

**FACTORS INFLUENCING CROPPING-
PATTERNS ON INDIVIDUAL HOLDINGS**

(JALGAON DISTRICT, MAHARASHTRA STATE)

PART II

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THE CASE STUDIES OF THE SAMPLE CULTIVATORS

FROM

KHIRODE

CASE STUDY K 1

Name	: S. P. M.	Family size	: 6 members
Age	: 31 years	Earners	: Male Female Total
Education	: 4th standard		1 2 3
Caste	: Leva-Patidar	Total income	: Rs.600
Main occupation	: Agricultural labour	(1962-63)	
Subsidiary occupation	: Agriculture	Land-holding	: 0.80 acre
Livestock	:	Home-collected manure	: 3 cart-loads
Working	Milch Young Total		
-	1 - 1		

This is a small cultivator having a land-holding of 0.80 acre only, within the village. The details as regards his land and the crop-rotation practised on it are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	0.80	1.1	0.80	Light	G-J

As the land in the fragment is of lighter soil, the cultivator is required to follow the two-year rotation of G-J. The annual food requirement of his family is about 25 maunds. Considering the annual requirement of food for the family, he would like to grow jowar every year; but his land-holding is so small and is of such a soil type that it is not possible. If he grows jowar continuously, its yield will decline to a considerable extent. To keep up the soil fertility at a profitable level, he is required to follow the two-year rotation of G-J. As the land-holding is small, it is not economic and convenient to divide it into two plots to grow both the crops in a year. He,

therefore, prefers to grow each of the two crops in alternate years.

He cannot meet the entire food needs of his family from the home-production of jowar. He is required to purchase every year, 7 to 15 maunds of jowar, depending on the crop grown in his land. If it is jowar, he is required to purchase comparatively smaller quantity, and if it is groundnut, he has to purchase a large quantity of jowar. He collects 8 to 10 maunds of jowar as kind-wages.

The crops grown in the four years are as follows :

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.80	G-J	Jowar	Groundnut	Jowar	Groundnut
Total : Jowar			0.80	-	0.80	-
Groundnut			-	0.80	-	0.80

The cultivator had grown crops strictly according to the accepted rotation in all the four years.

CASE STUDY K 2

Name	: L. D. T.	Family size	: 7 members
Age	: 36 years	Earners	: Male Female Total
Education	: Illiterate		1 2 3
Caste	: Nav-Budha	Total income (1962-63)	: Rs.900
Main occupation	: Agricultural labour	Land-holding	: 1.60 acres
Subsidiary occupation	: Agriculture	Home-collected manure	: 6 cart-loads
Livestock	:		
Working	Milch 1 Young 1 Total 2		

This cultivator has a small land-holding of 1.60 acres, consisting of two fragments, one of an acre, and the other of 0.60 acre. The details of the land-holding and the crop-rotations practised on different plots are presented below :

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.00	1.1	1.00	Light	G-J
2	0.60	2.1	0.60	Medium-black	G-J

The cultivator follows the two-year rotation of G-J on both the fragments, even on the second fragment having medium-black soil, where cotton can be grown. He considers cotton as the risky crop as it is susceptible to various diseases and pests, and often results in a total failure. He reports that such loss of a total failure of a crop in any year cannot be sustained by a small cultivator like him. He, therefore, prefers to practise the rotation of G-J on both the fragments. The rotation is so arranged that each year groundnut is grown on one fragment, and jowar on the other.

He prefers to grow both the crops every year, in order to meet, though partly, his both types of needs--food and cash. He reports that a combination of the two crops every year provides him with some amount of both food and cash, which he can supplement by following other occupations. His total annual requirement of jowar for family consumption is about 30 maunds. This is not met entirely from the home production of jowar. He is required to supplement it through the kind wages received and also through purchases. He reports that in a year, 8 to 10 maunds of jowar are collected as kind wages. He is required to

purchase 5 to 7 maunds of jowar every year. The fodder requirement of his cattle, however, is generally met from the home production of jowar stalks and groundnut vines.

The crops grown on the two fragments in the four years are as follows:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.00	G-J	Groundnut	Jowar	Groundnut	Jowar
2.1	0.60	G-J	Jowar	Groundnut	Jowar	Groundnut
Total : Jowar			0.60	1.00	0.60	1.00
Groundnut			1.00	0.60	1.00	0.60

The cultivator had grown the crops strictly according to the rotation in all the four years.

CASE STUDY K 3

Name	: T. D. M.	Family size	: 2 members
Age	: 45 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Hotel	Total income (1962-63)	: Rs.1,650
Subsidiary occupation	: Agriculture	Land-holding	: 1.98 acres
Livestock	:	Home-collected manure	: 4 cart-loads
Working	Milch 1 Young - Total 1		

This is a small cultivator, cultivating only his owned land of 1.98 acres. Below are given the details of the fragment of land and the crop-rotation practised on it.

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.98	1.1	1.98	Medium-black	G-C

The cultivator, though small, prefers to practise the two-year rotation of cash-crops alone (G-C) on his entire land-holding. It may be noted that he has chosen the rotation with cotton which the small cultivators consider as a risky crop and generally hesitate to grow. This is mainly because the financial condition of the cultivator is comparatively better. He has a regular flow of income from his main profession of running a hotel in the village. He is not wholly dependent on the crops for his needs, and hence, can sustain any loss of a crop failure. Secondly, his family being of two members only, the annual food requirement for family consumption is small (9 maunds). He can produce this much jowar by growing it as a mixed crop along with cotton and groundnut. He is not required to grow jowar as a main crop. Considering these points, he finds the two-year rotation of G-C, the most suited to him.

He reports that as the area of his land-holding is already small and inconvenient for cultivation, it will be more so, if it is further divided into two plots to grow both the cash-crops every year. Had there been two plots at two different places, he might have grown the two crops every year to take the advantages of location. But when the holding is small and is situated at one place, he thinks that he cannot minimize much, the risk of crop failure by dividing the fragment. Instead, he resorts to the method of mixed cropping and minimizes the risk of crop failure to some extent. As pointed out earlier he grows jowar

along with cotton and groundnut. If the cash-crop grown fails, he gets jowar at least for his family consumption needs.

The crops grown in the four years are as follows:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.98	G-C	Cotton	Groundnut	Cotton	Groundnut	
Total :			Groundnut	-	1.98	-	1.98
			Cotton	1.98	-	1.98	-

It may be noted that the cultivator had grown the crops as per the rotation in all the four years.

CASE STUDY K 4

Name	: M. Z. I.	Family size	: 4 members
Age	: 45 years	Earners	: Male Female Total
Education	: Illiterate		2 1 3
Caste	: Leva-Patidar	Total income	: Rs.950
Main occupation	: Agricultural labour	(1962-63)	
Subsidiary occupation	: Agriculture	Land-holding	: 2.03 acres
Livestock	:	Home-collected manure	: 14 cart-loads
Working	Milch 2 Young 2 Total 4		

The land-holding cultivated by this cultivator, consists of two fragments, having a total area of 2.03 acres. The details of these fragments and the crop-rotation followed on them are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.18	1.1	1.18	Light	G-J
2	0.85	2.1	0.85	Medium-black	G-J

It may be noted that the cultivator practises the two-year rotation of G-J on both the fragments, even on the second fragment having medium-black soil. He has arranged the rotation on the two fragments in such a way that both the crops are grown every year, groundnut, on one fragment and jowar, on the other. He does not prefer to grow cotton, even on the second fragment, firstly because he considers cotton as a risky crop. He prefers to grow groundnut, even though its cost of cultivation is comparatively high, as it is less risky than cotton. Secondly, cotton is an exhausting crop and cannot be well rotated with another exhausting crop like jowar without applying any manure or fertilizers to the land. He cannot afford to give manure or fertilizers to his land as his financial condition is very poor. The home-collected manure is sold every year as its price is quite attractive (Rs.12 to 15 per cart-load). He reports that by selling manure, he gets higher returns than utilizing it on his own land. Thirdly, he does not have an adequate place to store cotton produce till it is sold off. His house is very small--a hut having a roofed area of about one hundred square feet. He reports that cooking is done in the same place, and he is afraid to store cotton produce there, as it may catch fire any time. He prefers to grow groundnut, which can be harvested at a time and can be immediately sold out. He, therefore, finds

the G-J rotation more suited to his conditions, and profitable as it can be continued for several years without application of any manure etc.

He is required to grow jowar every year to meet the food needs of his family. He reports that the annual requirement of jowar for the family consumption is 18 maunds. This is generally met partly from the home production of jowar and partly from the jowar collected as kind wages.

