proportion to the total sown land in the year being 23.79 per cent. In Rozode, eighteen cultivators had to re-sow nearabout the same area (65.99 acres), but its proportion to the total sown land in the year was slightly high (30.45 per cent). In all these three villages, the crops had naturally failed more on the light and the medium-black land than on the deep-black land. In these villages, therefore, a large proportion of the total re-sown land was of medium-black soil, which had relatively low capacity to retain moisture. (See Table 7.5.) The deep-black soil which had a high retentive capacity was proportionately very small--14 per cent in Waghode and 4.0 per cent in Rozode.

In Vivare, the situation was totally different. The initially sown crops in this village were severely hit by the inadequate rains in the sowing period and almost all the cultivators (27 out of 30) were required to re-sow a major proportion of their lands. The total re-sown area was as high as 161.23 acres or about 69.63 per cent of the total. It is reported that the initial sowing on this area had completely failed. These cultivators had sown their lands, probably in

the first week of June, when there were some rains for four continuous days. They had undertaken sowing, hoping that the rains would continue in the period of 'Mrug' and 'Aradra' constellations. But it did not happen. There were no rains till the end of June. Because of insufficient rains, the seeds sown either did not germinate properly and the crops came up in a very scattered way, or the crop came up well but withered away in its early stage during the dry spell of about twenty days. As there was no sufficient moisture almost all the crops failed, irrespective of the soil type. The cultivators, therefore, had to re-sow these lands. In the total re-sown area, the proportion of deep-black land was quite high, 72.36 per cent (see Table 7.5), chiefly because the deep-black land was predominant in the village.

Some of the cultivators had to re-sow their land for the third time even. Such cases, however, were limited and the area reported was also comparatively small (see Table 7.6). In Vivare, nine cultivators had to sow for the third time on 19.42 acres of land. In Rozode and Waghode, one cultivator each, had to sow for the third time, about 0.65 and 1.88 acre/s of land respectively.

In Tables 7.5 and 7.6 is given the area re-sown for the second and third time, according to the different types of soil and the crops sown on these. It can be seen from these Tables that a large proportion of medium-black land was re-sown in Khirode, Waghode and Rozode. In Vivare, the deep-black land was proportionately high in the total re-sown area. As regards

Table 7.5 : Type of Soil and the Crops Sown at the Second Turn of Sowing Undertaken by the Cultivators in the Dry and the Irrigated Villages in 1963-64 (Area in Acres)

	Dry villages		Irrigated villages	
	Khirode	Vivare	Waghode	Rozode
<u>Light Soil</u>				
Jowar	2.80	8.09	-	20.01
Groundnut	-	0.75	-	2.00
Cotton	-	-	2.93	-
Total area	2.80	8.84	2.93	22.01
<u>Medium-black Soil</u>				
Jowar	17.49	17.77	26.39	26.64
Groundnut	5.33	2.66	-	9.18
Cotton	-	13.26	26.77	3.33
Wheat	3.40	2.03	-	2.18
Total area	26.22	35.72	53.16	41.33
<u>Deep-black Soil</u>				
Jowar	-	34.48	2.10	0.65
Cotton	-	66.28	7.00	1.00
Wheat	-	15.91	-	1.00
Total area	-	116.67	9.10	2.65
Total re-sown area	29.02	161.23	65.19	65.99

Table 7.6 : Type of Soil and the Crops Sown at the Third Turn of Sowing Undertaken by the Cultivators in the Dry and the Irrigated Villages in 1963-64 (Area in Acres)

Village	Medium-black soil				Deep-black soil				Total re-sown area
	Jowar	Cotton	Wheat	Total area	Jowar	Cotton	Wheat	Total area	
Dry village :									
Vivare	2.43	1.00	1.30	4.73	2.13	7.86	4.70	14.69	19.42
Irrigated villages:									
Waghode	1.88	-	-	1.88	-	-	-	-	1.88
Rozode	-	-	-	-	0.65	-	-	0.65	0.65

crops, it may be seen that jowar was taken to a large extent in Khirode and Rozode and jowar and cotton in Vivare and Waghode. It was observed from the data that in majority of the cases, the initially sown crops were themselves repeated in the second and the third sowing. This was more true particularly in the case of the crops like jowar and cotton of which the cost of sowing was not high. The cases reporting repetition of groundnut in the later sowings were rare as its cost of sowing was considerably high. Thus, in Vivare, where the re-sown land was the highest of all, the same crop was repeated on 122.67 acres or on about 76 per cent of the total land re-sown for the second and third time. On a major portion of this area jowar and cotton were repeated. In this village, the area on which the initial crop was not repeated was only 38.56 acres or about 23.9 per cent of the total re-sown area. Similar was the case in both the irrigated villages. In Rozode, the cultivators did not repeat the same crop only on 9.1 acres out of the total re-sown area of 65.99 acres. In Waghode, such area was far less--2.50 acres out of 65.19 acres of re-sown land. In Khirode, however, the same crop was not repeated on a comparatively larger portion of the re-sown land--17.04 acres out of 29.02 acres re-sown.

The areas where the initially sown crop was not repeated may be classified according to the subsequent sowings. By not repeating the initial crop in the second and the third sowing, the cultivators may take three types of possible shifts:

(1) Deviated in the initial sowing, but returned to the rotations in the second or the third sowing;

(2) Not deviated in the initial sowing but deviated later in the second or the third sowing; and

(3) Deviated in the initial sowing and continued to deviate in the later sowings as well, by taking a different crop. The areas where the same crop was not repeated are distributed in these three types of shifts as follows:

Village	Area in acres under			Total area in acres
	1	2	3	
Khirode	8.41	7.63	1.00	17.04
Vivare	21.27	12.09	5.20	38.56
Waghode	2.50	-	-	2.50
Rozode	0.65	8.36	-	9.01

The areas included in the last two types of shifts, constituted the area under deviations caused by the inadequate rainfall. In addition to this there was some more area where the cultivators anticipating the unfavourable rainfall conditions, had deviated in the first sowing itself. Such area was 5.85 acres in Khirode; 12.37 acres in Vivare; 9.06 acres in Waghode; and 4.10 acres in Rozode. Thus, the total area deviated on account of insufficient rainfall was 14.48 acres in Khirode; 27.78 acres in Vivare; 9.06 acres in Waghode; and 12.46 acres in Rozode. The details about this area in each village are presented in Tables 7.7 and 7.8.

The cultivators, who deviated because of the inadequate rainfall might be broadly classified into two groups: (1) those

Table 7.7 : Deviations Caused by the Rainfall in the Dry Villages in 1960-61 and 1963-64

Khirode				Vivare							
1963-64				1960-61				1963-64			
No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
4	9.48	Groundnut	Jowar	1	1.50	Jowar	Wheat	5	4.71	Cotton	Jowar
1	1.60	Cotton	Jowar	-	-	-	-	2	4.18	Cotton	Wheat
1	2.40	Cotton	Wheat	-	-	-	-	3	3.28	Cotton	Groundnut
1	1.00	Jowar	Wheat	-	-	-	-	1	1.30	Groundnut	Jowar
-	-	-	-	-	-	-	-	7	8.98	Jowar	Wheat
-	-	-	-	-	-	-	-	2	3.33	Jowar	Cotton
-	-	-	-	-	-	-	-	1	2.00	Wheat	Jowar
7	14.48	-	-	1	1.50	-	-	21	27.78	-	-

Table 7.8 : Deviations Caused by the Rainfall in the Irrigated Villages in 1963-64

Waghode				Rozode			
No. of Plots	Area in acres	Crop due	Crop taken	No. of Plots	Area in acres	Crop due	Crop taken
4	7.63	Cotton	Jowar	5	2.95	Cotton	Jowar
1	0.93	Cotton	Wheat	1	1.18	Cotton	Wheat
1	0.50	Cotton	Wheat	3	7.55	Groundnut	Jowar
				1	0.78	Jowar	Groundnut
6	9.06			10	12.46		

who anticipated the unfavourable conditions of rainfall and re-arranged their cropping on different types of land; and (2) those who followed the cropping due as per their rotation-plans but suffered a failure and were required to deviate in the later sowings. The cultivators in both these groups might differ as regards the crops taken in the initial sowings and the period for which those were retained. Some of them did not retain their initial crops for long and took the decision of re-sowing earlier. They, therefore, could re-sow even the crops like cotton and groundnut. Some retained their initially sown crops for a relatively longer period and took the decision of re-sowing a bit late. They could re-sow only the crops like jowar. There were still others who retained their initial crops for a very long period and when they decided to re-sow, the sowing season

of all the kharif crops had elapsed. They could not re-sow any of the crops of the kharif season; and were required to wait till the rabi season to grow the rabi crops like wheat, gram etc.

Thus, the cultivators were required to shift from the early kharif crops to the late kharif or rabi crops, depending on the period for which the initial crops were retained. We, therefore, find the deviations from cotton to groundnut; from groundnut to jowar and from jowar to wheat etc. It was observed from the data that in the two dry villages, the deviations from cotton to jowar, from groundnut to jowar and from cotton to wheat, claimed relatively larger areas. In the two irrigated villages, on the other hand, the deviations from cotton to jowar and from groundnut to jowar were resorted to on a large area. In the following, such deviations are illustrated by referring to some of the Case Studies.

A good illustration of the deviations resorted to in anticipation of the unfavourable conditions of rainfall, was provided by one of the cultivators in Vivare (Case Study V 23). It is interesting to see from this case, how a cultivator re-arranges his annual cropping on different types of his land to suit the rainfall conditions of the year. In the case of this cultivator, according to his rotation-plan, cotton was due in 1963-64, on four of his plots, having an area of 5.50 acres. Of these plots, two each were of deep-black (2.50 and 1.50 acres) and of medium-black soil (0.75 acre each). As the rains in the sowing season were not adequate, he took cotton on the first two plots of deep-black soil only, and deviated to the other

crops on the two plots of the medium-black soil. He took jowar on one of them and groundnut on the other. On his other two plots of deep-black soil (1.18 and 1.17 acres) where jowar and wheat were due according to the plan, he deviated to cotton. Thus, he re-arranged his whole cropping in such a way that cotton and wheat were sown on the deep-black soil; jowar and groundnut on the medium-black soil; and only jowar on the lighter type of soil, and tried to suit his cropping to the rainfall conditions in the year.

Many of the cultivators, however, did not anticipate the unfavourable conditions of rainfall during the sowing season, and went ahead with their normal rotation-plans. They suffered failures of the initially sown crops and were required to re-sow their land for the second or third time. A good illustration of such deviations can be found in the Case Studies V 6 and V 27. Both these cultivators had sown cotton pretty early on two of their plots (0.63 and 1.50 acre/s respectively), as it was due according to their accepted rotation-plans. But because of the inadequate rains after sowing, the cotton crop came up in a very scattered way and withered away in the dry spell of June. Thus, in the case of both these cultivators, the first sowing of cotton failed completely and they were required to re-sow their lands. As their two plots were of deep-black land, they made another attempt to grow cotton by repeating it in the second sowing. But it also failed. This time, the crop came up well but did not show satisfactory progress in its growth. The cultivators retained it till the middle of July, but it did not

improve; and finally they were required to remove it and sow their lands for the third time. In the third sowing they had to deviate to jowar as it was the only crop which they could sow so late. The sowing season of all the other kharif crops had elapsed. Thus, after making two attempts to grow the crop due as per the rotation-plan, these cultivators were finally required to deviate to jowar, because of inadequate rains during the sowing season.

Some of the cultivators retained their crops, sown for the first or second sowing for a very long period, hoping that those will improve and ultimately give satisfactory yield. But this did not happen, and they had to re-sow their lands. By this time, however, the sowing season of all the kharif crops, including jowar, had elapsed and they had no other alternative but to keep the lands fallow for the kharif season and re-sow these only in the rabi season. Many of the deviations from cotton to wheat, groundnut to wheat and jowar to wheat were of this nature. A good illustration of such deviations is found in the Case Study K 12. In the case of this cultivator, cotton was due on his plot of 2.40 acres, according to his rotation-plan. He had sown it, but the crop came up in a scattered way and withered away within a fortnight after sowing. He made another attempt to grow the same crop on it, by repeating cotton in the second sowing. This time the crop came up well but there was no satisfactory progress in its growth. It remained stunted. He retained the crop till the end of July, hoping that it will improve. But it did not show any progress and had to be

ultimately removed. By the time he took this decision of removing it, the sowing season of all the kharif crops had passed out. He, therefore, could not re-sow any of the kharif crop, not even jowar. He had to keep his land fallow in the kharif season and took wheat in the rabi season. He, thus, deviated from cotton to wheat, even after making two attempts to grow the crop due as per the rotation-plan.

Thus, the circumstances and the conditions under which the cultivators deviated because of the inadequate rainfall, differed from cultivator to cultivator. The deviations from cotton to groundnut or jowar or wheat depended on these circumstances and conditions. However, in all these deviations the cultivators attempted to minimise their losses by growing the crops suited to the rainfall conditions of the year.

7.3. Deviations Caused by the Changes in Resources

In this class of factors causing deviations, the changes in the resources like land, manure and water supply are included. As stated earlier, a change in any of the resources may disturb the usual resource position of the cultivators and they may be required to deviate to bring about a new balance in their resources and to attain the maximum level of income. In the following, we treat separately the deviations caused by the changes in each of these resources.

7.3.1. Deviations Caused by the Changes in Land Resource

A cultivated land-holding of a farmer may change in certain years because of leasing-in and leasing-out and/or purchase and sale of land. We first deal with the changes brought

about by leasing-in and leasing-out of land and then consider those of purchases and sales. The changes in the land-holding caused by leasing-in and leasing-out of land may be of long or short-term nature. If the changes are of long-term nature, the cultivators may re-cast their rotation-plan itself, rather than making any adjustments in the annual cropping through deviations. On the other hand, if the changes are of short-term nature, they may resort to deviations to make the temporary adjustments in annual cropping without disturbing the rotation-programme.

Deviations Caused by the Leased-in Land :- In Table 7.9, are given the number of cultivators reporting leasing-in of land and the areas leased-in in each year. The areas leased-in for a long and short-term are separately shown. It may be seen from the Table that except in Rozode, in all the other villages, the area leased-in for a long-term was high in each year. In Khirode, eight cultivators had leased-in on long-term basis, about 21.52 acres of land. In Vivare, the number of such cultivators was five and the land leased-in was about 33.06 acres. In Waghode there were only three such cultivators but the land leased-in by them was quite high--47.98 acres. In Rozode, however, only one cultivator reported long-term leasing-in of a small area of 1.65 acres.

The increase in the cultivated land-holding brought about by the land leased-in for a long-term was of a permanent nature and the cultivators had to re-cast their rotation-programmes, accepting different rotations on the leased-in land as well. Thus, all the cultivators who leased-in land on long-term basis

Table 7.9 : The Cultivators Leasing-in Land and the Area Leased-in for the Long and Short Term in the Dry and the Irrigated Villages (1960-61 to 1963-64) (Area in Acres)

Village	1960-61						1961-62					
	No. of cultivators	Land leased-in for long-term	No. of cultivators	Land leased-in for short-term	No. of cultivators	Total leased-in land	No. of cultivators	Land leased-in for long-term	No. of cultivators	Land leased-in for short-term	No. of cultivators	Total leased-in land
Dry villages :												
Khirode	8	21.52	-	-	8	21.52	8	21.52	1	5.65	9	27.17
Vivare	5	33.06	-	-	5	33.06	5	33.06	-	-	5	33.06
Irrigated villages:												
Waghode	3	47.98	2	14.21	5	62.19	3	47.98	5	24.63	8	72.61
Rozode	1	1.65	4	15.24	5	16.89	1	1.65	4	19.62	5	21.27
Village	1962-63						1963-64					
	No. of cultivators	Land leased-in for long-term	No. of cultivators	Land leased-in for short-term	No. of cultivators	Total leased-in land	No. of cultivators	Land leased-in for long-term	No. of cultivators	Land leased-in for short-term	No. of cultivators	Total leased-in land
Dry villages :												
Khirode	8	21.52	3	12.75	11	34.27	7	20.34	4	15.90	11	36.24
Vivare	5	33.06	-	-	5	33.06	5	33.06	-	-	5	33.06
Irrigated villages :												
Waghode	3	47.98	4	17.70	7	65.68	2	27.67	1	2.00	3	29.67
Rozode	1	1.65	5	13.19	6	14.84	1	1.65	4	18.94	5	20.59

practised different types of rotations on such land (Case Studies K 5, K 20, V 14, V 17, W 30, R 24 and others). In the case of all these cultivators, the land was leased-in since long and their rotation-plans were already re-adjusted. Such adjustments could not be studied here as those were made long ago and no data could be collected about these. During the period of study, no cultivator leased-in land on long-term basis, and hence the effects of long-term changes in the land resource could not be studied. The cultivators reported that because of the Tenancy Act of the State, lands were not leased-out for a long-term.

It can be seen from Table 7.9 that in the case of most of these cultivators, the leased-in land was under their cultivation for the entire period of four years. In the case of some, however, the tenancy disputes were settled in one of the four years and they had to give up the lease. Thus, in Khirode, one cultivator who had leased-in 1.18 acres of land since long had to return it to its owner in 1963-64 (Case Study K 21). Similar was the case of the two cultivators in Waghode (Case Studies W 25 and W 27). Both of them had to give up the lease in 1963-64. The long-term effects of these changes also could not be studied as the data collected was upto 1963-64 only. These cultivators, however, were required to deviate in that particular year (1963-64) to re-adjust their cropping on their owned land. One of the cultivators in Waghode provided a good example of such deviations (Case Study W 25). In his case, according to the rotation-plan, jowar was due only on the leased-in land, which he had to return to its owner. Banana and cotton were due

on the two plots of his owned land. But to make provision for jowar to meet the family consumption needs, he had to deviate from cotton to jowar on his plot of 1.50 acres. Similar was the case of the other two cultivators (Case Studies K 21 and W 27).

The land leased-in for a short-term was reported in all the villages except Vivare. The number of cultivators reporting such area and the total land leased-in varied from year to year (see Table 7.9). In Khirode, one cultivator had leased-in about 5.65 acres in 1961-62; three cultivators, 12.75 acres in 1962-63; and four cultivators, 15.90 acres in 1963-64. Similar was the case in Waghode and Rozode.

The area leased-in for a short-term, brings about a temporary increase in the total cultivated land and the cultivators adjust their cropping to it, to maximise their income on a higher level. Some of them may be required to deviate, in order to re-adjust their cropping. Such cases, however, were a few. Thus, in Khirode, out of the eight cultivators leasing-in land in different years, only three were required to deviate. Similar was the case in Waghode. Of the fourteen cultivators who had leased-in land, four had to deviate. In Rozode, thirteen cultivators had leased-in land but none was required to deviate on that account.

In Table 7.10, are given the details of the deviations caused by the leasing-in of land in different years. In Khirode, of the three cultivators reporting such deviations, one deviated in 1962-63 (Case Study K 22); and the other two in 1963-64 (Case

Table 7.10 : Deviations Caused by the Leased-in Land in the Dry and the Irrigated Villages (1960-61 to 1963-64)

Village	1960-61				1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Khirode	-	-	-	-	-	-	-	-	1	2.50	Groundnut	Cotton	1	1.75	Jowar	Groundnut
	-	-	-	-	-	-	-	-	-	-	-	-	1	0.70	Cotton	Jowar
Total	-	-	-	-	-	-	-	-	1	2.50	-	-	2	2.45	-	-
Waghode	1	1.50	'Nawati' banana	Cotton	1	1.00	'Nawati' banana	Cotton	-	-	-	-	1	1.50	Cotton	Jowar
	-	-	-	-	-	-	-	-	-	-	-	-	1	2.20	Groundnut	Jowar
	-	-	-	-	-	-	-	-	-	-	-	-	1	2.20	Groundnut	Cotton
	-	-	-	-	-	-	-	-	-	-	-	-	1	1.00	Cotton	Groundnut
Total	1	1.50	-	-	1	1.00	-	-	-	-	-	-	4	6.90	-	-

Studies K 10 and K 21). The area deviated was 2.50 acres in 1962-63 and 2.45 acres in 1963-64. The cultivator who was required to deviate in 1962-63 provided a good example of such deviations. He was required to deviate from groundnut to cotton on one of his plots on account of the leased-in land in that year (Case Study K 22). He, along with his two cultivator friends, leased-in about 18.83 acres of land for one year only. On the basis of the crops taken in the preceding year they took the three major crops--jowar, groundnut and cotton--on different plots of it. Groundnut claimed proportionately larger area. In his case, it was taken on the other plots also, which he himself had leased-in. As more groundnut was grown on the leased-in land, he was required to deviate on one of his plots of 2.50 acres, where the same crop was due according to the rotation-plan. He deviated to cotton on this plot even though its soil was of lighter type. He reported that as he got more leased-in land in that year, he could take the risk of growing cotton even on the lighter type of soil.

The case of the another cultivator in Khirode, was interesting (Case Study K 10). In 1963-64, he leased-in a plot of two acres which pushed up his cultivated holding from 5.88 to 7.88 acres. The leased-in land was of lighter type of soil. Because of short-term lease he could not follow any rotation on it. He tried to exploit it to his maximum advantage by putting it under jowar to meet his consumption needs and devoted his entire owned holding to the cash-crops. In this attempt he was required to deviate on one of his plots of 1.75 acres which was due for

jowar according to his rotation-plan. As the soil in this plot was of lighter type he had to deviate to groundnut. He could have taken groundnut on the leased-in plot as well, particularly when it was under jowar in the preceding year. But as he was not sure of reaping the benefits of the rotation-crop (groundnut) he did not take it. He preferred to repeat jowar on the leased-in land and to deviate to groundnut on the owned land.

The case of the second cultivator deviating in 1963-64 has been referred to earlier (Case Study K 21). He had to deviate from cotton to jowar on his one plot of 0.70 acre as he returned in that year, the leased-in land on which jowar was due.

In the case of the irrigated villages, most of the area leased-in on short-term basis was rented-in specifically for the cultivation of banana. Thus, in Waghode, all the area leased-in, in the first three years, was for banana cultivation only. More or less the same was the case in Rozode. The leased-in lands, generally did not cause any deviations on the owned holding. In some cases, however, the cultivators found the leased-in land for banana more convenient and economic and they deviated from banana to other crops on their owned land. At least one case of this type was found in Waghode (Case Study W 13). In his case, according to the rotation-plan, banana was due in 1960-61 on his plot of 1.50 acres. But in that year he got on lease about 5.25 acres for banana cultivation. The leased-in land was very convenient and bigger in size. He, therefore, preferred to grow banana, only on the leased-in land and deviated from banana to cotton on his owned land. He reported that it

was financially not possible for him to grow banana on the owned as well as on the leased-in land. The same was the case in the next year as well.

The cases of the two cultivators deviating in 1963-64 have been discussed earlier. Both of them were required to deviate as they returned the leased-in lands to their owners in that year.

Deviations Caused by the Leased-out Land :- In Table 7.11, we give the number of cultivators reporting leased-out land and the total area of leased-out land in each year. The areas leased-out for long and short-term are given separately. It may be noted from the Table that the area leased-out for a long-term was reported only in Khirode and that too by one cultivator. In the other three villages, no cultivator reported any leased-out land for long-term in any of the four years. This may be due to the Tenancy Act of the State. Because of this Act, the cultivators were rather reluctant to disclose the land leased-out for long-run.

The land leased-out for a long-term brings about a decrease of a permanent nature in the total cultivated land-holding, and affects the rotation-plans of the cultivators. They have to re-cast their rotation programmes so as to maximise the total income on the remaining portion of the holding. The effects of such changes in the cultivated land-holding could not be discussed here as there was no case reporting such lease during the period of the study. The only cultivator from Khirode, who reported such land, had leased-out his land since long (1942),

Table 7.11 : The Cultivators Leasing-out Land and the Area Leased-out for the Long and Short Term in the Dry and the Irrigated Villages (1960-61 to 1963-64) (Area in Acres)

Village	1960-61						1961-62					
	No. of cultivators	Land leased-out for long-term	No. of cultivators	Land leased-out for short-term	No. of cultivators	Total leased-out land	No. of cultivators	Land leased-out for long-term	No. of cultivators	Land leased-out for short-term	No. of cultivators	Total leased-out land
Dry villages :												
Khirode	1	3.15	-	-	1	3.15	1	3.15	-	-	1	3.15
Vivare	-	-	1	1.65	1	1.65	-	-	1	1.65	1	1.65
Irrigated villages :												
Waghode	-	-	14	61.34	14	61.34	-	-	21	93.79	21	93.79
Rozode	-	-	10	21.73	10	21.73	-	-	12	24.25	12	24.25
Village	1962-63						1963-64					
	No. of cultivators	Land leased-out for long-term	No. of cultivators	Land leased-out for short-term	No. of cultivators	Total leased-out land	No. of cultivators	Land leased-out for long-term	No. of cultivators	Land leased-out for short-term	No. of cultivators	Total leased-out land
Dry villages :												
Khirode	1	3.15	1	1.08	2	4.23	1	3.15	3	6.41	4	9.56
Vivare	-	-	-	-	-	-	-	-	2	5.78	2	5.78
Irrigated villages:												
Waghode	-	-	22	70.26	22	70.26	-	-	19	58.56	19	58.56
Rozode	-	-	15	29.97	15	29.97	-	-	16	35.52	16	35.52

and no data could be collected about his re-adjustments in the rotation-plan (Case Study K 9).

The area leased-out for short-term, however, was reported by many cultivators, particularly in the two irrigated villages. It can be seen from Table 7.11 that in Waghode, fourteen cultivators leased-out 61.34 acres of land in 1960-61; twenty-one cultivators leased-out 93.73 acres in 1961-62; twenty-two cultivators leased-out 70.26 acres in 1962-63; and nineteen cultivators leased-out 58.56 acres in 1963-64. Similar was the case in Rozode. Most of these cultivators leased-out their land, specifically for the cultivation of banana. In the dry villages even, out of four such cultivators, three cultivators leased-out their lands for banana cultivation. This is all the more true in the two irrigated villages. As pointed out earlier, most of these cultivators in the irrigated villages had established a definite relationship with their tenants and could give a definite place for banana in their rotation-programmes. The land leased-out for banana cultivation, therefore, did not cause deviations in many cases. However, some of the cultivators were required to deviate because of the leased-out land for banana. In the case of some the relations with the tenant were not so definite and hence they could not give a place for banana in their cropping programmes and had to deviate whenever they could lease-out their lands for it. In the case of others, the relations were definite but were not kept up in certain years and they could not lease-out their land for banana. In such circumstances, they were required to deviate to the dry crops. In the

case of still others, the leased-out land for banana caused deviations on the remaining portion of their land-holding. We may discuss in brief these three types of deviations caused by the leased-out land for banana.

In Table 7.12, are given the area under deviations caused by the leased-out land in the dry and the irrigated villages. The area under such deviations was obviously large in the two irrigated villages. It was observed from the data that six cultivators in Waghode, two in Rozode and one in Vivare reported deviations of the first type, the deviated area being 7.23, 2.08 and 1.68 acres respectively. Of these cultivators, the case of one of the cultivators in Rozode provided a good example of such deviations (Case Study R 23). He had accepted the two-year rotation of C-J, on one of his plots of 1.30 acres. As the irrigation facility was not available on it, and as he had no definite type of relations with any tenant cultivator, he could not include banana in the crop-rotation practised on the plot. According to the rotation followed, cotton was due on this plot for the year 1963-64. But in that year, one of his neighbouring cultivators who had newly sunk a well in the adjacent land agreed to lease-in this plot for banana cultivation. He, therefore, had to deviate from the rotation and leased-out the plot for banana, which was more profitable than cotton. The deviation from cotton to banana, thus, occurred in his case in 1963-64. The other cultivators reporting such deviations were also faced with similar situations and deviated to banana from different dry crops.

Table 7.12 : Deviations Caused by the Leased-out Land in the Dry and the Irrigated Villages (1960-61 to 1963-64)

Village	1960-61				1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Vivare	-	-	-	-	-	-	-	-	-	-	-	-	2	1.68	Jowar	'Nawati' banana
	-	-	-	-	-	-	-	-	-	-	-	-	1	0.10	Chillies	Cotton
Total	-	-	-	-	-	-	-	-	-	-	-	-	3	1.78	-	-
Waghode	1	2.20	'Nawati' banana	Wheat	1	1.50	Cotton	'Nawati' banana	1	1.00	Jowar	'Nawati' banana	4	4.73	Jowar	'Nawati' banana
	-	-	-	-	2	2.90	'Nawati' banana	Cotton	-	-	-	-	5	8.45	'Nawati' banana	Jowar
	-	-	-	-	2	3.38	'Nawati' banana	Jowar	-	-	-	-	2	6.98	'Nawati' banana	Cotton
	-	-	-	-	1	1.45	Jowar	Wheat	-	-	-	-	2	1.65	'Nawati' banana	Groundnut
Total	1	2.20	-	-	6	9.23	-	-	1	1.00	-	-	13	21.81	-	-
Rozode	1	0.70	'Nawati' banana	Jowar	1	0.70	'Nawati' banana	Cotton	-	-	-	-	1	0.78	Jowar	'Nawati' banana
	-	-	-	-	1	0.45	Jowar	Wheat	-	-	-	-	1	1.30	Cotton	'Nawati' banana
	-	-	-	-	-	-	-	-	-	-	-	-	1	1.05	'Nawati' banana	Cotton
Total	1	0.70	-	-	2	1.15	-	-	-	-	-	-	3	3.13	-	-

The second type of deviations were reported by eleven cultivators in Waghode and three cultivators in Rozode, the area deviated being 25.86 and 2.45 acres respectively. Of these cultivators, the Case Study W 17 may serve as a good example to illustrate the deviations of this type. This cultivator had accepted the three-year rotation of NB-JB-C, on one of his plots of 1.75 acres. In fact the irrigation facility was not available on it, but he had established a definite sort of relations with his neighbour cultivator having water supply and had adjusted the cropping on this plot with that of the neighbour. Thus, he could give a definite place for banana in the crop-rotation practised on the plot, even though it had no irrigation. In 1963-64, the plot was to be leased-out for banana which was due on it according to the rotation. But the tenant did not lease-in the plot as he had leased-in a large area for banana at some other place. In the circumstances, the cultivator had no other way left but to deviate to any dry crop which he himself could grow. He deviated to jowar as the area allotted to it in the year was very small and would not have met the total requirements of food. This led to the deviation from banana to jowar in his case. In the case of the other cultivators also similar circumstances had developed. The tenants did not lease-in lands because of different reasons such as shortage of water supply, shortage of finance and disagreement about the terms of lease, and the cultivators were required to deviate to the dry crops. They deviated from banana to different dry crops depending on the individual circumstances and situations in that particular year.

The deviations of the third type were reported by two cultivators only, one each from Waghode and Vivare. The area deviated was also very small--1.20 acres in Waghode and 0.10 acre in Vivare. The case of the cultivator in Vivare was more interesting (Case Study V 18). He had a small land-holding of two fragments--one of 1.58 acres and the other of 4.13 acres. In 1963-64, he leased-out his bigger fragment of 4.13 acres for banana cultivation. As a result his cultivated holding declined to 1.58 acres only. He had to meet his food and cash needs within this small area. In such circumstances he could not devote any of its area to chillies which he used to grow every year. Instead, he took jowar and cotton on the two plots of that fragment. In his case, therefore, the deviation from chillies to cotton occurred on a small area of 0.10 acre in 1963-64. Similar was the case of the cultivator in Waghode (Case Study W 4).

Purchase and Sale of Land :- The transactions of purchase and sale of land bring about a permanent type of changes in the cultivated land-holding and thereby affect the rotation-programmes of the cultivators. In the case of purchases, they have to re-cast their rotation-plan to accommodate the new land in the most profitable way. In the case of sales, on the other hand, they have to re-arrange their cropping programmes in order to attain the maximum level of income within the land left with them. The long-term effects of such transactions could not be studied here as the data collected pertain to a short period of four years.

In Table 7.13, are given the number of cultivators reporting purchase and sale of land and the land purchased and sold by them during the period of study. In Khirode, one cultivator purchased 4.81 acres of land in 1963-64 and sold 2.80 acres in the same year (Case Study K 29). Similar was the case of one cultivator in Rozode (Case Study R 30). He purchased 4.48 acres in 1962-63 and sold 16.50 acres in the same year. In Rozode, there was another cultivator who bought about 9.10 acres of land in 1962-63. In Waghode and Vivare, three cultivators reported only sales of land in 1963-64. One of these in Waghode, sold his entire land-holding and took to the non-agricultural occupation of running a flour-mill in the village (Case Study W 5).

The long-term adjustments in the rotation-programme necessitated by the transactions of sales and purchases of land could not be done immediately. It required time. Some of these cultivators, therefore, were required to deviate to make temporary adjustments in the cropping, particularly in the year of transactions. The cultivator in Rozode, who bought and sold land in the same year, provided a good case of such deviations (Case Study R 30). In 1962 he sold one fragment of 16.50 acres and bought another of 4.48 acres, the total cultivated holding going down from 50.80 to 38.78 acres. In view of these transactions, he was required to re-adjust his cropping for the year 1962-63. According to the rotation-plan, groundnut and jowar were due on the fragment of 16.50 acres; but as he sold it, he had to make provision, particularly for groundnut on his other plots. He could not grow it on the land purchased in the same year as it

Table 7.13 : The Cultivators Reporting Purchase and Sale of Land and the Land Purchased and/or Sold in the Four Years (1960-61 to 1963-64)

Village	Purchase of land				Sale of land			
	1962-63		1963-64		1962-63		1963-64	
	No. of culti- vators	Area in acres	No. of culti- vators	Area in acres	No. of culti- vators	Area in acres	No. of culti- vators	Area in acres
Dry villages :								
Khirode	-	-	1	4.81	-	-	1	2.80
Vivare	-	-	-	-	-	-	1	6.43
Irrigated villages:								
Waghode	-	-	-	-	-	-	2	4.48
Rozode	2	13.58	-	-	1	16.50	-	-

was of deep-black soil. He, therefore, put this land under cotton and deviated from cotton to groundnut on his two other plots (3.00 and 3.40 acres) having medium-black land. He was not required to deviate for jowar on any other plot as it was already due according to the plan, on his two plots of 2.38 and 3.38 acres. The cultivator in Khirode was also required to re-adjust his cropping in 1963-64, in a similar way. The other cultivators, however, did not make any adjustments in their cropping.

7.3.2. Deviations Caused by the Manure Resource

In the case of all the cultivators, manure supply remains almost constant in the short-term period. It depends mainly on the owned livestock which do not vary much from year to year. This is particularly true in the dry villages, where the cultivators largely depend on their own supply of home-collected manure. In the irrigated villages, however, the condition is different. In these villages, because of the irrigated crops like banana, the requirement of manure is considerably large, and supply of home-collected manure falls far short to meet it. The cultivators in these villages, therefore, have to depend much on the outside supply. It is reported that they purchase manure in the far off villages where mostly dry crops are grown and the local demand for it is not high.

It is observed from the data that the cultivators in both the dry and the irrigated villages link manuring of land with the crop-rotations followed so as to utilize manure in the most profitable way. Generally, a major cash-crop in the rotation

is given manure, the other crops following in sequence to utilize the residuals of it. Thus manuring is also rotated on different plots of land-holding, along with the major cash-crop. In the dry villages, cotton is the major cash-crop included in the rotations practised on deep and medium-black soil and groundnut in the rotations followed on lighter soil. In the irrigated villages, banana is the major cash-crop of this type, included in the rotations followed on the land having irrigation facility. Thus, the land is manured, whenever these crops become due on it according to the rotations followed.

The application of manure, however, may not be carried out in perfect consonance with the accepted rotations on all plots, for all years. In some years differences may occur and these may cause deviations from the due crops according to the rotations. Thus, manuring may cause deviations in three different situations:

- (1) when manuring is not done where it is due for the crop in the rotation;
- (2) when manuring is done where it is not due for the crop in the rotation; and
- (3) when the manure applied is not fully utilized because of failure of the crop.

The cultivators are required to deviate under these three situations. Under the first situation, they deviate to a crop which can be satisfactorily grown without any application of manure; under the second, to a crop which requires manure and gives better yield when it is applied and under the third, they

repeat the same crop in the following year to utilize manure already applied.

In Tables 7.14 and 7.15 are given the deviations caused by manure supply and the area deviated in each year. It may be seen from the Table that in Khirode, on account of manuring, three cultivators each, had to deviate on 2.98 and 5.73 acres in 1960-61 and 1961-62 respectively. In 1962-63, one cultivator deviated on 5.45 acres of his land. In 1963-64, four cultivators deviated on 10.47 acres of land. Similar was the case in the other village. In the irrigated villages also the area reported under such deviations was fairly large. Another striking point to be noted from the Table is that in the irrigated villages all the deviations reported on account of manuring were as regards the dry crops alone (see Table 7.15). The deviations from banana or other irrigated crops were not reported, obviously because no cultivator deviated from banana just for the shortage of manure.

It was observed from the data, that five cultivators from Khirode and three from Rozode deviated in different years under the first type of situation. The cultivators deviating under the second situation were three, in Khirode; two, in Vivare; six, in Waghode; and four, in Rozode. The cultivators reporting deviations under the third situation were three, each in Khirode and Vivare; and one, in Waghode. We may explain in brief the deviations under each of the situations by referring to one of the cases.

Of the cultivators deviating under the first situation,

Table 7.14 : Deviations Caused by the Manure Supply in the Dry Villages (1960-61 to 1963-64)

Village	1960-61				1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Khirode	1	1.00	Groundnut	Cotton	1	1.00	Groundnut	Cotton	1	5.45	Cotton	Groundnut	1	1.00	Jowar	Cotton
	1	1.00	Jowar	Cotton	2	3.23	Cotton	Jowar	-	-	-	-	3	5.64	Jowar	Groundnut
	1	0.98	Cotton	Jowar	1	1.50	Jowar	Groundnut	-	-	-	-	1	2.93	Cotton	Jowar
	-	-	-	-	-	-	-	-	-	-	-	-	1	0.90	Groundnut	Cotton
Total	3	2.98	-	-	4	5.73	-	-	1	5.45	-	-	6	10.47	-	-
Vivare	-	-	-	-	2	2.75	Groundnut	Cotton	3	2.36	Jowar	Cotton	2	4.18	Jowar	Cotton
	-	-	-	-	4	3.78	Jowar	Cotton	2	2.65	Wheat	Cotton	1	1.17	Wheat	Cotton
	-	-	-	-	-	-	-	-	1	0.40	Cotton	Groundnut	-	-	-	-
Total	-	-	-	-	6	6.53	-	-	6	5.41	-	-	3	5.35	-	-

Table 7.15 : Deviations Caused by the Manure Supply in the Irrigated Villages (1960-61 to 1963-64)

Village	1960-61				1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Waghode	1	1.10	Cotton	Jowar	2	4.93	Jowar	Cotton	1	0.80	Groundnut	Cotton	3	5.81	Groundnut	Cotton
	-	-	-	-	1	2.63	Jowar	Groundnut	1	1.80	Jowar	Cotton	1	2.15	Jowar	Cotton
Total	1	1.10	-	-	3	7.56	-	-	2	2.60	-	-	4	7.96	-	-
Rozode	1	0.43	Jowar	Cotton	1	0.40	Jowar	Cotton	2	1.38	Cotton	Jowar	2	6.68	Jowar	Groundnut
	-	-	-	-	2	1.63	Cotton	Jowar	2	3.25	Jowar	Groundnut	1	5.76	Groundnut	Cotton
	-	-	-	-	1	1.50	Groundnut	Cotton	-	-	-	-	-	-	-	-
Total	1	0.43	-	-	4	3.53	-	-	4	4.63	-	-	3	12.44	-	-

one from Khirode, provided a good case (Case Study K 27). He was required to deviate from cotton to groundnut on his one plot of 5.45 acres in 1962-63. He had a land-holding of two fragments, one of 7.33 acres and the other of 5.45 acres. On the two plots of the first fragment, he followed the two-year rotation of G-J, and on the second fragment, the four-year rotation of C-C-C-J. He reported that he generally manured the second fragment as it was better situated and had relatively good quality soil. His practice was to manure this land heavily once in four years, and grow cotton continuously for three years and jowar for the fourth year. His annual manure supply was of ten cart-loads, collected from the owned livestock--one cow and three calves. According to the rotation-programme, the next round of the four-year rotation was to begin on the second fragment in 1962-63 and it was due for cotton. The fragment was to be manured in this year, but he could not do it, as he fell seriously ill. He could not transport even the home-collected manure to his land. As it was not manured, he could not grow cotton on it and had to deviate. In the circumstances, he preferred to deviate to groundnut, the other cash-crop which could be satisfactorily grown without any application of manure. The other cultivators deviating under the first situation faced, more or less similar circumstances and had to deviate to such crops which could be grown without application of manure. It was observed from the data, that all the other cultivators in Khirode and Rozode deviated from cotton to jowar.

As regards the deviations under the second type of

situation, the Case Study K 9 may serve as a good illustration. This cultivator had a manure supply of ten cart-loads, from his three cattle heads--two cows and a calf. He reported that according to the rotations followed on different plots of his land-holding, cotton was due, only on a small area of 0.75 acre in 1960-61. Considering the requirement of this area at an average rate of five cart-loads of manure per acre, he had surplus manure in that year. He, therefore, manured another plot of one acre, which was adjacent to the 0.75 acre plot and took cotton on both. Thus, because of manuring, he deviated to cotton on the one acre plot, where groundnut was due according to the rotation-plan. The other cultivators also deviated to the crops like cotton and groundnut under similar circumstances. Most of them deviated to cotton. Of the other cultivators, thirteen deviated to cotton--six each from groundnut to cotton and from jowar to cotton and one from wheat to cotton. The remaining three deviated from jowar to groundnut.

The cultivator referred to above (Case Study K 9) had to deviate in 1961-62 under the third type of situation as well. He deviated on the same plot (1.00 acre) and for the same crop. The cotton crop to which he had deviated in 1960-61 on account of manuring, was attacked in its early stage by a fungoid disease and it did not grow well. Because of this type of partial failure of the crop, the cultivator felt that the manure which he had applied in the preceding year was not utilized to its full extent. He, therefore, repeated cotton in 1961-62, once again deviating from groundnut. He did not grow groundnut, as

he feared that the manure applied in the preceding year being not fully utilized, may cause excessive vegetative growth and the crop may ultimately give poor yield. The other cultivators deviating under the third type of situation were also placed in more or less the same circumstances. Of these, five deviated to cotton--four from jowar to cotton and one from wheat to cotton. The remaining cultivators deviated from jowar to groundnut.

7.3.3. Deviations Caused by the Water Resources

As pointed out earlier, irrigation from wells only is available in these villages. The water supply in wells depends obviously on rainfall conditions in a given year. In this region, however, rainfall being fairly certain, the water supply in wells does not vary much, so as to affect annual cropping of individual cultivators. In the case of old wells, the water supply may decline because of accumulation of silt; but such cases are rare. Majority of the cultivators remove silt every five years as a precautionary measure against the choking of water currents.