He does not own any working cattle and hence the entire bullock-labour required for cultivation is hired. He owns a she-buffalo and a cow. The milk from both is sold to meet day-to-day cash needs of the family. The fodder requirement of the livestock is met from the home production of jowar stalks and groundnut vines.

The crops grown and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.18	G-J	Jowar	Groundnut	Jowar	Groundnut
2.1	0.85	G-J	Groundnut	Jowar	Groundnut	Jowar
Total : Jowar			1.18	0.85	1.18	0.85
Groundnut			0.85	1.18	0.85	1.18

It can be seen that the cultivator had grown crops strictly according to the accepted rotation in all the four years.

CASE STUDY K 5

Name	: P. B. N.	Family size	: 4 members
Age	: 56 years	Earners	: Male Female Total
Education	: 4th standard		1 2 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,075
Subsidiary occupation	: Agricultural labour	Land-holding	: 2.88 acres
Livestock :		Home-collected manure	: 15 cart-loads
Working	Milch	Young	Total
1	1	3	5

The land-holding cultivated by this cultivator is of two fragments, having a total area of 2.88 acres. Of these, one fragment of 2.53 acres is owned, while the other of 0.35 acre is leased-in for a cash-rent of Rs.6 per year. He has leased-in this land continuously for more than twenty years. The details about these fragments and the crop-rotations followed on different plots are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.53	1.1	0.40 to 1.40	Medium-black	C-J
		1.2	1.13 to 2.13	Medium-black	C-J
2	0.35	2.1	0.35	Medium-black	C-J

The cultivator prefers to practise the two-year rotation of C-J on both the fragments even though the land in these fragments is of medium-black type. In fact it is more suited to the three-year rotation of G-C-J. The cultivator could not follow this rotation mainly because both of his fragments suffer from the locational disadvantages. His own fragment of 2.53 acres is

situated near the village and the Secondary School. He reports that if groundnut is grown on this land, the students from the school and the villagers uproot a large portion of it. Similar is the case with the other fragment. It is situated adjacent to the village, only a road running in between. It is, therefore, not at all safe for the cultivation of groundnut. In such circumstances he is required to practise the C-J rotation on both the fragments.

In the accepted rotation, however, he has given a marked preference for cotton as it is the only cash-crop which he can grow on his land-holding. He divides his larger fragment of 2.53 acres every year. But he cannot keep the division uniform in all years as he prefers to devote larger area to cotton. It can be seen, that the area put under cotton is larger than that of jowar in all the four years. Because of his preference for cotton he is required to grow it repeatedly on an area of 1.00 acre.

The cultivator is required to grow jowar every year to meet the consumption needs of the family. He reports that the annual requirement of jowar for the family consumption is about 18 maunds. This is generally met from the home production of jowar which he grows both as a main crop and also as a subsidiary crop along with cotton. The fodder requirement of his livestock, however, is pretty heavy and cannot be met from the home production of jowar stalks. He does not prefer to increase the area under jowar in order to meet his total fodder needs. He prefers to purchase fodder from outside. The cow-dung manure collected

from the owned livestock is applied every year to that portion of the land where cotton is due.

The crops grown by the cultivator in all the four years are presented below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.40 to 1.40	C-J	Cotton (1.40)	Jowar (0.40)	Cotton (1.40)	Jowar (0.40)
1.2	1.13 to 2.13	C-J	Jowar (1.13)	Cotton (2.13)	Jowar (1.13)	Cotton (2.13)
2.1	0.35	C-J	Cotton	Jowar	Cotton	Jowar
Total : Jowar			1.13	0.75	1.13	0.75
Cotton			1.75	2.13	1.75	2.13

It can be seen that the cultivator took crops in all the four years strictly according to the accepted rotation.

CASE STUDY K 6

Name	: K. M. J.	Family size	: 7 members
Age	: 47 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Kalal		
Main occupation	: Hotel	Total income (1962-63)	: Rs.1,800
Subsidiary occupation	: Agriculture	Land-holding	: 3.75 acres
Livestock	:	Home-collected manure	: 4 cart-loads
Working	Milch 1 Young - Total 1		

This cultivator cultivates only his owned land of 3.75 acres. It is a single fragment. The details of the fragment and the crop-rotation followed on it are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	3.75	1.1	3.75	Medium-black	G-J-C

The cultivator prefers to follow the three-year rotation of G-J-C on the entire area of his fragment mainly because of its medium-black soil which is most suited to such rotation. The sequence of crops in the rotation, however, is not very profitable. The sequence of crops in the three-year rotation of G-C-J has been proved more profitable. This cultivator prefers to practise such a sequence of crops because he wants to give the benefits of the leguminous crop (groundnut) to jowar which he needs in larger quantity, to meet the consumption requirement of the family.

He takes jowar as the main crop once in three years, and in the other two years he grows it as a subsidiary crop along with cotton and groundnut. The annual requirement of jowar for his family consumption needs is about 30 maunds. Whenever jowar is grown as the main crop on his entire land, he meets his total food needs from the home-production. In the other two years, however, when jowar is grown as a mixed crop, he is required to purchase jowar to meet the entire food needs of the family.

The cultivator is largely engaged in his main profession of running a hotel in the village, and finds a little time to look after his land. He, therefore, finds it convenient to devote the entire area of his land-holding to one main crop every year.

The crops grown by the cultivator in all the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	3.75	G-J-C	Jowar	Cotton	Groundnut	Jowar
Total : Jowar			3.75	-	-	3.75
Groundnut			-	-	3.75	-
Cotton			-	3.75	-	-

It can be seen that the cultivator grew crops strictly according to the rotation in all the four years.

CASE STUDY K 7.

Name	: K. H. C.	Family size	: 2 members
Age	: 26 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,200
Subsidiary occupation	: Agricultural labour	Land-holding	: 3.90 acres
Livestock	:	Home-collected manure	: 6 cart-loads
Working	Milch 1 Young - Total 1		

The land-holding of this cultivator consists of two fragments, having a total area of 3.90 acres. Of these, one fragment is larger in size, measuring 3.20 acres, while the other is very small, having an area of 0.70 acre only. The details regarding each of these fragments and the crop-rotations practised on these are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	3.20	1.1	1.60	Light	G-J
		1.2	1.60	Light	G-J
2	0.70	2.1	0.70	Light	G-J

The cultivator is required to follow the two-year rotation of G-J all over the land as his entire holding is of light soil where these two crops only can be profitably grown. The cultivator reported that he tried to grow cotton on the larger fragment but could not succeed as he got a very poor yield of 2 maunds of seed-cotton per acre. It was totally unprofitable. He has, therefore, to restrict himself to groundnut and jowar on his entire land.

He is required to grow jowar every year to meet the food needs of his family and also of the family of his elder brother serving in Bombay. He reported that he generally sends half of the jowar produce every year to his elder brother. The total annual requirement of jowar for the two families is about 25 maunds. This is generally met from the home production of jowar whenever it is grown on two plots. Whenever jowar is taken on one plot only he faces its shortage and is required to purchase.

He does not have any working cattle, and hence he is required to hire all the bullock-labour required for cultivation. He has only a she-buffalo. The milk produce is sold to meet day-to-day cash needs of the family. The manure collected is also sold every year. The fodder requirement of the she-buffalo is entirely met from the home produced jowar stalks and groundnut vines.

The crops grown and the areas devoted to each of these in all the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.60	G-J	Jowar	Groundnut	Jowar	Groundnut
1.2	1.60	G-J	Groundnut	Jowar	Groundnut	Jowar
2.1	0.70	G-J	Jowar	Groundnut	Jowar	Groundnut
Total : Jowar			2.30	1.60	2.30	1.60
Groundnut			1.60	2.30	1.60	2.30

It may be noted that the cultivator followed the rotation strictly and grew the crops according to it in all the four years.

CASE STUDY K 8

Name	: D. T. M.	Family size	: 6 members
Age	: 42 years	Earners	: Male Female Total
Education	: 4th standard		1 1 2
Caste	: Leva-Patidar	Total income	: Rs.950
Main occupation	: Agriculture	(1962-63)	
Subsidiary occupation	: Agricultural labour	Land-holding	: 4.50 acres
Livestock	:	Home-collected manure	: 6 cart-loads
Working	Milch 1 Young 1 Total 2		

The land-holding cultivated by this cultivator is a single fragment of 4.50 acres which he owns. The details of the fragment and the crop-rotation followed on it are given below:

Fragment No.	Acres	Plot No.	Acres	Soil-type	Crop-rotation
1	4.50	1.1	2.00	Medium-black	G-J-C
		1.2	2.25	Medium-black	G-J-C
		1.3	0.25	Medium-black	G-J-C

The cultivator follows the three-year rotation of G-J-C on the entire area of his land-holding because of its medium-black soil which suited most to the three crops. The crop sequence in the rotation, though not very profitable, is followed mainly to meet the large requirement of jowar for family consumption.