Irrigation facility, thus, may cause deviations in two ways:

- (1) when the water supply declines much, because of accumulation of silt; and
- (2) when it becomes available through purchase of land having facility of well irrigation or through sinking a new well.

When the water supply declines much, the cultivators may be required to take a major shift from the irrigated to the dry

crops. The opposite will be the case when irrigation is newly made available. The availability of irrigation will cause a major shift from the dry to the irrigated crops. In both the cases, the shifts may affect the cropping on the other plots of holding as well, as the cultivators have to re-adjust their farm economy into a different gear.

Three cultivators, one each from Waghode, Khirode and Vivare, reported deviations on account of water supply. The area deviated was 1.00 acre in Waghode; 3.65 acres, in Khirode; and 5.30 acres, in Vivare. In Rozode no cultivator reported any deviations on such account. The cultivator in Waghode deviated because of the shortage of water in his well (Case Study W 22). In one of his fragments of 6.00 acres, he had an old well, jointly owned along with his two cousin-brothers. His share in the ownership of the well was one-half. The water supply in the well, however, was short because of the accumulation of silt and falling down of the inside portion of the well. He could irrigate only 2.00 to 3.00 acres of his land from the available supply of water. In order to restrict the area under banana to this limit, he was required to deviate from banana on the plot of 1.00 acre in the last three years. He deviated to jowar in 1961-62; to wheat in 1962-63; and to cotton in 1963-64.

The case of the remaining two cultivators was different. They were required to deviate as irrigation was newly introduced on their farms. In the case of the cultivator in Khirode, irrigation was introduced through the purchase of an irrigated

land (Case Study K 29); while in the case of the cultivator in Vivare, it was introduced through sinking a new well (Case Study V 25). The cultivator from Khirode purchased in 1963 one fragment of land of 2.43 acres in which irrigation from a well was available. This fragment was nearer to his other fragments of holding and it was possible for him to extend irrigation to these as well. In 1963-64, therefore, he deviated on his plot of 3.65 acres, which was nearer to the purchased land and took banana, instead of cotton, which was due on it. He preferred to grow banana on this particular plot mainly because it was of relatively better soil and was under jowar in the preceding year. It is generally believed that banana taken after jowar gives better yield. He started growing the irrigated crops from 1963-64 only. Till then, he had to grow only the dry crops as irrigation, though available in some of his fragments, was not adequate. However, the shift from the dry to the irrigated crops did not upset the cropping on his other land and did not cause any further deviations as his land-holding was fairly large--25.93 acres.

The cultivator from Vivare sank a new well in 1963 in one of his large fragments of 5.30 acres. He received for this purpose a loan of Rs.3,000 from the Land Mortgage Bank of Jalgaon district. In 1963-64, therefore, he shifted for the first time to the irrigated crops. He divided the fragment into two plots and put one plot of 3.50 acres under banana and the other of 1.80 acres under wheat. In fact he wanted to devote the entire fragment to banana, but because of the shortage of

finance, he could not do it. Besides, the supply of water in the well was not that large to irrigate the entire area of the fragment for the crop like banana. According to the accepted rotation on the fragment, it was due for jowar in 1963-64; but because of the irrigation he had to deviate from it. This shift from jowar to banana and wheat, caused deviations on two of his other plots as well. As jowar was due on this fragment only, where he could not take, he had to make provision for it through deviations. He, therefore, deviated from cotton and wheat to jowar on his two plots of 1.78 and 1.50 acres respectively.

7.3.4. Deviations Caused by the Non-availability of Seeds

It is observed during the field-work that the cultivators, particularly the medium and large, preserve different types of seeds required for their own land. The small cultivators, however, do not follow this practice because of many reasons. They largely depend for their requirements of seeds on the market. In certain years, if the prices of seeds are high some of the small cultivators cannot afford to purchase the required quantity of seeds and are, thus, forced to deviate to other crops of which the seeds are relatively cheap. This happens particularly in the case of groundnut as its seeds are generally more costly and the total requirement of its seeds per acre is also high. In the year 1962-63, the price of groundnut seeds was as high as Rs.1.25 to Rs.1.50 per seer. The per acre requirement of groundnut seeds was also as high as 25 to 30 seers.

It was observed from the data that five cultivators were required to deviate in different years on account of the non-availability of seeds. Of these, one each was from Waghode and Rozode (Case Studies W 8 and R 8) and three were from Vivare (Case Studies V 6, V 16 and V 28). The deviated area was 1.45 acres in Waghode (1963-64), 1.88 acres in Rozode (1961-62). In Vivare it was 0.75 acre in 1962-63 and 3.33 acres in 1963-64. It may be noted that all these cultivators deviated from groundnut as they had not preserved seeds and could not purchase as its price was considerably high. The case of one of the cultivators in Vivare may provide a good illustration of such deviations (Case Study V 6). He was a small cultivator having a land-holding of 2.41 acres. According to the rotation-plan groundnut was due in 1962-63 on one of his plots of 0.75 acre. But he could not grow it as he had no seeds of groundnut and could not purchase it as its price was considerably high--Rs.1.25 to Rs.1.50 per seer. As he had not grown groundnut anywhere on his land-holding in the preceding year he did not preserve the seeds. In the circumstances he was required to deviate from groundnut. He preferred to deviate to jowar as its seeds were comparatively cheap. He was faced with similar circumstances in the next year (1963-64) as well, and deviated from groundnut to jowar once again. In the case of the other cultivators also the circumstances were similar and all of them were required to deviate from groundnut. Of the five cultivators three, deviated to jowar, and the remaining two, to cotton.

7.3.5. Deviations Caused by the Non-availability of Finance

Of the five major crops grown in the dry and the irrigated villages, banana is the costliest crop. As pointed out in Chapter II, the average cost of banana cultivation is as high as Rs.1,599.34 per acre. Its initial cost of planting alone is about Rs.470 per acre. Besides this current cost, a large amount of capital investment in the form of pumping-sets etc. has to be done. The small and many of the medium cultivators, therefore, do not cultivate this crop. Instead, they always prefer to lease-out their lands for it. It is observed in both the irrigated villages that the large and some of the medium cultivators only, grow banana. Most of them finance the cultivation of banana crop through the borrowings from the Raver Taluka Co-operative Fruit Sale Society, which advances crop loans at the rate of Rs.1,000 per acre of banana. However, some of the medium cultivators, who cannot get a crop loan from the Society because of their arrears, take advances either from the banana traders or from the money lenders like the cloth merchants from Sindh, and Mahanubhav priests. Sometimes they borrow at a very high rate of interest but do not prefer to deviate from banana on account of the shortage of finance. Banana being the most profitable and certain crop, the cultivators generally do not deviate from it, unless some factor beyond their control (water supply, rains etc.) forces them. The deviations caused by the shortage of finance, therefore, are rarely reported. Some of the large cultivators only had to deviate when a considerably large area of their holding became

due to banana in certain years. They were required to deviate as they could not finance the cultivation of banana on all the area due for it (Case Study W 32). We have discussed such cases in the preceding chapter and noted that the accepted rotations themselves were responsible for the large area becoming due for banana in certain years.

Two other cultivators deviated in 1962-63, because of the non-availability of finance to buy an oil-engine operated pumping set. Of these, one was from Waghode (Case Study W 17), and the other from Rozode (Case Study R 25). Both of them were the medium cultivators and had to deviate from banana to cotton as they could not make arrangements for the capital required to purchase an oil-engine operated pumping set. The area deviated was 3.45 acres in Waghode and 1.25 acres in Rozode. The cultivator in Waghode was employed till 1962 as an accountant with one big banana trader in the village. He had a land-holding of 9.03 acres, distributed into four fragments. In the fragment of 3.45 acres he had his own well having sufficient water supply. But he did not have any pumping set to irrigate the land. He, therefore, leased-out the land to his employer, for banana cultivation. In 1962-63, however, he wanted to grow banana himself, as his employer had promised him a loan of Rs.3,000 to purchase a pumping set. But it did not materialize because of some serious disagreement between them and ultimately he had to give up the service even. He had made all the arrangements to grow banana, but as he could not purchase a pumping set, he could not grow it. He could not either lease-out the land for

banana cultivation, to any other cultivator, as it was very late to enter into such agreement. In the circumstances, therefore, he was required to deviate to cotton. Similar was the case of the cultivator in Rozode, except the difference in the agency of finance. He had applied for the Taccavi loan to purchase an oil-engine pumping set. The loan was sanctioned but he could not get the amount in time (i.e. before June) to purchase a pumping set and hence was required to deviate from banana to cotton.

In the case of the other major crops, no cultivator reported any deviations caused by the shortage of finance.

7.4. Deviations Caused by the Changes in Requirements

In this section we deal with the deviations caused by the three types of requirements--food, fodder and cash. We may consider each of these separately.

7.4.1. Deviations Caused by the Food-Requirements

We have observed earlier that the basic attitude of the cultivators is of self-sufficiency, particularly as regards food. They first aim at the minimum security of food required for the family. With this point of view only, the rotations with jowar, are selected. Thus, the provision for jowar is made in the rotation-plan itself. We have seen that the area devoted to jowar, averaged over the rotation cycle, has a close bearing on the total food requirement. However, in certain years, the cultivators are required to deviate because of food requirements. It is observed from the data that the food requirements cause deviations under three different situations:

(1) When there is a sufficient stock of foodgrain from the preceding year and there is no need to devote any area to food-crops;

(2) When there is an extra need for more foodgrains to arrange for a feast to the village people, on such occasions as marriage, thread ceremony, etc.;

(3) When the cultivators want to meet their minor food-needs as well, from their own production.

The cultivators are required to deviate from their rotation-plans, under these situations. Under the first situation, they invariably deviate to the cash-crops which can give them higher returns. Under the second situation, they are required to deviate to the crops like wheat, gram, groundnut etc. which are needed to meet the additional demand for foodgrains on the social occasions. Under the third situation, they deviate on some minor portion of their land to grow the crops like chillies, vegetables, paddy, gram, wheat, etc., and meet the minor consumption needs of the family from their own production. The requirements of such crops are minor and hence these do not find any place in the rotation-plan.

In Tables 7.16 and 7.17, are given the deviations caused by food requirements and the deviated area in each year. It is observed from the data that out of the 48 cultivators deviating because of food-requirements, three, deviated under the first situation; ten, under the second situation; and the remaining thirty-five, under the third situation.

Of the three cultivators deviating under the first

Table 7.17 : Deviations Caused by the Food Requirements of the Cultivators in the Irrigated Villages (1960-61 to 1963-64)

Village	1960-61				1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Waghode	3	3.23	Jowar	Wheat	2	4.33	Cotton	Wheat	2	2.48	Cotton	Wheat	2	1.05	Jowar	Groundnut
	1	1.15	Cotton	Wheat	1	0.50	Jowar	Paddy	2	0.63	Jowar	Groundnut	1	0.98	Cotton	Wheat
	1	0.18	Cotton	Chillies	-	-	-	-	1	1.00	Cotton	Groundnut	1	1.80	Jowar	Cotton
Total	5	4.56	-	-	3	4.83	-	-	5	4.11	-	-	4	3.83	-	-
Rozode	1	0.80	Cotton	Wheat	-	-	-	-	-	-	-	-	-	-	-	-
	2	0.50	Cotton	Groundnut	3	2.58	Cotton	Wheat	4	2.63	Jowar	Wheat	1	0.48	Cotton	Groundnut
	1	0.40	Jowar	Groundnut	1	1.53	Wheat	Jowar	-	-	-	-	1	1.00	Cotton	Wheat
	1	0.10	'Nawati' banana	Chillies	-	-	-	-	-	-	-	-	-	-	-	-
Total	5	1.80	-	-	4	4.11	-	-	4	2.63	-	-	2	1.48	-	-

situation, one each was from Khirode, Waghode and Rozode (Case Studies K 30, W 24 and R 29). The area deviated was 5.40 acres in Khirode (1963-64), 1.80 acres in Waghode (1963-64) and 1.53 acres in Rozode (1961-62). Of these cultivators, the case of the cultivator in Khirode provided a good example of such deviations. In his case, according to the rotation-plan, jowar was due in 1963-64 on one of his plots of 5.40 acres; but because of the jowar stocks with him he did not grow it and deviated to groundnut. In the two years preceding to 1963-64, jowar had claimed a comparatively larger area of his land and its production was considerably higher than the requirement. His total requirement of jowar was about 30 maunds per year. In 1962-63, therefore, he had enough jowar stocks, which he could store even after selling some of its production; and there was no need for him to devote any area to jowar for the family consumption needs. He, therefore, preferred to reduce the area due for jowar in 1963-64 and divert it to the cash-crops. This caused a deviation on the plot of 5.40 acres, where he grew groundnut instead of jowar which was due. Considering the restraint from the manure supply and the type of land available in the plot, he had to deviate to groundnut. For his fodder requirements he had taken jowar and bajara as usual on his three plots of lighter soil. The other two cultivators in Waghode and Rozode also faced similar situation in 1961-62 and 1963-64, and were required to deviate from the food-crops due.

Out of the ten cultivators deviating under the second situation, four were from Vivare and three each from Waghode and

Rozode (Case Studies V 14, V 18, W 11, W 30, R 2 and R 9 etc.). The total deviated area in Vivare was 1.63 acres in 1960-61; 2.55 acres in 1961-62; and 1.48 acres in 1962-63. In Waghode, it was 2.40 acres in 1960-61 and 0.83 acre in 1961-62. In Rozode it was 1.58 acres in 1961-62 and 1.25 acres in 1962-63. One of the cultivators in Vivare, provided a good illustration of the deviations under the second situation (Case Study V 18). He had a holding of two fragments--one having an area of 1.58 acres and the other 4.13 acres. He had accepted the rotation of C-J on the two plots of the first fragment and the rotation of G-J-C on the three plots of the second fragment. According to the rotation followed, jowar was due in 1962-63 on the two plots (0.75 and 0.73 acre) of the first fragment; but he had to deviate in order to grow wheat which he required for his daughter's marriage. He reported that his daughter's marriage was to be celebrated in 1963 and he had to make provision for wheat, the major foodgrain required for the marriage feast. In order to reduce the cash expenditure on the foodgrains required for the marriage, he preferred to produce wheat on his own land. He, therefore, deviated from jowar on both the plots and took wheat. For the usual food needs of the family he grew jowar on his other plot of 1.63 acres, where it was due according to the rotation-plan. The other cultivators in Vivare, Waghode and Rozode also deviated to wheat to meet its extra demand for the feasts given on the occasions of marriage and other social functions. Seven of them deviated from jowar to wheat and two from cotton to wheat.

As stated earlier, the number of the cultivators deviating under the third situation was comparatively large (35 cultivators). Of these, four were from Khirode, eleven from Vivare, twelve from Waghode and eight from Rozode (Case Studies K 26, K 29, V 15, V 29, W 27, W 28 and R 15 etc.). The total deviated area of such cases was also relatively large as many of the cultivators grow such crops of minor food items on their land to meet their family consumption needs (see Tables 7.16 and 7.17). The Case Study W 27 may serve as a good illustration of such deviations. In his case, according to the rotation-plan cotton was due in 1960-61 on a small plot of 0.18 acre. The plot had irrigation facility from a jointly owned well. It was very convenient for irrigation as it was situated near the well. Considering the availability of water supply, and the convenience of irrigation, the cultivator preferred to deviate on the plot, to grow chillies in 1960-61 to meet the family consumption needs. He, thus, deviated from cotton to chillies on the small plot of 0.18 acre. Cotton was due on his other plots of holding as well, and its area was not much affected by this deviation. The other cultivators also deviated to minor food-crops such as paddy, wheat, groundnut etc. in the similar circumstances. In their case also such deviations did not affect much the areas under the major crops. Many of the Leva-Patidar cultivators in Khirode, Rozode and Vivare were found deviating to groundnut, to meet their consumption needs. It was one of the important items in their daily consumption as they prepared its curry and 'chatani' to consume along with jowar breads.

7.4.2. Deviations Caused by the Fodder Requirements

We have observed in Chapter V, that the cultivators largely meet fodder requirements of their livestock mainly from the stalks of jowar and other crops like wheat etc. grown to meet the food needs of the family. The fodder requirements are, thus, met along with that of food and no cultivator has to devote any separate area for the fodder crops as such. In these villages, therefore, the fodder requirements do not have any influence on the rotation-plans of the cultivators. The deviations for fodder were also rare. The big cultivators only, who have large area of land, deviate on the lighter type of soil and grow bajara to get a different type of fodder than jowar.

It was observed from the data that four cultivators only reported deviations because of the fodder requirements. Of these, one each was from Khirode and Vivare (Case Studies K 30 and V 24) and two were from Rozode (Case Studies R 12 and R 23). The deviated area was about 2.23 acres in Khirode (1962-63); 1.00 acre in Vivare (1960-61) and 1.46 acres in Rozode (1960-61 and 1962-63). The case of the cultivator in Khirode presented a good example of such deviations. He was a big cultivator having a land-holding of 35.54 acres. One of his fragments of the land-holding having an area of 2.23 acres was of very inferior type of land where he could not follow any rotation. He was required to grow jowar on it year after year. In 1962-63 according to the rotation-plan jowar was due on 10.48 acres of his land. Of this area, 5.48 acres were of lighter type of soil where usually jowar was taken mainly for fodder. As the area

due to jowar was large in this year, he thought of diverting some of it to bajara to get a different type of fodder for his livestock. It is believed that the husk of bajara is very good, particularly for bullocks. He, therefore, deviated on the fragment of 2.23 acres and grew bajara instead of jowar which was continuously taken on it. The other cultivators in Vivare and Rozode also deviated to bajara under similar conditions. All the three of them deviated from jowar to bajara.

7.4.3. Deviations Caused by the Cash-Requirements

We have seen earlier that in the rotation-plans the cultivators try to achieve and maintain the required balance between the food-crops and the cash-crops. After making the provision for food consumption of the family, they devote the rest of their land entirely to the cash-crops. In certain years, however, the cultivators need cash-income more than usual to meet the unusual expenses on the occasions like marriages or other social functions or to meet the expenses of higher education of children or to repay the loans drawn for different purposes, and they are required to re-adjust their annual cropping from that point of view, even at the cost of the food-crops. They are required to curtail the area under the food-crops, in order to increase the area under the cash-crops. At times, if the need for cash-income is high and pressing, they do not grow the food-crops at all and put the entire land-holding under the cash-crops. After meeting the unusual demand for more cash-income, they again return to their normal cropping as per the rotation-plans.

In Table 7.18 are given the details about the deviations caused by the cash-requirements. It was observed from the data that the number of cultivators reporting such deviations in different years was three, in Khirode (Case Studies K 8, K 18 and K 24); six, in Vivare (Case Studies V 4, V 17, V 22 and V 24 etc.); and two each, in Waghode and Rozode (Case Studies W 7, W 24, R 1 and R 8). In Khirode, all the cultivators deviated in 1963-64, the deviated area being 4.18 acres. In Vivare, the deviated area was 3.78 acres in 1961-62; 1.75 acres in 1962-63; and 3.38 acres in 1963-64. In the two irrigated villages the deviated area was rather small. One of the three cultivators in Khirode furnished a good case of such deviations (Case Study K 18). He was a medium cultivator having a land-holding of 8.46 acres, divided into two fragments of 7.53 acres and 0.93 acre. He had accepted three different types of two-year rotations (G-J, G-C and C-J) on the three plots of the first fragment; and the three-year rotation (G-C-J) on the second fragment. According to the accepted rotation-plan, jowar was due in 1963-64 on the second fragment. But he deviated from it and took groundnut as he wanted more cash-income in this year to repay the loan, borrowed for reconstructing the portion of his house which had collapsed in 1962-63. In this particular year, he devoted a major portion of his land-holding (7.33 out of 8.46 acres) to the two cash-crops--cotton and groundnut--in order to meet the extra cash needs of the year. He grew jowar only on 1.13 acres of the first fragment. The jowar production from this much area was not enough to meet his annual food requirements

Table 7.18 : Deviations Caused by the Cash Requirements of the Cultivators in the Dry and the Irrigated Villages (1961-62 to 1963-64)

Village	1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Khirode	-	-	-	-	-	-	-	-	2	3.00	Jowar	Cotton
	-	-	-	-	-	-	-	-	2	1.18	Jowar	Groundnut
Total	-	-	-	-	-	-	-	-	4	4.18	-	-
Vivare	2	3.78	Jowar	Cotton	1	1.00	Jowar	Cotton	1	1.50	Jowar	Cotton
	-	-	-	-	1	0.75	Jowar	Groundnut	2	1.88	Jowar	Groundnut
Total	2	3.78	-	-	2	1.75	-	-	3	3.38	-	-
Waghode	-	-	-	-	1	3.00	Jowar	Groundnut	1	1.25	Jowar	Cotton
Total	-	-	-	-	1	3.00	-	-	1	1.25	-	-
Rozode	-	-	-	-	1	0.63	Jowar	Cotton	1	0.37	Jowar	Cotton
Total	-	-	-	-	1	0.63	-	-	1	0.37	-	-

of the family (27 maunds of jowar); but in view of the immediate cash needs he could not help. He had to curtail the area under jowar in order to grow more cash-crops. The other cultivators in Khirode and in other three villages also faced similar circumstances in different years and were required to deviate from the food-crops to the cash-crops. It may be seen from the Table that all of them deviated from jowar. Some of them did not grow jowar at all and put the entire land-holding under the cash-crops only (Case Studies K 8, V 4, W 7, W 24 and R 8). Of the total number of these cultivators eight deviated from jowar to cotton and five from jowar to groundnut.

7.5. Deviations Caused by the Changes in Prices

As pointed out earlier, it is found from the data that the cultivators both in the dry and the irrigated villages, have a general preference for the cash-crops. This is mainly because the general price level of such crops is higher and the average per acre returns from these are always greater than those of the food-crops. As observed in Chapter V, most of the cultivators grow food-crops only on that much area required to meet their family needs and devote the rest of their land to the cash-crops. This type of balance between the food-crops and the cash-crops is achieved and maintained through the rotation-plans formulated necessarily for a long period. While formulating such rotation-plans, the cultivators take into consideration the general level of prices of different crops to know their relative profitability. The yearly fluctuations in the prices of different crops are generally not taken into consideration. However, some of the

cultivators may be attracted by a high price rise of a particular crop in certain years and may be induced to deviate from the rotation-plan, to put larger area under that particular crop.

Prices, thus, have their influence on the long-run cropping programmes and have to be studied mainly in that context. However, such a study is not done here as the data collected pertain to a short-period of four years only. It is observed that during the short period the cultivators are, more or less, rotation bound and grow their annual crops mostly as per the rotation-plans. Prices, therefore, do not have much influence in the short period, on the year to year cropping of the individual cultivators. Most of the cultivators in the four villages reported that the prices of different agricultural commodities vary from year to year and do not provide a stable base for the annual crop decisions. They stated that they cannot be certain that the prices received in the current year, would prevail in the following year as well. They, therefore, consider very risky to make any adjustments in their annual cropping on the basis of the prices received. They find rotation-plans more safe to rely on. They, in fact, follow the rotation-plans as a safeguard against the variations in the prices of different agricultural commodities.

However, there were a few cultivators who re-adjusted their cropping in response to the yearly fluctuations in the prices of different crops. The rise in prices induced them to deviate from the rotation-plan in order to put larger areas under that particular crop. It was observed from the data that the

changes in prices cause deviations in two ways:

(1) when price changes act as a direct incentive to put larger area under that particular crop; and

(2) when price changes act as a deterrent on consumption of certain food-crop and force the cultivators to grow that particular crop on their own land to meet the family consumption needs.

The first type of deviations are more simple and clear. A marked rise in the prices of certain crops may attract some of the cultivators and make them deviate from the rotation-plan. In order to take the benefit of price rise, they may prefer to put larger land under those particular crops. Opposite is the case when there is a serious fall in the prices of different crops. The second type of deviations are more interesting. In such cases, because of the sharp rise in prices, the cultivators may be required to curb the consumption of certain food-crops. This may induce some of the cultivators to grow those particular food-crops on their own land and meet the family consumption needs. As an alternative to high prices, they may find it convenient to deviate from the rotation-plan on some minor area and produce those crops to meet the family requirements.

In Tables 7.19 and 7.20, are given the details of such deviations caused by the price changes and the deviated area in different years. It may be noted from the Tables that the area deviated on account of prices was small in the dry villages. It was relatively larger in the two irrigated villages. The first type of deviations were reported by a few cultivators in

Table 7.20 : Deviations Caused by the Changes in Prices of Different Agricultural Commodities at the Irrigated Villages (1960-61 to 1963-64)

Village	1960-61				1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Waghode	1	0.50	'Nawati' banana	Paddy	3	2.30	Cotton	Paddy	3	2.47	Cotton	Paddy	2	1.25	Cotton	Paddy
	1	1.00	Groundnut	Paddy	-	-	-	-	1	0.55	'Nawati' banana	Groundnut	1	3.98	'Nawati' banana	Groundnut
	1	0.50	'Nawati' banana	Chillies	1	1.50	'Nawati' banana	Wheat	1	0.75	Cotton	Sugarcane	1	1.93	'Nawati' banana	Wheat
	1	3.13	'Nawati' banana	Sugarcane	1	3.13	'Nawati' banana	Sugarcane	2	4.63	'Nawati' banana	Sugarcane	2	2.25	'Nawati' banana	Sugarcane
	1	4.20	'Nawati' banana	Groundnut	1	1.50	Cotton	Sugarcane	-	-	-	-	1	0.50	Cotton	Chillies
	-	-	-	-	-	-	-	-	-	-	-	-	1	2.95	'Nawati' banana	Chillies
Total	5	9.33	-	-	6	8.43	-	-	7	8.40	-	-	8	12.86	-	-
Rozode	2	0.35	Cotton	Paddy	1	0.10	'Nawati' banana	Paddy	1	0.48	Jowar	Paddy	-	-	-	-
	1	0.15	Cotton	Brinjal	1	0.95	Jowar	Groundnut	1	0.38	Jowar	Wheat	-	-	-	-
	-	-	-	-	1	2.80	Cotton	Wheat	1	0.10	'Nawati' banana	Wheat	-	-	-	-
	-	-	-	-	1	1.25	Cotton	Wheat	1	2.00	'Nawati' banana	Groundnut	-	-	-	-
	-	-	-	-	-	-	-	-	1	0.50	Jowar	Brinjal	-	-	-	-
	-	-	-	-	-	-	-	-	1	0.50	Jowar	Chillies	-	-	-	-
Total	3	0.50	-	-	4	5.10	-	-	6	3.96	-	-	-	-	-	-

Khirode and Waghode. In the other two villages no cultivator reported this type of deviations. Many of the cultivators, particularly in the irrigated villages reported the second type of deviations. In Rozode, all the cultivators deviating on account of prices reported such deviations. The same was the case in Vivare. In Waghode, also, the number of cultivators reporting such deviations was comparatively large.

Of the cultivators reporting the first type of deviations, two were from Khirode and nine from Waghode. Of the two cultivators in Khirode, one deviated in 1961-62 (Case Study K 15); and the other in 1963-64 (Case Study K 13). The deviated area was 2.40 acres in the first case and 2.20 acres in the second. In Waghode, out of the nine cultivators two each, deviated in the first three years (Case Studies W 8, W 19 and W 28 etc.) and three, in the last year (Case Studies W 16, W 17 and W 28). One of these cultivators deviated in all the four years. The deviated area of all the cultivators in this village was 7.33 acres in 1960-61; 6.08 acres in 1961-62; 5.93 acres in 1962-63; and 11.61 acres in 1963-64.

Both the cultivators in Khirode deviated because of the marked rise in the prices of cotton and groundnut in the two years. The cultivator deviating in 1963-64 provided a good case of such deviations (Case Study K 13). He was a medium cultivator having a land-holding of 6.58 acres, divided into three fragments. He had accepted the two-year rotation of G-J on all the four plots of his three fragments. In 1962-63, he grew two crops--jowar and groundnut--strictly according to the rotation-

plan. But in this year the price of cotton ruled very high throughout the post-harvesting period. It varied between Rs.33 and Rs.37 per maund. He reported that all his cultivator friends who had grown cotton in that year had benefited to a great extent. He felt it much as he did not take cotton in that year on any part of his land. In the following year (1963-64), therefore, he deviated on two of his plots (1.40 acres and 0.80 acre) and took cotton on both, instead of jowar and groundnut which were due on these two plots respectively. Because of this deviation, he had to curtail the area under jowar from 2.78 to 1.38 acres. This much area under jowar was very small to meet the total food needs of the family. He was, therefore, required to grow jowar as a mixed crop along with cotton.

The second cultivator also deviated to groundnut under similar conditions (Case Study K 15). In 1961-62, he devoted a major portion of his land-holding to groundnut (5.55 out of 6.38 acres), as its price was as high as Rs.25 to Rs.30 per maund in 1960-61. He reported that in 1960-61 he had taken groundnut on 2.40 acres of land and had benefited to a considerable extent because of the rise in its prices. He sold his produce at Rs.28.40 per maund. In the following year, therefore, he took more groundnut on his land (5.55 acres), hoping that the same prices will prevail. In order to devote larger area to groundnut, he had to deviate on one of his plots of 2.40 acres. He had to repeat groundnut on this plot, instead of putting it under jowar which was due according to the crop-rotation. In that year he could grow jowar only on 0.80 acre. However, his family

requirement of jowar was quite high and he was not wholly depending for it on his land.

These were the only two cultivators in all the four villages who changed their annual cropping in response to the yearly variations in the prices of the two cash-crops. They might have been induced by such price fluctuations as they were quite young (25 to 30 years of age) and new to the occupation of cultivation. One of them had started looking to agriculture independently only after the death of his father in 1958 (Case Study K 13). The second was in fact a tailor but had recently taken to cultivation by purchasing 7.25 acres of land in 1957 (Case Study K 15). It was observed that the cultivators of long standing generally did not respond to such price fluctuations in the short-run.

The case of the cultivators reporting the first type of deviations in Waghode was different. Five of them deviated to take 'kandya bāg' banana. In fact, according to their rotation-plan, banana was due; but instead of growing it as 'Mrug bāg' they preferred to deviate to 'Kandya bāg' as the prices of banana taken in this season are generally high. As pointed out in Chapter II, a majority of the cultivators in the irrigated villages grow banana as a 'Mrug bāg' planted in June and harvested in October and November of the following year. The prices of banana, therefore, are generally low in the harvesting season when its supply is considerable. Its supply gradually declines from January onwards and reaches the lowest level in the summer season. The prices of banana in the summer season,

therefore, are always high. In order to take the advantage of such high prices in the off season, some of the cultivators grow banana as a 'Kandya bāg'--planted in October and harvested in April and May of the following year. The Case Study W 23 may serve as a good illustration of such deviations. He was a big cultivator having a land-holding of 20.57 acres distributed in five fragments. He had accepted two types of three-year rotations of NB-JB-C and G-C-J on different fragments. According to the rotation-plan banana was due in 1960-61, on two of his fragments (4.98 and 4.20 acres). He had no irrigation facility on the fragment of 4.98 acres; but he had established definite type of relationship with his neighbour cultivator having irrigation and used to lease-out his land regularly for banana cultivation. He had his own irrigation facility on the other fragment. Of the two fragments due for banana in 1960-61, he had to lease-out one (4.98 acres) as usual for 'Mrug bāg' banana. On the other fragment, where his own irrigation facility was available, he preferred to grow banana as 'Kandya bāg' so as to sell the produce in the off season. He, therefore, took groundnut in the kharif season and planted banana suckers in the month of October. Such a deviation on this fragment did not affect the cropping on his other fragments. The other cultivators also deviated to 'Kandya bāg' in similar circumstances. However, one cultivator who wanted to lease-out his land for 'Kandya bāg' could not do so because of some disagreement with the tenant and was forced to deviate to wheat (Case Study W 8). The cultivator who reported this type of deviations in all the four years, had

deviated from banana to sugarcane as he had found that sugarcane gave better returns than banana, particularly on his land which was much alkaline. In 1963-64, he had deviated to chillies on some of his plots as its prices had risen to a considerable extent (Case Study W 28).

The second type of deviations caused by the prices were reported more in the irrigated villages. In Waghode, three cultivators each, reported such deviations on 2.00 and 2.47 acres in 1960-61 and 1962-63; and two cultivators each, on 1.35 and 1.25 acres in 1961-62 and 1962-63. In Rozode, the area under such deviations was relatively large in 1961-62 and 1962-63 (see Table 7.20). In Khirode and Vivare, however, the number of cultivators reporting such deviations was very small. The deviated area reported by them was also very minor (see Table 7.19). It was observed, that in these villages some of the foodgrains like rice and wheat were not freely available because of the Government policies about rationing. In such circumstances, the cultivators were required to curb their consumption of such foodgrains. Some of the enterprising cultivators, however, found an alternative to this and started producing those crops on their own land. They deviated on a small area of their land and raised such crops mainly to meet the consumption needs of the family. Thus, paddy which was not a crop of this region was grown by some of the cultivators to meet their family consumption needs. Same is the case with chillies. The case of one of the cultivators in Waghode may be given as an illustration of such deviations (Case Study W 21).

He was a medium cultivator having 16.86 acres of land distributed into four fragments. He had accepted three types of crop-rotations (NB-JB-J, NB-JB-C and G-C) on different plots of his land-holding. According to his rotation-plan, cotton was due in 1962-63 on one plot of 0.77 acre but he deviated from it to grow paddy in order to meet the family consumption needs of rice, which was not available freely in the village. The rice supplied through the fair price shops was very limited and was not sufficient to meet his total consumption needs. Rice was available in black market but he could not buy it as its price was as high as Rs.1.50 to Rs.2 per seer. In such circumstances, he preferred to produce paddy on his own land and hence deviated on his small plot of 0.77 acre. He preferred to deviate for paddy on this particular plot as it was nearer the well and very convenient to irrigate. The other cultivators also deviated to crops like wheat, rice, chillies, etc. under similar circumstances.

7.6. Deviations Caused by the Other Factors

In this class are included other factors which could not be covered in any of the above categories. Among these, the interactions of deviations caused by some other factors was the major one. Many of the deviations reported in this category were caused by this factor alone. Besides this, there were two other factors--nuisance from the wild animals and birds, and the change in the practice of following the accepted crop-rotation--included in this class. These two factors, however, were very peculiar and caused deviations only in stray cases.

In Table 7.21 are given the details of such deviations and the deviated area in different years. The case of one cultivator in Khirode furnished a good example of such deviations (Case Study K 11). He was a small cultivator having a land-holding of 5.91 acres, distributed into two fragments. He had accepted three types of rotations (G-J, G-C and G-C-J) on different plots of his land-holding. According to his rotation-plan, jowar was due in 1963-64 on the plot of 0.83 acre only. He had sown jowar accordingly but its seeds were all eaten by the wild pigeons, attracted by the mango grove which was near the field. He did not re-sow jowar as he was afraid that it would meet the same evil. Instead, he deviated to groundnut, the seeds of which are comparatively bigger in size and are not generally eaten by such birds. Thus, the nuisance from the wild birds made him deviate from jowar to groundnut on his plot of 0.83 acre. This deviation affected the cropping on his other plots. Because of this deviation he had to deviate on one more plot of 1.50 acres. According to the rotation-plan, groundnut was due on this plot in 1963-64. But as he deviated from jowar to groundnut on the plot of 0.83 acre, he had to make provision for jowar on his other plot of 1.50 acres, in order to meet the family consumption needs. In his circumstances in 1963-64, the plot of 1.50 acres was the most convenient to deviate for jowar. The other plots of his holding were not so convenient as, on one, it would have caused the repetition of the same crop (1.55 acres) and on the other which was manured, it would have given poor yield (2.03 acres). The cultivator, therefore, had to

Table 7.21 : Deviations Caused by the Interactions of Deviations and Other Factors in the Dry and Irrigated Villages (1961-62 to 1963-64)

Village	1961-62				1962-63				1963-64			
	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken	No. of plots	Area in acres	Crop due	Crop taken
Khirode	-	-	-	-	-	-	-	-	1	0.83	Jowar	Groundnut
	-	-	-	-	-	-	-	-	1	1.50	Groundnut	Jowar
Total	-	-	-	-	-	-	-	-	2	2.33	-	-
Vivare	4	6.01	Cotton	Jowar	1	0.75	Jowar	Wheat	1	1.78	Wheat	Jowar
	-	-	-	-	-	-	-	-	1	1.50	Cotton	Jowar
Total	4	6.01	-	-	1	0.75	-	-	2	3.28	-	-
Waghode	1	0.10	Cotton	Jowar	1	2.00	Groundnut	Cotton	1	0.75	'Nawati' banana	Jowar
	1	2.00	Groundnut	Jowar	1	2.63	Cotton	Jowar	1	2.00	'Nawati' banana	Groundnut
	-	-	-	-	-	-	-	-	1	2.00	Jowar	'Nawati' banana
	-	-	-	-	-	-	-	-	1	2.73	Jowar	Cotton
Total	2	2.10	-	-	2	4.63	-	-	4	7.48	-	-
Rozode	1	0.13	Cotton	Jowar	1	1.73	Groundnut	Jowar	-	-	-	-
Total	1	0.13	-	-	1	1.73	-	-	-	-	-	-

deviate for jowar on this plot of 1.50 acres only. The other cultivators also had to deviate because of the similar type of interactions of deviations in different years.

In the case of one cultivator in Vivare, the change in the usual practice of following the accepted rotation was responsible for deviations in two years (Case Study V 10). He was a small cultivator having a land-holding of one fragment of 2.73 acres. He had accepted the two-year rotation of C-J on it. He used to divide the fragment into two plots of 1.73 acres and 1.00 acre and practise the same rotation on both of them, so that both the crops are taken every year--cotton on one plot and jowar on another. But in 1961-62 he gave up this practice of dividing the fragment. He preferred to put the entire fragment under one crop and practise the same rotation. This caused deviation on one of his plots of 1.00 acre in 1961-62. As he devoted the entire fragment to jowar in this year, jowar got repeated on this plot, instead of cotton which was due. In 1963-64, he reverted to his old practice of dividing the fragment and growing the two crops every year. In this year also, he had to repeat cotton on the plot of one acre. Thus, both the deviations were caused by the shift in the practice of following the accepted rotation. Such deviations were not reported by any of the cultivators in the other villages.

Summary

The external factors causing deviations may be classified into five groups: (1) climatic factors; (2) resource factors; (3) requirement factors; (4) price factors; and (5) other factors.

In the climatic factors, rainfall was the major one, which vitiated the cropping programmes of the cultivators in 1963-64 and caused deviations to a considerable extent. Among the resources, land, manure and water supply were the three important factors which caused deviations in many cases. The requirement factors were of three types--food, fodder and cash. Of these, the food and the cash requirements were important and caused deviations in the case of some cultivators. Prices did not cause many deviations. It was found from the data that in the short-run, the prices of different crops generally did not affect the annual cropping of the individual cultivators. In the long-run, however, prices may be effective and influence the rotation-plans of the cultivators. Among the factors included in the last group, the interaction of the deviations caused by some other factors, was the major one and caused deviations in some cases.

CHAPTER VIII

THE CROP-ROTATIONS, DEVIATIONS, AND THE CROP-PATTERN

As seen earlier, the cultivators accept different types of crop-rotations as a long-run cropping programme and adhere to these to the extent possible. In some years, however, they are required to deviate from the rotation course because of the factors inherent in the rotation programme itself or because of the other factors external to the rotations. Such deviations and the area deviated under them are discussed in the preceding two chapters. In this chapter we consider the aggregate crop-pattern of all the sample cultivators in each village, and try to see, to what extent the rotations are responsible for the variations in the aggregate areas under different crops. We may further consider the effect of the area under deviations on the aggregate level.

It is observed in Chapter V that the cultivators accepted different types of crop-rotations in order to secure stable maximum income over years, through the best use of the available resources. Almost all the area of their land-holdings was, thus, subjected to the accepted rotations. In the case of some cultivators, however, some portion of their land, which suffered from physical or other peculiarities could not be put under any rotation. They were required to devote such area to single cropping, suited to the peculiarities of the land. The total cropped land of the sample cultivators, therefore, may be

classified into two basic categories: (1) the area under the accepted crop-rotations; and (2) the area under single cropping. Such a classification of the total cropped area in the four villages is given in Table 8.1. The table evidently shows that the area under single cropping was negligible in all the villages except Waghode. It was relatively high in Waghode because of the orchards of oranges and lemons. We may first consider the areas under these two categories in the dry villages; and then, the areas in the irrigated villages.

Table 8.1 : Total Area Under the Rotations and Single Cropping in the Four Villages (Area in Acres)

	Khirode	Vivare	Waghode	Rozode
Area under the rotations	258.02	225.53	319.44	247.82
Area under single cropping	5.44	6.02	34.80	0.13
Total	263.46	231.55	354.24	247.95

8.1. Area Under the Crop-Rotations in the Dry Villages

In Khirode the cultivators practised different types of rotations on 258.02 acres, out of the total cropped area of 263.46 acres. They were required to follow single cropping on 5.44 acres only. Similar was the case in Vivare as well. Out of the total area of 231.55 acres, 225.53 acres were under rotations and 6.02 acres only under single cropping (see Table 8.1). The crop-rotations practised in the two villages and the area

under each of these are given in Tables 8.2 and 8.3. It can be seen from Table 8.2 that in Khirode two-year rotations were accepted on a major portion of the total area--180.14 acres or about 70.00 per cent. The three and four-year rotations were adopted on relatively smaller areas. Of the different types of the accepted rotations, the rotations of G-J, G-C, and G-C-J were the three major types, claiming larger proportion of the total land. In Vivare also, the two-year rotations were relatively preferred to other kinds (see Table 8.3). In this village, because of the predominance of the deep-black soil, the rotations with cotton as one of the crops, were largely accepted. Thus, the crop-rotations like C-J, W-C, C-C-C-J and C-C-J-W were the major types, having larger areas under them.