The annual requirement of jowar for the family consumption is about 25 maunds. This is generally met from the home production when jowar is grown on the plots of 2 to 2.25 acres. Whenever it is grown on the smaller plot he is required to purchase jowar. The cultivator receives about three maunds of jowar as kind wages.

The crops grown by the cultivator on different plots of his land in all the four years are presented below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.00	G-J-C	Cotton	Groundnut	Jowar	Cotton
1.2	2.25	G-J-C	Jowar	Jowar (Cotton)	Cotton	Groundnut
1.3	0.25	G-J-C	Jowar	Cotton	Groundnut	Groundnut (Jowar)
Total : Jowar			2.50	2.25	2.00	-
Groundnut			-	2.00	0.25	2.50
Cotton			2.00	0.25	2.25	2.00

It can be seen that the cultivator had grown his crops according to the accepted rotation, except on one plot each in

1961-62 and 1963-64. In the year 1961-62 he was required to deviate from the rotation on the plot of 2.25 acres. He reported that in this year, he could not manure the plot because of financial difficulties and hence could not put it under cotton which was due according to the rotation. The home-collected manure was not sufficient to cover the entire area of the plot. Besides the difficulties of manuring, the major point was that in this year no area of his plots was due for jowar which he had to grow to meet the food needs of the family. In the circumstances, therefore, he deviated from the rotation-crop (cotton) and repeated jowar on the plot. In 1963-64, he deviated on the plot of 0.25 acre and grew groundnut instead of jowar which was due on it. It may be noted that in this year the cultivator made a marked change in his usual cropping pattern, by putting the entire area of his land-holding under the two cash-crops only. He reported that he wanted more cash in that year to repay the loan of Rs.500 which he had drawn for his daughter's marriage. Because of this pressing need for cash, he was required to grow cotton and groundnut on his entire land. He took jowar as a mixed crop along with cotton and groundnut but its yield was far short to meet the total consumption needs of the family. In this year he was required to purchase jowar to meet the family requirements.

CASE STUDY K 9

Name	: D. B. Z.	Family size	: 5 members
Age	: 45 years		
Education	: 7th standard	Earners	: Male Female Total
Caste	: Leva-Patidar		1 1 2
Main occupation	: Service (Craft-teacher)	Total income (1962-63)	: Rs.2,200
Subsidiary occupation	: Agriculture	Land-holding	: 5.28 acres
Livestock	:		
Working	Milch 2	Young 1	Total 3
		Home-collected manure	: 10 cart-loads

The cultivator owns 8.43 acres of land, of which 3.15 acres have been leased-out for the cash-rent of Rs.14.37, fixed by the Tenancy Mamlatdar of the Raver Taluka. The cultivator has made an appeal to get back his land for self-cultivation but the case is still under consideration in the Tenancy Tribunal. The cultivated holding of this cultivator, therefore, is of 5.28 acres only. It comprises of three fragments. The details of these fragments and the crop-rotations followed on different plots are given below:

Fragment No.	Acres	Plot No.	Acres	Soil-type	Crop-rotation
1	2.05	1.1	2.05	Light	G-J
2	1.48	2.1	1.48	Medium-black	G-C
3	1.75	3.1	1.00	Medium-black	G-C
		3.2	0.75	Medium-black	G-C-J

It is interesting to note from the rotation-plan of the cultivator how he has allocated only the required area to jowar and the rest to the two cash-crops. On two of his plots having

medium-black soil (Plots 2.1 and 3.1) he follows the two-year rotation of G-C. In fact the land in these plots is well suited to the G-C-J rotation. But in order to restrict the area under jowar, he prefers the G-C rotation to the rotation of G-C-J. The averaged areas under different crops, over a rotation cycle, come to 2.51 acres under groundnut; 1.49 acres under cotton; and 1.26 acres under jowar. The area allocated to jowar is just enough to meet the yearly jowar requirement of his family. He reports that his annual requirement of jowar for the family consumption is about 23 maunds.

The crops grown and the area devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	2.05	G-J	Jowar	Groundnut	Jowar	Groundnut	
2.1	1.48	G-C	Groundnut	Cotton	Groundnut	Jowar (Cotton)	
3.1	1.00	G-C	Cotton (Groundnut)	Cotton (Groundnut)	Groundnut	Cotton	
3.2	0.75	G-C-J	Cotton	Jowar	Groundnut	Cotton	
Total :			Jowar	2.05	0.75	2.05	1.48
			Groundnut	1.48	2.05	3.23	2.05
			Cotton	1.75	2.48	-	1.75

It may be noted that the cultivator had grown crops mostly according to the accepted rotations. He deviated only on one plot each in 1960-61, 1961-62 and 1963-64. In the year 1960-61 he was required to deviate from groundnut to cotton on the plot of 1.00 acre. He reported that in this year he had comparatively larger quantity of the home-collected manure. He, therefore,

manured the plot of 0.75 acre, which was due for cotton, and also the plot of 1.00 acre which was to go under groundnut according to the rotation. Because of manuring he deviated on the plot of 1.00 acre and put it under cotton, instead of groundnut. In the next year (1961-62) also, he was required to deviate on the same plot and once again from groundnut to cotton. He reported that the cotton crop grown on this plot in 1960-61 failed because of some fungoid disease, and the manure which he had applied was not fully utilized. He, therefore, took the decision of repeating cotton on the same land in the next year (1961-62) by deviating from groundnut which was due according to the rotation. In 1963-64 he was required to deviate from cotton to jowar on the plot of 1.48 acres. This deviation was necessitated by his rotation-plan itself. According to the rotations followed on different plots, no area was due for jowar in this year. In order to make provision for jowar required for family consumption, he had to deviate on some area. He preferred to deviate for jowar on the plot of 1.48 acres, mainly because it was not manured in this year.

CASE STUDY K 10

Name	: G. H. C.	Family size	: 2 members
Age	: 28 years		
Education	: 4th standard	Earners	: Male Female Total
Caste	: Leva-Patidar		1 1 2
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,050
Subsidiary occupation	: Agricultural labour	Land-holding	: 5.88 acres
Livestock	:	Home-collected manure	: 20 cart-loads
Working	Milch	Young	Total
2	2	1	5

The total land-holding cultivated by this cultivator is 5.88 acres, of which 2.95 acres are from the village and the remaining, 2.93 acres, from the neighbouring village (Janori). The total area cultivated in the village comprises of two fragments. The details of the fragments of land and the crop-rotations practised on these are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.60	1.1	1.60	Medium-black	G-C
2	1.35	2.1	1.35	Medium-black	G-C-J
3	2.93	3.1	1.75	Light	G-C-J
		3.2	1.18	Light	G-J

The rotation-plan formulated by this cultivator shows his marked preference for the cash-crops. This is mainly because of the two basic factors. Firstly, his annual requirement of jowar is quite small (9 maunds) as his family is of two members only. Secondly, he has a comparatively large supply of home-collected manure from his livestock. Because of such a large supply of manure (20 cart-loads) he grows cotton even on the lighter type of soil (Plot 3.1), by practising the three-year rotation of G-C-J on it. The areas under different crops, averaged over the period of rotation-cycle, come to 2.42 acres under groundnut; 1.83 acres under cotton; and 1.62 acres under jowar. The area allocated to jowar is more than sufficient to meet the yearly food needs of his family.

The cultivator owns a pair of bullocks, even though his land-holding is not big enough to provide sufficient work for it. He reports that he hires out the services of the pair to

supplement his income from agriculture. The fodder requirement of the livestock is rather heavy and is not met from the home-produced jowar stalks and groundnut plants. He reported that he is required to purchase fodder worth Rs.400 every year. The manure collected from the livestock is generally applied to the land every year.