The cultivators adhere to the accepted crop-rotations to the extent possible, in their annual cropping. However, a strict adherence to the accepted rotations over years is not feasible and they are required to undertake deviations in certain years which cause variations in the areas under different crops. The variations in the areas of different crops, are in fact, basically caused by the accepted rotations themselves. The variations in the areas of different crops occur even if the accepted rotations are strictly followed from year to year. In this section, an attempt is made to point out such variations resulting from the accepted rotations themselves. We have to make two assumptions here; one, the accepted rotations are strictly adhered to over a period; and two, the size of plots under the accepted rotations remains the same throughout. On the

Table 8.2 : Area under the Rotations Practised by the Cultivators in Khirode

Rotation	No. of plots	Area in acres	Percentage to total area
Two-Year Rotation:			
Groundnut-Jowar	40	73.46	40.79
Groundnut-Cotton	26	70.55	39.16
Cotton-Jowar	14	28.00	15.54
Bajara-Jowar	2	6.50	3.61
Wheat-Jowar	2	1.63	0.90
Total	84	180.14	69.82
Three-Year Rotation:			
Groundnut-Cotton-Jowar	24	50.20	69.31
Groundnut-Jowar-Cotton	9	18.63	25.72
Groundnut-Cotton-Bajara	3	3.60	4.97
Total	36	72.43	28.07
Four-Year Rotation:			
Cotton-Cotton-Cotton-Jowar	1	5.45	100.00
Total	1	5.45	2.11
Grand Total	121	258.02	100.00

Table 8.3 : Area under the Rotations Practised by the Cultivators in Vivare

Rotation	No. of Plots	Area in acres	Percentage to total area
Two-Year Rotation:			
Cotton-Jowar	53	62.53	63.59
Groundnut-Cotton	6	4.43	4.51
Groundnut-Jowar	10	9.03	9.18
Wheat-Cotton	14	20.84	21.19
Wheat-Jowar	2	1.50	1.53
Total	85	98.33	43.60
Three-Year Rotation:			
Groundnut-Cotton-Jowar	9	13.34	22.46
Groundnut-Jowar-Cotton	3	4.13	6.95
Cotton-Cotton-Jowar	12	17.63	29.68
Cotton-Cotton-Wheat	1	1.18	1.99
Wheat-Cotton-Jowar	7	23.11	38.92
Total	32	59.39	26.33
Four-Year Rotation:			
Cotton-Cotton-Cotton-Jowar	10	20.49	30.21
Cotton-Cotton-Jowar-Wheat	12	47.32	69.79
Total	22	67.81	30.07
Grand Total	139	225.53	100.00

basis of these two assumptions, are presented the resulting crop-pattern for the period of four years in Tables 8.4 and 8.5; and point out the yearly variations in the aggregate areas of the different crops. In these tables, the variations resulting from the different kinds of rotations are separately shown and these are added up at the end to get a total effect of all the accepted rotations. The variations in the aggregate areas under the major crops are shown in Graphs 8.1 and 8.2. These Tables and Graphs clearly reveal that the variations resulting from the accepted rotations were cyclical in nature. The areas under different crops varied according to the sequence of the crops included in the rotations and the proportions of the areas allotted to them in the initial year (1960-61).

It will be seen from Table 8.4 that in Khirode the areas under all the three major crops, when grown strictly according to the accepted rotations, show wide variations from year to year. In the period of four years the area under groundnut, varied between 77.63 acres in 1960-61 and 110.78 acres in 1961-62; the area under cotton between 65.80 acres in 1961-62 and 86.26 acres in 1960-61; and the area under jowar between 75.54 acres in 1962-63 and 88.05 acres in 1960-61. It may be noted from Graph 8.1 that the area under groundnut moved on a higher level (except in 1960-61) than that of cotton and jowar. This was because in all the three major rotations--G-C, G-J and G-C-J-- which commanded a large proportion of the total area, groundnut was the common crop rotated with either cotton or jowar or with both. It was a common crop in the other major rotations as well.

Table 8.4 : Variations in Areas under Different Crops Grown Strictly according to the Rotations Practised by the Cultivators in Khirode (1960-61 to 1963-64) (Area in Acres).

Rotation	No. of plots	Total area	1960-61					1961-62				
			J	G	C	B	W	J	G	C	B	W
Two-year rotation:												
Groundnut-Jowar												
Groundnut in 1960-61	18	34.62	-	34.62	-	-	-	34.62	-	-	-	-
Jowar in 1960-61	22	38.84	38.84	-	-	-	-	-	38.84	-	-	-
Groundnut-Cotton												
Groundnut in 1960-61	14	30.65	-	30.65	-	-	-	-	-	30.65	-	-
Cotton in 1960-61	12	39.90	-	-	39.90	-	-	-	39.90	-	-	-
Cotton-Jowar												
Cotton in 1960-61	7	13.38	-	-	13.38	-	-	13.38	-	-	-	-
Jowar in 1960-61	7	14.62	14.62	-	-	-	-	-	-	14.62	-	-
Bajara-Jowar												
Bajara in 1960-61	1	3.25	-	-	-	3.25	-	3.25	-	-	-	-
Jowar in 1960-61	1	3.25	3.25	-	-	-	-	-	-	-	3.25	-
Wheat-Jowar												
Wheat in 1960-61	2	1.63	-	-	-	-	1.63	1.63	-	-	-	-
Total	84	180.14	56.71	65.27	53.28	3.25	1.63	52.88	78.74	45.27	3.25	-
Three-year rotation:												
Groundnut-Cotton-Jowar												
Groundnut in 1960-61	7	10.23	-	10.23	-	-	-	-	-	10.23	-	-
Cotton in 1960-61	6	17.73	-	-	17.73	-	-	17.73	-	-	-	-
Jowar in 1960-61	11	22.24	22.24	-	-	-	-	-	22.24	-	-	-
Groundnut-Jowar-Cotton												
Groundnut in 1960-61	1	0.93	-	0.93	-	-	-	0.93	-	-	-	-
Jowar in 1960-61	5	9.10	9.10	-	-	-	-	-	-	9.10	-	-
Cotton in 1960-61	3	8.60	-	-	8.60	-	-	-	8.60	-	-	-

(continued)

Table 8.4 : (continued)

Rotation	No. of plots	Total area	1960-61					1961-62				
			J	G	C	B	W	J	G	C	B	W
Three-year rotation:(cont'd.)												
Groundnut-Cotton-Bajara												
Groundnut in 1960-61	1	1.20	-	1.20	-	-	-	-	-	1.20	-	-
Cotton in 1960-61	1	1.20	-	-	1.20	-	-	-	-	-	1.20	-
Bajara in 1960-61	1	1.20	-	-	-	1.20	-	-	1.20	-	-	-
Total	36	72.43	31.34	12.36	27.53	1.20	-	18.66	32.04	20.53	1.20	-
Four-year rotation:												
Cotton-Cotton-Cotton-Jowar												
Cotton in 1960-61	1	5.45	-	-	5.45	-	-	5.45	-	-	-	-
Total	1	5.45	-	-	5.45	-	-	5.45	-	-	-	-
Grand Total	121	258.02	88.05	77.63	86.26	4.45	1.63	76.99	110.78	65.80	4.45	-

(continued)

Table 8.4 : (continued)

Rotation	No. of Plots	Total area	1962-63					1963-64				
			J	G	C	B	W	J	G	C	B	W
Two-year rotation:												
Groundnut-Jowar												
Groundnut in 1960-61	18	34.62	-	34.62	-	-	-	34.62	-	-	-	-
Jowar in 1960-61	22	38.84	38.84	-	-	-	-	-	38.84	-	-	-
Groundnut-Cotton												
Groundnut in 1960-61	14	30.65	-	30.65	-	-	-	-	-	30.65	-	-
Cotton in 1960-61	12	39.90	-	-	39.90	-	-	-	39.90	-	-	-
Cotton-Jowar												
Cotton in 1960-61	7	13.38	-	-	13.38	-	-	13.38	-	-	-	-
Jowar in 1960-61	7	14.62	14.62	-	-	-	-	-	-	14.62	-	-
Bajara-Jowar												
Bajara in 1960-61	1	3.25	-	-	-	3.25	-	3.25	-	-	-	-
Jowar in 1960-61	1	3.25	3.25	-	-	-	-	-	-	-	3.25	-
Wheat-Jowar												
Wheat in 1960-61	2	1.63	-	-	-	-	1.63	1.63	-	-	-	-
Total	84	180.14	56.71	65.27	53.28	3.25	1.63	52.88	78.74	45.27	3.25	-
Three-year rotation:												
Groundnut-Cotton-Jowar												
Groundnut in 1960-61	7	10.23	10.23	-	-	-	-	-	10.23	-	-	-
Cotton in 1960-61	6	17.73	-	17.73	-	-	-	-	-	17.73	-	-
Jowar in 1960-61	11	22.24	-	-	22.24	-	-	22.24	-	-	-	-
Groundnut-Jowar-Cotton												
Groundnut in 1960-61	1	0.93	-	-	0.93	-	-	-	0.93	-	-	-
Jowar in 1960-61	5	9.10	-	9.10	-	-	-	9.10	-	-	-	-
Cotton in 1960-61	3	8.60	8.60	-	-	-	-	-	-	8.60	-	-

(continued)

Table 8.4 : (continued)

Rotation	No. of Plots	Total area	1962-63					1963-64				
			J	G	C	B	W	J	G	C	B	W
Three-year rotation: (cont'd.)												
Groundnut-Cotton-Bajara												
Groundnut in 1960-61	1	1.20	-	-	-	1.20	-	-	1.20	-	-	-
Cotton in 1960-61	1	1.20	-	1.20	-	-	-	-	-	1.20	-	-
Bajara in 1960-61	1	1.20	-	-	1.20	-	-	-	-	-	1.20	-
Total	36	72.43	18.83	28.03	24.37	1.20	-	31.34	12.36	27.53	1.20	-
Four-year rotation:												
Cotton-Cotton-Cotton-Jowar												
Cotton in 1960-61	1	5.45	-	-	5.45	-	-	-	-	5.45	-	-
Total	1	5.45	-	-	5.45	-	-	-	-	5.45	-	-
Grand Total	121	258.02	75.54	93.30	83.10	4.45	1.63	84.22	91.10	78.25	4.45	-

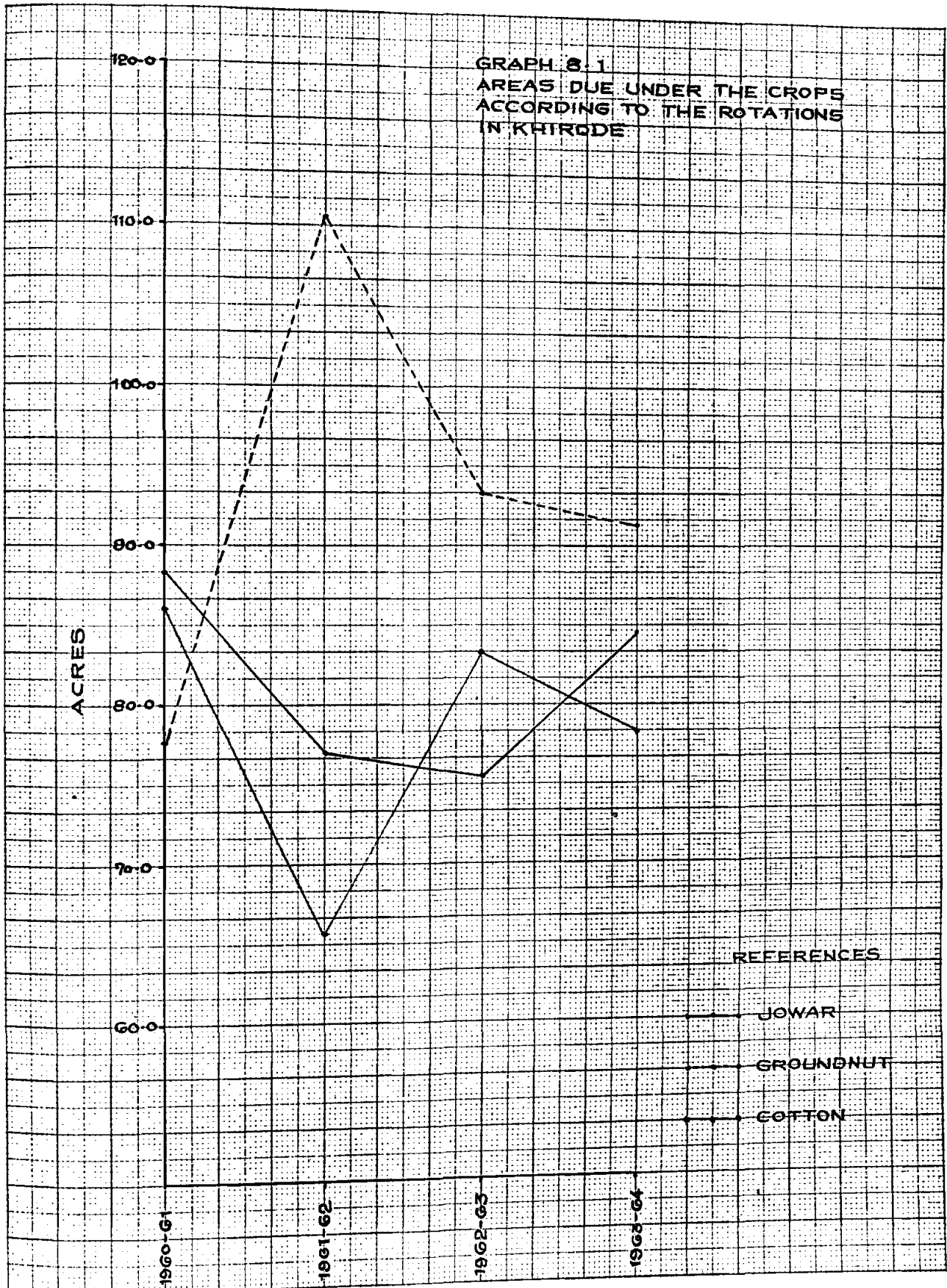
Table 8.5 : Variations in Areas under Different Crops Grown Strictly according to the Rotations Practised by the Cultivators in Vivare (1960-61 to 1963-64)
(Area in Acres)

Rotation	No. of plots	Total area	1960-61				1961-62				1962-63				1963-64			
			J	C	G	W	J	C	G	W	J	C	G	W	J	C	G	W
Two-year rotation:																		
Cotton-Jowar																		
Cotton in 1960-61	28	32.25	-	32.25	-	-	32.25	-	-	-	32.25	-	-	32.25	-	-	-	
Jowar in 1960-61	25	30.28	30.28	-	-	-	-	30.28	-	-	30.28	-	-	-	30.28	-	-	
Groundnut-Jowar																		
Groundnut in 1960-61	6	5.43	-	-	5.43	-	5.43	-	-	-	-	5.43	-	5.43	-	-	-	
Jowar in 1960-61	4	3.60	3.60	-	-	-	-	-	3.60	-	3.60	-	-	-	-	3.60	-	
Groundnut-Cotton																		
Groundnut in 1960-61	5	3.13	-	-	3.13	-	-	3.13	-	-	-	3.13	-	-	3.13	-	-	
Cotton in 1960-61	1	1.30	-	1.30	-	-	-	-	1.30	-	-	1.30	-	-	-	1.30	-	
Wheat-Cotton																		
Wheat in 1960-61	8	11.16	-	-	-	11.16	-	11.16	-	-	-	-	11.16	-	11.16	-	-	
Cotton in 1960-61	6	9.68	-	9.68	-	-	-	-	-	9.68	-	9.68	-	-	-	-	9.68	
Wheat-Jowar																		
Jowar in 1960-61	2	1.50	1.50	-	-	-	-	-	1.50	1.50	-	-	-	-	-	-	1.50	
Total	85	98.33	35.38	43.23	8.56	11.16	37.68	44.57	4.90	11.18	35.38	43.23	8.56	11.16	37.68	44.57	4.90	11.18
Three-year rotation:																		
Groundnut-Cotton-Jowar																		
Groundnut in 1960-61	3	2.76	-	-	2.76	-	-	2.76	-	-	2.76	-	-	-	-	2.76	-	
Cotton in 1960-61	4	7.68	-	7.68	-	-	7.68	-	-	-	-	7.68	-	-	7.68	-	-	
Jowar in 1960-61	2	2.90	2.90	-	-	-	-	-	2.90	-	-	2.90	-	-	2.90	-	-	
Groundnut-Jowar-Cotton																		
Groundnut in 1960-61	1	0.75	-	-	0.75	-	0.75	-	-	-	-	0.75	-	-	-	0.75	-	
Jowar in 1960-61	1	1.38	1.38	-	-	-	-	1.38	-	-	-	-	1.38	-	1.38	-	-	
Cotton in 1960-61	1	2.00	-	2.00	-	-	-	-	2.00	-	2.00	-	-	-	-	2.00	-	

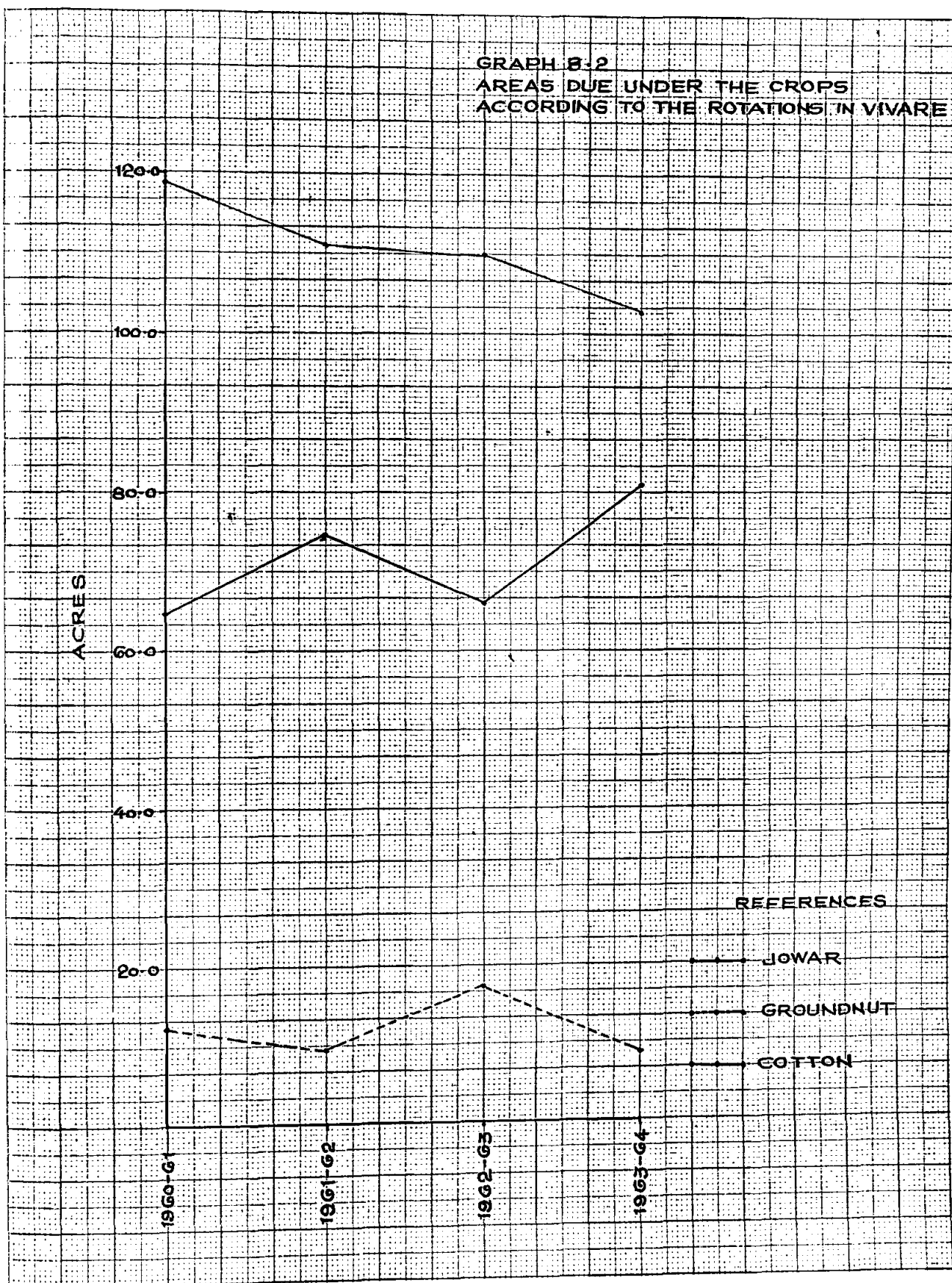
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Table 8.5 : (continued)

Rotation	No. of plots	Total area	1960-61				1961-62				1962-63				1963-64			
			J	C	G	W	J	C	G	W	J	C	G	W	J	C	G	W
Three-year rotation:(cont'd)																		
Cotton-Cotton-Jowar																		
Cotton in 1960-61	3	3.45	-	3.45	-	-	-	3.45	-	-	3.45	-	-	-	-	3.45	-	-
Cotton in 1960-61	5	7.60	-	7.60	-	-	7.60	-	-	-	-	7.60	-	-	-	7.60	-	-
Jowar in 1960-61	4	6.58	6.58	-	-	-	-	6.58	-	-	-	6.58	-	-	6.58	-	-	
Cotton-Cotton-Wheat																		
Cotton in 1960-61	1	1.18	-	1.18	-	-	-	-	-	1.18	-	1.18	-	-	-	1.18	-	-
Wheat-Cotton-Jowar																		
Wheat in 1960-61	2	9.88	-	-	-	9.88	-	9.88	-	-	9.88	-	-	-	-	-	-	9.88
Cotton in 1960-61	4	10.33	-	10.33	-	-	10.33	-	-	-	-	-	-	10.33	-	10.33	-	-
Jowar in 1960-61	1	2.90	2.90	-	-	-	-	-	-	2.90	-	2.90	-	-	2.90	-	-	
Total	32	59.39	13.76	32.24	3.51	9.88	26.36	24.05	4.90	4.08	18.09	21.91	9.06	10.33	13.76	32.24	3.51	9.88
Four-year rotation:																		
Cotton-Cotton-Cotton-Jowar																		
Cotton in 1960-61	10	20.49	-	20.49	-	-	-	20.49	-	-	-	20.49	-	-	20.49	-	-	
Cotton-Cotton-Jowar-Wheat																		
Cotton in 1960-61	3	12.46	-	12.46	-	-	-	12.46	-	-	12.46	-	-	-	-	-	-	12.46
Cotton in 1960-61	2	10.41	-	10.41	-	-	10.41	-	-	-	-	-	-	10.41	-	10.41	-	-
Jowar in 1960-61	5	15.62	15.62	-	-	-	-	-	-	15.62	-	15.62	-	-	-	15.62	-	-
Wheat in 1960-61	2	8.83	-	-	-	8.83	-	8.83	-	-	-	8.83	-	-	8.83	-	-	
Total	22	67.81	15.62	43.36	-	8.83	10.41	41.78	-	15.62	12.46	44.94	-	10.41	29.32	26.03	-	12.46
Grand Total	139	225.53	64.77	118.83	12.07	29.86	74.45	110.39	9.80	30.89	65.93	110.09	17.62	31.89	80.76	102.84	8.41	33.52



GRAPH 8.2
 AREAS DUE UNDER THE CROPS
 ACCORDING TO THE ROTATIONS IN VIVARE



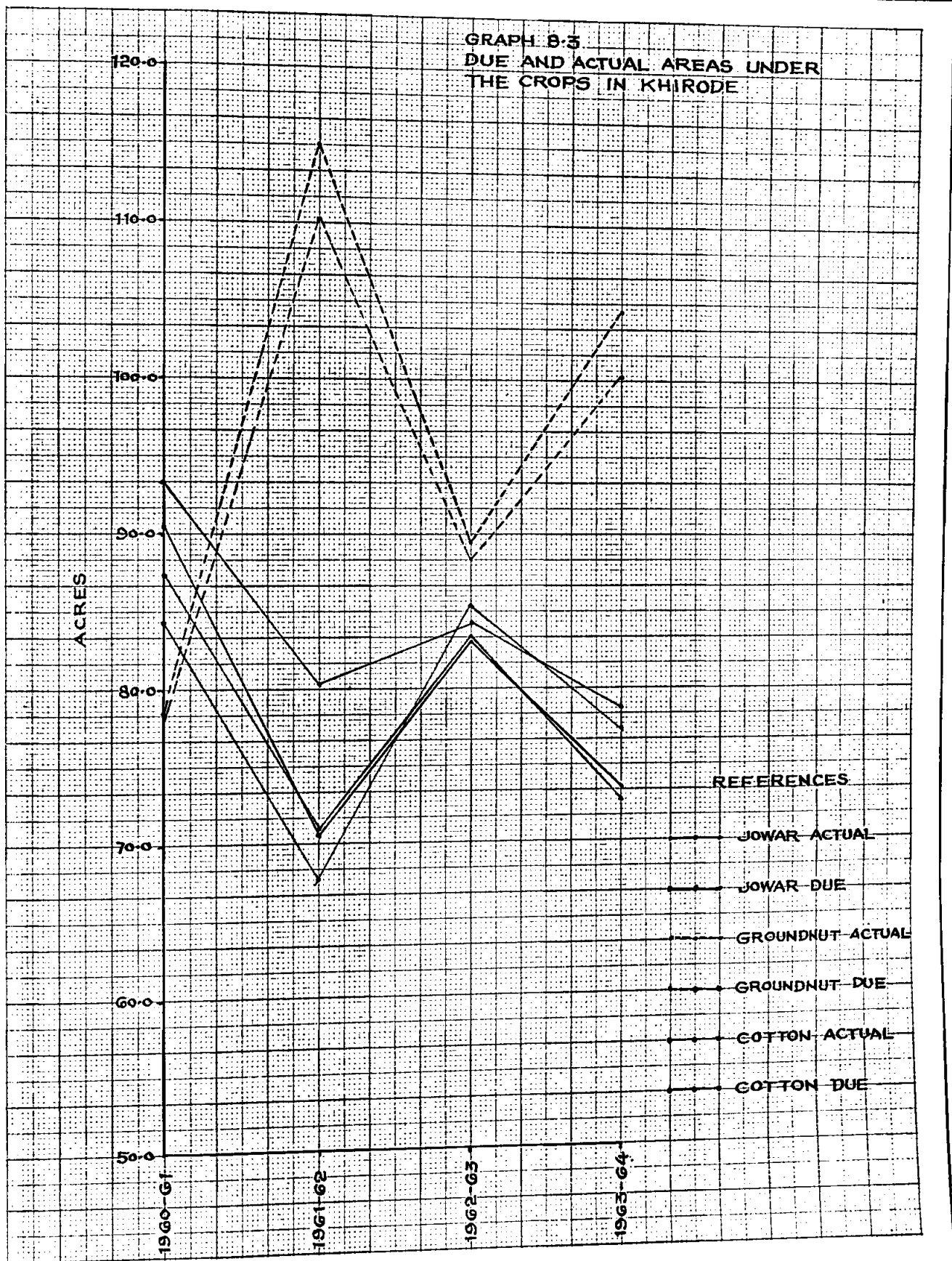
Of the nine types of rotations practised by the cultivators, five were with groundnut as one of the crops. The area under groundnut grown according to the accepted rotations, was, therefore, high in almost all years. The case of cotton and jowar areas was rather different, in the sense that these moved on a lower level in comparison with that of groundnut. This was because both of these crops were included in two, out of the three major rotations, claiming bulk of the cropped land. Cotton was included in G-C and G-C-J and jowar in G-J and G-C-J only.

In Vivare, the variations caused by the three kinds of the accepted rotations were rather peculiar. It may be seen from Graph 8.2 that the areas under the major crops in this village, moved on distinctly different levels. Cotton was always on the higher plane than all the other crops. It varied between 102.84 acres in 1963-64 and 118.83 acres in 1960-61. This was because cotton was included in most of the rotation types of all the three kinds of rotations. It was included in nine out of eleven rotation types. In four of the rotation types, it was repeatedly grown for two and three years. The area under cotton, therefore, always remained higher than that of the other crops every year. Cotton was distantly followed by jowar. The area under jowar varied from 64.77 acres in 1960-61 to 80.76 acres in 1963-64. Jowar was included in eight of the eleven rotation types. However, in no rotation it was repeatedly grown for more than one year. The areas under the other two crops--groundnut and wheat--were minor and the variations in these areas were also not wide.

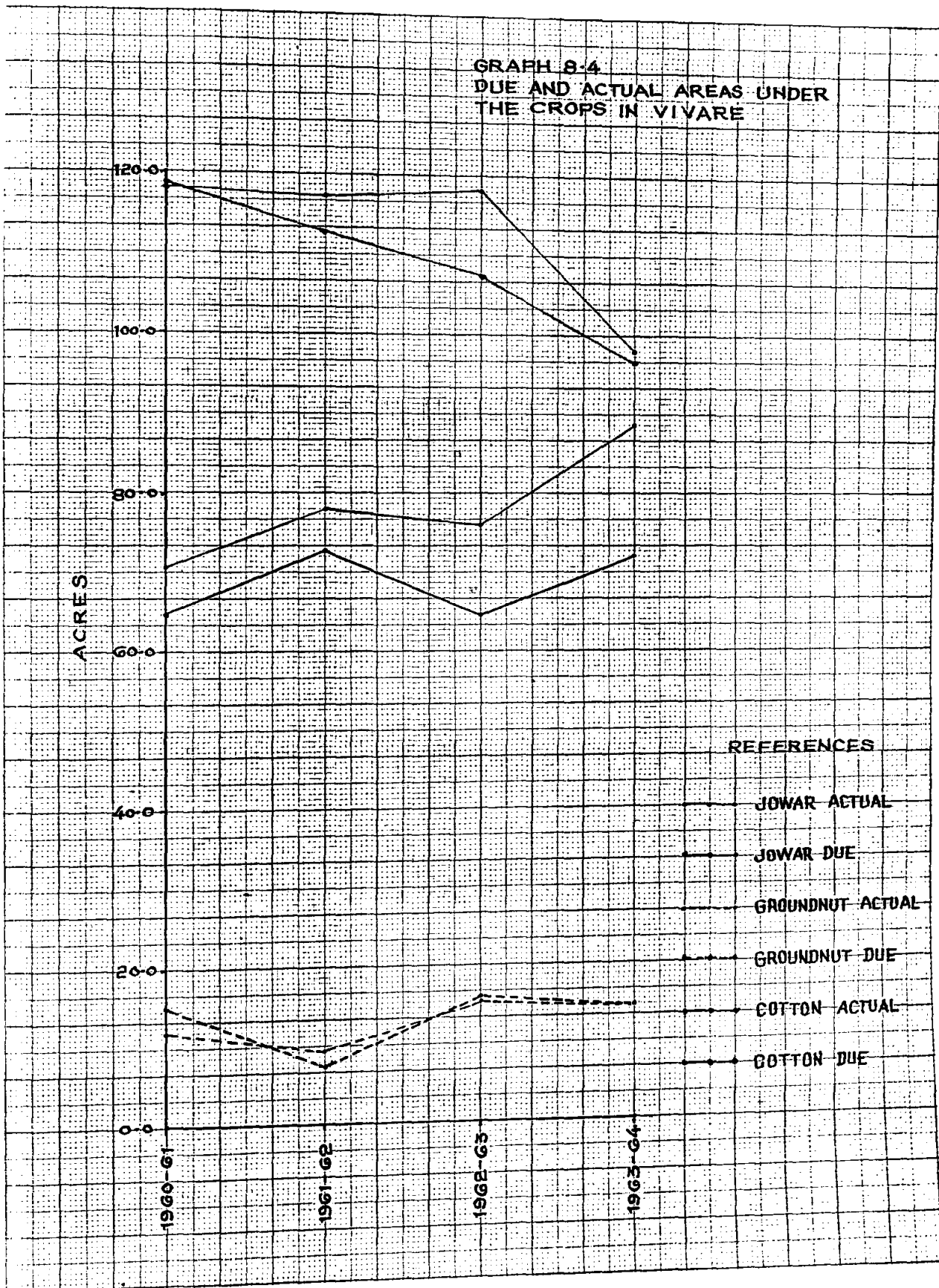
Thus, the accepted rotations, when strictly followed from

year to year cause wide variations in the areas of different crops in both the dry villages. However, the accepted rotations could not be adhered to so strictly and followed year by year. As pointed out earlier, the cultivators practised the accepted rotations to the extent possible. They deviated from the rotation-plans, whenever it was not feasible to adhere to them because of the peculiar situation arising out of the inherent or external factors. The area variations shown on the assumption of strict adherence to the rotation-plans, were, therefore, far from facts. The variations in the due areas in actual had to be different from these, because of the deviations followed by the cultivators in different years. In Graphs 8.3 and 8.4, are shown the due areas calculated after taking into consideration the deviations practised in different years. Such due areas were calculated on the basis of the crop taken in the preceding year and the accepted crop-rotations. Along with these due areas, are presented in the same Graphs, the actual areas reported under different crops to point out the differences between the two. It may be seen from the Graphs that the differences between the due and the actual areas were not far wide in any year.

The Graph 8.3 shows that in the case of the three major crops in Khirode, the areas due were quite close to the areas actually reported under them. The relation between the due and the actual areas was different for different crops. In the case of jowar, the area due according to the rotations was always higher than the area actually devoted to it. This means some portion of the area due for jowar had deviated-out from it in



GRAPH 8-4
DUE AND ACTUAL AREAS UNDER
THE CROPS IN VIVARE



all the four years. The opposite is the case of groundnut. The area due for groundnut was always lower than the area actually put under it; which means some of the area, not due under groundnut had come to it in all the four years. The case of cotton was still different. The area due for cotton was lower than the actual in the first two years and higher than the actual in the remaining two years. This means, some area deviated-in to cotton in the first two years and some area deviated-out from cotton in the last two years.

In Vivare, the relation between the due and the actual areas under the major crops were similar. In this village also, the area due for jowar was always higher than the area actually put under it. The relation in the case of cotton was mixed as in Khirode. The area due for it was slightly higher than the actual, only in the first year and lower than the actual in the remaining three years (see Graph 8.4). The Graph clearly shows that in the case of jowar, some portion of the area due for it deviated-out in all the four years. In the case of cotton, however, some area deviated-out in the first year and some area deviated-in, in the remaining three years.

These differences in the due and the actual areas under the major crops clearly reveal that the accepted rotations were not strictly adhered to throughout the period and deviations from the rotations were practised in different years. Thus, the area under the accepted rotations has to be classified into two categories: (1) the rotated area; and (2) the deviated area. Such a classification of the area in each year is presented in

Tables 8.6 and 8.7. It can be seen from Table 8.6 that in Khirode more than three-fourths of the total area under the accepted rotations was rotated every year. The rotated area varied between 205.92 acres or 79.81 per cent of the total in 1963-64 and 251.36 acres or 97.42 per cent in 1960-61. The area deviated, therefore, was small in 1960-61 and relatively large in 1963-64. It was between 52.10 acres or 20.19 per cent of the total area in 1963-64 and 6.66 acres or 2.58 per cent in 1960-61. More or less the same was the case in Vivare (see Table 8.7). A bulk of the area under the accepted rotations was rotated every year. It was between 71.44 per cent of the total area in 1963-64 and 95.63 per cent in 1960-61. The deviated area varied between 4.37 per cent in 1960-61 and 28.56 per cent in 1963-64. Thus, the rotated area was considerably high every year in both the dry villages. The deviated area, therefore, was always small and formed a minor proportion to the total area. Below, the rotated and the deviated areas in the two villages, are discussed in brief.

8.2. The Rotated Area

In Tables 8.8 and 8.9 are given the areas due under the different crops; the areas deviated from them and the areas rotated under them. The areas due under different crops have been estimated on the basis of the crop grown in the preceding year and the rotations accepted. From the area due to each crop, we deduct the area deviated-out from it, in order to get the total rotated area under it. The yearly variations in the rotated areas under the major crops are shown in Graphs 8.5 and

Table 8.6 : Total Rotated and Deviated Areas in Khirode (1960-61 to 1963-64)

	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Area rotated according to the rotations	251.36	97.42	241.05	93.42	243.04	94.19	205.92	79.81
Area deviated from the rotations	6.66	2.58	16.97	6.58	14.98	5.81	52.10	20.19
Total area under the rotations	258.02	100.00	258.02	100.00	258.02	100.00	258.02	100.00
Area under single cropping	5.44	2.06	5.44	2.06	5.44	2.06	5.44	2.06
Total cropped area	263.46	100.00	263.46	100.00	263.46	100.00	263.46	100.00

Table 8.7 : Total Rotated and Deviated Areas in Vivare (1960-61 to 1963-64)

	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Area rotated according to the rotations	215.67	95.63	200.72	89.00	197.74	87.68	161.11	71.44
Area deviated from the rotations	9.86	4.37	24.81	11.00	27.79	12.32	64.42	28.56
Total area under the rotations	225.53	100.00	225.53	100.00	225.53	100.00	225.53	100.00
Area under single cropping	6.02	2.60	6.02	2.60	6.02	2.60	6.02	2.60
Total cropped area	231.55	100.00	231.55	100.00	231.55	100.00	231.55	100.00

Table 8.8 : Total Areas Due, Deviated-out and Rotated under Different Crops in Khirode
(1960-61 to 1963-64) (Area in Acres)

Crop	1960-61			1961-62			1962-63			1963-64		
	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated
Jowar	89.05	4.38	84.67	75.63	12.74	62.89	80.00	4.23	75.77	74.21	24.60	49.61
Cotton	84.28	-	84.28	67.81	3.23	64.58	85.35	5.45	79.90	77.25	13.19	64.06
Groundnut	78.61	2.28	76.33	110.13	1.00	109.13	88.22	5.30	82.92	100.48	12.68	87.80
Bajara	4.45	-	4.45	4.45	-	4.45	4.45	-	4.45	4.45	-	4.45
Wheat	1.63	-	1.63	-	-	-	-	-	-	1.63	1.63	-
Total	258.02	6.66	251.36	258.02	16.97	241.05	258.02	14.98	243.04	258.02	52.10	205.92

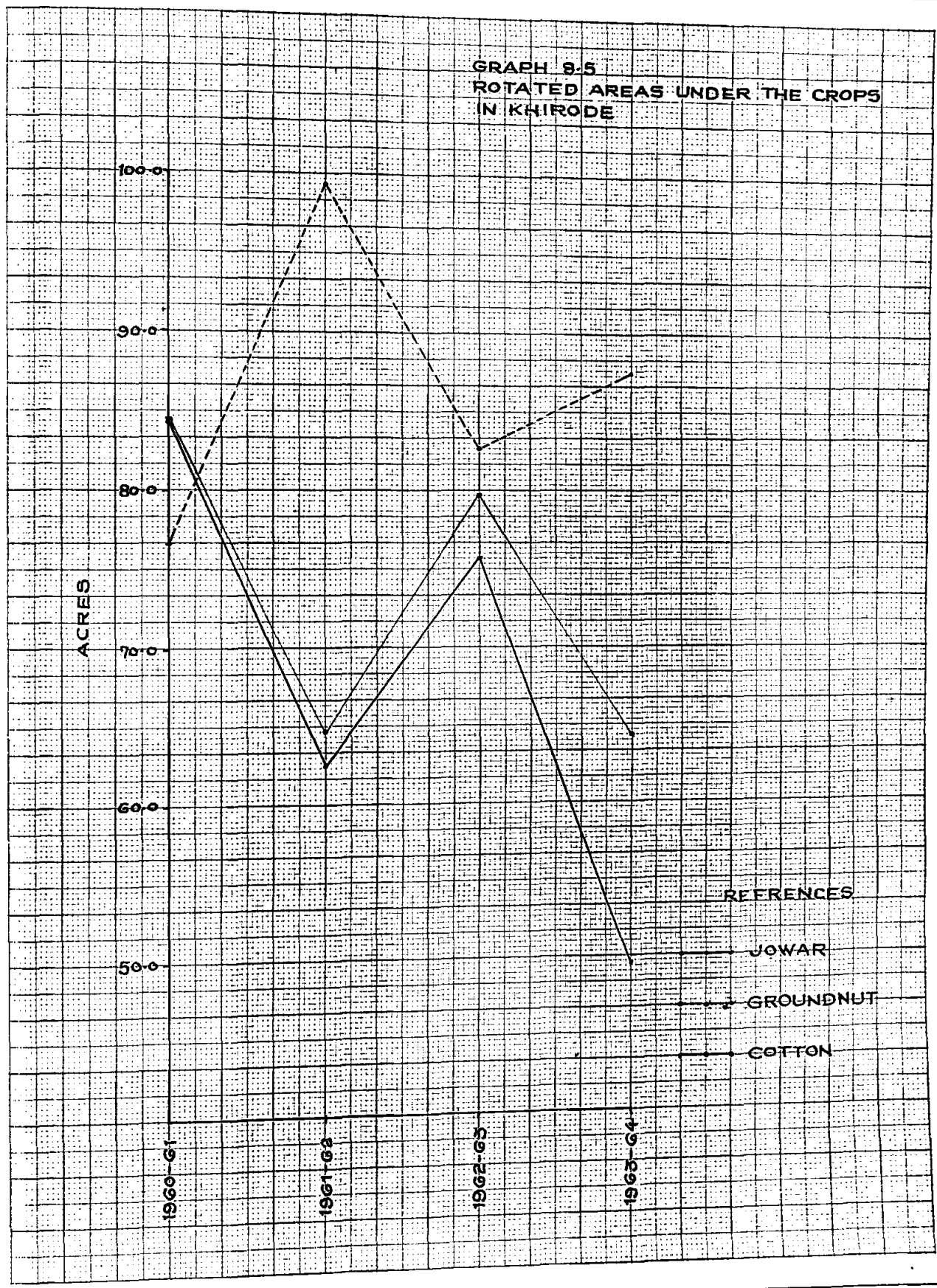
Table 8.9 : Total Areas Due, Deviated-out and Rotated under Different Crops in Vivare
(1960-61 to 1963-64) (Area in Acres)

Crop	1960-61			1961-62			1962-63			1963-64		
	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated
Jowar	64.82	6.18	58.64	72.25	12.64	59.61	70.10	12.74	57.36	82.90	34.12	48.78
Cotton	118.83	2.68	116.15	112.59	8.14	104.45	107.70	4.83	102.87	96.15	19.07	77.08
Groundnut	12.07	1.00	11.07	9.80	3.65	6.15	15.84	1.47	14.37	14.44	5.53	8.91
Wheat	29.81	-	29.81	30.89	0.38	30.51	31.89	8.75	23.14	32.04	5.70	26.34
Total	225.53	9.86	215.67	225.53	24.81	200.72	225.53	27.79	197.74	225.53	64.42	161.11

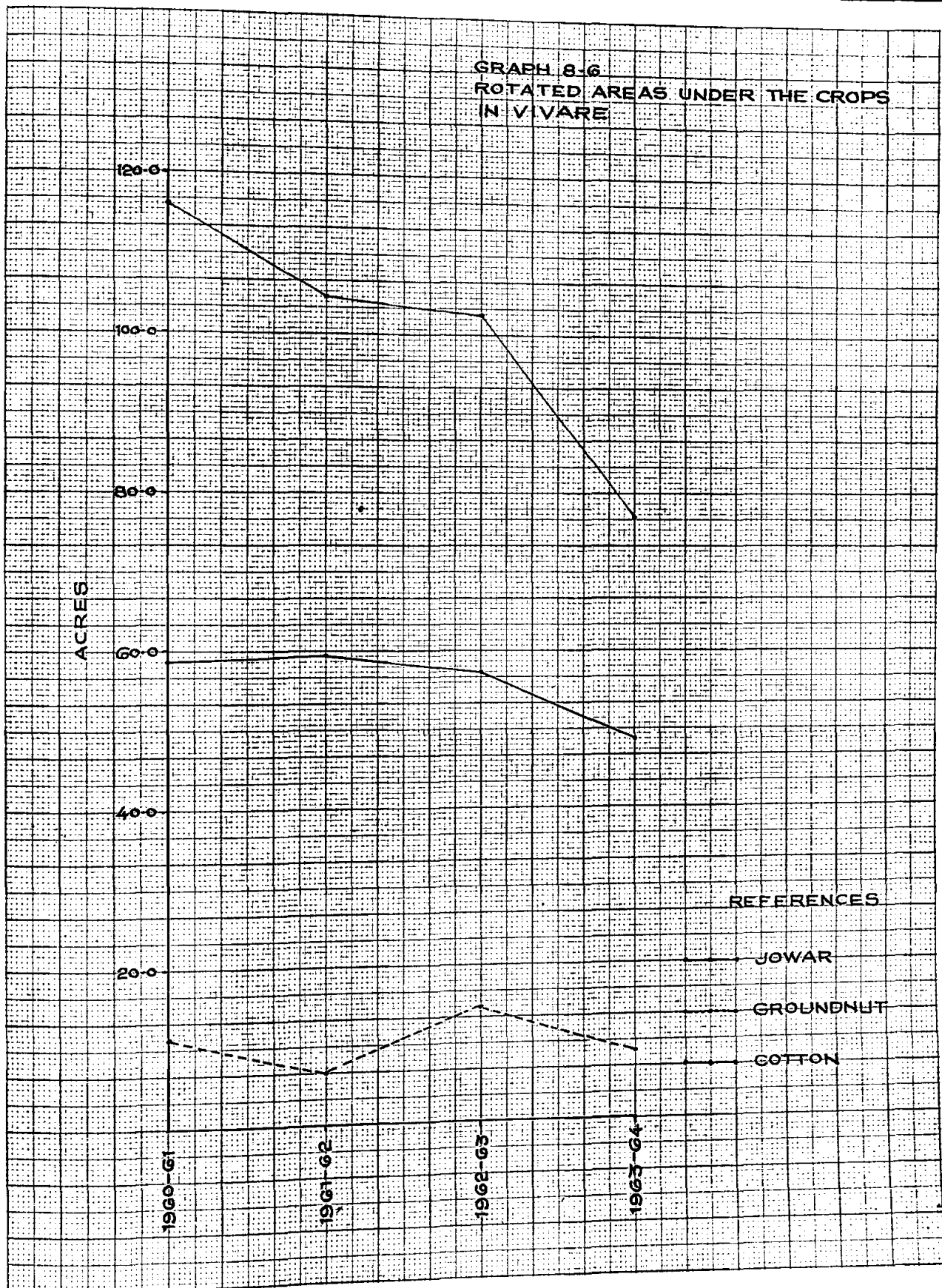
8.6. It may be seen from Graph 8.5, that in Khirode the variations in the rotated areas under the major crops were rather wide. The rotated area under jowar varied between 49.61 acres in 1963-64 and 84.67 acres in 1960-61; the rotated area under groundnut between 76.33 acres in 1960-61 and 109.13 acres in 1961-62; and the rotated area under cotton between 64.06 acres in 1963-64 and 84.28 acres in 1960-61. The rotated area under groundnut moved on a relatively higher plane because of its predominant position in the rotations practised by the cultivators. Another point to be noted is that a large proportion of the rotated area under each crop was continuously under the accepted rotations for all the four years. The proportion of such area was between 69.04 and 87.68 per cent in the case of jowar; between 71.36 and 88.80 per cent in the case of groundnut; and between 71.21 and 89.93 per cent in the case of cotton. We have discussed such areas at length in Chapter III, and need not be repeated here. The remaining portion of the rotated area under each crop was not under the accepted rotations continuously for the entire period of four years. In some years it deviated from the rotations; while in others it continued under the rotations or reverted to them after the deviation.