The crops grown and the area put under each of these in the four years are shown below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.60	G-C	Groundnut	Cotton	Groundnut	Cotton
2.1	1.35	G-C-J	Cotton	Jowar	Groundnut	Cotton
3.1	1.75	G-C-J	Jowar	Groundnut	Cotton	Groundnut (Jowar)
3.2	1.18	G-J	Groundnut	Groundnut (Jowar)	Jowar	Groundnut
Total : Jowar			1.75	1.35	1.18	-
Groundnut			2.78	2.93	2.95	2.93
Cotton			1.35	1.60	1.75	2.95

The cropping pattern in the four years clearly points out that the cultivator had grown crops mostly according to the accepted rotations. In the four year period he was required to deviate on only two plots, one each in 1961-62 and 1963-64. In 1961-62 he was required to deviate from jowar to groundnut on the plot of 1.18 acres. The deviation was mainly caused by the rotation-plan itself. According to the plan jowar was due on two of his plots (Plots 2.1 and 3.2) in this year. His annual requirement of jowar for family consumption being small, he did not prefer to put all the due area under jowar. He took jowar

on 1.35 acre plot and preferred to deviate from it on the other plot of 1.18 acres. He had to deviate to groundnut even though it caused repetition of the crop, as the land in the plot is of very inferior quality. In 1963-64 also, he deviated from jowar to groundnut on the plot of 1.75 acres. He reported that in this year he leased-in 2.00 acres of land, which was of lighter soil. It was leased-in for a short-term of two years. Because of the short term lease he could not practise any rotation on it. He tried to exploit it to his maximum advantage by putting it under jowar to meet the annual food needs of his family, and devoted his own land entirely to the cash-crops. Thus, in 1963-64, he deviated from jowar on his own plot of 1.75 acres and took groundnut on it. He could have grown groundnut on the leased-in land as well, particularly when it was under jowar in the preceding year. But as he was not sure of getting the benefits of the rotation crop (groundnut) he did not grow it. He preferred to repeat jowar on the leased-in land and to deviate to groundnut on the owned land.

CASE STUDY K 11

Name	: P. M. C.	Family size	: 2 members
Age	: 55 years	Earners	: Male Female Total
Education	: Illiterate		1 1 2
Caste	: Leva-Patidar	Total income	: Rs.900
Main occupation	: Agriculture	(1962-63)	
Subsidiary occupation	: -	Land-holding	: 5.91 acres
Livestock	:	Home-collected	
Working Milch	Young Total	manure	: 8 cart-loads
2 - -	2		

The cultivator cultivates his own land of 5.91 acres. Of this, 0.83 acre is in the village and the remaining (5.08 acres), in the neighbouring village (Janori). The details of these two fragments of land and the crop-rotations followed on their plots are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	0.83	1.1	0.83	Medium-black	G-C-J
2	5.08	2.1	2.03	Medium-black	G-C
		2.2	1.50	Medium-black	G-C
		2.3	1.55	Light	G-J

It is interesting to note how this cultivator has formulated his rotation-plan, giving only the required area to jowar and the rest to the cash-crops. His annual requirement of jowar for the family consumption is of 9 maunds only, as his family is of two members. He, therefore, follows the two-year rotation of the cash-crops alone (G-C) on the major portion of his land-holding (Plots 2.1 and 2.2). He follows the rotations having jowar as one of the crops (G-C-J and G-J) on the remaining two plots (Plots 1.1 and 2.3). On the plot of 1.55 acres, he is required to follow the G-J rotation as the land in the plot is of lighter soil. The areas allocated to different crops, averaged over rotation cycle, come to 2.82 acres under groundnut; 2.04 acres under cotton; and 1.05 acres under jowar. The average area allocated to jowar is just enough to meet the annual food needs of his family.

The crops grown and the area put under each of these crops in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.83	G-C-J	Jowar	Groundnut	Cotton	Groundnut (Jowar)
2.1	2.03	G-C	Groundnut	Cotton	Groundnut	Cotton
2.2	1.50	G-C	Cotton	Groundnut	Cotton	Jowar (Groundnut)
2.3	1.55	G-J	Jowar	Groundnut	Jowar	Groundnut
Total : Jowar			2.38	-	1.55	1.50
Groundnut			2.03	3.88	2.03	2.38
Cotton			1.50	2.03	2.33	2.03

It can be seen that the cultivator had grown crops strictly according to the accepted rotations, except in 1963-64. In this year he was required to deviate on two plots (Plots 1.1 and 2.2). In fact on the first plot of 0.83 acre, the cultivator had sown jowar which was due according to the rotation but in the first week after sowing almost all the jowar seeds were eaten away by the wild pigeons attracted by the mango grove which was near the plot. The crop came up in a very scattered way, and the cultivator had to re-sow the land. He did not prefer to re-sow the same crop as it would have met the same evil. He, therefore, deviated to groundnut the seeds of which are relatively thicker in size and are not usually eaten by such birds. Because of this deviation the cultivator was required to deviate on one more plot of 1.50 acres. According to the rotation-plan jowar was due in 1963-64, only on the plot of 0.83 acre, where he could not grow it because of the wild pigeons. As he deviated from jowar to groundnut on this plot, he had to make provision for jowar on some other plot, in order to meet the food needs

of the family. In his circumstances in 1963-64, the plot of 1.50 acres was the most convenient plot 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 (Plot 2.3) and on the other, which was manured, it would have given poor yield (Plot 2.1). The cultivator, therefore, deviated on the plot of 1.50 acres and took jowar on it instead of groundnut which was due according to the rotation.

CASE STUDY K 12

Name	: M. S. C.	Family size	: 10 members
Age	: 56 years	Earners	: Male Female Total
Education	: 4th standard		2 2 4
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,650
Subsidiary occupation	: Agricultural labour	Land-holding	: 6.28 acres
Livestock	:	Home-collected manure	: 20 cart-loads
Working	Milch	Young	Total
2	2	3	7

The cultivated land-holding of this cultivator is of two fragments, one of 5.25 acres and the other of 1.03 acres. Both these fragments are owned by him. The details of these fragments and the crop-rotation practised on their different plots are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	5.25	1.1	2.40	Medium-black	C-J
		1.2	2.85	Medium-black	C-J
2	1.03	2.1	1.03	Medium-black	G-C-J

The rotation-plan of this cultivator appears to have been largely influenced by two factors : (1) the annual requirement of jowar for the family consumption; and (2) the supply of home-collected manure. The cultivator has a relatively big family and hence his annual requirement of jowar is also as large as 45 maunds. In order to meet such a large requirement of jowar, he is required to allocate larger area to jowar by accepting the rotations with jowar as one of the crops on all the plots of land-holding. The cultivator has an annual supply of 20 cart-loads of home-collected manure. Because of such a high supply of manure, the cultivator has a marked preference for cotton. It may be seen that the averaged areas under different crops, over the period of rotation cycle, come to 2.97 acres each under cotton and jowar; and 0.34 acre under groundnut. The area allocated to jowar is not enough to meet the entire food needs of the family. But in the circumstances the cultivator can devote only this much area to jowar.

The crops grown and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	2.40	C-J	Jowar	Cotton	Jowar	Wheat (Cotton)	
1.2	2.85	C-J	Cotton	Jowar	Cotton	Jowar	
2.1	1.03	G-C-J	Jowar	Groundnut	Cotton	Groundnut (Jowar)	
Total :			Jowar	3.43	2.85	2.40	2.85
			Groundnut	-	1.03	-	1.03
			Cotton	2.85	2.40	3.88	-
			Wheat	-	-	-	2.40

It may be noted that the cultivator had grown the crops

strictly according to the accepted rotations on all the plots, except in the year 1963-64. In this year he was required to deviate on two plots (Plots 1.1 and 2.1), because of the inadequate rainfall during the sowing season. The cultivator reported that on the plot of 2.40 acres he had sown cotton which was due according to the rotation-plan. But, because of insufficient rains after sowing, the crop came up in a scattered way and withered away within a fortnight. He made another attempt to grow the same rotation crop on it, by repeating cotton in the second sowing. This time the crop came up well but there was no further growth. It remained stunted. The cultivator retained the crop till the end of July, hoping that it will improve. But it did not show any progress and he had to remove it ultimately. By the time he removed the cotton crop, the sowing season of all the kharif crops had elapsed. He, therefore, had to keep the land fallow in the kharif season. In the rabi season the rains were favourable and hence he put this land under wheat. He, thus, deviated from cotton to wheat, even after making two attempts to grow the crop due as per the rotation. On the plot of 1.03 acres, the cultivator was required to deviate from jowar to groundnut, mainly to meet the family's consumption needs of groundnut. The cultivator reported that groundnut is one of the important items in their daily consumption as they prepare its curry and 'chatani' to consume along with jowar breads.

CASE STUDY K 13

Name	: E. V. C.	Family size	: 8 members
Age	: 25 years		
Education	: 7th standard	Earners	: Male Female Total
Caste	: Leva-Patidar		2 1 3
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,100
Subsidiary occupation	: Agricultural labour	Land-holding	: 6.58 acres
Livestock	:		
Working	Milch	Young	Total
2	1	-	3
		Home-collected manure	: 12 cart-loads

The total land-holding cultivated by the cultivator is of 6.58 acres, of which 3.58 acres are in the village and the remaining (3.00 acres) in the neighbouring village (Savkhed). The land-holding comprises of three fragments. The crop-rotations followed on different plots of the land-holding are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.78	1.1	1.38	Medium-black	G-J
		1.2	1.40	Medium-black	G-J
2	0.80	2.1	0.80	Medium-black	G-J
3	3.00	3.1	3.00	Light	G-J

The second fragment (0.80 acre) cultivated in the village has irrigation facility from an old well, jointly owned by the cultivator and his cousin brothers. His share in the ownership of the well is one-eighth. The cultivator, however, does not utilize water from the well to grow irrigated crops, mainly because his share is very small. Besides, the water supply in the well is very limited. He, therefore, prefers to grow dry

crops on this plot. The rotation-plan formulated by this cultivator is rather peculiar in the sense that he follows the G-J rotation on all the plots having medium-black soil. The cultivator reports that the land in these plots though of medium-black type is of inferior quality and is not much suited to cotton. He is, therefore, required to practise the G-J rotation on the entire area of his land-holding. As he follows the same rotation on all the plots, the averaged area under the two crops, over the period of rotation cycle, is 3.29 acres each under groundnut and jowar. The area allotted to jowar is larger than required to meet the yearly food needs (36 maunds) of the family. This is mainly because he is required to practise the G-J rotation all over the area of his land-holding.

The crops grown on different plots of the land-holding in the four years are presented below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.38	G-J	Groundnut	Jowar	Groundnut	Jowar
1.2	1.40	G-J	Groundnut	Jowar	Groundnut	Cotton (Jowar)
2.1	0.80	G-J	Jowar	Groundnut	Jowar	Cotton (Groundnut)
3.1	3.00	G-J	Jowar	Groundnut	Jowar	Groundnut
Total : Jowar			3.80	2.78	3.80	1.38
Groundnut			2.78	3.80	2.78	3.00
Cotton			-	-	-	2.20

It may be noted from the cropping that the cultivator grew crops strictly according to the G-J rotation on all the plots. In the last year only (1963-64) he was required to deviate from

the rotation on two plots (Plots 1.2 and 2.1). The deviations on both the plots were caused by a marked rise in the price of cotton in the year 1962-63. The cultivator reported that in 1962-63, he had grown only two crops (groundnut and jowar) strictly according to the rotation-plan. But in this year the price of cotton ruled very high throughout the post-harvesting period. It was between Rs.33 and Rs.37 per maund. He reported that all his cultivator friends who had taken cotton in that year were benefited to a considerable extent. In the following year (1963-64), therefore, the cultivator decided to devote some area to cotton and deviated on two of his plots (Plots 1.2 and 2.1) to grow cotton, in the place of jowar and groundnut which were due on the two plots respectively. Because of these deviations the area under jowar was brought down from 2.78 to 1.38 acres. This much area under jowar was not sufficient to meet his yearly food needs. He was, therefore, required to grow jowar as a mixed crop along with cotton.

CASE STUDY K 14

Name	: A. M. C.	Family size	: 6 members
Age	: 50 years	Earners	: Male Female Total
Education	: Illiterate		2 2 4
Caste	: Leva-Patidar	Total income	: Rs.2,280
Main occupation	: Agriculture	(1962-63)	
Subsidiary occupation	: Agricultural labour	Land-holding	: 6.63 acres
Livestock	:	Home-collected	
Working	Milch Young Total	manure	: 12 cart-loads
-	2 2 4		

The cultivator cultivates only his owned land of 6.63 acres. It is a single fragment. The details of the fragment and the crop-rotation followed on its different plots are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	6.63	1.1	2.00 to 3.20	Light	G-C-J
		1.2	1.70 to 3.00	Medium-black	G-C-J
		1.3	1.43 to 2.63	Medium-black	G-C-J

The cultivator follows a single rotation of G-C-J on the entire area of his land-holding. He reports that he divides his fragment of land into three plots every year and grows the three crops included in the rotation. Between the three crops, however, he has a clear preference for groundnut. He maintains that groundnut is a less risky crop and gives a steady income from land. He does not prefer cotton firstly because it is more risky than groundnut as it is susceptible to various diseases and pests; and secondly, it requires manure, the supply of which is limited with him. Considering all these points he prefers to devote relatively larger area under groundnut every year. Because of his preference for one crop in the rotation, he cannot keep the division of plots the same in all the years. He is required to change it in order to put larger area under groundnut. This can be seen from the cropping in the four years. The cultivator reports that his annual requirement of jowar for the family consumption is about 27 maunds. It is entirely met from home production of jowar.

The crops grown in the four years and the area devoted to each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.00 to 3.20	G-C-J	Groundnut (3.20)	Cotton (2.00)	Jowar (2.20)	Groundnut (2.63)
1.2	1.70 to 3.00	G-C-J	Cotton (1.70)	Jowar (2.00)	Groundnut (3.00)	Cotton (2.00)
1.3	1.43 to 2.63	G-C-J	Jowar (1.73)	Groundnut (2.63)	Cotton (1.43)	Jowar (2.00)
Total :			Jowar 1.73	2.00	2.20	2.00
			Groundnut 3.20	2.63	3.00	2.63
			Cotton 1.70	2.00	1.43	2.00

It can be seen from the cropping that the area put under groundnut was larger than that of the other two crops in all the years. According to the 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, the cultivator put 2.63 acres under groundnut, 0.90 acre more than the due area. In fact, on the 0.90 acre area jowar was due according to the rotation. But this area was put under groundnut. On this area of 0.90 acre, therefore, there occurred a deviation from jowar to groundnut. Similarly, the whole area under groundnut in 1960-61 (3.20 acres) was due for cotton in the following year. But in 1961-62 he grew cotton on 2.00 acres only. The remaining area (1.20 acres) was put under jowar, thus causing a deviation from cotton to jowar. Such deviations occurred in the remaining years as well. It can be seen that the accepted rotation of G-C-J was followed strictly on 4.23 acres only. The rest of the area of his land-holding (2.40 acres) was subjected to deviations, both of cross-cropping and the interplay of other unaccepted rotations. All these

deviations occurred because of his preference for one of the crops (groundnut) included in the rotation.

CASE STUDY K 15

Name	: P. O. I.	Family size	: 12 members
Age	: 30 years	Earners	: Male Female Total
Education	: 6th standard		4 3 7
Caste	: Leva-Patidar		
Main occupation	: Tailoring	Total income (1962-63)	: Rs.1,850
Subsidiary occupation	: Agriculture	Land-holding	: 6.35 acres
Livestock	:		
Working	Milch 1	Young 1	Total 2
	-		
		Home-collected manure	: 8 cart-loads

The total land-holding of this cultivator is of a single fragment, having an area of 7.25 acres. Of this, 0.90 acre is uncultivable waste and the remaining area of 6.35 acres is cultivated. The cultivator has bought this fragment of land in 1957 and has taken to cultivation since then. He had no land till then and was entirely dependent on his occupations of tailoring and agricultural labour. The details of the fragment and the rotations followed on different plots of it are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	6.35	1.1	3.15	Light	G-J
		1.2	2.40	Medium-black	G-J
		1.3	0.80	Light	J-J-J

The cultivator is required to practise the two-year rotation of G-J on the major portion of his land-holding as the land

is of inferior type. In the second plot of 2.40 acres, the land, though reported as medium-black is nearer to lighter variety where no other crop except jowar and groundnut can be grown. The third plot of 0.80 acre is subject to constant erosion. Because of continuous erosion, the land in this plot has become so poor that except jowar no other crop can be grown on it. The cultivator, therefore, cannot follow any rotation on this plot. He practises single cropping of jowar and grows it mainly as a fodder crop.

The cultivator reported that his annual requirement of jowar for the family consumption is quite large (50 maunds) as he has a big family of 12 members. The entire requirement of jowar is not met from home-production, as his land-holding is comparatively small and is of inferior soil. On an average, he devotes about 2.78 acres of jowar every year but this much area falls short to meet his entire food needs. He is required to purchase jowar every year.