In Vivare also, the variations in the rotated areas under the major crops were wide, particularly in the case of cotton (see Graph 8.6). It may be seen from the Graph that the rotated area under cotton varied between 77.08 acres in 1963-64 and 116.15 acres in 1960-61. The area under jowar, on the other hand, varied within a comparatively narrow range--between 48.78

GRAPH 9.5
ROTATED AREAS UNDER THE CROPS
IN KHIRODE



GRAPH 8-6
ROTATED AREAS UNDER THE CROPS
IN VIVARE



acres in 1963-64 and 58.64 acres in 1960-61. The rotated area under cotton in this village moved on a higher level as it was a predominant crop in the accepted crop-rotations. In this village also, a large proportion of the rotated area under each crop was continuously under the accepted rotations for all the four years.

8.3. The Deviated Area

In both the dry villages the deviated area was small, particularly in the first three years--1960-61 to 1962-63 (see Tables 8.6 and 8.7). In these years it varied between 2.58 and 5.81 per cent of the total area under rotations in Khirode and between 4.37 and 12.32 per cent in Vivare. In the fourth year (1963-64), however, the deviated area suddenly shot up. It went up to 20.19 per cent in Khirode and 28.56 per cent in Vivare. As seen earlier, this was mainly because the inadequate rainfall during the sowing season of that year. This distorted the farming plans of many of the cultivators. As we have seen in the preceding chapter, many of them were required to re-sow their lands as the first crop sown according to the rotations failed for want of rains. This caused deviations on larger areas.

The areas deviated from different crops in both the villages are given in Tables 8.8 and 8.9. It may be seen from these tables that the area deviated from each crop formed a very low proportion (almost negligible in some cases) of the total due area. In the fourth year (1963-64) only, when the rainfall conditions were rather bad, the deviated area was proportionately high--particularly in the case of jowar. In this year, the area

deviated from jowar was 24.60 acres which formed about 33.25 per cent of the area due for jowar in Khirode. In Vivare, such a proportion of the deviated area was still higher--41.16 per cent. In the case of the other crops, it was not so high. It was not more than 20 per cent in any of the major crops in both the villages. Another point to be noted is that in almost all the years, the area deviated-out from jowar, was relatively larger than that from cotton and groundnut.

In Tables 8.10 and 8.11, are given the area deviated-out from each crop and the other crops grown on that particular area. In Khirode, for example, 4.38 acres deviated-out from jowar in 1960-61 and three other crops--groundnut (1.95 acres), cotton (2.00 acres) and mug (0.43 acre)--were grown on it. Thus, the area which deviated-out from jowar in the year, deviated-in under these three crops. Such shifts of the deviated area are given for all the years in the two Tables. These two Tables reveal that in both the villages more area deviated-out from the food-crops, mainly jowar, and went under the cash-crops like cotton and groundnut.

As seen earlier, deviations are practised chiefly as a corrective measure and are, therefore, for a short duration of a year or two, after which the cultivators revert to the rotations. The deviated area in a year, therefore, may be either continued under deviation or brought back under the rotations in the following year/s. During the period of four years, fresh deviations also may occur for more than one time on the same area. Such year to year movements of the deviated areas in

Table 8.10 : Areas Deviated-out and Deviated-in under Different Crops in Khirode (1960-61 to 1963-64) (Area in Acres)

1960-61				1961-62				1962-63				1963-64			
Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in	
Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area
Jowar	4.38	Groundnut	1.95	Jowar	12.74	Groundnut	5.78	Jowar	4.23	Bajara	2.23	Jowar	24.60	Cotton	7.12
		Cotton	1.00			Cotton	4.33			Groundnut	1.00			Groundnut	16.48
		Mug	0.43			Wheat	1.63			Cotton	1.00			Wheat	1.00
		Cotton	1.00			Cotton	1.00								
Groundnut	2.28	Jowar	1.28	Groundnut	1.00	Cotton	1.00	Groundnut	5.30	Jowar	2.80	Groundnut	12.68	Jowar	10.98
		Cotton	1.00							Cotton	2.50			Cotton	1.70
				Cotton	3.23	Jowar	3.23	Cotton	5.45	Groundnut	5.45	Cotton	13.19	Jowar	6.71
														Banana	3.65
														Wheat	2.40
												Wheat	1.63	Groundnut	0.43
														Jowar	1.30
														Chillies	0.33
	6.66		6.66		16.97		16.97		14.98		14.98		52.10		52.10

Table 8.11 : Areas Deviated-out and Deviated-in under Different Crops in Vivare (1960-61 to 1963-64) (Area in Acres)

1960-61				1961-62				1962-63				1963-64			
Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in	
Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area
Jowar	6.18	Groundnut	1.05	Jowar	12.64	Cotton	9.56	Jowar	12.74	Cotton	5.91	Jowar	34.12	Cotton	15.91
		Wheat	3.13			Groundnut	0.53			Groundnut	1.19			Groundnut	2.25
		Cotton	2.00			Wheat	2.55			Wheat	5.64			Wheat	10.78
														Banana	5.18
Groundnut	1.00	Bajara	1.00	Groundnut	3.65	Cotton	3.65	Groundnut	1.47	Jowar	0.75	Groundnut	5.53	Jowar	2.95
										Cotton	0.72			Cotton	2.58
Cotton	2.68	Groundnut	2.68	Cotton	8.14	Jowar	7.01	Cotton	4.83	Groundnut	0.40	Cotton	19.07	Jowar	10.61
						Groundnut	0.13			Wheat	3.30			Wheat	5.18
						Paddy	1.00			Paddy	1.00			Groundnut	3.28
										Jowar	0.13				
				Wheat	0.38	Groundnut	0.38	Wheat	8.75	Cotton	8.70	Wheat	5.70	Jowar	3.78
										Jowar	0.05			Cotton	1.92
	9.86		9.86		24.81		24.81		27.79		27.79		64.42		64.42

both the villages are shown in Tables 8.12 and 8.13. It may be seen from Table 8.12 that in Khirode, the deviated area in the first year (1960-61) was 6.66 acres. Of this 4.48 acres continued under the deviations in the next year (1961-62) and the remaining 2.18 acres were reverted to the rotations. In the third year (1962-63), 5.36 acres were reverted to the rotations, 1.00 acre continued under deviation, and on the remaining area of 0.30 acre, fresh deviation occurred. In the fourth year (1963-64), 3.58 acres were put back under the rotations, 1.20 acres continued under the deviations, and on the remaining area of 1.88 acres, fresh deviations were reported. The two Tables reveal that in both the villages, a large proportion of the deviated area in a year, was turned back under the rotations in the following year/s. However, fresh deviations occurred every year and the total deviated area in each year remained fairly large. It may be noted that the total deviated area in each year was large, mainly because of the fresh deviations. The area continued under deviations formed a small proportion of it.

The total deviated-in area in each year and its distribution under the different crops grown on it are presented in Tables 8.14 and 8.15. The movements of the deviated-in areas under the major crops are also shown in Graphs 8.7 and 8.8. It may be seen that in both the villages, a large proportion of the deviated area in each year went under the cash-crops like groundnut and cotton. This was particularly true of the first three years. In the fourth year (1963-64), however, the situation was different. In this year the deviated-in area was quite

Table 8.12 : Year to Year Shifts of the Deviated Areas in Khirode (1960-61 to 1963-64) (Area in Acres)

Total deviated area	1960-61		1961-62				1962-63				1963-64									
	Area under deviations		Area put back to rotations		Area continued under deviations		Area under fresh deviations		Area put back to rotations		Area continued under deviations		Area under fresh deviations							
	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area						
6.66 acres	Jowar Cotton Groundnut Mug	1.28 3.00 1.95 0.43	Groundnut Cotton Jowar	0.75 0.43 1.00	Cotton Groundnut Jowar	2.00 1.50 0.98	- - -	- - -	Groundnut Jowar Cotton	1.45 1.93 1.98	Cotton	1.00	Groundnut	0.30	Jowar Cotton Groundnut	1.08 1.00 1.50	Groundnut Cotton	0.20 1.00	Groundnut Cotton Groundnut	0.45 1.00 0.43
Total	-	6.66	-	2.18	-	4.48	-	-	-	5.36	-	1.00	-	0.30	-	3.58	-	1.20	-	1.88
16.97 acres	-	-	-	-	-	-	Groundnut	4.28	Jowar	5.21	Groundnut	0.70	-	-	Jowar	5.03	-	-	Jowar	1.30
	-	-	-	-	-	-	Wheat	1.63	Cotton	2.25	-	-	-	-	Groundnut	5.83	-	-	Chillies	0.33
	-	-	-	-	-	-	Jowar	2.25	Groundnut	4.33	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	Cotton	4.33	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	12.49	-	11.79	-	0.70	-	-	-	10.86	-	-	-	1.63
14.98 acres	-	-	-	-	-	-	-	-	-	-	-	-	Bajara	2.23	Jowar	2.23	Jowar	2.80	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Cotton	2.50	Groundnut	2.50	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Jowar	2.80	Cotton	5.45	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Groundnut	5.45	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	12.98	-	10.18	-	2.80	-	-
52.10 acres	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cotton	6.82
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Groundnut	15.83
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Jowar	14.89
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Banana	3.65
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Wheat	3.40
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44.59
Grand Total	-	6.66	-	2.18	-	4.48	-	12.49	-	17.15	-	1.70	-	13.28	-	24.62	-	4.00	-	48.10

Table 8.13 : Year to Year Shifts of the Deviated Areas in Vivare (1960-61 to 1963-64) (Area in Acres)

Total deviated area	1960-61		1961-62				1962-63				1963-64									
	Area under deviations		Area put back to rotations		Area continued under deviations		Area under fresh deviations		Area put back to rotations		Area continued under deviations		Area under fresh deviations							
	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area						
9.86 acres	Bajara Wheat Groundnut Cotton	1.00 3.13 3.73 2.00	Cotton Jowar Wheat	4.26 2.00 1.30	Cotton Groundnut	2.00 0.30	- - -	- -	Jowar Groundnut Cotton	3.13 1.00 0.38	Cotton Groundnut	2.00 0.30	Cotton Wheat	0.75 2.30	Cotton Jowar	4.43 1.00	Banana Jowar Cotton Groundnut	0.75 1.00 2.00 0.30	Wheat	0.38
Total	-	9.86	-	7.56	-	2.30	-	-	-	4.51	-	2.30	-	3.05	-	5.43	-	4.05	-	0.38
24.81 acres	-	-	-	-	-	-	Cotton	11.21	Cotton	9.17	Wheat	1.58	-	-	Cotton	5.53	-	-	Groundnut	2.53
	-	-	-	-	-	-	Jowar	7.01	Jowar	9.63	Cotton	0.18	-	-	Jowar	5.26	-	-	Cotton	1.18
	-	-	-	-	-	-	Groundnut	0.74	Groundnut	0.75	Groundnut	0.07	-	-	Groundnut	4.13	-	-	Wheat	2.53
	-	-	-	-	-	-	Wheat	2.55	-	-	Paddy	1.00	-	-	-	-	-	-	Jowar	1.35
	-	-	-	-	-	-	Paddy	1.00	-	-	Jowar	0.13	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	22.51	-	19.55	-	2.96	-	-	-	14.92	-	-	-	7.59
27.79 acres	-	-	-	-	-	-	-	-	-	-	-	-	Cotton	12.40	Cotton	8.56	Wheat	1.00	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Jowar	0.80	Wheat	2.65	Groundnut	0.82	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Groundnut	1.22	Jowar	3.30	Jowar	0.75	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Wheat	5.06	-	-	Banana	0.93	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cotton	1.47	-	-	
Total	-	-	-	-	-	-	-	-	-	-	-	-	19.48	-	14.51	-	4.97	-	-	
64.42 acres	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cotton	15.76
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Jowar	14.24
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Wheat	12.05
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Groundnut	1.88
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Banana	3.50
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47.43
Grand Total	-	9.86	-	7.56	-	2.30	-	22.51	-	24.06	-	5.26	-	22.53	-	34.86	-	9.02	-	55.40

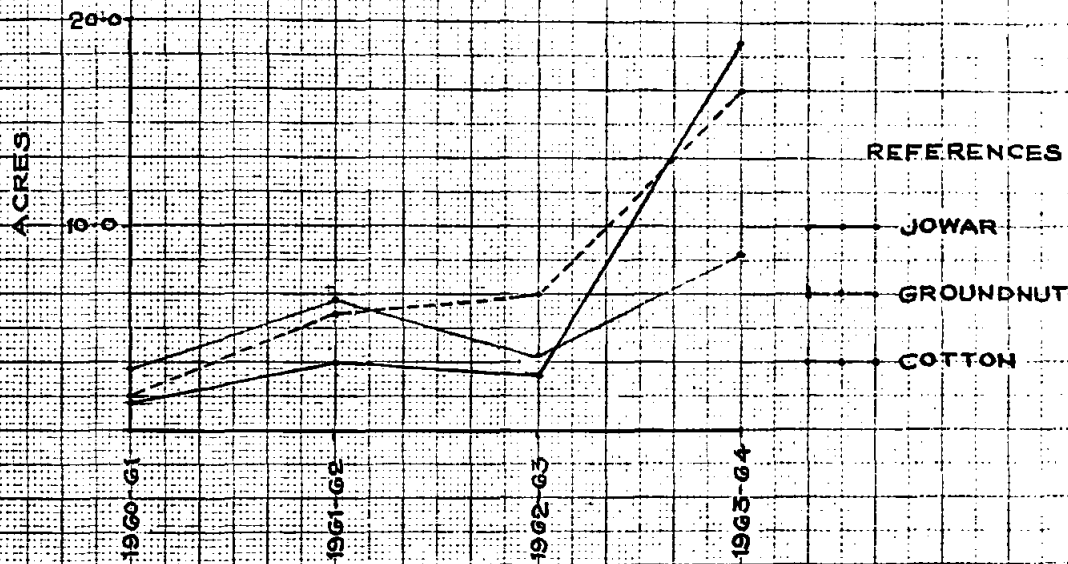
**Table 8.14 : The Crops Taken on the Deviated Areas in Khirode
(1960-61 to 1963-64)**

Crop	Area in Acres			
	1960-61	1961-62	1962-63	1963-64
Jowar	1.28	3.23	2.80	18.99
Cotton	3.00	6.33	3.50	8.82
Groundnut	1.95	5.78	6.45	16.91
Bajara	-	-	2.23	-
Wheat	-	1.63	-	3.40
Mug	0.43	-	-	-
Chillies	-	-	-	0.33
Banana	-	-	-	3.65
Total	6.66	16.97	14.98	52.10

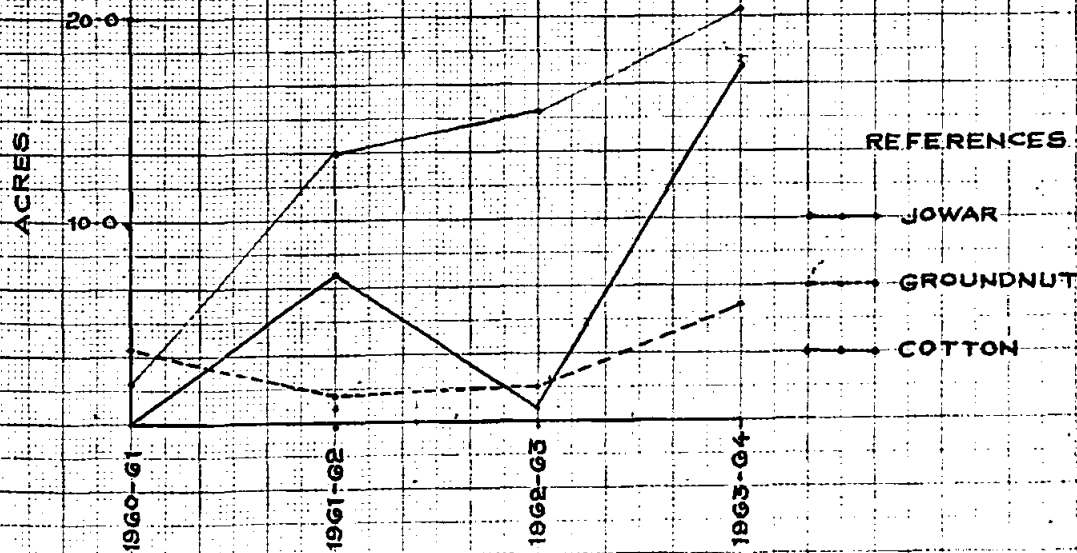
**Table 8.15 : The Crops Taken on the Deviated Area in Vivare
(1960-61 to 1963-64)**

Crop	Area in Acres			
	1960-61	1961-62	1962-63	1963-64
Jowar	-	7.01	0.93	17.34
Cotton	2.00	13.21	15.33	20.41
Groundnut	3.73	1.04	1.59	5.53
Bajara	1.00	-	-	-
Wheat	3.13	2.55	8.94	15.96
Paddy	-	1.00	1.00	-
'Nawati' Banana	-	-	-	5.18
Total	9.86	24.81	27.79	64.42

GRAPH 8.7
DEVIATED-IN AREAS UNDER
THE CROPS IN KHIRODE



GRAPH 8.8
DEVIATED-IN AREAS UNDER
THE CROPS IN VIVARE



high in the case of all the three major crops. This was mainly because of the bad conditions of rainfall during the year, due to which the farming plans of many of the cultivators were vitiated and many of them were required to deviate from the rotations.

8.4. Area Under Single Cropping

As stated earlier, the area reported under the second basic category--single cropping--was very low in both the dry villages. It was 5.44 acres only in Khirode and 6.02 acres in Vivare. The crops grown on this area are given in Table 8.16. A large

Table 8.16 : Area Under Single Cropping in Khirode and Vivare (1960-61 to 1963-64)

Crop	Khirode		Vivare	
	No.of Plots	Area in Acres	No.of Plots	Area in Acres
Jowar	4	4.51	6	5.92
Paddy	1	0.93	-	-
Chillies	-	-	1	0.10
Total	5	5.44	7	6.02

proportion of such area in both the villages was reported under jowar. Almost all the area in this category was such that the cultivators could not accept any crop-rotation on it because of the peculiarities of the plots and hence were required to resort to single cropping continuously. In Khirode, for example, four such plots were reported. All these suffered from locational disadvantages. Three of these were situated on the banks of the

streams and were subjected to continuous erosion. Because of constant erosion, the land in these plots had become so poor that no other crop except jowar could be grown on it. The cultivators could not follow any crop-rotation on it and were required to grow jowar year after year. The remaining plot was situated in the low lying area, where rain water from the neighbouring fields accumulated. Because of such accumulation of water, the cultivator could not grow any of the major kharif crops on it. To utilize the peculiar situation to his advantage, he put this plot of 0.93 acre under paddy continuously.

In Vivare also, five out of six plots, were peculiar in their situation and the cultivators were required to grow jowar on these continuously. The remaining small plot of 0.10 acre was continuously devoted to chillies, as it was near the well and very convenient to irrigate. The cultivator stated that in his opinion, it was beneficial to grow chillies continuously on the same area.

In both the villages, single cropping was resorted to on the areas which had some peculiarities, inhibiting the cultivators from following any crop-rotation. They were required to accept single cropping as the only profitable alternative left for them.

8.5. Total Area

In Tables 8.17 and 8.18 the effects of the rotations and the deviations on the total area under each crop in different years are summarised. The Tables give the total areas due according to the rotations and single cropping, areas deviated-out

Table 8.17 : Total Areas Due, Deviated-out, Rotated and Deviated-in under Different Crops in Khirode (1960-61 to 1963-64) (Area in Acres)

Crop	1960-61						1961-62					
	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area
Jowar	93.56	4.38	84.67	1.28	4.51	90.46	80.14	12.74	62.89	3.23	4.51	70.63
Cotton	84.28	-	84.28	3.00	-	87.28	67.81	3.23	64.58	6.33	-	70.91
Groundnut	78.61	2.28	76.33	1.95	-	78.28	110.13	1.00	109.13	5.78	-	114.91
Bajara	4.45	-	4.45	-	-	4.45	4.45	-	4.45	-	-	4.45
Wheat	1.63	-	1.63	-	-	1.63	-	-	-	1.63	-	1.63
Paddy	0.93	-	-	-	0.93	0.93	0.93	-	-	-	0.93	0.93
Mug	-	-	-	0.43	-	0.43	-	-	-	-	-	-
Chillies	-	-	-	-	-	-	-	-	-	-	-	-
Banana	-	-	-	-	-	-	-	-	-	-	-	-
Total	263.46	6.66	251.36	6.66	5.44	263.46	263.46	16.97	241.05	16.97	5.44	263.46

(continued)

Table 8.17 : (continued)

Crop	1962-63						1963-64					
	Total Area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area
Jowar	84.51	4.23	75.77	2.80	4.51	83.08	78.72	24.60	49.61	18.99	4.51	73.11
Cotton	85.35	5.45	79.90	3.50	-	83.40	77.25	13.19	64.06	8.82	-	72.88
Groundnut	88.22	5.30	82.92	6.45	-	89.37	100.48	12.68	87.80	16.91	-	104.71
Bajara	4.45	-	4.45	2.23	-	6.68	4.45	-	4.45	-	-	4.45
Wheat	-	-	-	-	-	-	1.63	1.63	-	3.40	-	3.40
Paddy	0.93	-	-	-	0.93	0.93	0.93	-	-	-	0.93	0.93
Mug	-	-	-	-	-	-	-	-	-	-	-	-
Chillies	-	-	-	-	-	-	-	-	-	0.33	-	0.33
Banana	-	-	-	-	-	-	-	-	-	3.65	-	3.65
Total	263.46	14.98	243.04	14.98	5.44	263.46	263.46	52.10	205.92	52.10	5.44	263.46

Table 8.18 : Total Areas Due, Deviated-out, Rotated and Deviated-in under Different Crops in Vivare (1960-61 to 1963-64) (Area in Acres)

Crop	1960-61						1961-62					
	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area
Jowar	70.74	6.18	58.64	-	5.92	64.56	78.17	12.64	59.61	7.01	5.92	72.54
Cotton	118.83	2.68	116.15	2.00	-	118.15	112.59	8.14	104.45	13.21	-	117.66
Groundnut	12.07	1.00	11.07	3.73	-	14.80	9.80	3.65	6.15	1.04	-	7.19
Wheat	29.81	-	29.81	3.13	-	32.94	30.89	0.38	30.51	2.55	-	33.06
Bajara	-	-	-	1.00	-	1.00	-	-	-	-	-	-
Paddy	-	-	-	-	-	-	-	-	-	1.00	-	1.00
Chillies	0.10	-	-	-	0.10	0.10	0.10	-	-	-	0.10	0.10
Banana	-	-	-	-	-	-	-	-	-	-	-	-
Total	231.55	9.86	215.67	9.86	6.02	231.55	231.55	24.81	200.72	24.81	6.02	231.55

(continued)

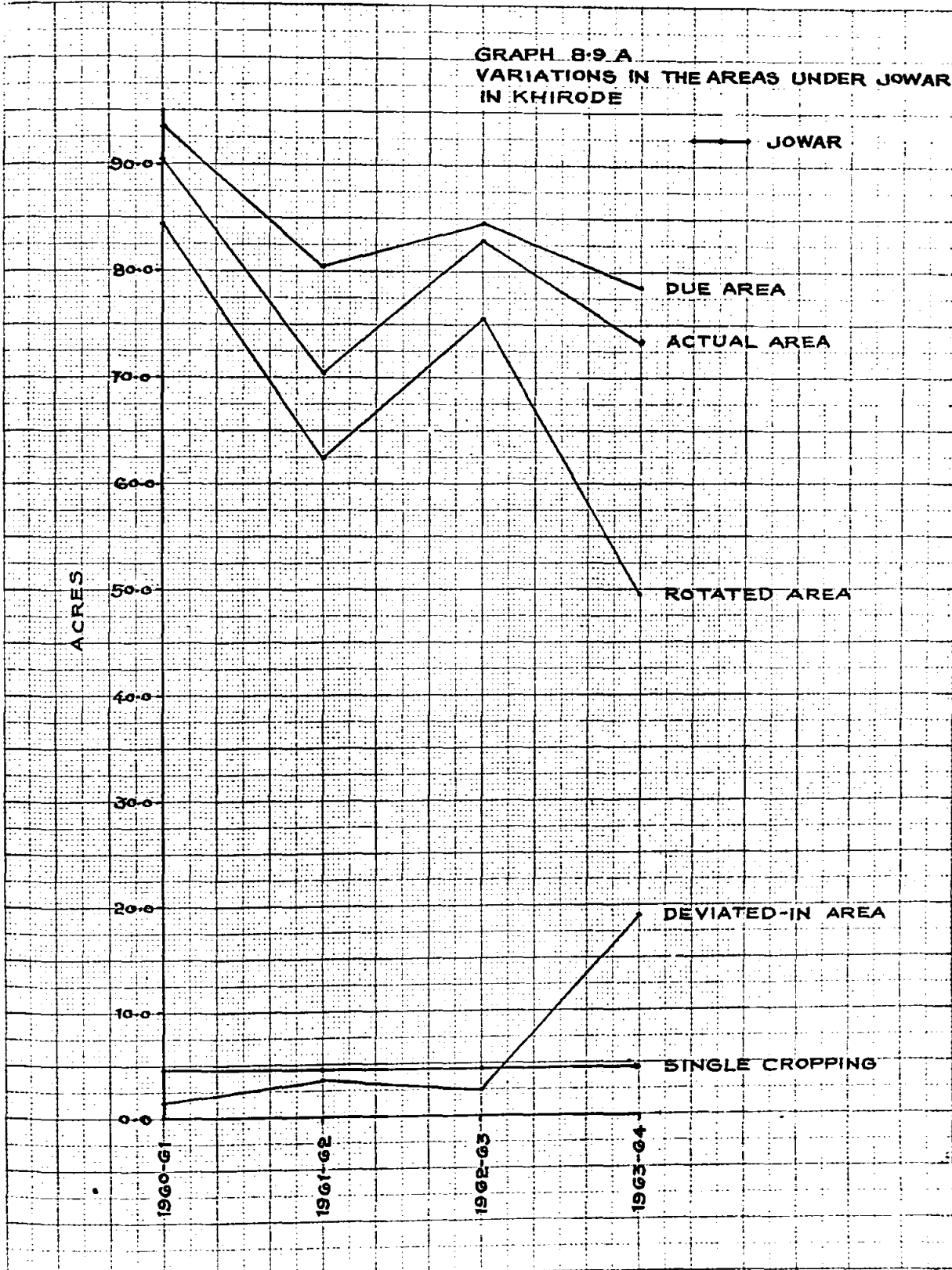
Table 8.18 : (continued)

Crop	1962-63					1963-64						
	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area
Jowar	76.02	12.74	57.36	0.93	5.92	64.21	88.82	34.12	48.78	17.34	5.92	72.04
Cotton	107.70	4.83	102.87	15.33	-	118.20	96.15	19.07	77.08	20.41	-	97.49
Groundnut	15.84	1.47	14.37	1.59	-	15.96	14.44	5.53	8.91	5.53	-	14.44
Wheat	31.89	8.75	23.14	8.94	-	32.08	32.04	5.70	26.34	15.96	-	42.30
Bajara	-	-	-	-	-	-	-	-	-	-	-	-
Paddy	-	-	-	1.00	-	1.00	-	-	-	-	-	-
Chillies	0.10	-	-	-	0.10	0.10	0.10	-	-	-	0.10	0.10
Banana	-	-	-	-	-	-	-	-	-	5.18	-	5.18
Total	231.55	27.79	197.74	27.79	6.02	231.55	231.55	64.42	161.11	64.42	6.02	231.55

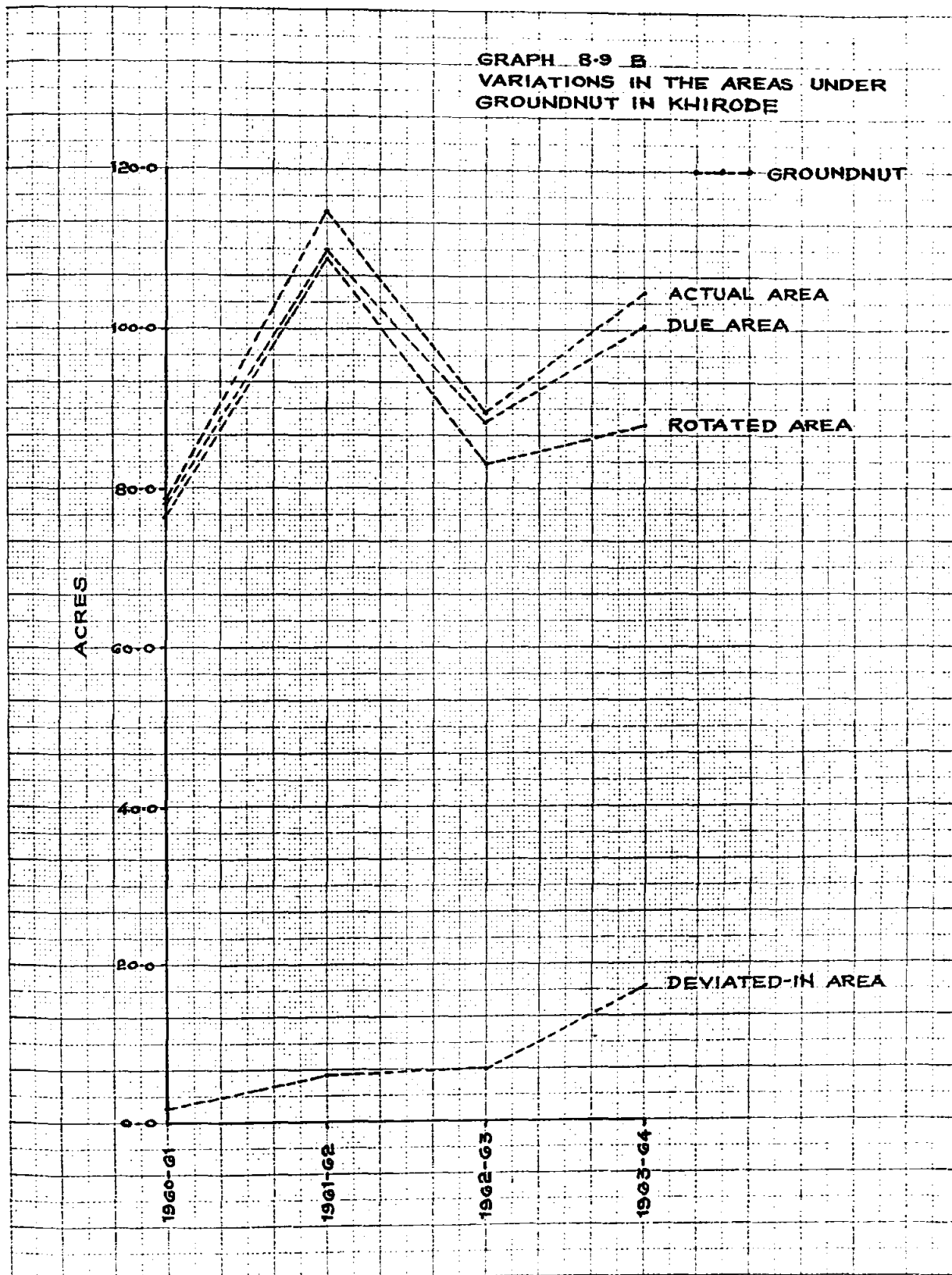
from the rotations, areas rotated, areas deviated-in and areas under single cropping. These areas are also shown in Graphs 8.9A to 8.10C drawn separately for each individual crop. It may be seen that the aggregate area under each crop comprised of the areas coming from three categories: (1) the area coming through the rotations; (2) the area coming through the deviations; and (3) the area coming through the single cropping. A large portion of the total area under each crop, however, came from the rotations. In the case of each of the major crops, more than three-fourths of the total area came through the rotations, particularly in the first three years. In the fourth year the rotations were more vitiated because of the bad conditions of rainfall and hence the deviated area under each crop was comparatively large. The areas under single cropping being very small in both the years did not affect much the total areas under different crops.

As seen earlier, the area deviating-out from a crop, went under other crop/s and was considered as a deviated-in area under them. Such shifts of the areas occurred mostly in the case of the major crops. These crops lost some of their due areas and gained other areas through deviations. It may be noted that in both the villages, the cash-crops like cotton and groundnut gained larger area through deviations than the area lost. The net effect in the case of these crops, therefore, was positive. In some years, the total area under these crops, was even larger than the area due according to the rotations and single cropping (see Graphs 8.9A to 8.10C). The case of the food-crop, jowar, was just opposite. It lost more area due to it under the