The crops grown in the four years and the area devoted to these are presented below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	3.15	G-J	Jowar	Groundnut	Jowar	Groundnut
1.2	2.40	G-J	Groundnut	Groundnut (Jowar)	Jowar	Groundnut
1.3	0.80	J-J-J	Jowar	Jowar	Jowar	Jowar
Total : Jowar			3.95	0.80	6.35	0.80
Groundnut			2.40	5.55	-	5.55

It may be noted that the cultivator has grown crops in all

the four years strictly as per the accepted rotation. The only exception to this was of a plot of 2.40 acres in the year 1961-62. In this year he deviated from jowar to groundnut on 2.40 acre plot. This deviation was caused by a sharp rise in the price of groundnut in the year 1960-61. The cultivator reported that in 1960-61 the price of groundnut was as high as Rs.25 to Rs.30 per maund. In this year he had grown groundnut only on 2.40 acres of his land. He sold his produce at Rs.28.40 per maund, and had benefited to a considerable extent. In the following year, therefore, he decided to devote larger area to groundnut, and took groundnut on 5.55 acres of his land, hoping that the high price will continue for this year as well. In order to put larger area under groundnut, he was required to deviate on the plot of 2.40 acres. He repeated groundnut on this plot, instead of growing jowar on it, which was due as per the rotation. Because of this deviation the area under jowar in this year went down to 0.80 acre only. And as pointed out earlier, jowar is grown on the 0.80 acre plot mainly as a fodder crop. This means the cultivator had practically no area under jowar to meet the food needs of the family.

CASE STUDY K 16

Name	: H. G. M.	Family size	: 2 members
Age	: 60 years	Earners	: Male Female Total
Education	: 4th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,500
Subsidiary occupation	: -	Land-holding	: 7.50 acres
Livestock	:		
Working	Milch Young Total	Home-collected manure	: -
-	- - -		

This is a medium cultivator, cultivating his own land-holding of 7.50 acres. His land-holding consists of five fragments, of which two are within the village and three in the neighbouring villages. Of the three fragments cultivated outside, two are in the village Savkhed and one in Rozode. The details of the fragments and the crop-rotations practised on each of these are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.25	1.1	2.25	Medium-black	G-C
2	1.60	2.1	1.60	Medium-black	G-J-C
3	1.32	3.1	1.32	Medium-black	G-C
4	1.00	4.1	1.00	Medium-black	G-J-C
5	1.33	5.1	1.33	Medium-black	G-C

The fifth fragment situated in Rozode has irrigation facility from an old well. The well is jointly owned by him and his three brothers. His share in its ownership is one-fourth. However, he does not put to use the available irrigation as there is an acute shortage of male-labour in his family. He is

quite old and there is nobody else in the family to look after cultivation. He reports that he cannot engage an attached servant as his land-holding is small to provide sufficient and year round work for such servant. In the circumstances, he prefers to grow dry crops even on the irrigable land of this plot.

It is interesting to see how this cultivator has formulated his rotation-plan, giving only the required area to jowar, and the rest, to cash-crops. His annual requirement of jowar is very small (9 maunds) as his family is of two members only. He, therefore, follows the two-year rotation of cash-crops alone, on a major portion (Plots 1.1, 3.1 and 5.1) of his land-holding. On the remaining two small plots (Plots 2.1 and 4.1) he follows the three-year rotation having jowar as one of the crops. The average area allocated to different crops, over the rotation cycle is 3.32 acres each to cotton and groundnut; and 0.87 acre, to jowar. The average area allocated to jowar is just enough to meet his yearly food needs. He has no supply of home-collected manure as he does not own any cattle. However, he purchases manure every year to apply it to the plots, due for cotton. He reports that because of his old age he does not keep any cattle and prefers to hire-in all the bullock-labour required for cultivation. The fodder of jowar stalks and groundnut vines produced in his land is sold every year.

The crops grown and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.25	G-C	Cotton	Groundnut	Cotton	Jowar (Groundnut)
2.1	1.60	G-J-C	Cotton	Groundnut	Jowar	Cotton
3.1	1.32	G-C	Cotton	Groundnut	Cotton	Groundnut
4.1	1.00	G-J-C	Jowar	Cotton	Groundnut	Wheat (Jowar)
5.1	1.33	G-C	Groundnut	Cotton	Groundnut	Cotton
Total : Jowar			1.00	-	1.60	2.25
Groundnut			1.33	5.17	2.33	1.33
Cotton			5.17	2.33	3.57	2.92
Wheat			-	-	-	1.00

It can be seen that the cultivator had grown crops strictly according to the rotation-plan, except in 1963-64. In the year 1963-64, he was required to deviate on two plots (Plots 1.1 and 4.1) because of the inadequate rainfall during the sowing season of that year. On the first plot of 2.25 acres, he had sown groundnut which was due on it as per the rotation-plan; but because of insufficient rains, the seeds did not germinate properly and the crop came up in a very scattered way. He could not re-sow the same crop as he did not have groundnut-seeds any more, and could not purchase, as the price was quite high. In the circumstances, he preferred to sow jowar on this plot, the seeds of which were available with him. Similar was the case on the other plot. He had sown jowar, which was due on this plot according to the plan; but the crop came up in a scattered way and withered away within a fortnight. He sowed jowar on it for the second time. This time the crop came up well, but there

was no satisfactory growth. The crop 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, the sowing season of all the kharif crops had elapsed. He, therefore, had to keep the land fallow in the kharif season and took wheat in the rabi season. He, thus deviated from jowar to wheat, even after making two attempts to grow the crop due as per the rotation-plan.

CASE STUDY K 17

Name	: L. K. M.	Family size	: 5 members
Age	: 45 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,225
Subsidiary occupation	: Agricultural labour	Land-holding	: 5.40 acres
Livestock	:	Home-collected manure	: -
Working	Milch Young Total		
-	- - -		

The total land-holding cultivated by the cultivator is of 5.40 acres, of which 4.40 acres are owned and the remaining area of 1.00 acre is leased-in. It has been leased-in since 1952 for the cash rent of Rs. 50 per year. The rotation-plan of the cultivator practised on different plots of his land-holding is presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	4.40	1.1	2.80	Medium-black	G-C
		1.2	0.80	Light	G-J
		1.3	0.80	Light	G-J
2	1.00	2.1	1.00	Light	G-J

It may be seen that the rotation-plan of the cultivator is much influenced by the lighter type of soil which occupies nearly half of the area of his total land-holding. On such areas of light soil, he is required to practise the two-year rotation of G-J. On the remaining portion of the land-holding, however, the cultivator follows the two-year rotation of cash-crops alone (G-C) as it is of medium-black soil. Besides, his annual requirement of jowar for the family consumption is relatively small (23 maunds) and can be met from jowar grown on the plots of lighter soil. The averaged area under different crops, over a rotation cycle, comes to 2.70 acres under groundnut; 1.40 acres under cotton and 1.30 acres under jowar. The average area under jowar is just enough to meet the yearly food needs of the family.

The crops grown and the areas devoted to these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.80	G-C	Cotton	Groundnut	Cotton	Groundnut
1.2	0.80	G-J	Jowar	Groundnut	Jowar	Groundnut
1.3	0.80	G-J	Groundnut	Jowar	Groundnut	Jowar
2.1	1.00	G-J	Jowar	Groundnut	Jowar	Groundnut
Total : Jowar			1.80	0.80	1.80	0.80
Groundnut			0.80	4.60	0.80	4.60
Cotton			2.80	-	2.80	-

It is interesting to note that in all the four years the cultivator had grown his crops strictly as per the accepted rotations. There was no deviation on any of the plots in any year.

Another point to be noted is that the cultivator grows cotton even though he does not have any supply of home-collected manure. He reports that he purchases manure to apply to his land whenever cotton is due on the plot of 2.80 acres.

In the last two years (1962-63 and 1963-64) the cultivator had leased-in about 2.25 acres of land on the basis of share rent. The leasing-in of this land, however, did not affect his usual rotation-plan on his cultivated land-holding.

CASE STUDY K 18

Name	: D. I. C.	Family size	: 6 members
Age	: 50 years	Earners	: Male Female Total
Education	: 3rd standard		2 1 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,300
Subsidiary occupation	: Agricultural labour	Land-holding	: 8.46 acres
Livestock	:		
Working	Milch	Young	Total
2	1	1	4
		Home-collected manure	: 15 cart-loads

The cultivator cultivates his owned land of 8.46 acres. His land-holding comprises of two fragments, one having an area of 7.53 acres and the other, only 0.93 acre. The details of these fragments and the crop-rotations followed on their different

plots are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	7.53	1.1	1.13 to 2.00	Light	G-J
		1.2	2.75 to 3.55	Medium-black	G-C
		1.3	2.33 to 3.65	Medium-black	C-J
2	0.93	2.1	0.93	Medium-black	G-C-J

The cultivator divides his larger fragment of land into three plots and practises three different two-year rotations on them. Between the three crops included in these rotations, he has a marked preference for cotton. This is mainly because he has a large supply of home-collected manure. Because of such a preference for cotton, he cannot keep the division of the three plots uniform in all the years. In order to devote larger area to cotton he is required to change the division of plots every year. The area under different crops averaged over the rotation-cycle, comes to 3.51 acres under cotton; 2.67 acres under groundnut; and 2.26 acres under jowar. The area allocated to jowar is more than enough to meet his yearly needs of jowar for family consumption. He reports that his annual requirement of jowar for the family consumption is about 27 maunds.