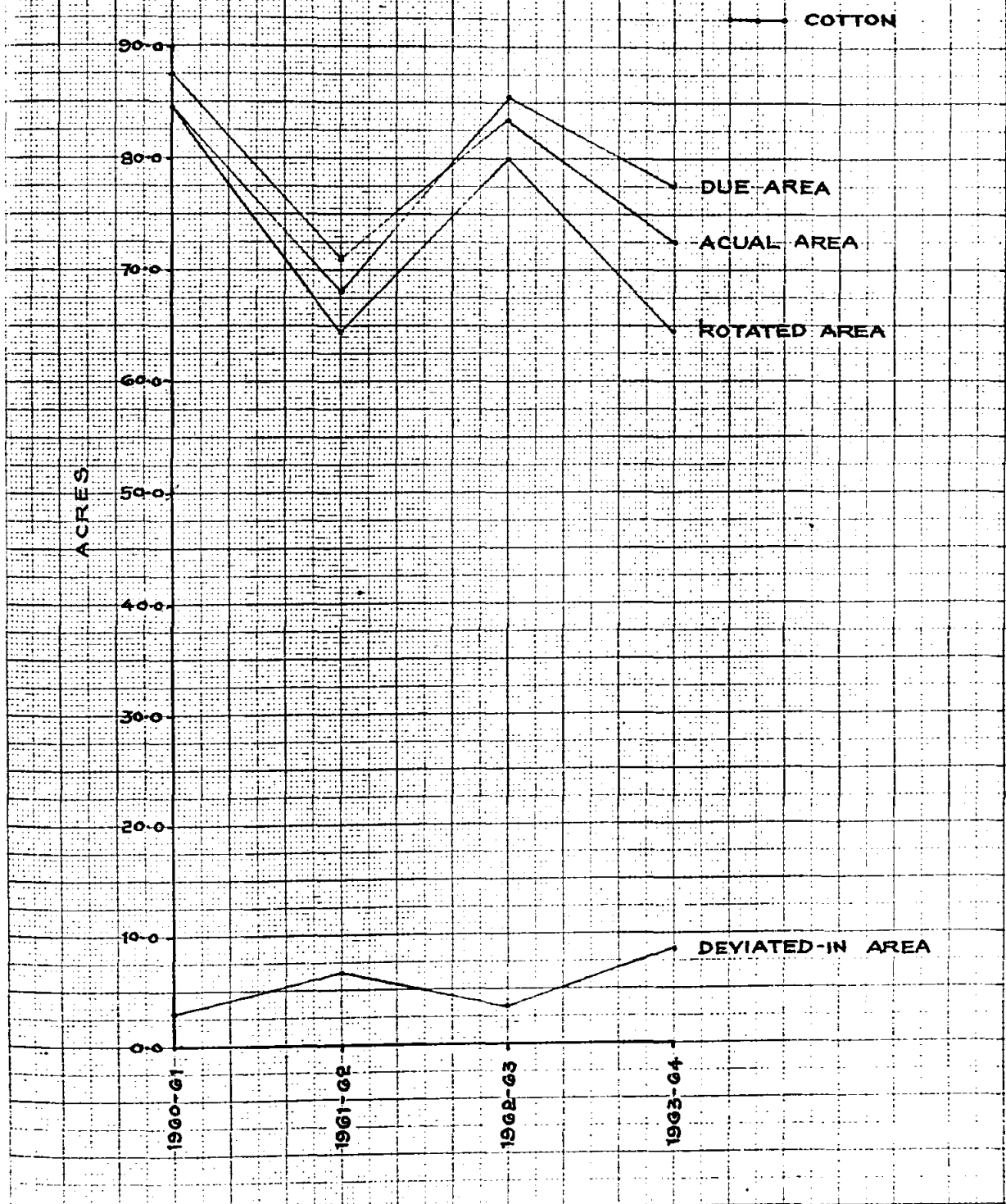
GRAPH 8.9.A
 VARIATIONS IN THE AREAS UNDER JOWAR
 IN KHIRODE

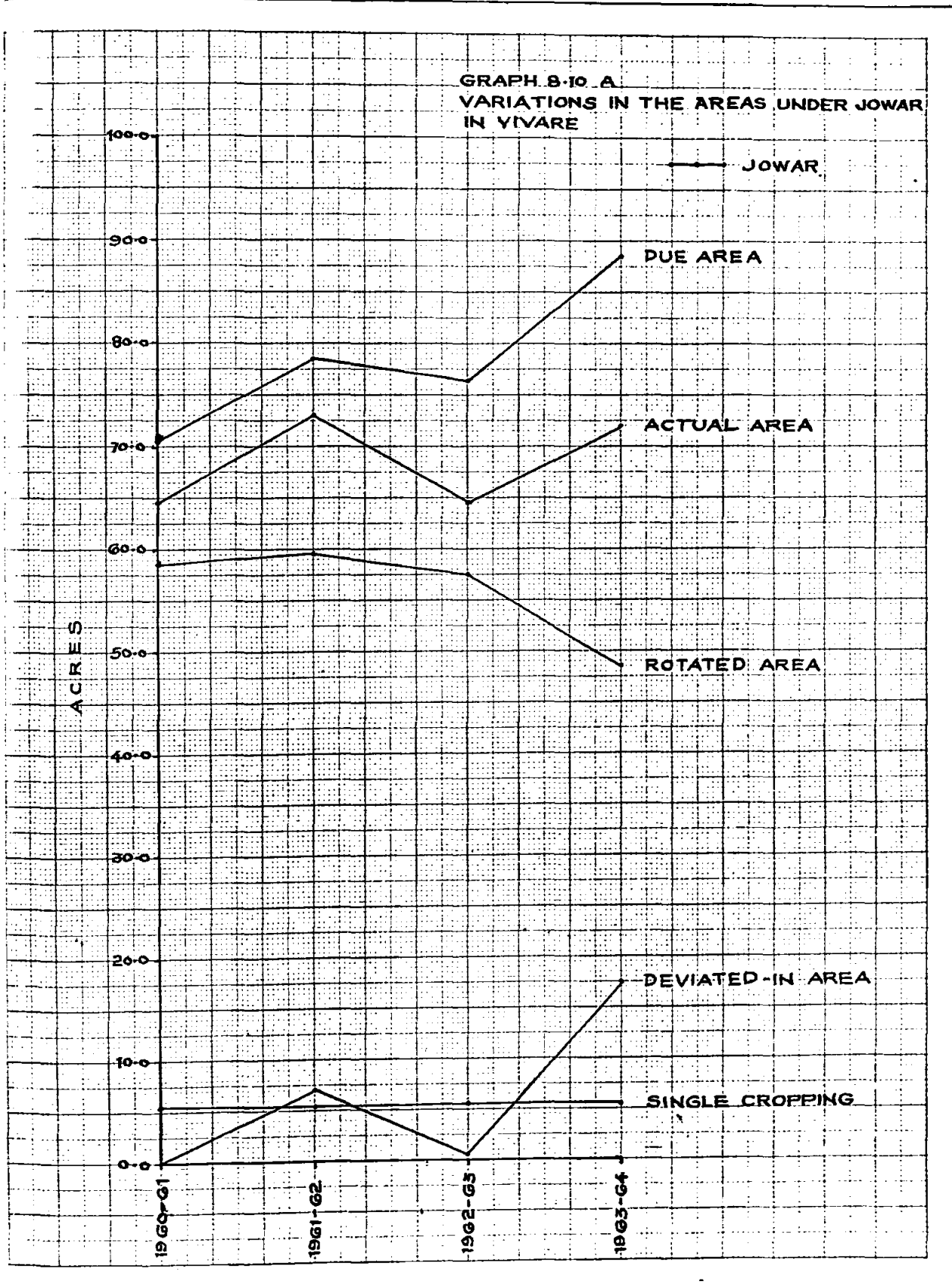


GRAPH 8-9 B
 VARIATIONS IN THE AREAS UNDER
 GROUNDNUT IN KHIRODE

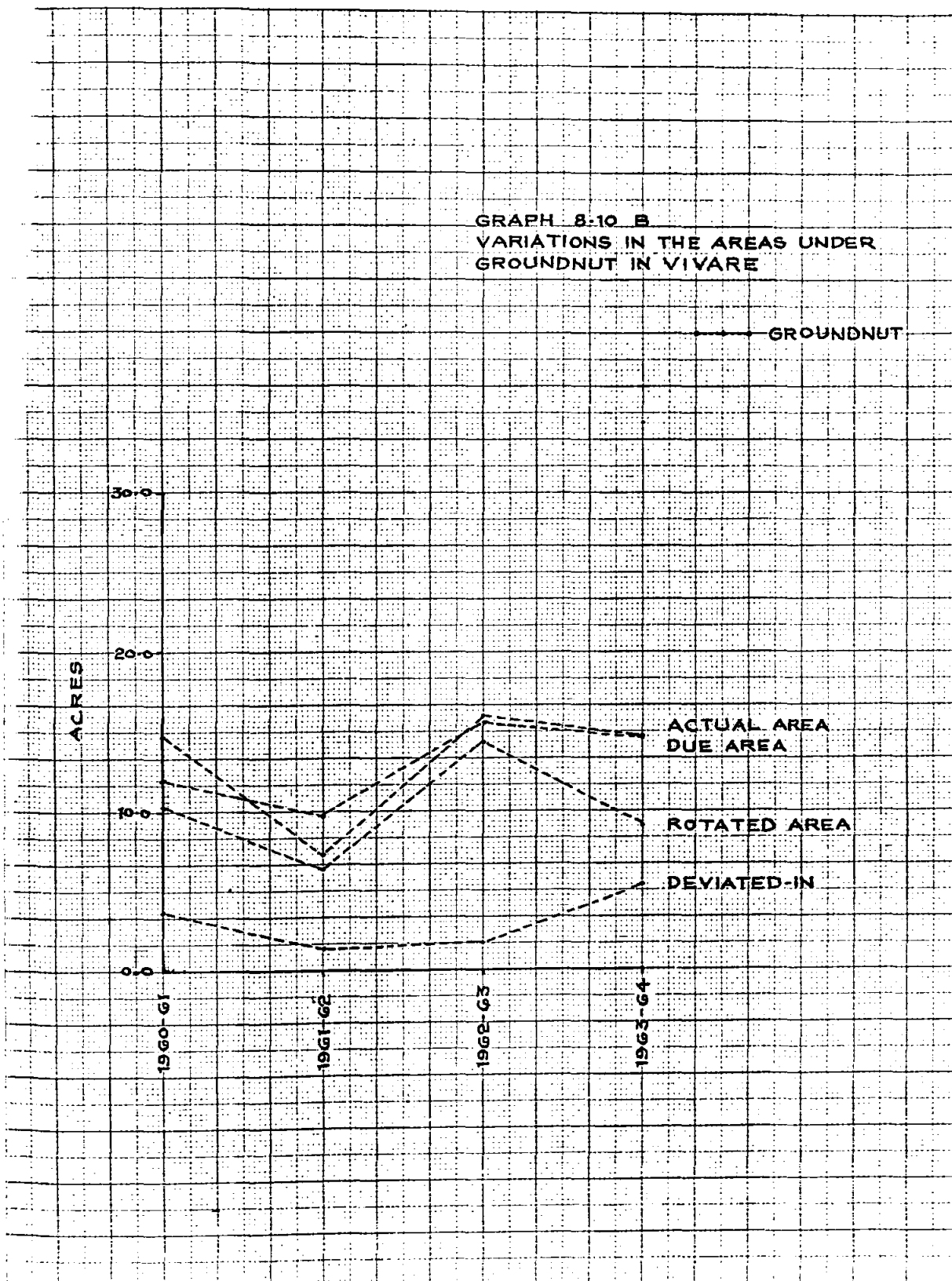


GRAPH 8-9 C
 VARIATIONS IN THE AREAS UNDER COTTON
 IN KHIRODE

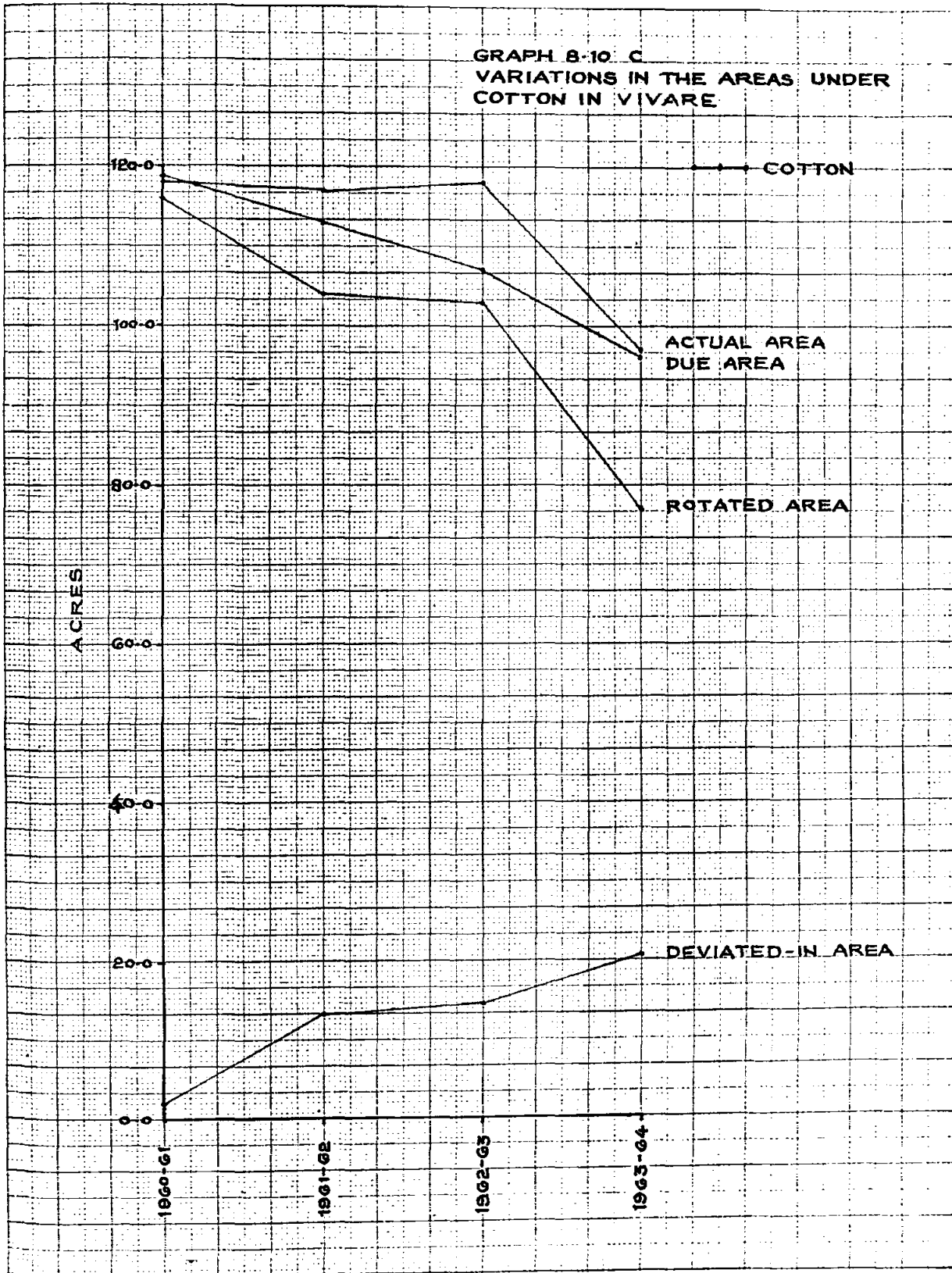




GRAPH 8-10 B
VARIATIONS IN THE AREAS UNDER
GROUNDNUT IN VIVARE



GRAPH B-10. C
 VARIATIONS IN THE AREAS UNDER
 COTTON IN VIVARE



rotations than what it gained through the deviations. This was true in both the villages. The total area under jowar, therefore, was always lower than the area due to it according to the rotations and single cropping. This clearly depicted the basic attitude of the cultivators. They grew jowar on the area just sufficient to meet their family food requirements and not more. They did not grow more jowar, even though it was due according to the rotation-plan. The fact that the areas under the cash-crops were higher than the due areas, also pointed out the second part of the basic attitude of the cultivators, that they tried to maximise their cash-income by growing more of cash-crops whenever possible.

The yearly variations seen in the aggregate area of each crop were largely caused by the rotations themselves, as bulk of the area under a crop came through rotations only. The deviations played a very minor role (see Graphs 8.9 and 8.10). The trend of area variations set by the total rotated area under a crop was not much affected and never changed completely in any year by the deviations.

8.6. Irrigated Villages

In Table 8.1, is given the classification of the total cropped land in the irrigated villages into the two basic categories--the area under rotations and the area under single cropping. From this Table it is evident that a bulk of the cropped area in both the villages was under rotations. The area under single cropping was negligible in Rozode. In Waghode, however, it was high (34.80 acres) or about 9.82 per cent of the

total. As stated earlier, such area was large in this village because of the orchards of oranges and lemons. We may first deal with the areas under rotations in both the villages and then take up the areas under single cropping.

8.7. Area Under the Crop-Rotations

The total area under the rotations was as high as 319.44 acres or 90.18 per cent of the total in Waghode and 247.82 acres or 99.95 per cent in Rozode. In Tables 8.19 and 8.20 are given the different crop-rotations practised by the cultivators and the areas claimed by each of these. It may be seen that in Waghode, three-year rotations were predominantly followed by the cultivators. Such rotations claimed more than 60 per cent of the total area under the rotations. The areas under the two and four-year rotations were comparatively very small. The dual rotations were accepted on 43.90 acres or 13.74 per cent of the land. Of the different types of the rotations practised in this village, the rotations of G-J, NB-JB-C and NB-JB-J were the major ones, claiming larger proportion of the total area. In Rozode, however, the two-year rotations were more predominant. This kind of rotations commanded nearly half of the total area under the rotations. The three-year rotations claimed about 37.57 per cent of the total area. These two kinds of rotations--two and three-year--claimed more than 80 per cent of the total area. The dual rotations were accepted on a very small area of 19.39 acres only. In this village, among the crop-rotations, the rotations of G-J, NB-JB-C and NB-JB-J were more common with the cultivators and claimed larger areas under them.

Table 8.19 : Area under the Rotations Practised by the Cultivators in Waghode

Rotation	No. of plots	Area in acres	Percentage to total area
Two-Year Rotation:			
Cotton-Jowar	16	20.22	69.29
Groundnut-Jowar	5	8.96	30.71
Total	21	29.18	9.13
Three-Year Rotation:			
'Nawati' banana-'Junar' banana-Cotton	57	120.40	62.08
'Nawati' banana-'Junar' banana-Jowar	32	49.95	25.75
'Nawati' banana-'Junar' banana-Groundnut	2	4.00	2.06
Groundnut-Cotton-Jowar	7	12.33	6.36
Wheat-Cotton-Jowar	1	7.28	3.75
Total	99	193.96	60.73
Four-Year Rotation:			
'Nawati' banana-'Junar' banana-Cotton-Jowar	9	15.59	29.75
'Nawati' banana-'Junar' banana-Cotton-Groundnut	3	2.88	5.50
'Nawati' banana-'Junar' banana-Wheat-Jowar	1	6.50	12.40
'Nawati' banana-'Junar' banana-Cotton-Cotton	7	17.68	33.74
Cotton-Cotton-Cotton-Jowar	2	9.75	18.61
Total	22	52.40	16.40
Dual Rotation:			
'Nawati' banana-'Junar' banana-Jowar Or Cotton-Jowar	4	6.31	14.37
'Nawati' banana-'Junar' banana-Cotton Or Cotton-Jowar	10	9.94	22.64
'Nawati' banana-'Junar' banana-Cotton Or Groundnut-Cotton	4	10.60	24.15
'Nawati' banana-'Junar' banana-Jowar Or Groundnut-Jowar	4	2.76	6.29
'Nawati' banana-'Junar' banana-Jowar Or Wheat-Jowar	1	2.20	5.01
'Nawati' banana-'Junar' banana-Cotton Or Groundnut-Cotton-Jowar	5	12.09	27.54
Total	28	43.90	13.74
Grand Total	170	319.44	100.00

Table 8.20 : Area under the Rotations Practised by the Cultivators in Rozode

Rotation	No. of Plots	Area in acres	Percentage to total area
Two-Year Rotation:			
Groundnut-Jowar	41	97.54	86.04
Groundnut-Cotton	3	4.51	3.98
Cotton-Jowar	6	6.98	6.16
Wheat-Jowar	5	4.33	3.82
Total	55	113.36	45.74
Three-Year Rotation:			
'Nawati' banana-'Junar' banana-Cotton	29	42.77	45.94
'Nawati' banana-'Junar' banana-Jowar	24	30.30	32.55
'Nawati' banana-'Junar' banana-Groundnut	3	3.42	3.67
'Nawati' banana-'Junar' banana-Wheat	1	1.03	1.11
Groundnut-Cotton-Jowar	6	15.58	16.73
Total	63	93.10	37.57
Four-Year Rotation:			
'Nawati' banana-'Junar' banana-Jowar-Cotton	3	4.08	18.57
'Nawati' banana-'Junar' banana-Cotton-Jowar	4	4.23	19.25
'Nawati' banana-'Junar' banana-Cotton-Wheat	3	7.03	32.00
'Nawati' banana-'Junar' banana-Maize-Cotton	1	2.15	9.79
'Nawati' banana-'Junar' banana-Maize-Bajara	1	4.48	20.39
Total	12	21.97	8.87
Dual Rotation:			
'Nawati' banana-'Junar' banana-Cotton Or Cotton-Jowar	5	7.34	37.85
'Nawati' banana-'Junar' banana-Jowar Or Cotton-Jowar	11	8.02	41.37
'Nawati' banana-'Junar' banana-Jowar Or Groundnut-Jowar	2	2.63	13.56
'Nawati' banana-'Junar' banana-Cotton Or Wheat Jowar	1	0.75	3.87
'Nawati' banana-'Junar' banana-Jowar Or Jowar-Jowar	1	0.37	1.91
'Nawati' banana-'Junar' banana-Jowar Or Chillies-Chillies	1	0.28	1.44
Total	21	19.39	7.82
Grand Total	151	247.82	100.00

As is the case in the dry villages, the area variations in the irrigated villages also, were basically caused by the accepted rotations themselves. The variations in the areas under the different crops occur, even if the accepted rotations are strictly practised year by year. In this section we show the variations resulting from the rotations alone, presuming that these are adhered to throughout the period and the size of plots under them remains the same. Such variations in the areas of different crops are given in Tables 8.21 to 8.24. The area variations given in Tables 8.21 and 8.23 are calculated considering that, of the dual rotations, the rotations of dry crops alone, which are basically accepted by such cultivators, are followed throughout the period. The variations in Tables 8.22 and 8.24, on the other hand, are calculated assuming that irrigation is made available to such cultivators for all the four years and of the dual rotations, the rotations with banana crop, are followed by them throughout the period. The areas under the different crops, therefore, varied between the minimum and the maximum areas given by these two types of calculations. In Waghode, the area under 'Nawati' banana varied between 42.65 acres in 1962-63 and 118.44 acres in 1960-61; 'Junar' banana between 36.94 acres in 1960-61 and 118.44 acres in 1961-62; cotton between 68.74 acres in 1961-62 and 111.69 acres in 1962-63; and jowar between 28.94 acres in 1961-62 and 83.25 acres in 1960-61. In Graphs 8.11 and 8.12 are shown the area variations calculated on the basis of the basic rotations as done in Tables 8.21 and 8.23. It may be seen from Graph 8.11 that in Waghode,

Table 8.21 : Variations in Areas under Different Crops Grown Strictly according to the Basic Rotations Practised by the Cultivators in Waghode (1960-61 to 1963-64) (Area in Acres)

Rotation	No. of plots	Total area	1960-61						1961-62						
			NB	JB	C	J	G	W	NB	JB	C	J	G	W	
Two-year rotation:															
Cotton-Jowar															
Cotton in 1960-61	13	15.14	-	-	15.14	-	-	-	-	-	-	15.14	-	-	
Jowar in 1960-61	17	21.33	-	-	-	21.33	-	-	-	-	-	21.33	-	-	
Groundnut-Cotton															
Groundnut in 1960-61	2	3.80	-	-	-	-	3.80	-	-	-	-	3.80	-	-	
Cotton in 1960-61	2	6.80	-	-	6.80	-	-	-	-	-	-	-	6.80	-	
Groundnut-Jowar															
Groundnut in 1960-61	3	3.88	-	-	-	-	3.88	-	-	-	-	3.88	-	-	
Jowar in 1960-61	6	7.84	-	-	-	7.84	-	-	-	-	-	-	7.84	-	
Wheat-Jowar															
Jowar in 1960-61	1	2.20	-	-	-	2.20	-	-	-	-	-	-	-	2.20	
Total	44	60.99	-	-	21.94	31.37	7.68	-	-	-	-	25.13	19.02	14.64	2.20
Three-year rotation:															
'Nawati' banana-'Junar' banana-Cotton															
'Nawati' banana in 1960-61	29	57.79	57.79	-	-	-	-	-	-	-	57.79	-	-	-	
'Junar' banana in 1960-61	9	22.46	-	22.46	-	-	-	-	-	-	-	22.46	-	-	
Cotton in 1960-61	19	40.15	-	-	40.15	-	-	-	-	40.15	-	-	-	-	
'Nawati' banana-'Junar' banana-Jowar															
'Nawati' banana in 1960-61	11	18.01	18.01	-	-	-	-	-	-	-	18.01	-	-	-	
'Junar' banana in 1960-61	6	9.48	-	9.48	-	-	-	-	-	-	-	9.48	-	-	
Jowar in 1960-61	15	22.46	-	-	-	22.46	-	-	-	22.46	-	-	-	-	
'Nawati' banana-'Junar' banana-Groundnut															
'Nawati' banana in 1960-61	1	3.00	3.00	-	-	-	-	-	-	-	3.00	-	-	-	
Groundnut in 1960-61	1	1.00	-	-	-	-	1.00	-	-	1.00	-	-	-	-	
Wheat-Cotton-Jowar															
Wheat in 1960-61	1	7.28	-	-	-	-	-	-	7.28	-	-	7.28	-	-	

(continued)

Table 8.21 : (continued)

Rotation	No. of plots	Total area	1960-61						1961-62					
			NB	JB	C	J	G	W	NB	JB	C	J	G	W
Three-year rotation: (continued)														
Groundnut-Cotton-Jowar														
Groundnut in 1960-61	3	4.63	-	-	-	-	4.63	-	-	-	4.63	-	-	-
Cotton in 1960-61	5	10.13	-	-	10.13	-	-	-	-	-	-	10.13	-	-
Jowar in 1960-61	4	9.66	-	-	-	9.66	-	-	-	-	-	-	9.66	-
Total	104	206.05	78.80	31.94	50.28	32.12	5.63	7.28	63.61	78.80	34.37	19.61	9.66	-
Four-year rotation:														
'Nawati' banana-'Junar' banana-Cotton-Jowar														
'Nawati' banana in 1960-61	1	1.20	1.20	-	-	-	-	-	-	1.20	-	-	-	-
Cotton in 1960-61	2	4.38	-	-	4.38	-	-	-	-	-	-	4.38	-	-
Jowar in 1960-61	6	10.01	-	-	-	10.01	-	-	10.01	-	-	-	-	-
'Nawati' banana-'Junar' banana-Cotton-Groundnut														
Groundnut in 1960-61	3	2.88	-	-	-	-	2.88	-	2.88	-	-	-	-	-
'Nawati' banana-'Junar' banana-Cotton-Cotton														
'Nawati' banana in 1960-61	1	6.35	6.35	-	-	-	-	-	-	6.35	-	-	-	-
'Junar' banana in 1960-61	5	5.00	-	5.00	-	-	-	-	-	-	5.00	-	-	-
Cotton in 1960-61	1	6.33	-	-	6.33	-	-	-	-	-	6.33	-	-	-
'Nawati' banana-'Junar' banana-Wheat-Jowar														
'Nawati' banana in 1960-61	1	6.50	6.50	-	-	-	-	-	-	6.50	-	-	-	-
Cotton-Cotton-Cotton-Jowar														
Jowar in 1960-61	2	9.75	-	-	-	9.75	-	-	-	-	9.75	-	-	-
Total	22	52.40	14.05	5.00	10.71	19.76	2.88	-	12.89	14.05	21.08	4.38	-	-
Grand Total	170	319.44	92.85	36.94	82.93	83.25	16.19	7.28	76.50	92.85	80.58	43.01	24.30	2.20

(continued)

Table 8.21 : (continued)

Rotation	No. of plots	Total area	1962-63						1963-64					
			NB	JB	C	J	G	W	NB	JB	C	J	G	W
Two-year rotation:														
Cotton-Jowar														
Cotton in 1960-61	13	15.14	-	-	15.14	-	-	-	-	-	-	15.14	-	-
Jowar in 1960-61	17	21.33	-	-	-	21.33	-	-	-	-	21.33	-	-	-
Groundnut-Cotton														
Groundnut in 1960-61	2	3.80	-	-	-	-	3.80	-	-	-	3.80	-	-	-
Cotton in 1960-61	2	6.80	-	-	6.80	-	-	-	-	-	-	-	6.80	-
Groundnut-Jowar														
Groundnut in 1960-61	3	3.88	-	-	-	-	3.88	-	-	-	-	3.88	-	-
Jowar in 1960-61	6	7.84	-	-	-	7.84	-	-	-	-	-	-	7.84	-
Wheat-Jowar														
Jowar in 1960-61	1	2.20	-	-	-	2.20	-	-	-	-	-	-	-	2.20
Total	44	60.99	-	-	21.94	31.37	7.68	-	-	-	25.13	19.02	14.64	2.20
Three-year rotation:														
'Nawati' banana-'Junar' banana-Cotton														
'Nawati' banana in 1960-61	29	57.79	-	-	57.79	-	-	-	-	57.79	-	-	-	-
'Junar' banana in 1960-61	9	22.46	22.46	-	-	-	-	-	-	-	22.46	-	-	-
Cotton in 1960-61	19	40.15	-	40.15	-	-	-	-	-	-	-	40.15	-	-
'Nawati' banana-'Junar' banana-Jowar														
'Nawati' banana in 1960-61	11	18.01	-	-	-	18.01	-	-	-	18.01	-	-	-	-
'Junar' banana in 1960-61	6	9.48	9.48	-	-	-	-	-	-	-	9.48	-	-	-
Jowar in 1960-61	15	22.46	-	22.46	-	-	-	-	-	-	-	-	22.46	-
'Nawati' banana-'Junar' banana-Groundnut														
'Nawati' banana in 1960-61	1	3.00	-	-	-	-	3.00	-	-	3.00	-	-	-	-
Groundnut in 1960-61	1	1.00	-	1.00	-	-	-	-	-	-	-	-	1.00	-
Wheat-Cotton-Jowar														
Wheat in 1960-61	1	7.28	-	-	-	7.28	-	-	-	-	-	-	-	7.28

(continued)

Table 8.21 : (continued)

Rotation	No. of plots	Total area	1962-63						1963-64					
			NB	JB	C	J	G	W	NB	JB	C	J	G	W
Three-year rotation: (continued)														
Groundnut-Cotton-Jowar														
Groundnut in 1960-61	3	4.63	-	-	-	4.63	-	-	-	-	-	-	4.63	-
Cotton in 1960-61	5	10.13	-	-	-	-	10.13	-	-	-	10.13	-	-	-
Jowar in 1960-61	4	9.66	-	-	9.66	-	-	-	-	-	-	9.66	-	-
Total	104	206.05	31.94	63.61	67.45	29.92	13.13	-	78.80	31.94	50.28	32.12	5.63	7.28
Four-year rotation:														
'Nawati' banana-'Junar' banana-Cotton-Jowar														
'Nawati' banana in 1960-61	1	1.20	-	-	1.20	-	-	-	-	-	-	1.20	-	-
Cotton in 1960-61	2	4.38	4.38	-	-	-	-	-	-	4.38	-	-	-	-
Jowar in 1960-61	6	10.01	-	10.01	-	-	-	-	-	-	10.01	-	-	-
'Nawati' banana-'Junar' banana-Cotton-Groundnut														
Groundnut in 1960-61	3	2.88	-	2.88	-	-	-	-	-	-	2.88	-	-	-
'Nawati' banana-'Junar' banana-Cotton-Cotton														
'Nawati' banana in 1960-61	1	6.35	-	-	6.35	-	-	-	-	-	6.35	-	-	-
'Junar' banana in 1960-61	5	5.00	-	-	5.00	-	-	-	5.00	-	-	-	-	-
Cotton in 1960-61	1	6.33	6.33	-	-	-	-	-	-	6.33	-	-	-	-
'Nawati' banana-'Junar' banana-Wheat-Jowar														
'Nawati' banana in 1960-61	1	6.50	-	-	-	-	-	6.50	-	-	-	6.50	-	-
Cotton-Cotton-Cotton-Jowar														
Jowar in 1960-61	2	9.75	-	-	9.75	-	-	-	-	-	9.75	-	-	-
Total	22	52.40	10.71	12.89	22.30	-	-	6.50	5.00	10.71	28.99	7.70	-	-
Grand Total	170	319.44	42.65	76.50	111.69	61.29	20.81	6.50	83.80	42.65	104.40	58.84	20.27	9.48

Table 8.22 : Variations in Areas under Different Crops Grown according to the Rotations, Assuming Water Is Made Available Throughout the Period in Waghode (1960-61 to 1963-64) (Area in Acres)

Rotation	No. of plots	Total area	1960-61						1961-62						
			NB	JB	C	J	G	W	NB	JB	C	J	G	W	
Two-year rotation:															
Cotton-Jowar															
Cotton in 1960-61	4	4.80	-	-	4.80	-	-	-	-	-	-	-	4.80	-	-
Jowar in 1960-61	12	15.42	-	-	-	15.42	-	-	-	-	-	15.42	-	-	-
Groundnut-Jowar															
Groundnut in 1960-61	2	3.15	-	-	-	-	3.15	-	-	-	-	-	3.15	-	-
Jowar in 1960-61	3	5.81	-	-	-	5.81	-	-	-	-	-	-	-	5.81	-
Total	21	29.18	-	-	4.80	21.23	3.15	-	-	-	-	15.42	7.95	5.81	-
Three-year rotation:															
'Nawati' banana-'Junar' banana-Cotten															
'Nawati' banana in 1960-61	38	79.09	79.09	-	-	-	-	-	-	-	79.09	-	-	-	-
'Junar' banana in 1960-61	10	23.96	-	23.96	-	-	-	-	-	-	-	23.96	-	-	-
Cotton in 1960-61	28	49.98	-	-	49.98	-	-	-	-	49.98	-	-	-	-	-
'Nawati' banana-'Junar' banana-Jowar															
'Nawati' banana in 1960-61	14	22.30	22.30	-	-	-	-	-	-	-	22.30	-	-	-	-
'Junar' banana in 1960-61	6	9.48	-	9.48	-	-	-	-	-	-	-	-	9.48	-	-
Jowar in 1960-61	21	29.44	-	-	-	29.44	-	-	-	29.44	-	-	-	-	-
'Nawati' banana-'Junar' banana-Groundnut															
'Nawati' banana in 1960-61	1	3.00	3.00	-	-	-	-	-	-	-	3.00	-	-	-	-
Groundnut in 1960-61	1	1.00	-	-	-	-	1.00	-	-	1.00	-	-	-	-	-
Wheat-Cotton-Jowar															
Wheat in 1960-61	1	7.28	-	-	-	-	-	7.28	-	-	-	7.28	-	-	-
Groundnut-Cotton-Jowar															
Groundnut in 1960-61	1	1.00	-	-	-	-	1.00	-	-	-	-	1.00	-	-	-
Cotton in 1960-61	4	7.13	-	-	7.13	-	-	-	-	-	-	-	7.13	-	-
Jowar in 1960-61	2	4.20	-	-	-	4.20	-	-	-	-	-	-	-	4.20	-
Total	127	237.86	104.39	33.44	57.11	33.64	2.00	7.28	80.42	104.39	32.24	16.61	4.20	-	-
Total area under four-year rotations	22	52.40	14.05	5.00	10.71	19.76	2.88	-	12.89	14.05	21.08	4.38	-	-	-
Grand Total	170	319.44	118.44	38.44	72.62	74.63	8.03	7.28	93.31	118.44	68.74	28.94	10.01	-	-

(continued)

Table 8.22 : (continued)

Rotation	No. of plots	Total area	1962-63						1963-64					
			NB	JB	C	J	G	W	NB	JB	C	J	G	W
Two-year rotation:														
Cotton-Jowar														
Cotton in 1960-61	4	4.80	-	-	4.80	-	-	-	-	-	-	4.80	-	-
Jowar in 1960-61	12	15.42	-	-	-	15.42	-	-	-	-	-	15.42	-	-
Groundnut-Jowar														
Groundnut in 1960-61	2	3.15	-	-	-	-	3.15	-	-	-	-	3.15	-	-
Jowar in 1960-61	3	5.81	-	-	-	5.81	-	-	-	-	-	-	5.81	-
Total	21	29.18	-	-	4.80	21.23	3.15	-	-	-	-	15.42	7.95	5.81
Three-year rotation:														
'Nawati' banana-'Junar' banana-Cotton														
'Nawati' banana in 1960-61	38	79.09	-	-	79.09	-	-	-	79.09	-	-	-	-	-
'Junar' banana in 1960-61	10	23.96	23.96	-	-	-	-	-	-	23.96	-	-	-	-
Cotton in 1960-61	28	49.98	-	49.98	-	-	-	-	-	-	49.98	-	-	-
'Nawati' banana-'Junar' banana-Jowar														
'Nawati' banana in 1960-61	14	22.30	-	-	-	22.30	-	-	22.30	-	-	-	-	-
'Junar' banana in 1960-61	6	9.48	9.48	-	-	-	-	-	-	9.48	-	-	-	-
Jowar in 1960-61	21	29.44	-	29.44	-	-	-	-	-	-	-	29.44	-	-
'Nawati' banana-'Junar' banana-Groundnut														
'Nawati' banana in 1960-61	1	3.00	-	-	-	-	3.00	-	3.00	-	-	-	-	-
Groundnut in 1960-61	1	1.00	-	1.00	-	-	-	-	-	-	-	-	1.00	-
Wheat-Cotton-Jowar														
Wheat in 1960-61	1	7.28	-	-	-	7.28	-	-	-	-	-	-	-	7.28
Groundnut-Cotton-Jowar														
Groundnut in 1960-61	1	1.00	-	-	-	1.00	-	-	-	-	-	-	1.00	-
Cotton in 1960-61	4	7.13	-	-	-	-	7.13	-	-	-	7.13	-	-	-
Jowar in 1960-61	2	4.20	-	-	4.20	-	-	-	-	-	-	4.20	-	-
Total	127	237.86	33.44	80.42	83.29	30.58	10.13	-	104.39	33.44	57.11	33.64	2.00	7.28
Total area under four-year rotations	22	52.40	10.71	12.89	22.30	-	-	6.50	5.00	10.71	28.99	7.70	-	-
Grand Total	170	319.44	44.15	93.31	110.39	51.81	13.28	6.50	109.39	44.15	101.52	49.29	7.81	7.28

Table 8.23 : Variations in Areas under Different Crops Grown Strictly according to the Basic Rotations Practised by the Cultivators in Rozode (1960-61 to 1963-64) (Area in Acres)

Rotation	No. of plots	Total area	1960-61											1961-62					1962-63							1963-64									
			NB	JB	C	J	G	W	M	B	Chil-lies	NB	JB	C	J	G	W	M	B	Chil-lies	NB	JB	C	J	G	W	M	B	Chil-lies						
Two-year rotation:																																			
Cotton-Jowar																																			
Cotton in 1960-61	10	13.22	-	-	13.22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jowar in 1960-61	12	9.12	-	-	-	9.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Groundnut-Cotton																																			
Cotton in 1960-61	3	4.51	-	-	4.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Groundnut-Jowar																																			
Groundnut in 1960-61	17	40.86	-	-	-	-	40.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Jowar in 1960-61	26	59.31	-	-	-	59.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Wheat-Jowar																																			
Wheat in 1960-61	3	1.70	-	-	-	-	-	1.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Jowar in 1960-61	3	3.38	-	-	-	3.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	74	132.10	-	-	17.73	71.81	40.86	1.70	-	-	-	-	-	9.12	55.78	63.82	3.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Three-year rotation:																																			
'Nawati' banana-'Junar' banana-Jowar																																			
'Nawati' banana in 1960-61	10	9.59	9.59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
'Junar' banana in 1960-61	7	10.91	-	10.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Jowar in 1960-61	7	9.80	-	-	-	9.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
'Nawati' banana-'Junar' banana-Cotton																																			
'Nawati' banana in 1960-61	10	16.72	16.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
'Junar' banana in 1960-61	7	12.33	-	12.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cotton in 1960-61	12	13.72	-	-	13.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
'Nawati' banana-'Junar' banana-Groundnut																																			
'Nawati' banana in 1960-61	1	1.65	1.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
'Junar' banana in 1960-61	1	1.00	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Groundnut in 1960-61	1	0.77	-	-	-	0.77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
'Nawati' banana-'Junar' banana-Wheat																																			
'Nawati' banana in 1960-61	1	1.03	1.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

(continued)

Table 8.23 : (continued)

Rotation	No. of plots	Total area	1960-61										1961-62					1962-63					1963-64														
			NB	JB	C	J	G	W	M	B	Chil-lies	NB	JB	C	J	G	W	M	B	Chil-lies	NB	JB	C	J	G	W	M	B	Chil-lies								
Three-year rotation : (continued)																																					
Groundnut-Cotton-Jowar																																					
Cotton in 1960-61	3	7.26	-	-	7.26	-	-	-	-	-	-	-	-	7.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Jowar in 1960-61	3	8.32	-	-	-	8.32	-	-	-	-	-	-	-	-	8.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total	63	93.10	28.99	24.24	20.98	18.12	0.77	-	-	-	-	-	-	24.29	28.99	12.33	18.17	-	-	-	-	24.24	24.29	25.04	9.59	8.91	1.03	-	-	-	-	28.99	24.24	20.98	18.12	0.77	
Four-year rotation:																																					
'Nawati' banana-'Junar' banana-Cotton-Jowar																																					
'Junar' banana in 1960-61	1	1.25	-	1.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cotton in 1960-61	1	1.25	-	-	1.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Jowar in 1960-61	2	1.73	-	-	-	1.73	-	-	-	-	-	-	-	-	1.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
'Nawati' banana-'Junar' banana-Jowar-Cotton																																					
'Nawati' banana in 1960-61	1	2.50	2.50	-	-	-	-	-	-	-	-	-	-	-	-	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Jowar in 1960-61	2	1.58	-	-	-	1.58	-	-	-	-	-	-	-	-	-	-	1.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
'Nawati' banana-'Junar' banana-Cotton-Wheat																																					
Wheat in 1960-61	3	7.03	-	-	-	-	-	7.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
'Nawati' banana-'Junar' banana-Maize-Bajara																																					
'Junar' banana in 1960-61	1	4.48	-	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	4.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
'Nawati' banana-'Junar' banana-Maize-Cotton																																					
Maize in 1960-61	1	2.15	-	-	-	-	-	-	2.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	12	21.97	2.50	5.73	1.25	3.31	-	7.03	2.15	-	-	-	-	8.76	2.50	4.98	1.25	-	-	-	-	4.48	-	-	-	-	4.98	8.76	-	3.75	-	-	-	4.48	5.73	4.98	11.26
Single cropping :																																					
Jowar-Jowar-Jowar																																					
Chillies-Chillies-Chillies	1	0.37	-	-	-	0.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chillies-Chillies-Chillies																																					
Chillies-Chillies-Chillies	1	0.28	-	-	-	-	-	-	-	-	0.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.28	
Total	2	0.65	-	-	-	0.37	-	-	-	-	0.28	-	-	-	-	-	-	-	-	-	-	0.28	-	-	-	-	0.37	-	-	-	-	-	-	-	0.28	0.28	
Grand Total	151	247.82	31.49	29.97	39.96	93.61	41.63	8.73	2.15	-	0.28	33.05	31.49	26.43	75.57	73.14	3.38	4.48	-	0.28	29.22	33.05	42.77	85.52	49.77	2.73	-	4.48	0.28	34.72	29.22	41.36	74.27	64.59	3.38	-	0.28

Table 8.24 : Variations in Areas under Different Crops Grown according to the Rotations Assuming Water Is Made Available Throughout the Period in Rozode (1960-61 to 1963-64) (Area in Acres)

Rotation	No. of plots	Total area	1960-61							1961-62						
			NB	JB	C	J	G	W	M	NB	JB	C	J	G	W	M
Two-year rotation:																
Groundnut-Jowar																
Groundnut in 1960-61	17	40.86	-	-	-	-	40.86	-	-	-	-	-	40.86	-	-	-
Jowar in 1960-61	24	56.68	-	-	-	56.68	-	-	-	-	-	-	-	56.68	-	-
Groundnut-Cotton																
Cotton in 1960-61	3	4.51	-	-	4.51	-	-	-	-	-	-	-	-	4.51	-	-
Cotton-Jowar																
Cotton in 1960-61	4	4.93	-	-	4.93	-	-	-	-	-	-	-	4.93	-	-	-
Jowar in 1960-61	2	2.05	-	-	-	2.05	-	-	-	-	-	2.05	-	-	-	-
Wheat-Jowar																
Wheat in 1960-61	3	1.70	-	-	-	-	-	1.70	-	-	-	-	1.70	-	-	-
Jowar in 1960-61	2	2.63	-	-	-	2.63	-	-	-	-	-	-	-	-	2.63	-
Total	55	113.36	-	-	9.44	61.36	40.86	1.70	-	-	-	2.05	47.49	61.19	2.63	-
Three-year rotation:																
'Nawati' banana-'Junar' banana-Jowar																
'Nawati' banana in 1960-61	15	12.25	12.25	-	-	-	-	-	-	-	-	12.25	-	-	-	-
'Junar' banana in 1960-61	9	12.86	-	12.86	-	-	-	-	-	-	-	-	12.86	-	-	-
Jowar in 1960-61	15	16.49	-	-	-	16.49	-	-	-	-	16.49	-	-	-	-	-
'Nawati' banana-'Junar' banana-Cotton																
'Nawati' banana in 1960-61	12	18.47	18.47	-	-	-	-	-	-	-	-	18.47	-	-	-	-
'Junar' banana in 1960-61	7	12.33	-	12.33	-	-	-	-	-	-	-	-	12.33	-	-	-
Cotton in 1960-61	16	20.06	-	-	20.06	-	-	-	-	-	20.06	-	-	-	-	-
'Nawati' banana-'Junar' banana-Groundnut																
'Nawati' banana in 1960-61	1	1.65	1.65	-	-	-	-	-	-	-	-	1.65	-	-	-	-
'Junar' banana in 1960-61	1	1.00	-	1.00	-	-	-	-	-	-	-	-	-	1.00	-	-
Groundnut in 1960-61	1	0.77	-	-	-	-	0.77	-	-	-	0.77	-	-	-	-	-

(continued)

Table 8.24 : (continued)

Rotation	No. of plots	Total area	1960-61							1961-62						
			NB	JB	C	J	G	W	M	NB	JB	C	J	G	W	M
Three-year rotation: (continued)																
'Nawati' banana-'Junar' banana-Wheat																
'Nawati' banana in 1960-61	1	1.03	1.03	-	-	-	-	-	-	-	1.03	-	-	-	-	-
Groundnut-Cotton-Jowar																
Cotton in 1960-61	3	7.26	-	-	7.26	-	-	-	-	-	-	-	7.26	-	-	-
Jowar in 1960-61	3	8.32	-	-	-	8.32	-	-	-	-	-	-	-	8.32	-	-
Total	84	112.49	33.40	26.19	27.32	24.81	0.77	-	-	37.32	33.40	12.33	20.12	9.32	-	-
Total area under four-year rotations	12	21.97	2.50	5.73	1.25	3.31	-	7.03	2.15	8.76	2.50	4.98	1.25	-	-	4.48
Grand Total	151	247.82	35.90	31.92	38.01	89.48	41.63	8.73	2.15	46.08	35.90	19.36	68.86	70.51	2.63	4.48

(continued)

Table 8.24 : (continued)