The crops grown in the four years and the area devoted to these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.13 to 2.00	G-J	Groundnut	Jowar	Groundnut	Jowar
			(1.60)	(1.25)	(2.00)	(1.13)
1.2	2.75 to 3.55	G-C	Cotton	Groundnut	Cotton	Groundnut
			(3.55)	(2.75)	(3.20)	(2.75)
1.3	2.33 to 3.65	C-J	Jowar	Cotton	Jowar	Cotton
			(2.38)	(3.53)	(2.33)	(3.65)

2.1	0.93	G-C-J	Jowar	Groundnut	Cotton	Groundnut (Jowar)
Total :	Jowar		3.31	1.25	2.33	1.13
	Groundnut		1.60	3.68	2.00	3.68
	Cotton		3.55	3.53	4.13	3.65

It may be seen that in all the four years the area devoted to cotton was larger than that of the other crops. Such a preference to one of the crops in the rotations had caused all sorts of deviations on the three plots of his fragment. The deviations were of the same type as we have seen the Case Study K 14. In the year 1963-64, the cultivator was required to deviate on his second fragment of 0.93 acre. He reported that he wanted more cash-income in this year to repay the loan, drawn for reconstructing the portion of his house which had collapsed in 1962-63. In this year, therefore, he devoted a major portion of his land (7.33 out of 8.46 acres) to the cash-crops. In this attempt he was required to deviate from jowar to groundnut on the plot of 0.93 acre. Because of this deviation, his jowar area in this year went down to 1.13 acres only and was not enough to meet the yearly food needs of the family. But in view of the immediate cash needs he was required to curtail the area under jowar in order to grow more cash-crops.

CASE STUDY K 19

Name	: P. B. N.	Family size	: 11 members
Age	: 36 years	Earners	: Male Female Total
Education	: 4th standard		2 2 4
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,400
Subsidiary occupation	: Hotel	Land-holding	: 10.33 acres
Livestock	:		
Working	Milch	Young	Total
2	2	2	6
		Home-collected manure	: 22 cart-loads

The total land-holding cultivated by the cultivator is of 10.58 acres. Of this, 0.25 acre is uncultivable waste. The rest of the area (10.33 acres), therefore, constitutes the cultivated land-holding. It comprises of three fragments of which one is in the village and the other two in the two neighbouring villages (Janori and Kalmode). The details of the fragments and the rotations practised on their plots are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	5.73	1.1	2.40	Medium-black	G-C-J
		1.2	2.23	Light	G-J
		1.3	1.10	Light	J-J-J
2	3.10	2.1	3.10	Light	G-J
3	1.50	3.1	1.50	Light	G-J

It may be seen that the rotation-plan formulated by this cultivator is highly influenced by the lighter type of soil. More than three-fourths of his land-holding is of lighter soil where the G-J rotation only can be followed. The remaining portion

of the holding (2.40 acres) is of medium-black soil, where the cultivator practises the three-year rotation of G-C-J. The cultivator has a large supply of home-collected manure but his land is such that he cannot utilize profitably the available manure. In fact because of this type of land-holding he keeps a large livestock. He reports that as he is constrained to grow jowar and groundnut on a major portion of his land-holding, he gets a large quantity of fodder every year. In order to utilize this supply of fodder more profitably, he has kept a large livestock. The area under different crops, averaged over a rotation-cycle, comes to 5.33 acres under jowar; 4.23 acres under groundnut; and 0.30 acre under cotton. The area allocated to jowar is more than sufficient to meet his yearly food needs of the family. His annual consumption needs of jowar for the family are about 45 maunds.

The crops grown in the four years and the area devoted to these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	2.40	G-C-J	Jowar	Groundnut	Cotton	Jowar	
1.2	2.23	G-J	Jowar	Groundnut	Jowar	Groundnut	
1.3	1.10	J-J-J	Jowar	Jowar	Jowar	Jowar	
2.1	3.10	G-J	Groundnut	Jowar	Groundnut	Jowar	
3.1	1.50	G-J	Groundnut (Jowar)	Groundnut (Jowar)	Jowar	Groundnut	
Total :			Jowar	5.73	4.20	4.83	6.60
			Groundnut	4.60	6.13	3.10	3.73
			Cotton	-	-	2.40	-

It can be seen from the cropping that the cultivator has grown his crops as per the rotation in all the four years. In the first two years only (1960-61 and 1961-62) he was required to deviate on one plot of 1.50 acres. In the year 1960-61, the deviation was necessitated because of the rotation-plan itself. Because of the rotation-plan, a major portion of the land-holding was due only for jowar in this year. Of the total area of 10.33 acres, 7.23 acres were due for jowar and only 3.10 acres for groundnut. In order to correct the imbalance between the two crops, he was required to deviate from jowar to groundnut on the plot of 1.50 acres. In the following year (1961-62) he was required to deviate on the same plot and once again from jowar to groundnut. The cultivator reported that the groundnut crop which he took on this plot in the preceding year (1960-61) failed because of the fungous disease. He, therefore, repeated the same crop (groundnut) in the following year (1961-62). This caused deviation from jowar to groundnut on the same plot.

The cultivator reports that his fodder requirement of the owned livestock is pretty heavy; but it is entirely met from the home produced fodder of jowar stalks and groundnut plants. The home-collected manure from the owned livestock is sold every year.

CASE STUDY K 20

Name	: W. Y. P.	Family size	: 4 members
Age	: 45 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.2,550
Subsidiary occupation	: Agricultural labour	Land-holding	: 11.74 acres
Livestock	:	Home-collected manure	: 22 cart-loads
Working	Milch 2	Young 2	Total 6

The land-holding cultivated by this cultivator is of 11.74 acres, of which 8.81 acres are owned and the rest, 2.93 acres are leased-in on the basis of cash-rent. The total land-holding consists of six fragments. Of these, five fragments having an area of 8.29 acres are cultivated in the village and the remaining one of 3.45 acres is in the neighbouring village (Kalmode).

The rotation-plan of the cultivator is presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	3.45	1.1	3.45	Medium-black	G-C
2	1.83	2.1	1.83	Medium-black	G-C-J
3	1.38	3.1	1.38	Medium-black	G-C-J
4	0.90	4.1	0.90	Medium-black	G-C-J
5	2.93	5.1	2.93	Medium-black	G-C-J
6	1.25	6.1	1.25	Light	G-J

It may be seen that in the total land-holding of this cultivator, the medium-black land predominates. More than 90 per cent of the total area of his land-holding is of such land.

In the rotation-plan of the cultivator, therefore, the three-year rotation of G-C-J dominates, as it is the most suited rotation to the medium-black type of land. In view of his annual food needs, the cultivator, in fact, could have restricted the area allocation to jowar at a lower level and have followed the rotation of the cash crops alone (G-C) on the major portion of his land. His yearly requirement of jowar for the family consumption is relatively small (18 maunds). But his annual requirement of fodder for the owned livestock is quite heavy, and in order to meet it from home-production, he is required to allocate comparatively larger area to jowar. It is interesting to see how this cultivator has taken a composite view of all the basic factors--his resources like land, soil type, supply of manure etc., and his requirements of food, fodder and cash. The area under different crops, averaged over the rotation-cycle, comes to 4.69 acres under groundnut; 4.07 acres under cotton; and 2.97 acres under jowar.

The crops grown and the areas devoted to these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	3.45	G-C	Groundnut	Cotton	Groundnut	Cotton
2.1	1.83	G-C-J	Jowar	Groundnut	Cotton	Groundnut (Jowar)
3.1	1.38	G-C-J	Jowar	Groundnut	Cotton	Groundnut (Jowar)
4.1	0.90	G-C-J	Groundnut	Cotton	Jowar	Cotton (Groundnut)
5.1	2.93	G-C-J	Cotton	Jowar	Groundnut	Jowar (Cotton)
6.1	1.25	G-J	Jowar	Groundnut	Jowar	Groundnut

Total : Jowar	4.46	2.93	2.15	2.93
Groundnut	4.35	4.46	6.38	4.46
Cotton	2.93	4.35	3.21	4.35

The cultivator had grown his crops strictly as per the rotation-plan in all the years except in 1963-64. In the year 1963-64, he was required to deviate on four of his plots. On two plots (Plots 2.1 and 3.1) he deviated from jowar to groundnut. He reported that he had heavily manured these two plots in the preceding year (1962-63) and in order to utilize the residuals of that manure in a better way he decided to grow groundnut on both of these in the following year. He, thus, took groundnut on both the plots in 1963-64, instead of jowar which was due as per the rotation-plan. On the plot of 0.90 acre (Plot 4.1) he deviated from groundnut to cotton as he manured this plot in 1963-64. He reported that his annual supply of home-collected manure (22 cart-loads) was not sufficient to manure all the area (Plots 1.1 and 5.1) due for cotton in the year 1963-64. He, therefore, manured one of these two plots (Plot 1.1) having a larger area. The rest of the manure he applied to the small plot of 0.90 acre, and put it under cotton. He was, thus, required to deviate from groundnut to cotton on this plot mainly because of manuring. On the plot of 2.93 acres (Plot 5.1) he was required to deviate from cotton to jowar. As stated earlier, he could not manure the plot in this year and hence the deviation from cotton to jowar. Besides, he had no other plot where he could take jowar to meet the yearly food needs of the family. In the case of this cultivator it is interesting to see how manuring causes deviations on different plots.