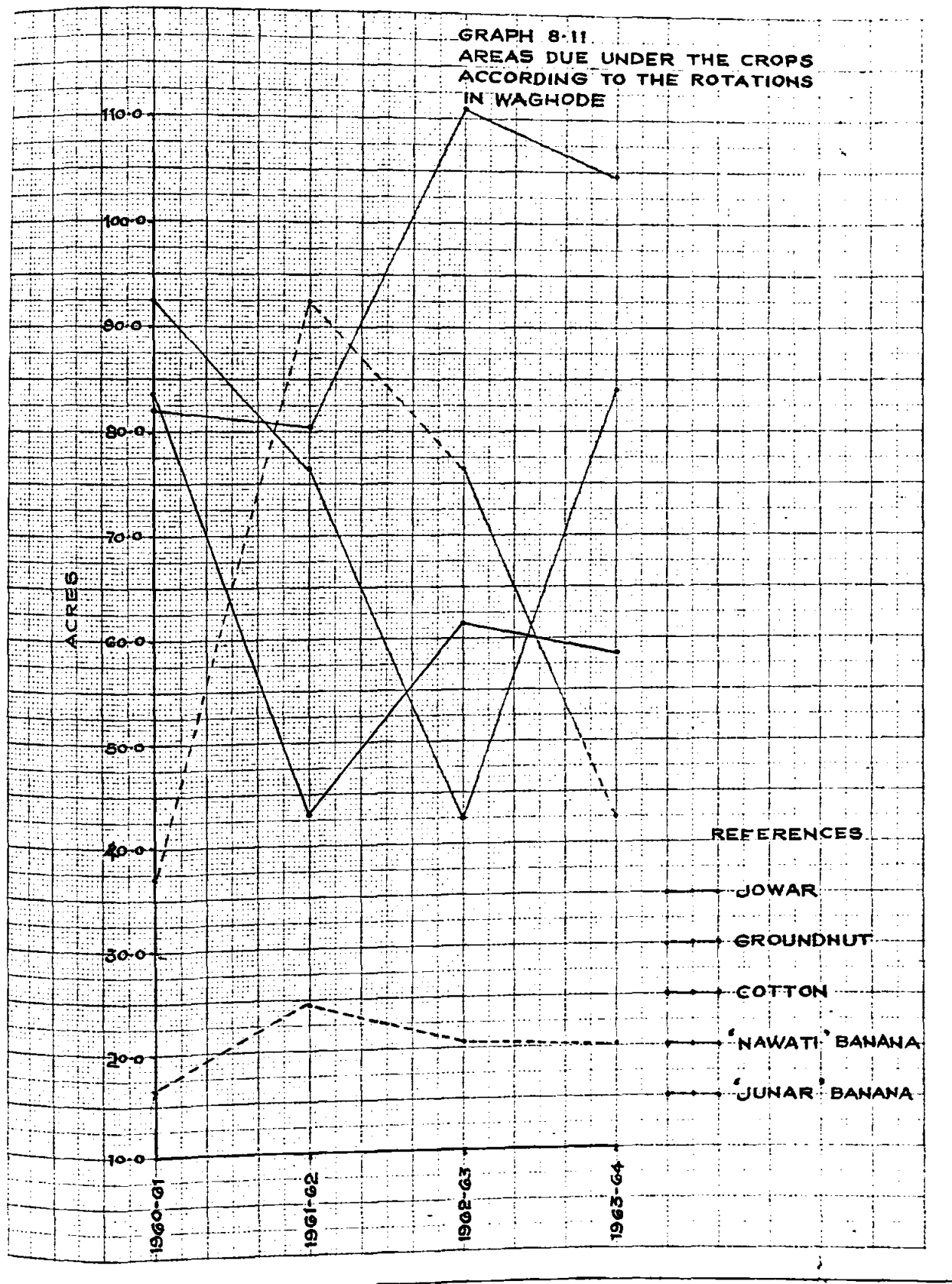
Rotation	No. of plots	Total area	1962-63							1963-64						
			NB	JB	C	J	G	W	M	NB	JB	C	J	G	W	M
Two-year rotation:																
Groundnut-Jowar																
Groundnut in 1960-61	17	40.86	-	-	-	-	40.86	-	-	-	-	-	40.86	-	-	-
Jowar in 1960-61	24	56.68	-	-	-	56.68	-	-	-	-	-	-	-	56.68	-	-
Groundnut-Cotton																
Cotton in 1960-61	3	4.51	-	-	4.51	-	-	-	-	-	-	-	-	4.51	-	-
Cotton-Jowar																
Cotton in 1960-61	4	4.93	-	-	4.93	-	-	-	-	-	-	-	4.93	-	-	-
Jowar in 1960-61	2	2.05	-	-	-	2.05	-	-	-	-	-	2.05	-	-	-	-
Wheat-Jowar																
Wheat in 1960-61	3	1.70	-	-	-	-	-	1.70	-	-	-	-	1.70	-	-	-
Jowar in 1960-61	2	2.63	-	-	-	2.63	-	-	-	-	-	-	-	-	2.63	-
Total	55	113.36	-	-	9.44	61.36	40.86	1.70	-	-	-	2.05	47.49	61.19	2.63	-
Three-year rotation:																
'Nawati' banana-'Junar' banana-Jowar																
'Nawati' banana in 1960-61	15	12.25	-	-	-	12.25	-	-	-	12.25	-	-	-	-	-	-
'Junar' banana in 1960-61	9	12.86	12.86	-	-	-	-	-	-	-	12.86	-	-	-	-	-
Jowar in 1960-61	15	16.49	-	16.49	-	-	-	-	-	-	-	-	16.49	-	-	-
'Nawati' banana-'Junar' banana-Cotton																
'Nawati' banana in 1960-61	12	18.47	-	-	18.47	-	-	-	-	18.47	-	-	-	-	-	-
'Junar' banana in 1960-61	7	12.33	12.33	-	-	-	-	-	-	-	12.33	-	-	-	-	-
Cotton in 1960-61	16	20.06	-	20.06	-	-	-	-	-	-	-	20.06	-	-	-	-
'Nawati' banana-'Junar' banana-Groundnut																
'Nawati' banana in 1960-61	1	1.65	-	-	-	-	1.65	-	-	1.65	-	-	-	-	-	-
'Junar' banana in 1960-61	1	1.00	1.00	-	-	-	-	-	-	-	1.00	-	-	-	-	-
Groundnut in 1960-61	1	0.77	-	0.77	-	-	-	-	-	-	-	-	-	0.77	-	-

(continued)

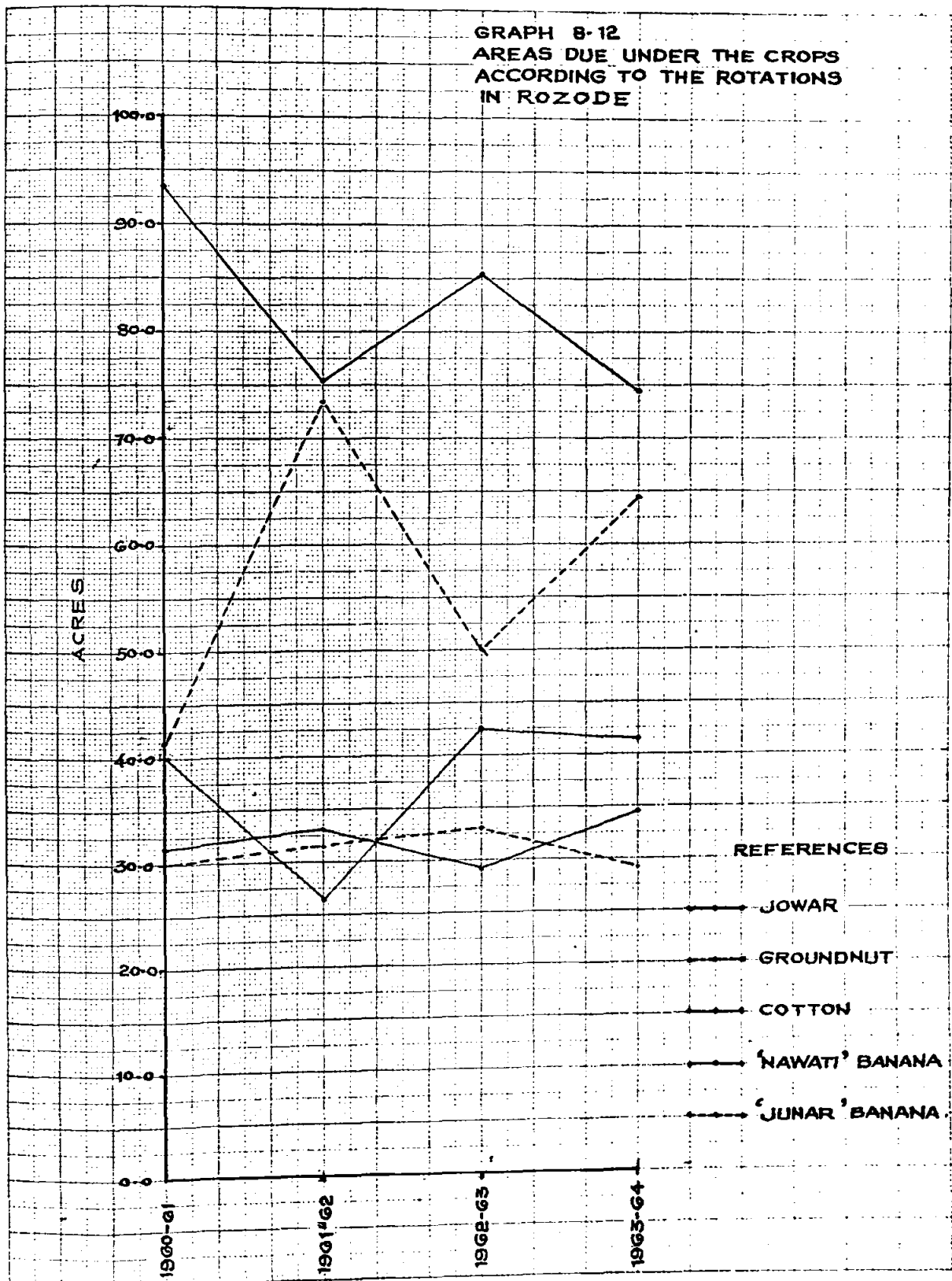
Table 8.24 : (continued)

Rotation	No. of plots	Total area	1962-63							1963-64						
			NB	JB	C	J	G	W	M	NB	JB	C	J	G	W	M
Three-year rotation: (continued)																
'Nawati' banana-'Junar' banana-Wheat																
'Nawati' banana in 1960-61	1	1.03	-	-	-	-	-	1.03	-	1.03	-	-	-	-	-	-
Groundnut-Cotton-Jowar																
Cotton in 1960-61	3	7.26	-	-	-	-	7.26	-	-	-	-	7.26	-	-	-	-
Jowar in 1960-61	3	8.32	-	-	8.32	-	-	-	-	-	-	-	8.32	-	-	-
Total	84	112.49	26.19	37.32	26.79	12.25	8.91	1.03	-	33.40	26.19	27.32	24.81	0.77	-	-
Total area under four-year rotations	12	21.97	4.98	8.76	-	3.75	-	-	4.48	5.73	4.98	11.26	-	-	-	-
Grand Total	151	247.82	31.17	46.08	36.23	77.36	49.77	2.73	4.48	39.13	31.17	40.63	72.30	61.96	2.63	-

GRAPH 8-11
 AREAS DUE UNDER THE CROPS
 ACCORDING TO THE ROTATIONS
 IN WAGHODE



GRAPH 8-12
 AREAS DUE UNDER THE CROPS
 ACCORDING TO THE ROTATIONS
 IN ROZODE



the area under cotton generally moved on a higher level than those of banana, jowar and groundnut. This was largely because of the three-year rotation of NB-JB-C, which commanded the largest area under it. Besides, cotton was the common crop included in many of the other crop-rotations practised by the cultivators.

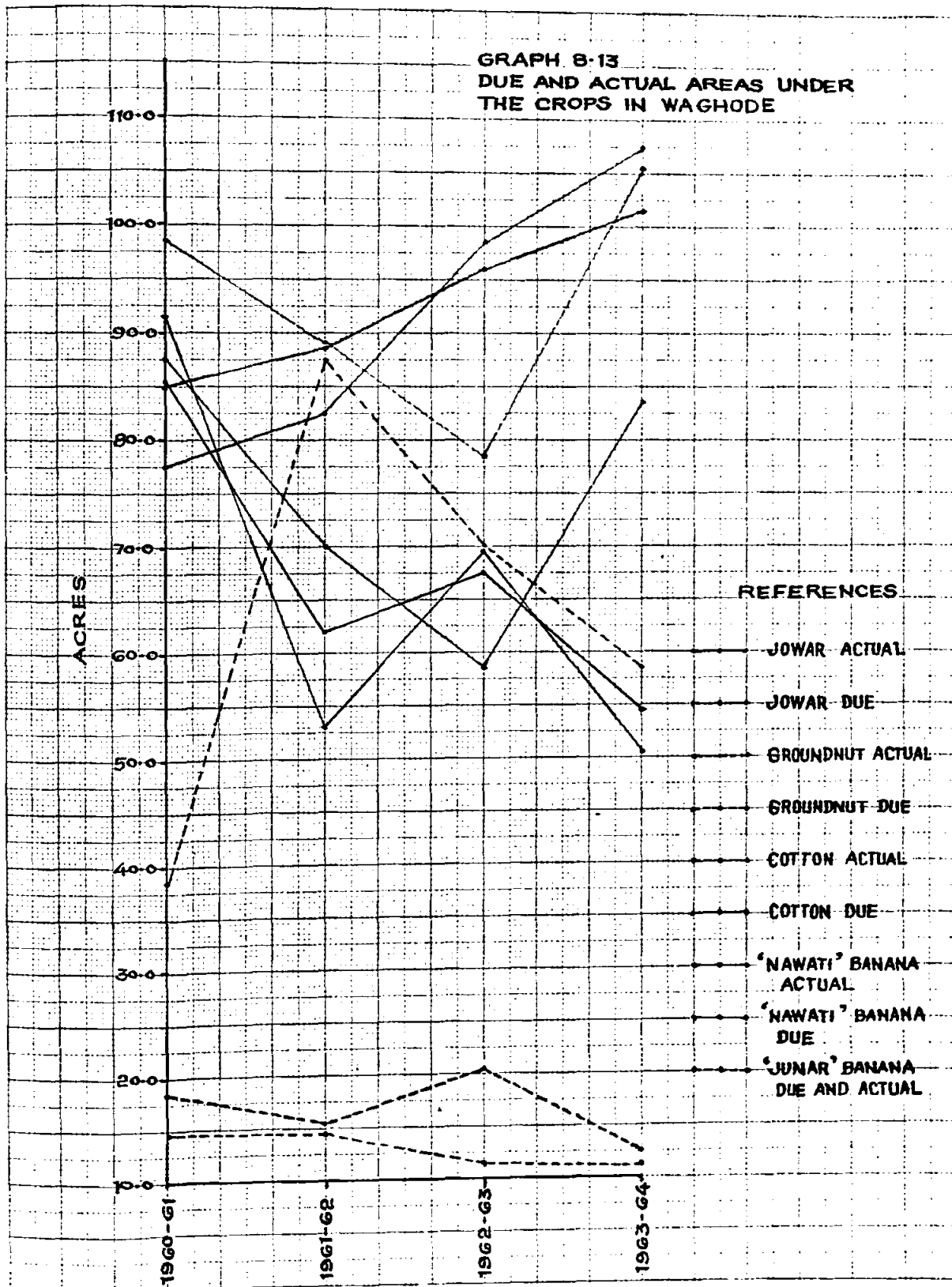
In Rozode also, the variations in the areas of different crops, resulting from the crop-rotations alone, were fairly wide. It may be seen from Tables 8.23 and 8.24 that the area under 'Nawati' banana, varied between 29.22 acres in 1962-63 and 46.08 acres in 1961-62; 'Junar' banana, between 29.22 acres in 1963-64 and 46.08 acres in 1962-63; cotton, between 19.36 acres in 1961-62 and 42.77 acres in 1962-63; jowar, between 68.86 acres in 1961-62 and 93.61 acres in 1960-61; and groundnut, between 41.63 acres in 1960-61 and 73.14 acres in 1961-62. In this village, the areas under jowar and groundnut always moved on different planes, higher than those of the other crops like cotton and banana (see Graph 8.12). Of the two, the area under jowar was always higher than groundnut. This was because jowar was one of the crops included in the major rotations such as G-J and NB-JB-J, which claimed a large proportion of the total land. Besides, it was taken in other crop-rotations as well, like the rotations of C-J, W-J and G-C-J etc. The area under groundnut was high mainly because of the two-year rotation of G-J, which alone claimed more than 39.36 per cent of the total land. In this village the areas under jowar and groundnut were considerably high as these were the only crops grown on the dry

land, which the cultivators cultivated outside the village. The areas under cotton and banana were relatively small as these crops were mainly grown on the land in the village. It may be seen from the tables that the area variations in the case of all the major crops were wide in this village.

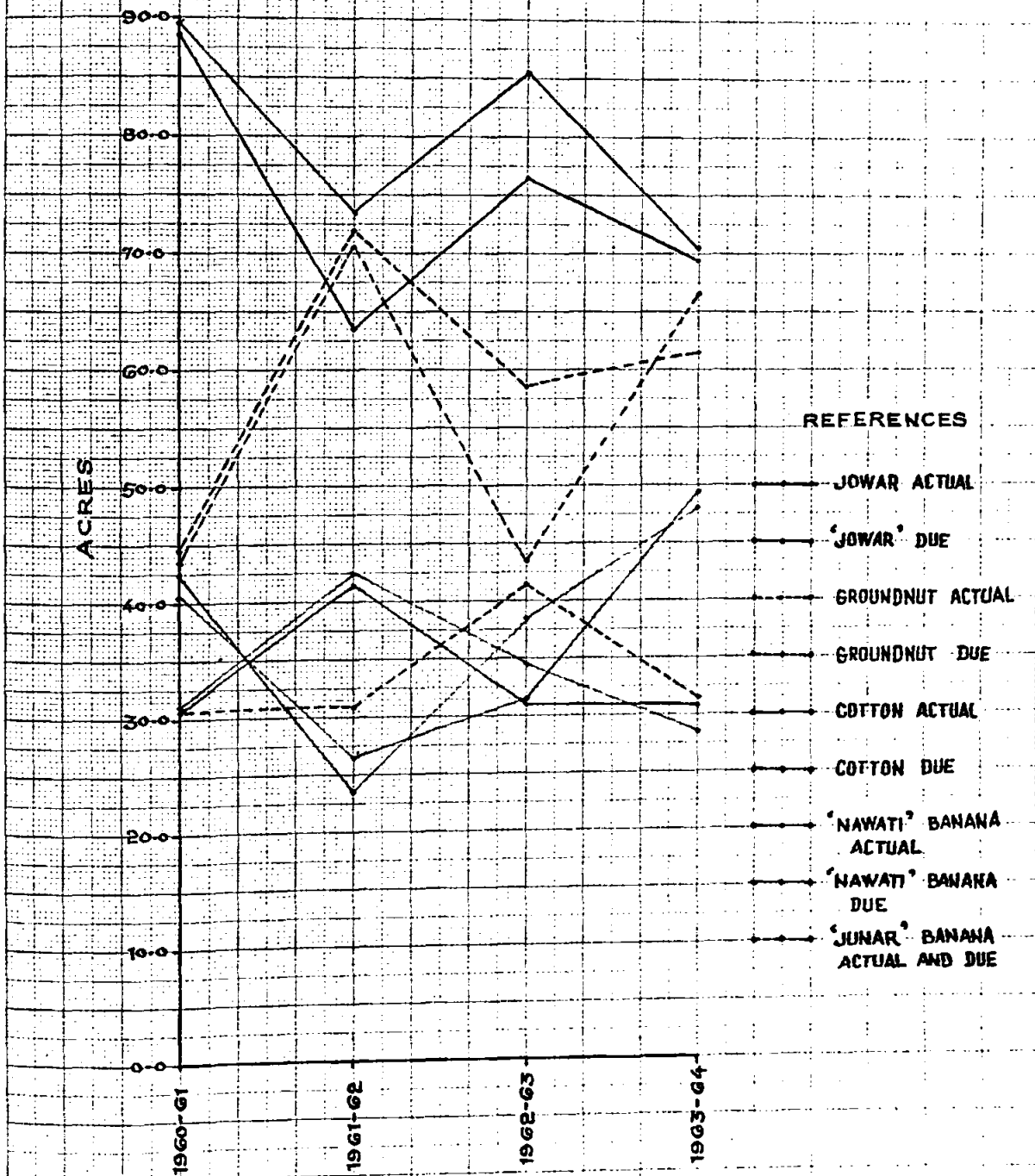
Thus, the accepted rotations, when strictly adhered to over a period of years, caused wide variations in the areas of all the major crops in both the irrigated villages. However, as seen earlier, the rotations could not be practised so strictly from year to year. The cultivators were required to deviate from the rotations, either to correct the area imbalance between different crops developed due to the rotation-plans or to adjust the cropping to a situation arising due to any external factors. Because of such deviations, therefore, the variations in the due areas might be different from those shown on the assumption of strict adherence to the accepted rotations. In Graphs 8.13 and 8.14, are presented the due areas calculated after considering the deviations practised in different years. These areas were calculated on the basis of the crops taken in the preceding year and the accepted rotations. Along with such areas, are presented in the same Graphs, the areas actually put under different crops, to point out the differences between the two. It may be noted from the Graphs that the differences between the due and the actual areas were not far wide in both the irrigated villages.

It may be seen from Graph 8.13, that in Waghode, the area due under 'Nawati' banana was always higher than the area

GRAPH 8-13
DUE AND ACTUAL AREAS UNDER
THE CROPS IN WAGHODE



GRAPH 8-14
DUE AND ACTUAL AREAS UNDER
THE CROPS IN ROZODE



actually devoted to it. This shows that in all the four years, some portion of the area due for 'Nawati' banana, deviated-out from it. The opposite is the case with groundnut. In all the four years, the area due for groundnut was lower than the area actually put under it. This means some area which was not due for groundnut was put under it in all the four years. The case of cotton and jowar was mixed. The area due under jowar was higher than the actual areas in 1960-61 and 1962-63; and lower than the actual areas in 1961-62 and 1963-64. This means that in 1960-61 and 1962-63, some of the area which was due under jowar could not be put under it; and in the other years (1961-62 and 1963-64) some of the area which was not due for jowar was devoted to it. Similar is the case of cotton. The area due under cotton was higher than the actual areas in the first two years (1960-61 and 1961-62) and lower than the actual in the latter two years (1962-63 and 1963-64). This means in the first two years some of the area due under cotton deviated-out from it; and in the latter two years, some of the area which was not due for cotton, deviated under it.

In Rozode, the area due under jowar, was always higher than the area actually put under it, which means, some of the area due for jowar deviated-out from it in all the four years. Opposite is the case of groundnut, except in the last year (1963-64). In the last year only, the areas due for groundnut was slightly higher than the actual. Otherwise in the first three years, it was lower than the actual. This means in the first three years some of the area deviated-in to groundnut

while in the last year some of the area deviated-out from it. The area due under banana was higher in the first three years and lower in the last year. In the case of cotton, the due area was higher than the actual in the two years, 1960-61 and 1962-63, and was lower than the actual in the remaining two years, 1961-62 and 1963-64 (see Graph 8.14).

The differences in the due and the actual areas under different crops clearly point out that the rotations were not strictly followed from year to year and the cultivators deviated to some extent in all the four years. The area under the rotations, therefore, may be classified into two categories--the rotated area and the deviated area. The distribution of the total area into these two categories is presented in Tables 8.25 and 8.26. It may be seen from the Tables that in both the villages, more than three-fourths of the total area was rotated according to the accepted rotations in all the four years. In Waghode, the area rotated according to the accepted rotations varied between 244.96 acres or about 76.68 per cent of the total area in 1963-64 and 290.64 acres or 90.98 per cent in 1960-61. The area that deviated from the rotations, was naturally small in 1960-61 and relatively large in 1963-64. It varied between 28.80 acres or 9.02 per cent in 1960-61 and 74.48 acres or 23.32 per cent in 1963-64. In Rozode, the rotated area was still high in each year, as compared to that in Waghode. In this village, the rotated area varied between 213.85 acres or 86.29 per cent of the total area in 1961-62 and 243.41 acres or 98.23 per cent in 1960-61. The area under the deviations was relatively small

Table 8.25 : Total Rotated and Deviated Areas in Waghode (1960-61 to 1963-64)

	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percen- tage to total area	Area in acres	Percen- tage to total area	Area in acres	Percen- tage to total area	Area in acres	Percen- tage to total area
Area rotated according to the rotations	290.64	90.98	264.65	82.85	271.22	84.90	244.96	76.68
Area deviated from the rotations	28.80	9.02	54.79	17.15	48.22	15.10	74.48	23.32
Total area under the rotations	319.44	100.00	319.44	100.00	319.44	100.00	319.44	100.00
Area under single cropping	34.80	9.82	34.80	9.82	34.80	9.82	34.80	9.82
Total cropped area	354.24	100.00	354.24	100.00	354.24	100.00	354.24	100.00

Table 8.26 : Total Rotated and Deviated Areas in Rozode (1960-61 to 1963-64)

	1960-61		1961-62		1962-63		1963-64	
	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area	Area in acres	Percentage to total area
Area rotated according to the rotations	243.41	98.23	213.85	86.29	221.56	89.40	216.69	87.44
Area deviated from the rotations	4.41	1.77	33.97	13.71	26.26	10.60	31.13	12.56
Total area under the rotations	247.82	100.00	247.82	100.00	247.82	100.00	247.82	100.00
Area under single cropping	0.13	0.05	0.13	0.05	0.13	0.05	0.13	0.05
Total cropped area	247.95	100.00	247.95	100.00	247.95	100.00	247.95	100.00

in this village. It moved between 4.41 acres or 1.77 per cent and 33.97 acres or 13.71 per cent. Thus, in both the irrigated villages, the area that rotated according to the rotations was considerably large in each year. The deviated area, on the other hand, was always small and formed a minor proportion to the total area reported under the rotations. We may discuss below the rotated and the deviated areas in the two villages separately.

8.8. The Rotated Area

In Tables 8.27 and 8.28 are given the area due under each crop, the area deviated-out from each and the area rotated under each of them. The areas due under different crops are calculated on the basis of the crop grown in the preceding year and the accepted rotations. From the due area calculated in such a way, we deduct the area deviated-out in order to get the area rotated under each crop. The variations in the rotated area under the major crops in each village, are presented in Graphs 8.15 and 8.16. It may be seen from Graph 8.15 that in Waghode the variations in the rotated areas under all the major crops, except cotton, were rather wide. The rotated area under jowar varied between 22.11 acres in 1963-64 and 73.10 acres in 1960-61. More or less the same is the case with banana--the rotated area under 'Nawati' banana varying between 57.71 acres in 1962-63 and 87.92 acres in 1960-61; and the rotated area under 'Junar' banana varying between 38.44 acres in 1960-61 and 87.92 acres in 1961-62. The rotated area under cotton, however, varied within a narrow range--between 66.00 acres in 1961-62 and 77.63 acres in 1963-64.

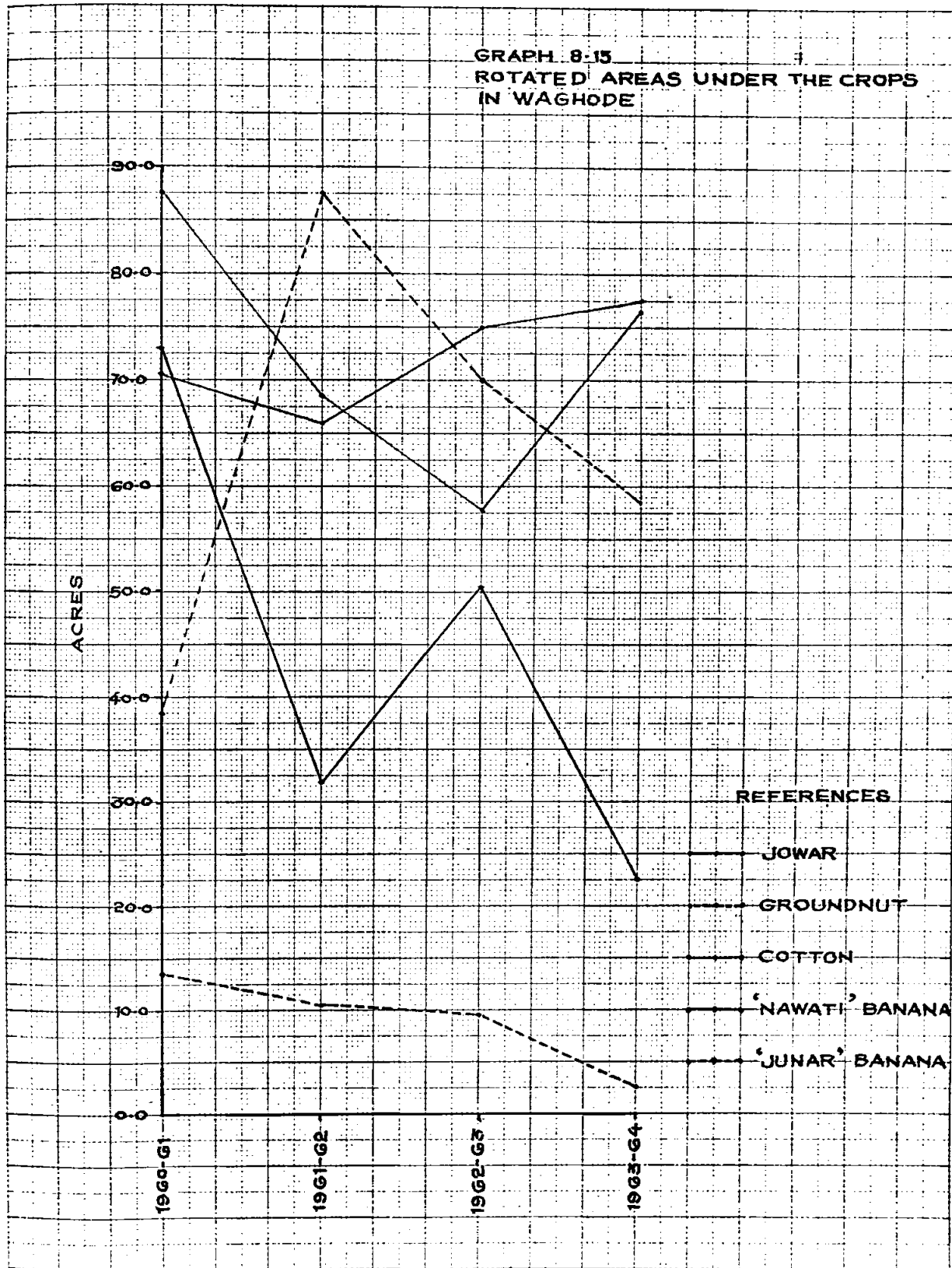
Table 8.27 : Total Areas Due, Deviated-out and Rotated under Different Crops in Waghode
(1960-61 to 1963-64) (Area in Acres)

Crop	1960-61			1961-62			1962-63			1963-64		
	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated
Jowar	81.56	8.46	73.10	43.31	11.71	31.60	60.08	9.26	50.82	40.75	18.64	22.11
Cotton	79.18	8.81	70.37	82.41	16.41	66.00	90.00	15.20	74.80	96.04	18.41	77.63
Groundnut	14.53	1.00	13.53	14.79	4.20	10.59	11.95	2.80	9.15	11.36	8.73	2.63
'Nawati' banana	98.45	10.53	87.92	88.81	20.27	68.54	78.67	20.96	57.71	105.30	28.70	76.60
'Junar' banana	38.44	-	38.44	87.92	-	87.92	70.04	-	70.04	58.71	-	58.71
Wheat	7.28	-	7.28	2.20	2.20	-	8.70	-	8.70	7.28	-	7.28
Total	319.44	28.80	290.64	319.44	54.79	264.65	319.44	48.22	271.22	319.44	74.48	244.96

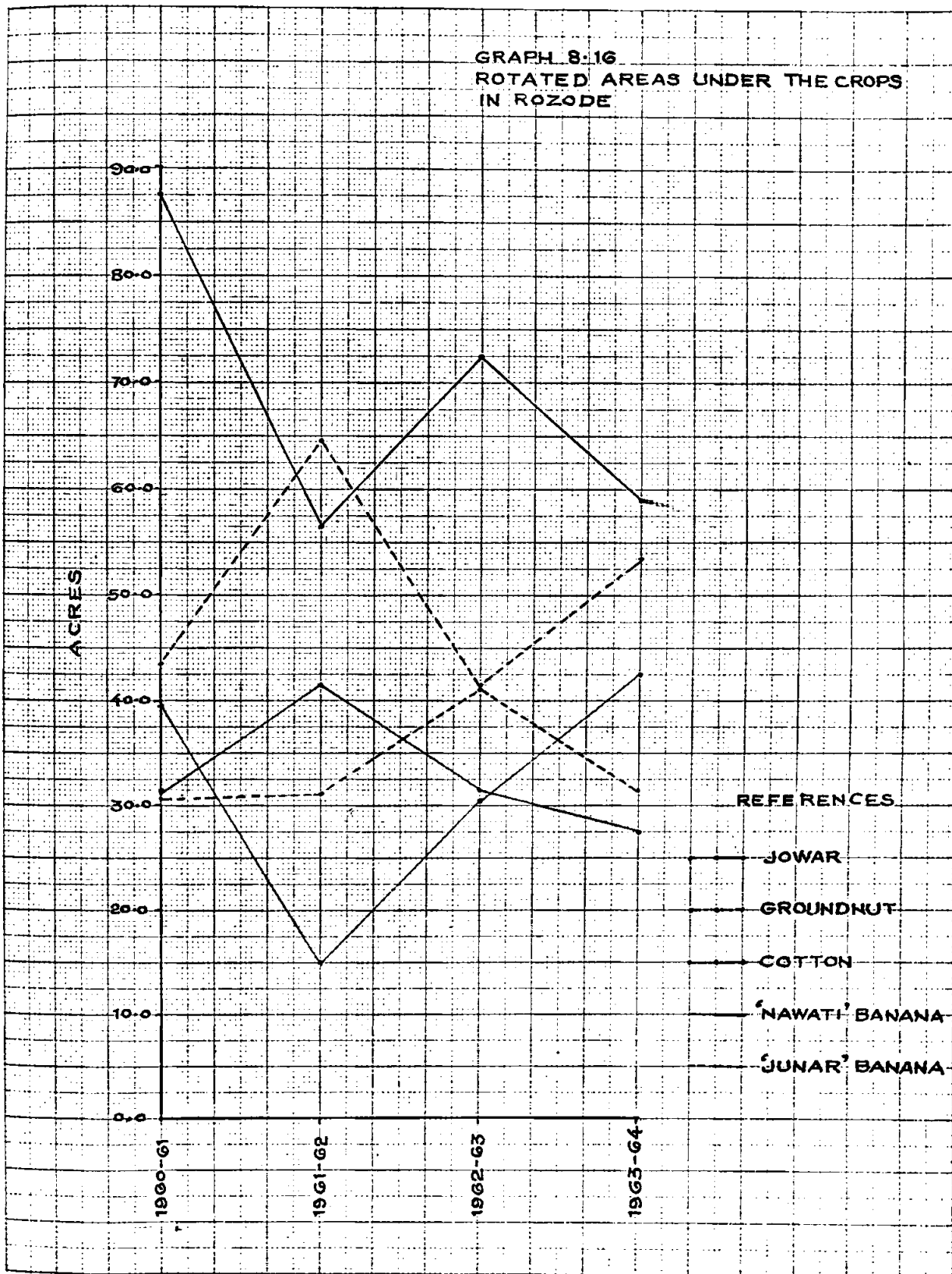
Table 8.28 : Total Areas Due, Deviated-out and Rotated under Different Crops in Rozode
(1960-61 to 1963-64) (Area in Acres)

Crop	1960-61			1961-62			1962-63			1963-64		
	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated	Area due	Area deviated-out	Area rotated
Jowar	89.29	1.81	87.48	73.71	16.99	56.72	85.63	12.77	72.86	70.38	11.34	59.04
Cotton	42.37	2.50	39.87	23.12	8.39	14.73	38.60	8.41	30.19	48.00	5.43	42.57
Groundnut	43.86	-	43.86	70.93	6.26	64.67	43.22	1.73	41.49	66.51	13.31	53.20
'Nawati' banana	30.89	0.10	30.79	42.26	0.80	41.46	34.55	3.35	31.20	28.58	1.05	27.53
'Junar' banana	30.43	-	30.43	30.79	-	30.79	41.46	-	41.46	31.20	-	31.20
Wheat	8.83	-	8.83	2.53	1.53	1.00	4.36	-	4.36	1.00	-	1.00
Maize	2.15	-	2.15	4.48	-	4.48	-	-	-	2.15	-	2.15
Total	247.82	4.41	243.41	247.82	33.97	213.85	247.82	26.26	221.56	247.82	31.13	216.69

GRAPH 8-15
 ROTATED AREAS UNDER THE CROPS
 IN WAGHODE



GRAPH 8:16
 ROTATED AREAS UNDER THE CROPS
 IN ROZODE



It was observed that a large proportion of the rotated areas under these major crops was continuously under the rotations for all the four years. The proportion of such area to the total rotated area was between 47.55 and 73.95 per cent in the case of jowar; between 66.08 and 80.96 per cent in the case of cotton; and between 56.23 and 69.53 per cent in the case of 'Nawati' banana. Such areas have been discussed in Chapter III. The remaining portion of the rotated area under each crop was not under the rotations continuously for all the four years. It deviated-out from the rotations in some years, and in other years it continued under the rotations or reverted to them after the deviation.

In Rozode also, there were wide variations in the rotated areas under all the major crops. It may be seen from Graph 8.16, that the rotated area under jowar varied between 56.72 acres in 1961-62 and 87.48 acres in 1960-61; the rotated area under groundnut varied between 41.49 acres in 1962-63 and 64.67 acres in 1961-62; the rotated area under cotton between 14.73 acres in 1961-62 and 42.57 acres in 1963-64; and the rotated area under 'Nawati' banana between 27.53 acres in 1963-64 and 41.46 acres in 1961-62. In this village also, a large proportion of the rotated area under each crop was continuously under the rotations for all the four years. The proportion of such area was between 35.25 and 92.31 per cent in the case of jowar; between 71.55 and 91.85 per cent in the case of groundnut; between 60.04 and 76.37 per cent in the case of cotton; and between 56.28 and 82.56 per cent in the case of 'Nawati' banana.

8.9. The Deviated Area

The deviated area in the two irrigated villages was large in comparison with that in the two dry villages. In the first year (1960-61), however, it was small--9.02 and 1.77 per cent of the total area under the rotations in Waghode and Rozode respectively. For the remaining three years, it was between 10 and 25 per cent in both the villages (see Tables 8.27 and 8.28). In the case of Waghode, it suddenly shot up to 23.32 per cent of the total in 1963-64, as the rainfall conditions in that year were bad. In Rozode, however, there was no such sudden rise in 1963-64. The deviated area in this village varied between 10.60 and 13.71 per cent of the total area in the last three years. In 1963-64 particularly it was relatively small--12.56 per cent. This might be because much of the dry lands cultivated outside the village were at the foots of the Satpuda hills, and therefore, had received fair rains during the sowing season of that year and the cultivators could grow crops according to their rotation-plans.

The areas deviated out from different crops in both the irrigated villages are given in Tables 8.27 and 8.28. It can be seen from these Tables that in the case of almost all the major crops, the deviated area formed a small proportion to the total due area in each year. Even in the last year, when the rainfall was not satisfactory, the deviated areas were not high. In Waghode, it was always below 20 acres in the case of jowar, cotton and groundnut. In the case of banana, however, the deviated area was slightly high. It was always between 20 and 30

acres. More or less the same was the case in Rozode. Another point to be noted is that in Waghode the area deviated-out from banana was relatively larger in each year, than the areas deviated-out from other crops. Similar was the case of jowar in Rozode. In almost all the years, the area deviated out from it was comparatively large in each year.

The area deviated out from each crop and the other crops grown on that particular area are shown in Tables 8.29 and 8.30. It may be seen from Table 8.29 that in Waghode, 8.46 acres deviated out from jowar in 1960-61 and three different crops; cotton (1.50 acres), groundnut (1.00 acre) and wheat (5.96 acres) were taken on it. Thus, the area that deviated out from jowar in 1960-61, went under three other crops. Such shifts of the deviated area from different crops in all the four years are given in these two Tables. It may be seen that from the Tables that there was no definite trend in the shifts of the deviated out area, as we noted in the case of the two dry villages.

As observed earlier, the deviated area in a year may be either continued under deviations or reverted to the rotations in the following year/s. Such year to year shifts of the deviated area in both the irrigated villages are given in Tables 8.31 and 8.32. In the period of four years fresh deviations also may occur for more than one time on the same area. It may be seen from Table 8.31 that in Waghode, the total deviated area in the first year (1960-61) was 28.80 acres. More than three-fourths of this area (23.67 acres) was reverted to the rotations in the following year only (1961-62). The remaining

Table 8.29 : Areas Deviated-out and Deviated-in under Different Crops in Waghode (1960-61 to 1963-64) (Area in Acres)

1960-61				1961-62				1962-63				1963-64			
Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in	
Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area
Jowar	8.46	Cotton	1.50	Jowar	11.71	Cotton	4.93	Jowar	7.43	Cotton	1.80	Jowar	18.64	Cotton	10.86
		Groundnut	1.00			Groundnut	4.83			Groundnut	4.63			Groundnut	1.05
		Wheat	5.96			Wheat	1.45			'Nawati'	1.00			'Nawati'	6.73
						Paddy	0.50			banana				banana	
Cotton	8.81	Jowar	3.05	Cotton	16.41	Jowar	4.78	Cotton	20.03	Jowar	6.83	Cotton	18.41	Jowar	9.35
		Wheat	5.58			Wheat	6.33			Groundnut	6.00			Wheat	1.48
		Chillies	0.18			Sugarcane	1.50			Wheat	2.48			Groundnut	2.65
						'Nawati'	1.50			Paddy	2.47			Paddy	1.25
						banana				Sugarcane	2.25			Mug	0.93
						Paddy	2.30							Sugarcane	2.25
														Chillies	0.50
Groundnut	1.00	Paddy	1.00	Groundnut	4.20	Jowar	2.00	Groundnut	2.80	Cotton	2.80	Groundnut	8.73	Cotton	5.08
						Cotton	2.20							Jowar	3.65
'Nawati'	10.53	Groundnut	4.20	'Nawati'	20.27	Cotton	3.90	'Nawati'	17.96	Cotton	13.28	'Nawati'	28.70	Jowar	9.86
banana		Wheat	2.20	banana		Jowar	11.74	banana		Wheat	1.00	banana		Cotton	7.98
		Sugarcane	3.13			Wheat	1.50			Groundnut	0.55			Groundnut	5.98
		Paddy	0.50			Sugarcane	3.13			Sugarcane	3.13			Mug	1.93
		Chillies	0.50											Chillies	2.95
-	-	-	-	Wheat	2.20	Jowar	2.20	-	-	-	-	-	-	-	-
	28.80		28.80		54.79		54.79		48.22		48.22		74.48		74.48

Table 8.30 : Areas Deviated-out and Deviated-in under Different Crops in Rozode (1960-61 to 1963-64) (Area in Acres)

1960-61				1961-62				1962-63				1963-64			
Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in		Area deviated-out		Area deviated-in	
Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area
Jowar	1.81	Cotton	0.43	Jowar	16.99	Cotton	8.06	Jowar	12.77	Groundnut	7.80	Jowar	11.34	Groundnut	7.94
		Groundnut	0.40			Groundnut	7.35			Paddy	0.48			Cotton	0.37
		Bajara	0.98			Mug	1.58			Mug	1.76			'Nawati' banana	2.03
										Maize	1.25			Mug	1.00
										Brinjal	0.50				
										Chillies	0.50				
										Bajara	0.48				
Cotton	2.50	Jowar	0.70	Cotton	8.39	Jowar	1.76	Cotton	8.41	Jowar	1.38	Cotton	5.43	Jowar	2.95
		Groundnut	0.50			Mug	3.38			Groundnut	7.03			'Nawati' banana	1.30
		Paddy	0.35			Wheat	2.80							Mug	1.18
		Maize	0.80			Maize	0.45								
		Brinjal	0.15												
	-	-	-	Groundnut	6.26	Jowar	3.11	Groundnut	1.73	Jowar	1.73	Groundnut	13.31	Jowar	7.55
						Cotton	3.15							Cotton	5.76
'Nawati' banana	0.10	Chillies	0.10	'Nawati' banana	0.80	Cotton	0.70	'Nawati' banana	3.35	Cotton	1.25	'Nawati' banana	1.05	Cotton	1.05
						Paddy	0.10			Groundnut	2.00				
										Mug	0.10				
Wheat	-	-	-	Wheat	1.53	Jowar	1.53	-	-	-	-	-	-	-	-
	4.41		4.41		33.97		33.97		26.26		26.26		31.13		31.13

Table 8.31 : Year to Year Shifts of the Deviated Areas in Waghode (1960-61 to 1963-64) (Area in Acres)

Total deviated area	1960-61		1961-62				1962-63				1963-64									
	Area under deviations		Area put back to rotations		Area continued under deviations		Area under fresh deviations		Area put back to rotations		Area continued under deviations		Area under fresh deviations							
	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area						
28.80 acres	Jowar	3.05	'Nawati' banana	14.61	Sugarcane	3.13	-	-	'Junar' banana	14.61	Sugarcane	3.13	Groundnut	0.25	'Junar' banana	7.66	Jowar	3.13	Jowar	2.00
	Groundnut	5.20	Cotton	4.78	Jowar	1.00	-	-	'Nawati' banana	7.66	Wheat	1.00	-	-	Cotton	8.53	Cotton	1.00	Chillies	0.50
	Wheat	13.74	Jowar	4.28	Paddy	1.00	-	-	Jowar	1.00	-	-	-	-	Jowar	5.23	Groundnut	0.25	Wheat	0.50
	Cotton	1.50	-	-	-	-	-	-	Cotton	1.15	-	-	-	-	-	-	-	-	-	-
	Sugarcane	3.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Paddy	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chillies	0.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	28.80	-	23.67	-	5.13	-	-	-	24.42	-	4.13	-	0.25	-	21.42	-	4.38	-	3.00
54.79 acres	-	-	-	-	-	-	Cotton	11.03	'Nawati' banana	14.49	Sugarcane	1.50	-	-	'Junar' banana	14.49	Sugarcane	1.50	Jowar	5.15
	-	-	-	-	-	-	Jowar	19.72	Jowar	5.58	Groundnut	8.55	-	-	'Nawati' banana	14.16	Jowar	3.35	Cotton	2.20
	-	-	-	-	-	-	Wheat	9.28	Wheat	2.20	-	-	-	-	Jowar	4.23	Groundnut	1.65	-	-
	-	-	-	-	-	-	'Nawati' banana	1.50	Cotton	2.53	Cotton	8.48	-	-	Cotton	0.30	Cotton	2.63	-	-
	-	-	-	-	-	-	Groundnut	4.83	-	-	Jowar	4.83	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	Sugarcane	1.50	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	Paddy	1.80	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	49.66	-	24.80	-	23.36	-	-	-	33.18	-	9.13	-	7.35
48.22 acres	-	-	-	-	-	-	-	-	-	-	-	-	Cotton	9.40	'Nawati' banana	9.18	Sugarcane	0.75	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Jowar	2.00	Cotton	5.95	Cotton	1.80	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Wheat	2.48	-	-	Groundnut	1.80	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Groundnut	2.38	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	'Nawati' banana	1.00	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Paddy	2.47	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Sugarcane	0.75	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	20.48	-	15.13	-	4.35	-	-
74.48 acres	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cotton	16.29
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Jowar	9.23
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Groundnut	5.98
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	'Nawati' banana	6.73
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Paddy	1.25
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Wheat	0.98
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mug	2.86
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Chillies	2.95
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46.27
Grand Total	-	28.80	-	23.67	-	5.13	-	49.66	-	49.22	-	27.49	-	20.73	-	69.73	-	17.86	-	56.62

Table 8.32 : Year to Year Shifts of the Deviated Areas in Rozode (1960-61 to 1963-64) (Area in Acres)

Total deviated area	1960-61		1961-62				1962-63				1963-64		Crop							
	Area under deviations		Area put back to rotations		Area continued under deviations		Area under fresh deviations		Area put back to rotations		Area continued under deviations									
	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area	Crop taken	Area								
4.41 acres	Jowar	0.70	Cotton	1.10	Paddy	0.10	-	-	'Junar' banana	2.78	Mug	0.10	Mug	0.40	'Junar' banana	0.70	-	-	Jowar	
	Groundnut	0.90	Groundnut	0.43	-	-	-	-	'Nawati' banana	0.70	-	-	-	-	'Nawati' banana	0.10	-	-	-	
	Cotton	0.43	'Nawati' banana	2.78	-	-	-	-	Jowar	0.43	-	-	-	-	Cotton	1.75	-	-	-	
	Bajara	0.98	-	-	-	-	-	-	-	-	-	-	-	Jowar	1.13	-	-	-	-	
	Paddy	0.35	-	-	-	-	-	-	-	-	-	-	-	Groundnut	0.43	-	-	-	-	
	Maize	0.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Chillies	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Brinjal	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	-	4.41	-	4.31	-	0.10	-	-	-	3.91	-	0.10	-	-	-	4.11	-	-	-	-
33.97 acres	-	-	-	-	-	-	Cotton	11.51	'Nawati' banana	6.89	Mug	0.50	-	-	'Junar' banana	6.89	-	-	Mug	
	-	-	-	-	-	-	Jowar	6.80	Cotton	5.28	Groundnut	2.28	-	-	'Nawati' banana	3.88	-	-	'Nawati' banana	
	-	-	-	-	-	-	Groundnut	7.35	Jowar	14.01	-	-	-	-	Cotton	2.15	-	-	Jowar	
	-	-	-	-	-	-	Wheat	2.80	Wheat	1.53	-	-	-	-	Jowar	3.41	-	-	Cotton	
	-	-	-	-	-	-	Mug	4.96	Groundnut	3.38	-	-	-	-	Groundnut	7.63	-	-	-	
	-	-	-	-	-	-	Maize	0.45	-	-	-	-	-	-	-	-	-	-	-	
Total	-	-	-	-	-	-	-	33.87	-	31.09	-	2.78	-	-	-	23.96	-	-	-	9.91
26.26 acres	-	-	-	-	-	-	-	-	-	-	-	-	Groundnut	14.55	'Nawati' banana	4.36	Groundnut	0.48	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Jowar	3.11	Jowar	6.63	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Cotton	1.25	Cotton	9.78	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Mug	0.86	Groundnut	1.73	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Bajara	0.48	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Paddy	0.48	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Maize	1.25	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Brinjal	0.50	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	Chillies	0.50	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	22.98	-	22.50	-	0.48	-	-
31.13 acres	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cotton	1.42
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Groundnut	7.46
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Jowar	8.30
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	'Nawati' banana	2.08
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mug	1.18
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.44
Grand Total	-	4.41	-	4.31	-	0.10	-	33.87	-	35.00	-	2.88	-	23.38	-	50.57	-	0.48	-	-

portion (5.13 acres), however, was continued under the deviations for the next year as well. In the third year (1962-63), 24.42 acres were reverted to the rotations; 4.13 acres continued under the deviations for the third year also, and on 0.25 acre, fresh deviation occurred for the second time during the period. In the fourth year (1963-64), 21.42 acres were put back under the rotations; 4.38 acres continued under the deviations, and on the remaining area of 3.00 acres, fresh deviations were reported (see Table 8.31). Similar shifts of the area under fresh deviations reported in the remaining three years are evident from the Tables. These two Tables clearly show that in both the villages, a large proportion of the deviated area in a year, was reverted to the rotations in the following year/s; and only a small area continued under deviations for more than two to three years. However, fresh deviations occurred every year and the total deviated area in each year remained fairly high. It has to be remembered, therefore, that the deviated area in a year was large mainly because of the fresh deviations. The area continued under deviations formed a minor proportion of the total deviated area in each year.

In Tables 8.33 and 8.34, is given the distribution of the deviated-in area under different crops grown in the four years. The variations in the deviated-in areas under the major crops are shown in Graphs 8.17 and 8.18. These Graphs clearly reveal that in both the villages more of the deviated area in each year went under the cash-crops like cotton in Waghode and groundnut in Rozode. Another point to be noted from the Graphs is that

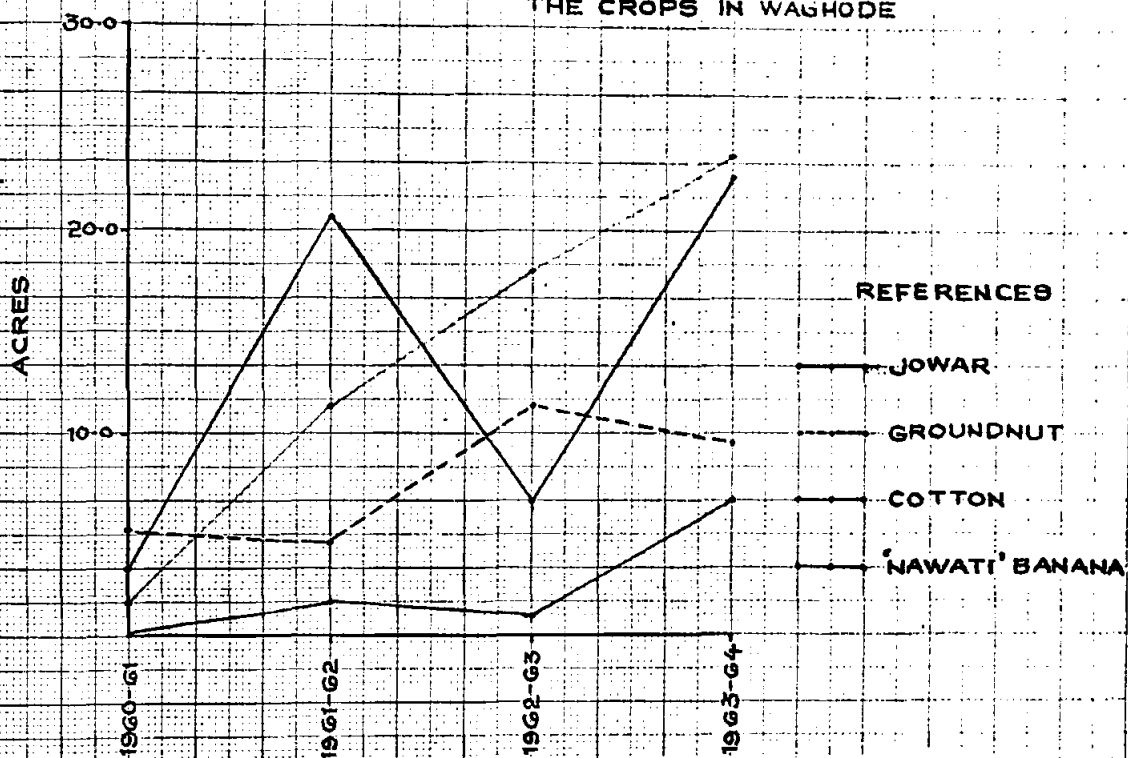
Table 8.33 : The Crops Grown on the Deviated Area in Waghode
(1960-61 to 1963-64)

Crop	Area in Acres			
	1960-61	1961-62	1962-63	1963-64
Jowar	3.05	20.72	6.83	22.86
Cotton	1.50	11.03	17.88	23.92
Groundnut	5.20	4.83	11.18	9.68
'Nawati' banana	-	1.50	1.00	6.73
Wheat	13.74	9.28	3.48	1.48
Paddy	1.50	2.80	2.47	1.25
Mug	-	-	-	2.86
Chillies	0.68	-	-	3.45
Sugarcane	3.13	4.63	5.38	2.25
Total	28.80	54.79	48.22	74.48

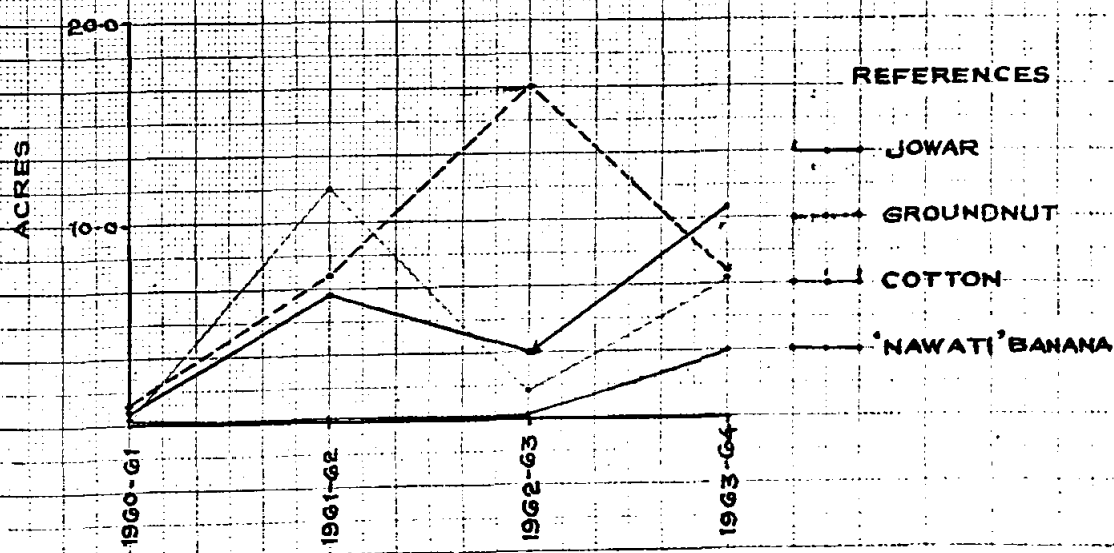
Table 8.34 : The Crops Grown on the Deviated Area in Rozode
(1960-61 to 1963-64)

Crop	Area in Acres			
	1960-61	1961-62	1962-63	1963-64
Jowar	0.70	6.40	3.11	10.50
Cotton	0.43	11.91	1.25	7.18
Groundnut	0.90	7.35	16.83	7.94
'Nawati' banana	-	-	-	3.33
Wheat	-	2.80	-	-
Maize	0.80	0.45	1.25	-
Bajara	0.98	-	0.48	-
Paddy	0.35	0.10	0.48	-
Mug	-	4.96	1.86	2.18
Chillies	0.10	-	0.50	-
Brinjal	0.15	-	0.50	-
Total	4.41	33.97	26.26	31.13

GRAPH 8-17
DEVIATED IN AREAS UNDER
THE CROPS IN WAGHODE



GRAPH 8-18
DEVIATED-IN AREAS UNDER
THE CROPS IN ROZUDE



the deviated-in area under banana was negligible in both the villages. This was mainly because banana required a well-prepared and heavily manured land and hence could not be shifted to it all of a sudden.

8.10. Area Under Single Cropping

As pointed out earlier, the area reported under single cropping was comparatively high in Waghode--34.80 acres (see Table 8.35). It was rather negligible in Rozode. A large portion

Table 8.35 : Area Under Single Cropping in Waghode and Rozode (1960-61 to 1963-64)

Crops	Waghode		Rozode	
	No. of Plots	Area in Acres	No. of Plots	Area in Acres
Jowar	10	9.72	1	0.13
Cotton	1	5.83	-	-
Oranges	3	15.75	-	-
Lemon	1	3.00	-	-
Lucerne	1	0.50	-	-
Total	16	34.80	1	0.13

of such area in Waghode was under orchards. It was seen that out of the total area of 34.80 acres, 18.75 acres were under orchards--15.75 acres under oranges and 3.00 acres under lemons. Of the remaining area of 16.05 acres, 9.72 acres were continuously put under jowar, 5.83 acres continuously under cotton and 0.50 acre under lucerne. The area put to jowar continuously

suffered from locational disadvantages and had very inferior type of land. The land was so poor that the cultivators could not grow any other crop than jowar on it. Continuous growing of cotton on the same land was rather striking and appeared to be unusual. It was reported by one cultivator, who pointed out that his fragment of 5.83 acres was near the village and hence very convenient to manure. He manured it almost every year and preferred to grow cotton on it continuously.

In Rozode, the small area (0.13 acre) reported in this category, was continuously put to jowar. It was reported that this area was situated on the bank of a big stream and hence was very poor in soil, where no other crop except jowar could be grown. The cultivator, therefore, was required to grow jowar on it continuously.

Thus, except the area under orchards, all other area under single cropping belonged to the same type of land as we noticed in the case of the two dry villages. All this land was such that no rotation of crops could be practised on it and the cultivators were required to put it under a single crop, largely jowar, year after year.

8.11. Total Area

In Tables 8.36 and 8.37 are summarised the total effects of the rotations and the deviations on the aggregate areas under different crops. In the Tables are given the total areas due according to the rotations and single cropping; the areas deviated-out, the areas rotated, the areas deviated-in and the areas under single cropping. These areas have been plotted in

Table 8.36 : Total Areas Due, Deviated-out, Rotated and Deviated-in under Different Crops in Waghode (1960-61 to 1963-64) (Area in Acres)

Crop	1960-61					1961-62						
	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area
Jowar	91.28	8.46	73.10	3.05	9.72	85.87	53.03	11.71	31.60	20.72	9.72	62.04
Cotton	85.01	8.81	70.37	1.50	5.83	77.70	88.24	16.41	66.00	11.03	5.83	82.86
Groundnut	14.53	1.00	13.53	5.20	-	18.73	14.79	4.20	10.59	4.83	-	15.42
'Nawati' banana	98.45	10.53	87.92	-	-	87.92	88.81	20.27	68.54	1.50	-	70.04
'Junar' banana	38.44	-	38.44	-	-	38.44	87.92	-	87.92	-	-	87.92
Wheat	7.28	-	7.28	13.74	-	21.02	2.20	2.20	-	9.28	-	9.28
Paddy	-	-	-	1.50	-	1.50	-	-	-	2.80	-	2.80
Mug	-	-	-	-	-	-	-	-	-	-	-	-
Chillies	-	-	-	0.68	-	0.68	-	-	-	-	-	-
Sugarcane	-	-	-	3.13	-	3.13	-	-	-	4.63	-	4.63
Oranges	15.75	-	-	-	15.75	15.75	15.75	-	-	-	15.75	15.75
Lemons	3.00	-	-	-	3.00	3.00	3.00	-	-	-	3.00	3.00
Lucerne	0.50	-	-	-	0.50	0.50	0.50	-	-	-	0.50	0.50
Total	354.24	28.80	290.64	28.80	34.80	354.24	354.24	54.79	264.65	54.79	34.80	354.24

(continued)

Table 8.36 : (continued)

Crop	1962-63					1963-64						
	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area
Jowar	69.80	9.26	50.82	6.83	9.72	67.37	50.47	18.64	22.11	22.86	9.72	54.69
Cotton	95.83	15.20	74.80	17.88	5.83	98.51	101.87	18.41	77.63	23.92	5.83	107.38
Groundnut	11.95	2.80	9.15	11.18	-	20.33	11.36	8.73	2.63	9.68	-	12.31
'Nawati' banana	78.67	20.96	57.71	1.00	-	58.71	105.30	28.70	76.60	6.73	-	83.33
'Junar' banana	70.04	-	70.04	-	-	70.04	58.71	-	58.71	-	-	58.71
Wheat	8.70	-	8.70	3.48	-	12.18	7.28	-	7.28	1.48	-	8.76
Paddy	-	-	-	2.47	-	2.47	-	-	-	1.25	-	1.25
Mug	-	-	-	-	-	-	-	-	-	2.86	-	2.86
Chillies	-	-	-	-	-	-	-	-	-	3.45	-	3.45
Sugarcane	-	-	-	5.38	-	5.38	-	-	-	2.25	-	2.25
Oranges	15.75	-	-	-	15.75	15.75	15.75	-	-	-	15.75	15.75
Lemons	3.00	-	-	-	3.00	3.00	3.00	-	-	-	3.00	3.00
Lucerne	0.50	-	-	-	0.50	0.50	0.50	-	-	-	0.50	0.50
Total	354.24	48.22	271.22	48.22	34.80	354.24	354.24	74.48	244.96	74.48	34.80	354.24

Table 8.37 : Total Areas Due, Deviated-out, Rotated and Deviated-in under Different Crops in Rozode (1960-61 to 1963-64) (Area in Acres)

Crop	1960-61					1961-62						
	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area
Jowar	89.42	1.81	87.48	0.70	0.13	88.31	73.84	16.99	56.72	6.40	0.13	63.25
Cotton	42.37	2.50	39.87	0.43	-	40.30	23.12	8.39	14.73	11.91	-	26.64
Groundnut	43.86	-	43.86	0.90	-	44.76	70.93	6.26	64.67	7.35	-	72.02
'Nawati' banana	30.89	0.10	30.79	-	-	30.79	42.26	0.80	41.46	-	-	41.46
'Junar' banana	30.43	-	30.43	-	-	30.43	30.79	-	30.79	-	-	30.79
Wheat	8.83	-	8.83	-	-	8.83	2.53	1.53	1.00	2.80	-	3.80
Maize	2.15	-	2.15	0.80	-	2.95	4.48	-	4.48	0.45	-	4.93
Bajara	-	-	-	0.98	-	0.98	-	-	-	-	-	-
Paddy	-	-	-	0.35	-	0.35	-	-	-	0.10	-	0.10
Mug	-	-	-	-	-	-	-	-	-	4.96	-	4.96
Chillies	-	-	-	0.10	-	0.10	-	-	-	-	-	-
Brinjal	-	-	-	0.15	-	0.15	-	-	-	-	-	-
Total	247.95	4.41	243.41	4.41	0.13	247.95	247.95	33.97	213.85	33.97	0.13	247.95

(continued)

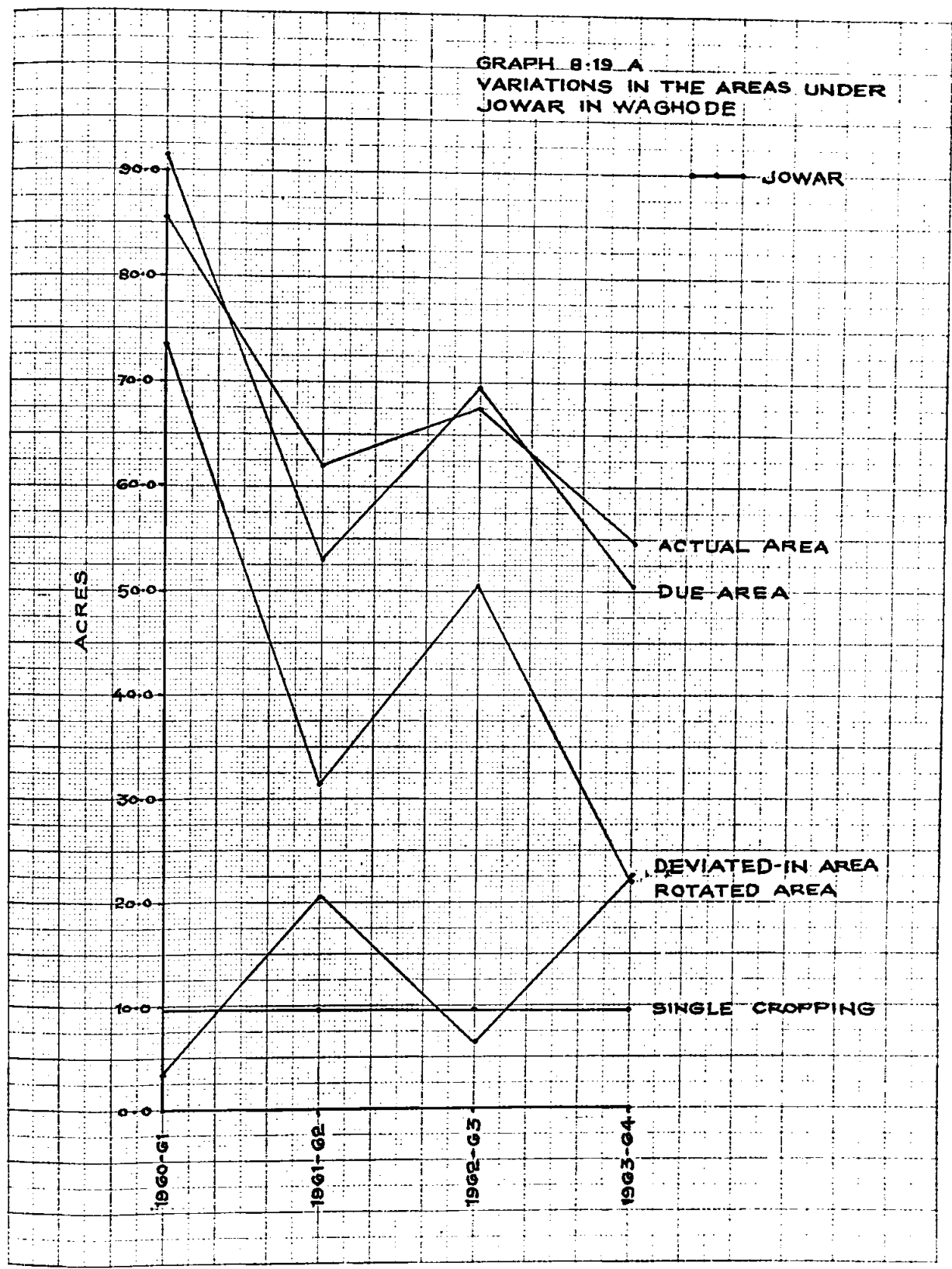
Table 8.37 : (continued)

Crop	1962-63						1963-64					
	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area	Total area due	Area deviated-out	Area rotated	Area deviated-in	Area under single cropping	Total area
Jowar	85.76	12.77	72.86	3.11	0.13	76.10	70.51	11.34	59.04	10.50	0.13	69.67
Cotton	38.60	8.41	30.19	1.25	-	31.44	48.00	5.43	42.57	7.18	-	49.75
Groundnut	43.22	1.73	41.49	16.83	-	58.32	66.51	13.31	53.20	7.94	-	61.14
'Nawati' banana	34.55	3.35	31.20	-	-	31.20	28.58	1.05	27.53	3.33	-	30.86
'Junar' banana	41.46	-	41.46	-	-	41.46	31.20	-	31.20	-	-	31.20
Wheat	4.36	-	4.36	-	-	4.36	1.00	-	1.00	-	-	1.00
Maize	-	-	-	1.25	-	1.25	2.15	-	2.15	-	-	2.15
Bajara	-	-	-	0.48	-	0.48	-	-	-	-	-	-
Paddy	-	-	-	0.48	-	0.48	-	-	-	-	-	-
Mug	-	-	-	1.86	-	1.86	-	-	-	2.18	-	2.18
Chillies	-	-	-	0.50	-	0.50	-	-	-	-	-	-
Brinjal	-	-	-	0.50	-	0.50	-	-	-	-	-	-
Total	247.95	26.26	221.56	26.26	0.13	247.95	247.95	31.13	216.69	31.13	0.13	247.95

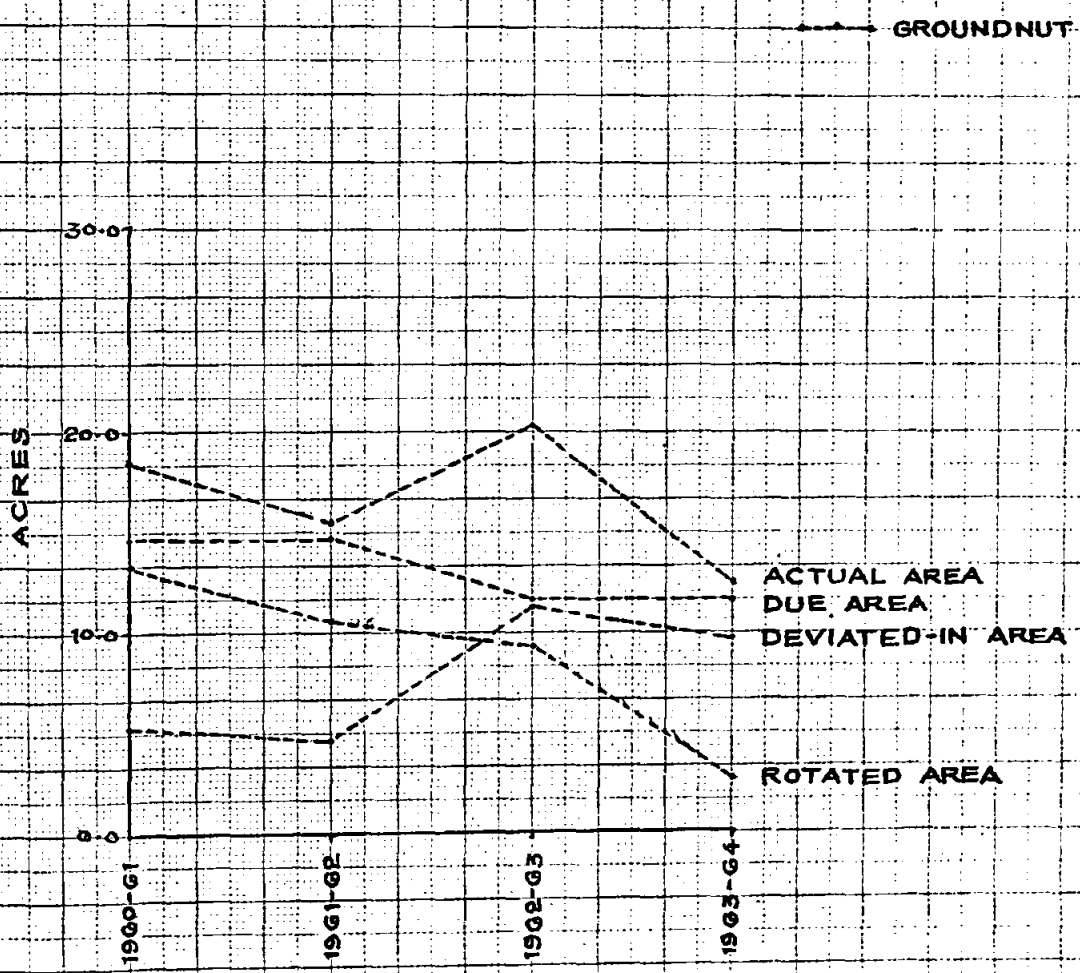
Graphs 8.19A to 8.20D, drawn separately for each of the major crops. As we have observed in the dry villages, the aggregate area under each crop comprised of the areas coming from three categories: (1) the crop-rotations; (2) the deviations; and (3) the single cropping. In the irrigated villages also, a large proportion of the total area under each crop came through the rotations practised by different cultivators. It was observed that in both the irrigated villages, nearly three-fourths of the total area under each crop came through rotations. This was true for all the four years. The areas coming through deviations and single cropping were only marginal in the case of all the major crops.

Because of the deviations, some of the area due under one crop, was shifted to the other crop/s where it was not due. Such shifts of the area occurred mostly in the case of the major crops. It may be seen from the Tables that all the major crops lost some of the area due under them and gained some other area through deviations. The net effect of such shifts on the aggregate areas of the crops might be different in different years. It might be positive in some years and negative in others or positive or negative continuously over the entire period. It can be seen from Table 8.36 that in Waghode, jowar crop lost more area than it gained in 1960-61 and 1962-63; and gained more area than it lost in 1961-62 and 1963-64. The net effect on the aggregate area under jowar was negative in 1960-61 and 1962-63; and positive in the remaining two years. The total area actually put under jowar was, therefore, lower than the total

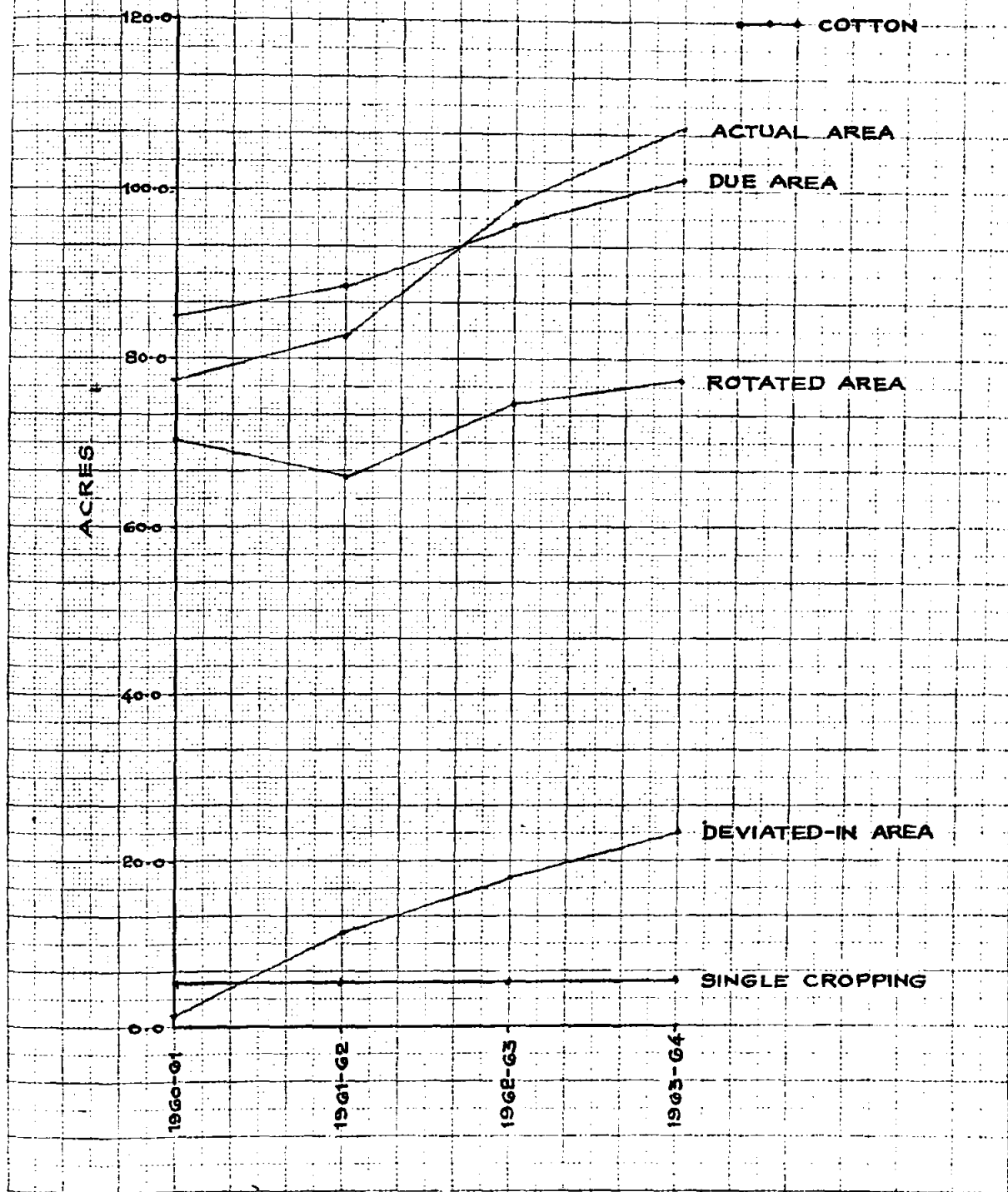
GRAPH 8.19 A
VARIATIONS IN THE AREAS UNDER
JOWAR IN WAGHODE



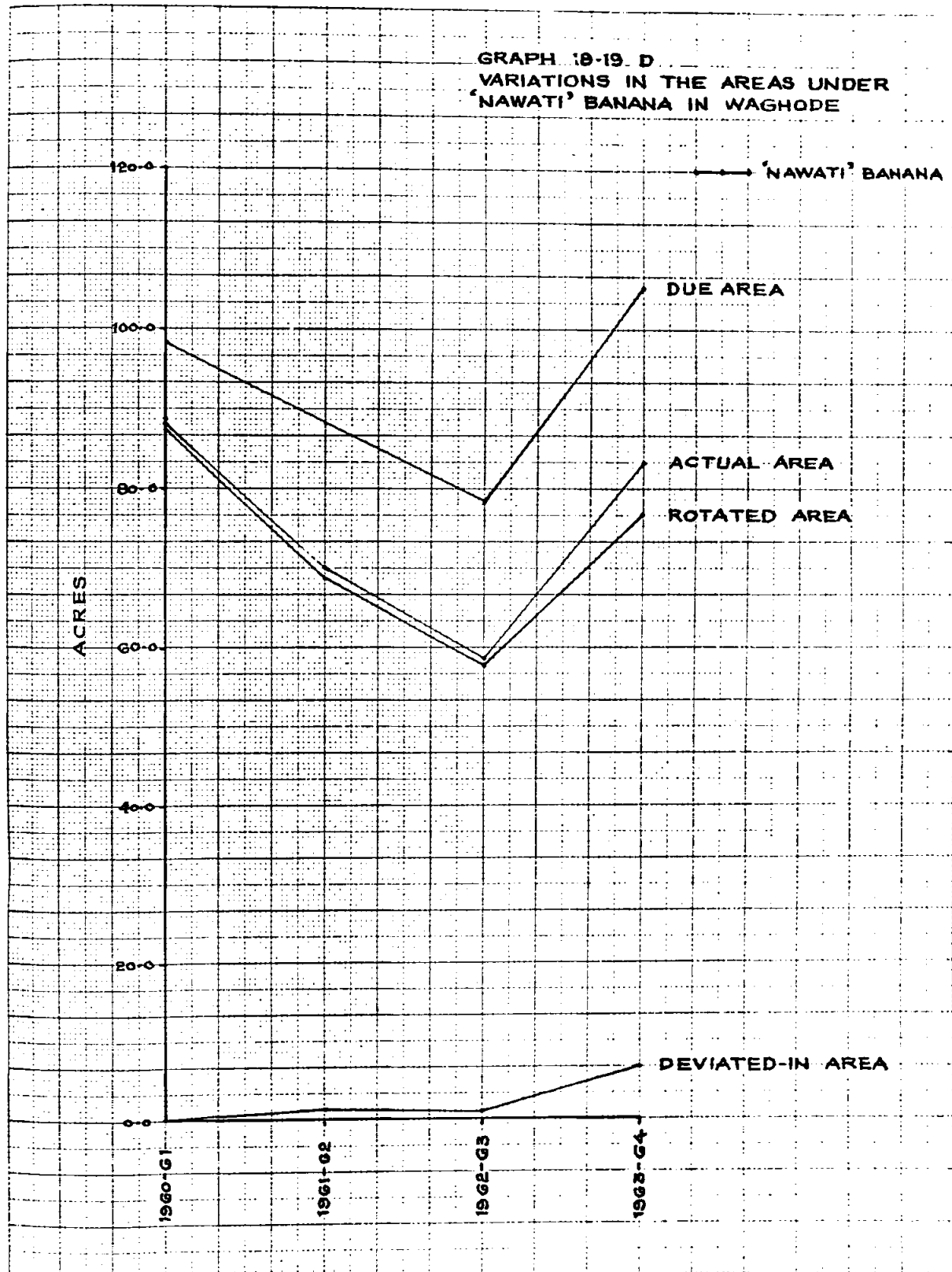
GRAPH B-19 B
VARIATIONS IN THE AREAS UNDER
GROUNDNUT IN WAGHODE



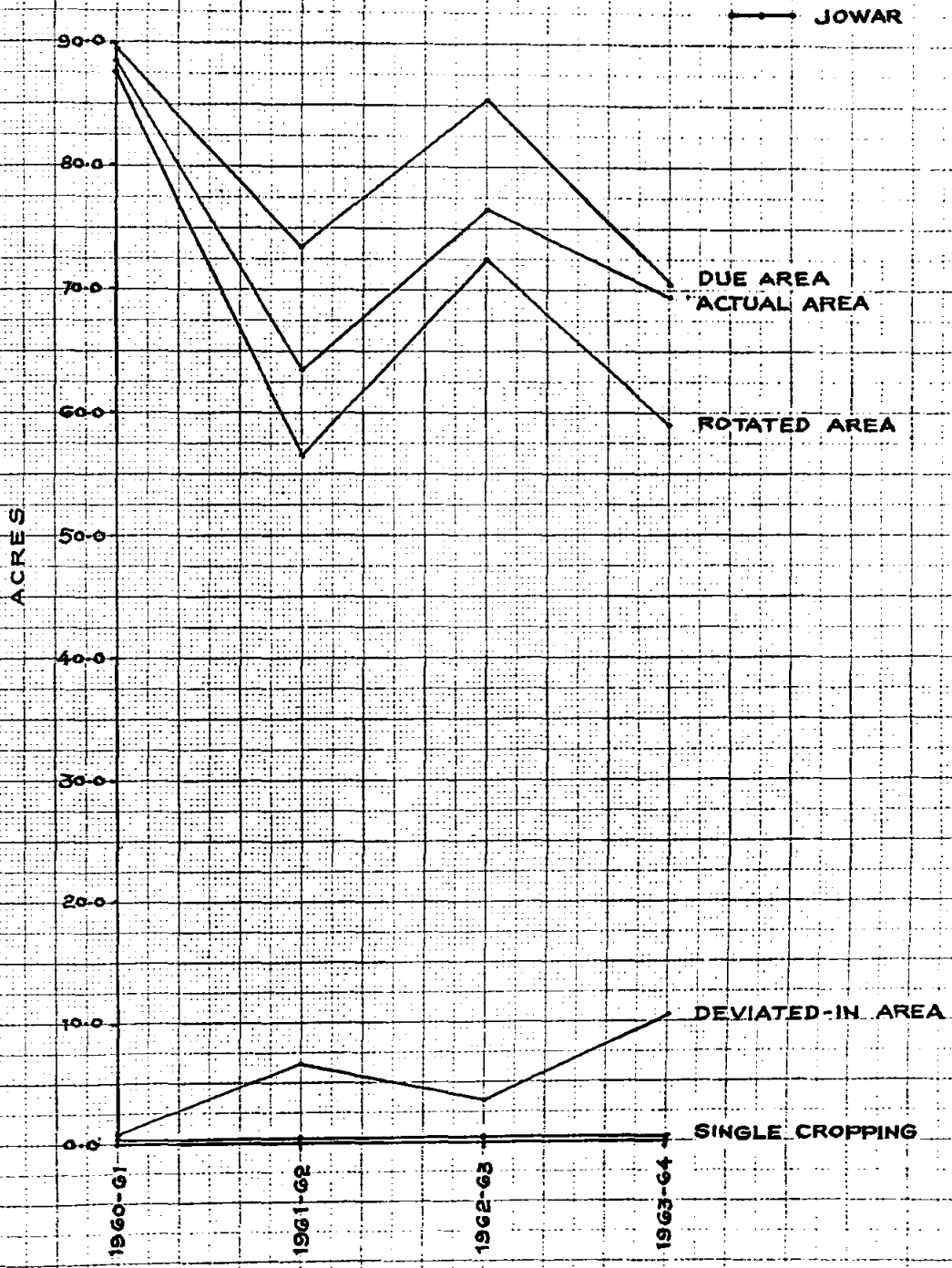
GRAPH 8-19 C
 VARIATIONS IN THE AREAS UNDER
 COTTON IN WAGHODE



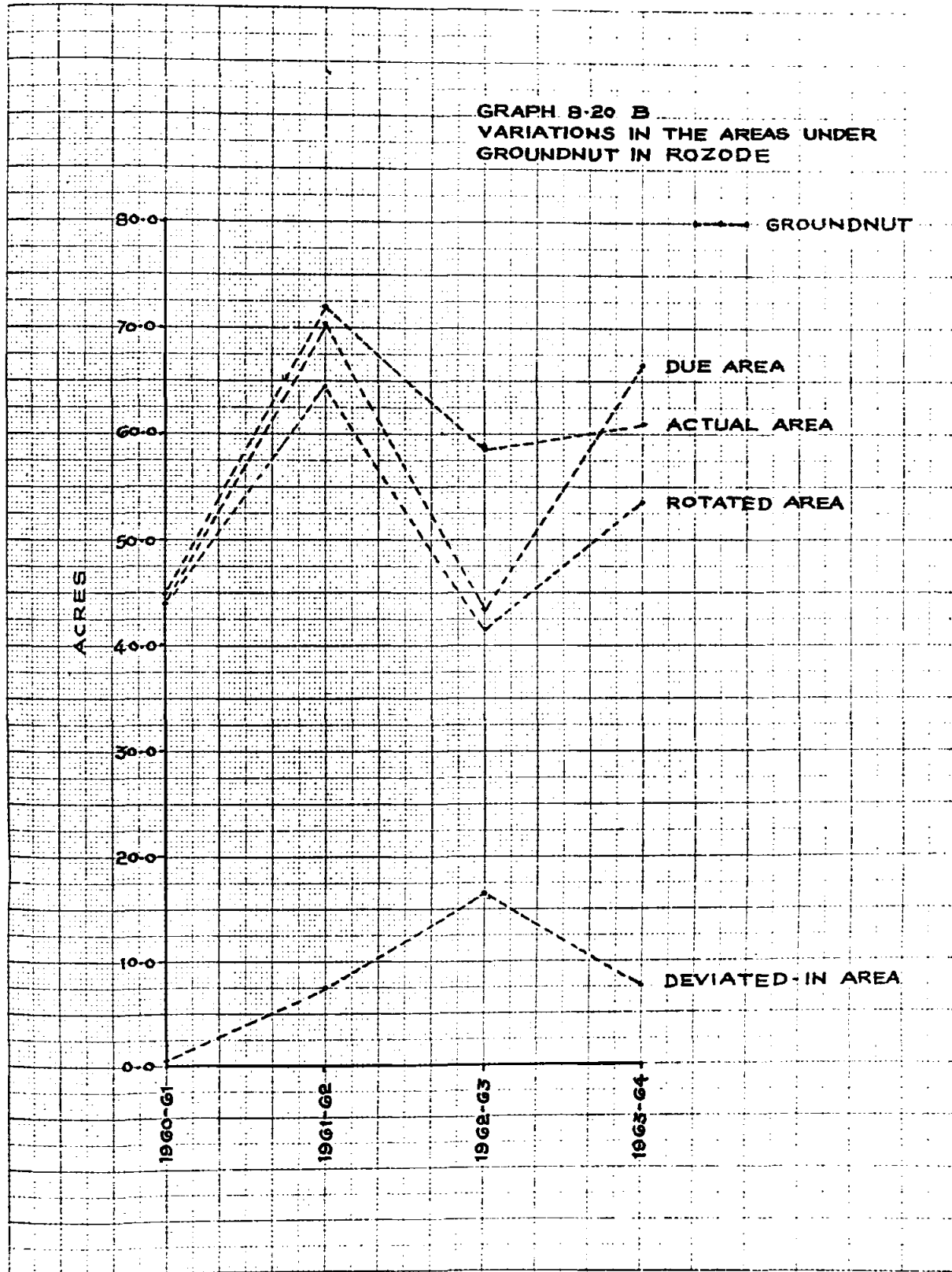
GRAPH 18-19 D
VARIATIONS IN THE AREAS UNDER
'NAWATI' BANANA IN WAGHODE

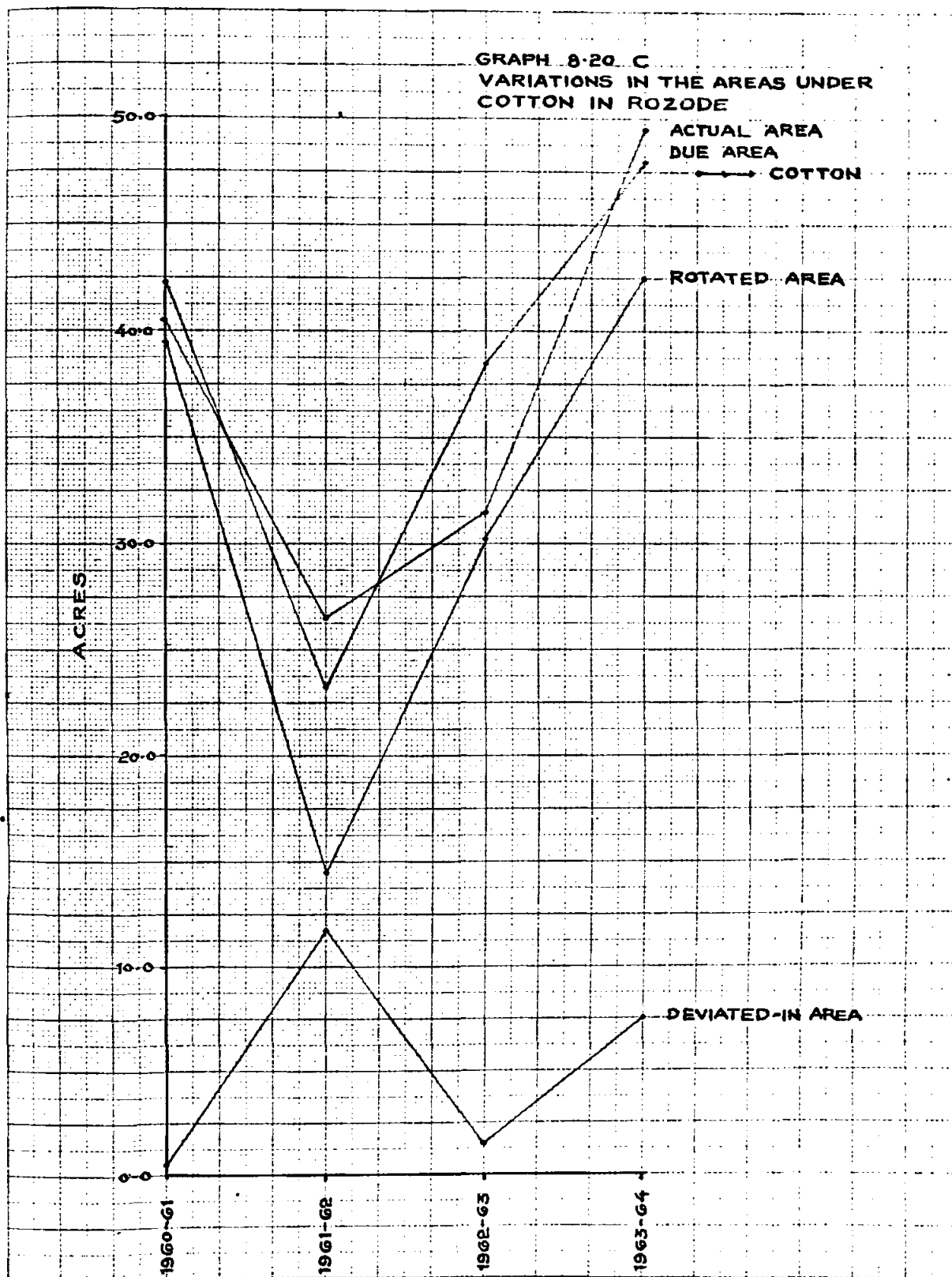


GRAPH 8-20 A
 VARIATIONS IN THE AREAS UNDER
 JOWAR IN ROZODE

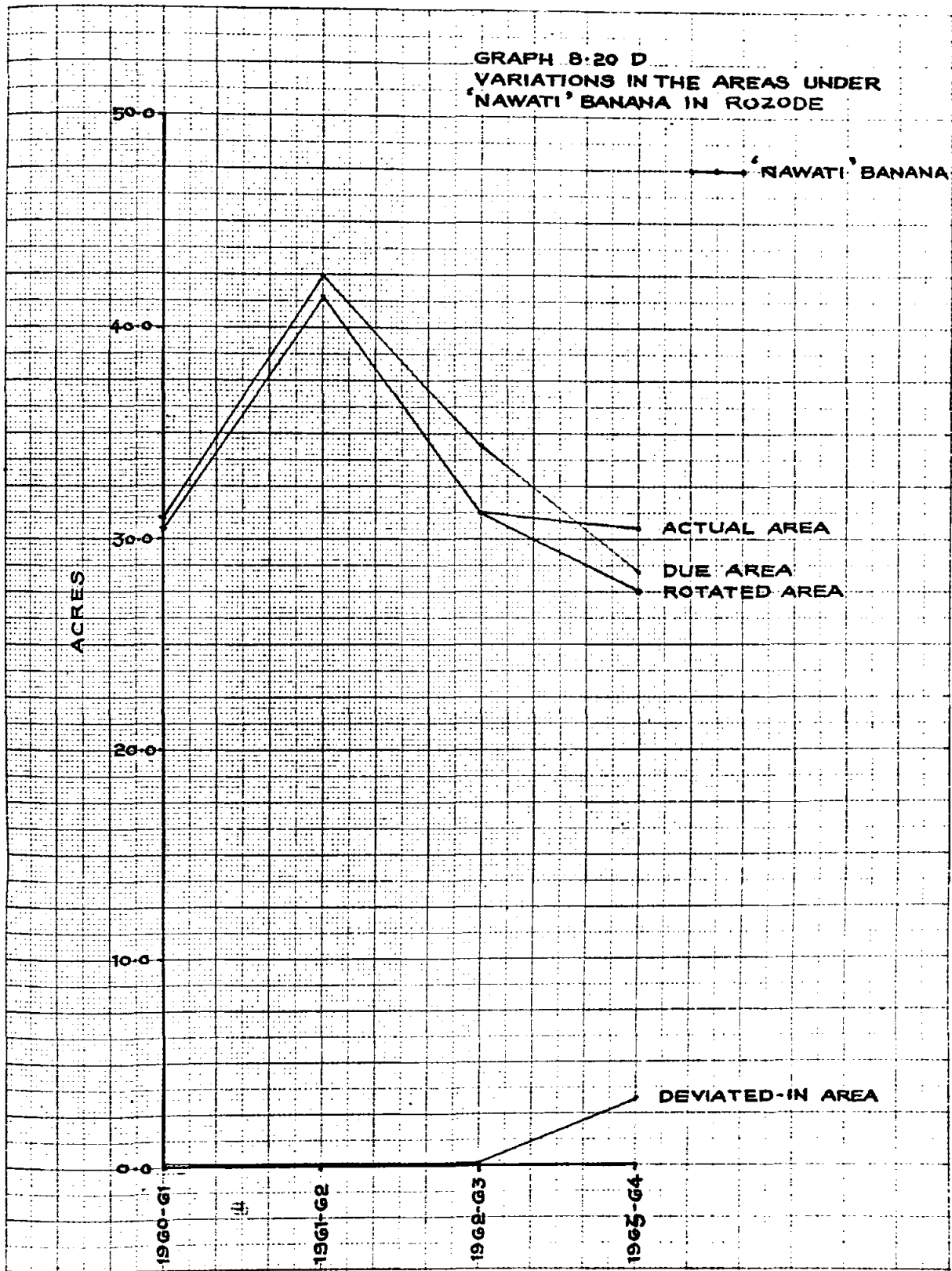


GRAPH B-20 B
VARIATIONS IN THE AREAS UNDER
GROUNDNUT IN ROZODE





GRAPH B-20 D
 VARIATIONS IN THE AREAS UNDER
 'NAWATI' BANANA IN ROZODE



due area in 1960-61 and 1962-63; and higher than the total due area in the other two years. Similar was the case of cotton. It also lost more area in the first two years and gained more in the last two years. As a result, the total area under it, was lower than the due in the first two years and higher than the due in the last two years. The case of banana, however, was totally different. In all the four years, it lost more of its due area than it gained through the deviations. The net effect on the aggregate area, therefore, was always negative. The total area actually put under banana was always short of the area due to it (see Graphs 8.19A to 8.19D). In Rozode, the net effect of the deviations on the aggregate area was always negative in the case of jowar; positive in the first three years and negative in the last year in the case of groundnut; positive in 1960-61 and 1963-64 and negative in 1961-62 and 1962-63 in the case of cotton; and negative in the first three years and positive in the last year in the case of banana (see Graphs 8.20A to 8.20D).

Another point to be noted is that the variations in the aggregate area under each crop were largely caused by the rotations practised, as bulk of the area under a crop came through rotations only. The deviations from the rotations had a minor effect and brought in marginal changes in the variations caused by the rotations (see Graphs 8.19A to 8.20D). In no case the deviations were so large as to vitiate completely the trend of area variations caused by the rotations.

Summary

As observed earlier, the cultivators accepted different

types of crop-rotations on their land-holdings, to secure stable maximum income over years, through the best utilization of the available resources. However, some area, having physical or other peculiarities, could not be put under any crop-rotations and they were required to practise single cropping on it. The total cropped land of the cultivators, therefore, may be classified into two basic categories: (1) area under the crop-rotations, and (2) area under the single cropping. It was seen that more than 90 per cent of the total cropped land in all the villages was under the rotations and a very negligible portion was under single cropping. The rotations, however, could not be strictly adhered to over years and the cultivators were required to deviate in some years to adjust their cropping to overcome the situations developed by the inherent or external factors. The area under rotations, therefore, has to be further classified into two categories: (1) the rotated area, and (2) the deviated area. It was observed that in the dry and the irrigated villages, a large proportion of the total area was rotated in all the four years. The deviated area was minor in all the villages. The variations in the aggregate areas under different crops, therefore, were largely caused by the rotations themselves. The deviations affected the area variations only on marginal level. It was seen that the crop-rotations, when strictly followed from year to year, caused wide variations in the areas under different crops.

The aggregate area under a crop comprised of the areas coming from three categories: (1) the area coming through the

rotations; (2) the area coming through the deviations; and (3) the area coming through the single cropping. As bulk of the area under each crop came through rotations, the variations in the area under each crop, were mainly caused by the rotations themselves. The deviations played a very minor role and caused minor changes in the area variations basically caused by the crop-rotations.

CHAPTER IX

SUMMARY AND CONCLUSIONS

The need for a micro-study, rather than a macro-study of crop-pattern has been spelt out in the introductory chapter. The macro-studies have mainly stressed price as the factor affecting crop-pattern and have arrived at conflicting findings--some putting forth that the Indian farmer is highly responsive to price, while the others revealing just the opposite. The role of price as a factor, can be better examined at the micro-level by studying how it affects the individual cultivator's crop-decisions, or selections and hence the rotations. This alone would bring out more explicitly the importance or the lack of the price factor. The present study is an attempt in this field to see as to what factors influence the individual cultivator's crop-decisions.

The study is essentially a short-term analysis of individual cropping-pattern, with the time limitation of a rotation cycle of three to four years and the actual data of cropping-pattern collected for four years. In such a short-period, the fluctuations of crop acreages in relation to their prices is least plausible and feasible. The minute changes that occur in the crop-acreages, need not necessarily be on account of prices alone; but can be a resultant of various factors. The study has dealt with such factors affecting the individual crop-pattern, while always keeping in mind that price is an essential

factor, though not observed as leading to fluctuations of crop areas from year to year, but having its bearing at the time of initial selection of crops and rotations.

The individual cultivator is required to take two kinds of decisions: first, about the long-term cropping programme; and second, about implementing the long-term decisions into annual cropping. In the long-term cropping programme, he has to decide upon the selection of crops for rotations, which will give him maximum returns over years. Once the rotations are chosen the short-term programme becomes simple. It is to implement the accepted rotation-plan into annual cropping, looking to the climatic conditions and the resource position in the individual year. The short-term decisions, therefore, are taken to fit in the individual year, in the long-term cropping.

Before going into the logic of the rotation-plan and the actual areas allotted to crops, it is essential to understand as to what the cultivator is trying to achieve through the rotations and the area allocation to individual crops. For, unless we look into what he is trying to achieve, it will not be possible to understand why he does, what he does. Effectively, what he does and what can be observed from his rotations and annual cropping are almost a reflection of what he is trying to achieve.

The aim of the individual cultivator is to get the stable maximum income over years. He tries to achieve this objective by making the selection of crop-rotations in a judicious manner, so that he can secure a regular flow of the stable maximum income over a period. He never aims at the highest production and

profits for a year or for a short-term. The cropping programme which is likely to give the highest income for a few years, to the permanent detriment of the soil fertility and future income are considered economically unsound and are never practised. The cultivator always prefers to have such a long-term cropping programme which gives him the maximum income and also keeps his land at a profitable level of productivity over years.

The aim--maximum income from land--which the cultivator tries to attain, has a peculiar interpretation, particularly in the subsistence economy. As spelt earlier in Chapter V, the approach of the individual cultivator to maximization of income is very peculiar. He essentially goes to combine his food requirement with cash-income. He never aims purely in terms of high production and high profits, but at that level of production and high profits which yield him the necessary food requirement and the maximum cash. This type of attitude suggests that the individual cultivator is a 'security expectant' operating within a field of 'bounded rationality', and is not willing to forgo the meeting of his own food requirement for high cash-income. In the light of this approach his 'judicious' selection of crop-rotations assumes great importance and it appears that his rotations are broadly an appraisal of his resources and what these can yield to him.

The peculiarity in the individual cultivator's approach necessarily puts a major constraint on the choice of rotations, making it obligatory to choose a rotation or rotations with jowar--the main food-crop, as an essential component. The expectation of minimum security for food, to an extent, decides

the area that needs to be allotted to growing jowar, but still does not tell anything about the rotations with jowar. This can be decided only after knowing the soil-composition of the cultivator's land-holding. The other factors such as supply of home-collected manure, availability of irrigation, do have a play, but these largely go to decide the area allocation to cash-crops. These factors are more relevant for growing cash-crops mainly because of the ability of such crops to yield a better return even after meeting the additional costs incurred on their account. After considering all the factors enumerated it is quite likely that jowar gets associated in various crop-rotations. It is more commonly associated with G-J, a two-year rotation; G-C-J or G-J-C, a three-year rotation; and C-C-C-J, a four-year rotation. The selection of rotations with jowar is done in such a way that adequate area is allotted to jowar every year to meet the annual food needs of the family.

The area allocation to jowar generally follows the argument as above, but is not wholly independent of the allocation of areas to cash-crops. The basis of growing jowar is mainly the food requirement, unless other constraints such as soil-type or shortage of manure are operative making it inevitable to grow more jowar. The cash-crops are essentially for the market and to yield the maximum cash-income. The two important cash-crops in the area being groundnut and cotton, it is convenient to consider these only. Besides these two, banana is a third important cash-crop, but is wholly dependent on availability of irrigation, and can be considered later. The area allocation to cotton and groundnut can be argued almost on the same lines

as jowar except for the difference of the best utilization of manure and the relative profitability of one crop over another. Even here the soil factor cannot be left out of the picture, especially because groundnut can be profitably grown on light soil and is quite well suited for medium-black soil also, but cannot be grown on deep-black soil with profit; whereas in respect of cotton the soil restraint is operative in a quite opposite direction. Cotton can be most profitably grown on deep-black soils and is well suited to medium-black soils, but cannot be grown on light soils at all. Considering jowar which is grown on all the three soils along with soil restraint operative in respect of the above two crops it appears that medium-black is the most adaptive soil and that is why all sorts of rotations are practised on it. The peculiarities of the three soils, hence weigh heavily in crop selection and rotations on a holding.

In the final choice of rotations, the soil constraint, more or less, limits the G-J rotation to light soils only. The result of this on the rest of the holding which might be composed of medium and deep-black soils happens to be a competition for the best utilization of manure to achieve the end result that the cultivator has in his mind. Both cotton and groundnut being the two major cash-crops in the area, the actual allocation of area, specifically to cotton, a comparatively better manured crop, have to be reached not only by taking into consideration the availability of manure but as well the relative profitability of the two crops. As stated earlier, of the two cash-crops, cotton is comparatively more profitable than groundnut. The

cultivator, therefore, tries to put, to the extent possible, larger area of his medium and deep-black land under cotton, if sufficient quantity of manure is available. He selects such rotations that cotton gets a predominant place in his cropping. On the other hand, if there are some restraints operative in the form of soil-composition of land-holding and/or manure supply, the cultivator tends to devote proportionately larger areas to groundnut. Thus, looking to all the factors, the cultivator selects the crop-rotations in such a manner that he could put his land under the crops most suited to it, could utilize the available quantity of home-collected manure in the best possible way and could secure the stable maximum income over years.

With the introduction of irrigation into the resource position of the cultivator the process of selection of crops, rotations and area allocation gets a bit more complicated, specially because three cash-crops have to be considered in terms of relative profitability and resources in place of the two dry-crops. Additional complication arises out of the time-span that occurs between the planting and harvesting of banana. Banana is a crop of one and a half years and if cotton and groundnut are to be compared with it, it will have to be borne in mind that within the cultivation-period of banana, two crops of cotton or groundnut can be raised. The result of this is that when banana is to be chosen in place of cotton or groundnut, the profitability of taking banana will have to be decided against the income that possibly can accrue to him by forgoing banana and raising cotton and groundnut or a third crop that gets

associated with cotton or groundnut in the crop-rotation. The situation is almost analogous to leasing-out of land specifically for banana cultivation. A cultivator having no irrigation facility of his own, occasionally leases-out his land specifically for banana cultivation and in such cases practises duality of rotations on that particular fragment. The basic rotation practised on this fragment is essentially of dry crops. Whenever he leases-out his land for banana cultivation, the comparison between incomes that can accrue has necessarily to be between the income from banana and income from two years of dry cultivation.

The use of irrigation being specifically made for banana alone, necessarily underlines the fact that it alone can achieve the best results. The essential restraint for the allotment of area to banana is the extent of irrigation facility available. The irrigation restraint is observable in the time span of the rotations of banana. Normally, the three-year rotations such as NB-JB-C and NB-JB-J are practised. The four-year rotations like NB-JB-C-J and NB-JB-C-C are generally practised by those who have limited irrigation potential. The four-year rotations, however, are practised, not necessarily because of restraints of irrigation, but may be a resultant of the other factors as well, such as manure supply and financial requirements. Whether banana gets associated in a crop-rotation with cotton or jowar depends on the food need and the soil-type. Even if jowar does not get associated with banana in a crop-rotation, that does not necessarily mean that a cultivator with irrigation facility is unmindful of the food requirement and aims at high production

and high incomes. At the most he could be less mindful in meeting the food needs. This can be observed by looking to the peculiar practice of taking jowar as a mixed crop along with cotton.

Thus, the major factors, which the individual cultivator has to take into account while deciding upon the long-term cropping programme, are: (1) food requirement of family; (2) soil-composition of land-holding; (3) supply of home-collected manure; (4) availability of irrigation; and (5) relative profitability of different cash-crops. The cultivator takes a composite view of all these factors and selects such crop-rotations and allocates his land to food and cash-crops in such a way that he could secure the stable maximum income over years. In some cases, one of the factors may be overwhelming, but none of them can operate independent of others and decide the whole rotation-plan. All these factors are interwoven and have a composite effect on the cropping programme. The cultivator has to take a total view of these and decide upon the rotation-plan. He does the final area allotments of different fragments or plots of his land-holding in such a way that over the whole rotation cycle of all the fragments or plots, the need to deviate will be minimised. Only when such need to minimise the deviations which occur not as a result of changes in the natural factors, but as a result of disturbance in the best utilization of resources both in respect of land and manure, is met, would it be possible for the cultivator to achieve stable maximum income over time.

Once the long-term cropping programme is determined, the cultivator tries to adhere to it, to the extent possible, in the

annual cropping. The short-term crop decisions, therefore, are taken simply to implement the long-term cropping programme, looking to the climatic conditions and the resource position in the individual year. The climate and the resource position do not change every year and hence the cultivator can have his annual cropping largely according to the rotation-plan in most of the years. In certain years, however, situations may and do arise that the cultivator cannot adhere to the cropping as per the rotation-plan and is required to deviate. Such situations arise because of many and varied factors over which the individual cultivator may or may not have any control. The factors causing deviations may be broadly classified into two groups: (1) factors inherent in the rotation-plan itself; and (2) factors external to the rotation-plan.

The rotation-plan necessitates deviations either by developing an area imbalance between different crops or by a preferential treatment in area, given to one of the crops included in the crop-rotation. The external factors causing deviations are of varied types, concerning climate, resources and requirements. Of these the major external factors causing deviations are rainfall, changes in the resources like land, manure and water supply and changes in the requirements like food and cash. The deviations occurring as a result of the inherent factors in the rotation-plan are different from the deviations caused by the external factors. The difference lies in respect of the resource position of the cultivator. When the deviations caused by the inherent factors occur, the resource

position of the cultivator does not change. The deviations are necessitated to correct the area imbalance in the cropping developed by the rotation-plan itself. On the other hand, when deviations are caused by the external factors, the resource position itself changes and the deviations are undertaken to set a new balance between the resources and thereby to attain the maximum income on a different level.

In the formulation of the long-term cropping programme, along with the deviations that occur as a result of rotations and the cultivator's own ideas about adequate use of resources, an income equilibrium and also a resource use equilibrium is attained. The income equilibrium so attained is a range of income that rules out high peaks and low troughs and is comparatively a stable maximum income within certain limits. This income equilibrium is attainable by taking into consideration the existing prices of crops, reflecting in their relative profitability. The income equilibrium is not necessarily a static phenomenon. It is amenable to changes allowing the cultivator to attain higher income equilibrium, depending upon the nature of changes in the resources at his command. Price changes as well may change the income equilibrium either way. However, the changes in the resource position may ask of him to re-cast the whole rotation-plan and hence the cropping. The changes in prices, on the other hand, may not affect the rotation-plan as such in the immediate, but may change the income equilibrium to higher or lower level, depending on the extent of the rise or fall in prices and the changes in the cost of cultivation.

Comparatively meagre benefits accruing by way of additional income, may not be a sufficient incentive to re-cast the whole rotation-plan. Under such circumstances any changes in crop areas that could be the result of prices are likely to be very marginal. Such a marginal extension of crop area may continue for some period and when he feels assured of the continuity of the price rise or the stabilization of price at the higher level, only then does he think of the realignment of the resources, and re-casting of the rotation-plan. So, if the cultivator is really responsive to the changes in prices, what needs to be studied along with the changes in prices and crop areas is the realignment of resources that eventually must take place in the course of time.

An introduction of a new crop is done on similar lines, in the sense that it is first grown on smaller areas by deviating from the existing rotation-plan. In fact, the cultivation of a new crop is first done and continued for a time on an experimental basis and the area changes that occur on account of such experiments are very marginal. Only when the cultivator feels assured that the existing resource position can meet the necessary requirement of raising a new crop or the additional resources that are required are within his reach, does he fit it, into his rotation-plan. During all this period of experiment, as he has checked upon the resource requirement and the ability to meet it, he has also found out that higher benefits do accrue from the cultivation of that crop. So whether an existing crop becomes more profitable on account of the price rise or a new

crop happens to be more profitable than the existing one, the essential condition in both these cases happens to be that a reconsideration of the resources and their possible supplementation has to be thought out. Only when all these conditions are met, can he think of reallocation of area commensurate with the existing resources or after the supplementation of those resources. This means a mere change in resource position or a mere rise or fall in prices need not necessarily be conducive to attain a higher level of income. What effects such changes will have on his overall approach to the stable maximum income will have to be looked into. The essential condition even for a long-term cropping study seems to be that a mere single factor such as prices alone may not cause a rise or fall in the acreages, but such a rise or fall could be a resultant of very many factors. The need, therefore, is not only of studying the fluctuations in acreages in relation to the prices, but studying them along with the other changes that might have occurred during that process.

During a short-term the cultivator is more or less rotation-bound and the area fluctuations are necessarily a result of the crop-rotations. The net additions to the fluctuations of the crop acreages on account of deviations are quite meagre. However, the actual area deviations are not necessarily that low. In the aggregate the areas that deviate-in and deviate-out of a given crop almost cancel each other and the aggregate crop areas show only a marginal variation. In a majority of the cases these deviations do not occur on account of prices but are a result of various factors and can be broadly classified as

complementary to rotation-plans and changes in the resource position. If, therefore, a long-term analysis of cropping pattern is to be tried, what seems to be essential is not only as to how the area fluctuations occurred during the short-term; but as well at what point of time the cultivator tries to re-set the whole rotation-plan resulting either from a price rise of a given crop or as a result of supplementation of his resource position.

Thus, in a short-period, the individual cultivator generally prefers to adhere to the rotations in his annual cropping. The sanctity of rotation, lies in making the adequate use of the available resources, while at the same time trying to conserve the basic resource--land. Earlier the rotation-plan, allocation of areas to different crops etc. have been looked into only in terms of resource use. Along with the resource use, the conservation measures as well, will have to be looked into, to give a complete picture. The lack of any conservation measures may not show any effects in the short-period, but these will certainly have bad effects in the long-term. So, a crop-plan that could be conducive to higher level of income in the short-term need not necessarily prove to be so in the long-term. The idea of conservation of resource, therefore, puts a constraint on the crop-plan at all stages. However, some individual cultivators may prefer to go against the dictates of conservation in certain years, particularly when there is a high price rise of a crop.

Agronomically the idea of rotation of crops is based upon the utilization of food nutrients in a balanced manner. The

alternation of crops belonging to different families helps to retain the fertility of land, as different nutrients are absorbed during the period of crop growth and the possible deficiencies of food nutrients by a continuous single cropping are avoided. Moreover the crops belonging to different families have essentially different root systems which tap the different layers of the soil for their food nutrients. This again helps to maintain the balance of food nutrients in the soil. The idea of growing exhausting and restorative crops in alternation is based on these facts only. However, in some crop-rotations, such as G-C-J, G-J-C and C-C-C-J etc. the balance of exhausting and restorative crops is not maintained. But in such cases, one of the exhausting crops is necessarily manured. Manuring helps to retain the fertility of the soil to quite an extent and two continuous exhausting crops can be grown with least detrimental effects.

The cultivator's idea of the stable maximum income, therefore, does not relate only to the utilization of available resources but to the conservation of them as well. The allocation of resources such as manure, irrigation etc. can maximise his income for some time but the cultivator's failure to give due attention to the conservation will ultimately lower down his income from land. This only means that even without any measures to conserve, the cultivator may get higher income in the initial period but this will not last for long. As it is not possible to replenish the lost fertility in soil, the income will certainly decline in the long-period. However, with due measures for

conservation, right from the start, the fertility of the soil can be retained at its level for a very long-period. So, the adequate use of resources along with the presence of conservation measures can assure the individual cultivator the stable maximum income over time. The practice of rotation is based on all these considerations. Even the deviations that occur as a result of rotation-plans and other factors are carried out in such a way that there is the least detrimental use of the land resource. Therefore, in the ultimate analysis, cropping-pattern appears to be essentially a problem in resource use and conservation.

APPENDIX I

BOTANICAL NAMES OF CROPS GROWN IN THE FOUR VILLAGES

Crops	Botanical names
Bajara	Pennisetum typhoideum
Banana	Musa Sapientum
Chillies	Capsicum annum
Cotton	Gossypium herbaceum
Gram	Cicer arietinum
Groundnut	Arachis hypogaea
Jowar	Andropogon sorghum
Maize	Zea Mays
Mug	Phaseolus Mungo
Orange	Citrus aurantium
Paddy	Oryza Sativa L.
Sugercane	Saccharum Officinerum
Tur	Cajanus cajan
Udid	Phaseolus radiatus
Wheat	Triticum pilosum

APPENDIX II
POINTS COVERED IN A CASE STUDY*

I.	1. Village	4. Serial No. of Plotwise Schedule		
	2. Head of the Family	5. Serial No.		
	3. Serial No. of General Family Schedule	6. Date		

II-A. Cultivated land in the last three years (1960-61 to 1962-63)				
		1960-61	1961-62	1962-63
	<u>Owned land</u>			
	Survey No.			
	Area			
	Land revenue			
	<u>Leased-out land</u>			
	Survey No.			
	Area			
	Land revenue			
	<u>Leased-in land</u>			
	Survey No.			
	Area			
	Land revenue			

II-B.		1960-61	1961-62	1962-63
		-----	-----	-----
		Dry	Irri- gated	Dry
			Irri- gated	Irri- gated
	1. Total area of land			
	2. Permanent Fallow			
	3. Cultivable			
	4. Current fallow			
	5. Net cropped area			
	6. Double cropped area			
	7. Gross cropped area			

* All the relevant data pertaining to the year 1963-64 were collected later.

III.

Details of the land cultivated in 1962-63

Village

Fragment

Survey No.

Name of the land

Area

Distance from home

Location of the land

Total cultivated area in : 1960-61

1961-62

1962-63

Plot No.

Area

Fallow area

Reason for fallow area

Soil-composition

Irrigation facility

Irrigable area

IV. Land cultivated in 1962-63

Village

Cultivation cost borne
by the landowner

Fragment No.

Name of land

Seeds
Manure
Others

Plot No.

Owned or cash-rented
or share-rented

Crop decisions

Leased-in land

Crops grown : Kharif

Rent : Cash
ShareRabi
Summer

V. Rotation-plan

Survey No.	Fragment No.	Area	Plot No.	Area	Crop-rotation
---------------	-----------------	------	-------------	------	---------------

Notes on the rotation-plan

1. Soil-composition of the land-holding
2. Irrigation facility
3. Annual requirement of jowar for family consumption
4. Annual requirement of fodder for the owned livestock
5. Home-collected manure per year

VI. Crops grown in 1962-63 and in the two years preceding to 1962-63

1960-61		1961-62		1962-63	
-----	-----	-----	-----	-----	-----
Kharif	Rabi	Kharif	Rabi	Kharif	Rabi

Village

Fragment No.

Plot No.

Crop-rotation on the plot

Reasons for practising such a rotation on the plot

If deviated from the crop-rotation, reasons

VIII. Disposals of Food and Fodder
in 1961-62 and 1962-63

1961-62 1962-63

Food/Fodder

Given as : Share rent
 Wages in kind
 Baluta payments
 Repayment of crop-loan
 Crop-loans

Sold : Quantity
 Place
 Through whom?
 To whom?
 Price

Stored for : Home-consumption
 Seeds
 Sale

Schedule No.1 : General Family Schedule

I.

- | | |
|-----------------------|----------------------|
| 1) Village | 5) Occupation - Main |
| 2) Head of the Family | Subsidiary |
| 3) Male/Female | 6) Serial No. |
| Age | 7) Date |
| 4) Religion - Caste | |

II. Family Members

- | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1) Name | | | | | | | | |
| 2) Sex | | | | | | | | |
| 3) Age | | | | | | | | |
| 4) Relation with the
Head of the Family | | | | | | | | |
| 5) Literate/Illiterate | | | | | | | | |
| 6) If literate which
examination have
you passed? | | | | | | | | |
| If educand, standard | | | | | | | | |
| 7) Earner/Non-earner | | | | | | | | |
| 8) If earner - occupation | | | | | | | | |

III. Attached Servant

- | | | |
|-------------------------------------|-----------------|---------------------|
| 1) Name | 5) Payment | : (a) In cash |
| 2) Religion - Caste | | (b) In kind |
| Age | 6) Perquisites: | (a) Meals |
| 3) Nature of work | | (b) Clothes |
| 4) For how many months
employed? | | (c) Other
things |

IV. Annual Family Income (1962-63)

- | | |
|---|--------------------|
| 1) Income from main family occupation | 4) Unearned income |
| 2) Income from subsidiary family occupation | 5) Other incomes |
| 3) Earning from individual's independent occupation | 6) Total income |

V-A. Land (1962-63)

	In the village	Out-side	Total	Rent Share	No. of Tenants/owners
1) Owned land					
Of which					
a) Cash rented					
b) Share rented					
c) Other					
d) Owner cultivated					
2) Taken on cash rent					
3) Taken on share rent					
4) Other					
5) Total cultivated land					

V-B. Cultivated land (1962-63)

Well irrigated	Total dry land
Canal irrigated	Total cropped area
Government canal irrigated	Current fallow
Total irrigated	Permanent fallow
	Total

VI-A. Livestock

<u>Working cattle</u>	<u>Milch cattle</u>	<u>Other cattle</u>
Number	Number	Number
Breed	Breed	Breed
Age	Age	Age
Home bred	Home bred	Home bred
Purchased: When	Purchased: When	Purchased: When
Price	Price	Price
Present Price	Present Price	Present Price

VI-B. Other Animals

Number Present Price

- 1) Goats
- 2) Sheep
- 3) Birds

VII. Agricultural Implements

Item	No.	Present Price	Item	No.	Present Price
1) Iron Plough			8) Hoe		
2) Wooden Plough			9) Leather water lift		
3) Small Wooden Plough			10) Iron water lift		
4) Harrow			11) Bullock-cart		
5) Small Harrow			12) Tractor		
6) Seed drill			13) Engine		
7) Small seed drill			14) Pump		

VIII. Land and Other Assets

Item	Present No. Price	Item	Present No. Price
1) Land		7) Investment in non-agricultural occupations	
2) Houses		8) Other	
3) Shares		9) Total	
4) Deposits etc.		VI) Total Livestock	
5) Gold and Silver		VII) Total Agricultural implements	
6) Amount for which insured and type of insurance		Grand Total	

IX-A. Outstanding Debt

Creditor	Present debt			Repayment during the year		
	Princi- pal	Interest	Total	Principal	Interest	Total

IX-B. Borrowings during the Current Year

	1	2	3	4	5
1) When did you borrow money?					
2) Amount borrowed					
3) From whom borrowed?					
4) Where does the creditor stay?					
5) His occupation					
6) Annual rate of interest					
7) What is the security?					
8) What is the duration of the loan?					
9) What is the purpose of the loan?					
10) How did you use the borrowed money?					

IX-C. Credit Needs

- | | |
|---------------------------------------|--|
| 1) For what purpose? | 4) Reason for not getting loan? |
| 2) How much? | 5) Any change in cropping pattern because of not getting loan? |
| 3) From whom did you try to get loan? | |

X. NOTES

Schedule No. 2 : Plotwise Schedule

Village	Area
Owner	Pot-kharab
Caste	Total Area
Occupation	Present value
Conditions of lease	Cultivator
Details of fixed rent, crop-sharing and other conditions, if any	Caste
Name of the field	Occupation
Survey No.	How long has the tenant been cultivating the field?
Type of tenure	Tenancy rights, if any
	Serial No.
	Revenue

Total Area:	Permanent Fallow:	Current Fallow:
-------------	-------------------	-----------------

1. Soil type

2. Erosion

Is the soil being eroded?

What proportion of the
field is eroded?Land rendered uncultivable
due to erosion3. Bunds

Masonry

Length, Breadth and Height

Year of construction

Has the bund a waste weir?

Pacca or kachcha?

Cost of construction

4. Well Irrigation

(Survey No. and Pot hissa)

Situation of well

Area occupied by well

Rights of ownership of well

When sunk?

When constructed?

Total expenditure

Your share in expenditure

Is the well in use?

Area that can be irrigated
by the well

5. Canal Irrigation
 Name of the canal
 Area that can be irrigated
6. Private canals
 Area irrigated
7. Drainage
 Type of drainage
 When constructed?
 Cost of construction
8. Farm - Structure
 Area occupied
 Use
 Masonry
 Roof
 When constructed?
 Present value
9. Permanent Fencing
 Type
 Length
 Year of construction
 Cost of construction
10. Trees in the field
 Area occupied
 Kinds of trees
 Numbers
11. Permanent Fallow
 Reason
 Area
12. New Area brought under cultivation during last 5 years
 When?
 Area
 Nature of waste land before brought under cultivation
 Measures taken
 Expenditure
13. Proposed reforms on the field
 Details
 Estimated expenditure

Information regarding cultivation: _____ Season: _____ Main Crop: _____ Area: _____

Date	Item	Area	Male labour (days)		Female Labour(days)		Bullock Labour(days)		Wages paid		
			Total	Of which hired	Total	Of which hired	Total	Of which hired	Cash	Paid in kind	
									Type	Quan-	Value
										tity	
	Ploughing First										
	Ploughing Second										
	Manure and Transport of										
	Spreading of Manure										
	Harrowing First										
	Harrowing Second										
	Seed and Sowing										
	Other Manure and Transport of										
	-do- Spreading										
	Interculturing										
	Weeding First										
	Weeding Second										
	Irrigation: Times										
	Watching										
	Harvesting and Threshing										
	Main Crop										
	Mixed Crop										

(continued)

Date	Item	Materials Used				Total		
		Type	Owned	Contributed by landlords	Purchased	Quan- tity	Value	Quan- tity
	Ploughing First							
	Ploughing Second							
	Manure and Transport of							
	Spreading of Manure							
	Harrowing First							
	Harrowing Second							
	Seed and Sowing							
	Other Manure and Transport of							
	-do- Spreading							
	Interculturing							
	Weeding First							
	Weeding Second							
	Irrigation: Times							
	Watching							
	Harvesting and Threshing							
	Main Crop							
	Mixed Crop							

Village: Taluka: District: State: Survey No.:
 Hissa and Plot No.: Sl.No. :

Ploughing

1. Type of plough used
No. of bullocks
2. Depth of ploughing
3. Whether ploughed along
or across the slopes
4. Reasons for ploughing twice
5. Reasons for not ploughing
6. When ploughed previously
7. Intervals of ploughing

Manure

1. How manured?
2. Practice of manuring

Harrowing

1. Whether present harrowing
is adequate?
2. If inadequate, reason?
3. How many times should have
been harrowed?
4. Reasons for not harrowing

Rotation

1. Rotation Practice?
2. Whether the present crop is
according to usual rotation
3. If not, why?

Sowing

1. Distance between two lines
2. Your opinion about changing
this distance

3. Home-seed selected or
unselected
4. Type of seed
5. Any treatment before sowing?
Any opinion?
6. Did you give any manure
along with sowing?
7. What are the main and the
mixed crops?
How do you sow them?
8. Your opinion as regards
mixed cropping
Your opinion as regards
concentrated manures

Weeding

1. Whether weeded at the
right time?
2. Reasons for not weeding at
the right time?
3. What is the adequate number
of weeding?

Irrigation

1. Interval of irrigation
2. Is this irrigation adequate?
3. If not, how much is desired?
4. Reasons for not irrigating
the field adequately
1. Reasons for not keeping
watch over the crop
2. Description of harvesting
and threshing of the crop

REMARKS:

APPENDIX III

APPROXIMATE PERIOD OF THE DIFFERENT CONSTELLATIONS
PERTAINING TO RAINY SEASON

Constellations	Period	
'Rohini'	22nd May	to 6th June
'Mrug'	7th June	to 21st June
'Āradra'	22nd June	to 6th July
'Punarvasu'	7th July	to 21st July
'Pushya'	22nd July	to 5th August
'Āshlesha'	6th August	to 20th August
'Magha'	21st August	to 4th September
'Purva'	5th September	to 19th September
'Uttara'	20th September	to 4th October
'Hasta'	5th October	to 19th October
'Chitra'	20th October	to 3rd November

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