CASE STUDY K 21

Name	: P. B. B.	Family size	: 6 members
Age	: 35 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,700
Subsidiary occupation	: Agricultural labour	Land-holding	: 10.88 acres
Livestock	:		
Working	2	Milch	1
		Young	-
		Total	3
		Home-collected manure	: 12 cart-loads

The total land-holding cultivated by the cultivator is 10.88 acres, of which 4.05 acres are owned and 6.83 acres are leased-in. The leased-in portion of the land-holding is of two fragments. Of these one having an area of 3.60 acres is leased-in on the basis of a cash-rent of Rs.300 per year. The other fragment of 3.23 acres is leased-in for one half share in the yield. The decision regarding crops to be grown on this plot is of the owner of the land. The cultivator is expected only to cultivate the crops decided by him. Besides these two leased-in fragments, he had leased-in one more fragment of 1.18 acres since 1952. In 1963-64, however, he was required to return this land to its owner who wanted it to cultivate himself. The details of the owned and leased-in fragments and the crop-rotations followed on different plots are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	4.05	1.1	1.60	Medium-black	G-C
		1.2	1.75	Medium-black	G-C
		1.3	0.70	Medium-black	G-C
2	3.60	2.1	3.60	Medium-black	G-J
3	3.23	3.1	3.23	Medium-black	G-C

The details of the fragment of 1.18 acres which was returned to its owner in 1963-64 are as follows:

1	1.18	1.1	1.18	Medium-black	G-J-C
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The cultivator reports that irrigation facility is available on his owned fragment. There is an old well in it, jointly owned by the cultivator and his two brothers. The cultivator's share in its ownership is one-third. The water supply in the well, however, is very limited and hence the cultivator does not grow any irrigated crops on this land. It may be noted that the entire land-holding of this cultivator is of medium-black land. The rotation-plan formulated by the cultivator is also interesting, in the sense that he has concentrated only on the cash-crops on his owned land and tries to meet his family food needs by following a rotation with jowar on the leased-in land. This is possible mainly because his annual requirement of jowar for the family consumption is relatively small (26 maunds). The two-year rotation reported on the leased-in fragment of 3.23 acres is determined by the owner of the land. The area under different crops, averaged over a rotation cycle, comes to 5.44 acres under groundnut; 3.64 acres under cotton; and 1.80 acres under jowar.

The crops grown on different plots in the four years and the area devoted to these crops are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.60	G-C	Groundnut	Cotton	Groundnut	Cotton
1.2	1.75	G-C	Groundnut	Cotton	Groundnut	Cotton
1.3	0.70	G-C	Groundnut	Cotton	Groundnut	Jowar (Cotton)
2.1	3.60	G-J	Jowar	Groundnut	Jowar	Groundnut
3.1	3.23	G-C	Cotton	Groundnut	Cotton	Groundnut
Total : Jowar			3.60	-	3.60	0.70
Groundnut			4.05	6.83	4.05	6.83
Cotton			3.23	4.05	3.23	3.35

The crops grown on the fragment of 1.18 acres, in the first three years are as follows:

		1960-61	1961-62	1962-63	1963-64
1.1	1.18	Groundnut	Jowar	Cotton	-

It may be noted that in all the four years the cultivator has grown the crops strictly as per rotation-plan, except on one plot of 0.70 acre in 1963-64. In this year, he was required to deviate from cotton to jowar. This deviation was caused mainly because of the leased-in land which he had to return in this year to its owner. He reported that he had leased-in one fragment of 1.18 acres since long on the basis of cash-rent. It was under his cultivation till 1962-63. In the year 1963-64, however, the tenancy case went against him and he had to return the land to its owner. According to the rotation-plan, jowar was due only on this land in 1963-64, but as it was returned to its owner he was required to make provision for it on the land of other plots. He, therefore, deviated on one small plot of 0.70 acre and grew jowar instead of cotton on it. This much area under jowar was not sufficient to meet his yearly food needs. In this year,

therefore, he was required to grow jowar as a mixed crop along with cotton, to supplement the production of jowar. In the year 1961-62 he had grown jowar on the leased-in plot of 1.18 acres which he had to return to the owner of the land in 1963-64.

CASE STUDY K 22

Name	: R. T. W.	Family size	: 7 members
Age	: 33 years	Earners	: Male Female Total
Education	: 7th standard		1 2 3
Caste	: Leva-Patidar	Total income	: Rs.1,500
Main occupation	: Agriculture	(1962-63)	
Subsidiary occupation	: Agricultural labour	Land-holding	: 6.60 acres
Livestock	:		
Working	Milch	Young	Total
2	3	1	6
		Home-collected manure	: 22 cart-loads

The total land-holding cultivated by the cultivator is of 6.60 acres, of which 5.00 acres are owned; and 1.60 acres are leased-in. The land-holding comprises of two fragments. He has leased-in the fragment of 1.60 acres from his widow sister for the cash-rent of Rs.65 per year. The fragment is under his cultivation since long and he could practise a rotation on it according to his plan. The cultivator reports that he usually leases-in lands every year for a short period of a year or two. Because of the short period lease he cannot follow any rotation-plan on such lands. In 1962-63 he had leased-in 4.85 acres for the cash-rent of Rs.225. In 1963-64 also, he had leased-in

other 6.00 acres of land for the cash-rent of Rs.400. The details of the fragments which are under his cultivation for the entire period of four years and the rotations practised on such fragments are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	5.00	1.1	2.50	Light	G-J
		1.2	2.50	Light	G-J
2	1.60	2.1	1.60	Light	G-J

It may be noted that the entire land-holding of this cultivator is of light soil. Because of such soil, he is constrained to practise the two-year rotation of G-J on the entire area of his land-holding. The cultivator reports that his annual requirement of jowar for family consumption is of 32 maunds. It is invariably met from home production of jowar. His yearly requirement of fodder for the livestock is heavy and cannot be met from the home produced fodder. He is required to purchase fodder every year.

The crops grown on the different plots and the areas devoted to each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	2.50	G-J	Jowar	Groundnut	Jowar	Groundnut	
1.2	2.50	G-J	Groundnut	Jowar	Cotton (Groundnut)	Groundnut	
2.1	1.60	G-J	Groundnut	Jowar	Groundnut	Jowar	
Total :			Jowar	2.50	4.10	2.50	1.60
			Groundnut	4.10	2.50	1.60	5.00
			Cotton	-	-	2.50	-

In all the four years the cultivator has grown his crops as per the rotation-plan, except on one plot in the year 1962-63. In this year he deviated on the plot of 2.50 acres (Plot 1.2) and grew cotton instead of groundnut which was due according to the rotation-plan. This deviation was necessitated because of the leased-in land. The cultivator reported that in 1962-63, he, along with his two cultivator friends had leased-in 18.83 acres of land for a year only. On the basis of the crops grown on this land in the preceding year, they took the three major crops--jowar, groundnut and cotton--on three plots of it. Of the three crops groundnut claimed relatively larger area. The cultivator had grown groundnut on two other plots which he himself had leased-in. As more groundnut was grown on the leased-in land, he deviated from it on his own land of 2.50 acres where the same crop was due according to the rotation-plan. He deviated to cotton on this land even though it was of light soil. In fact the land in this plot was not suited for cotton but he took it on an experimental basis by applying a heavy dose of farmyard manure. However, he reported that he did not get satisfactory yield of cotton and his experiment was a failure. In the year 1963-64, he had leased-in 6.00 acres of land, of which 2.40 acres were put under cotton, 2.00 acres under jowar and 1.60 acres under groundnut. It is important to note that the crops grown on the leased-in land in this year did not affect his cropping on the owned land-holding.

CASE STUDY K 23

Name	: N. N. M.	Family size	: 12 members
Age	: 48 years		
Education	: 4th standard	Earners	: Male Female Total
Caste	: Leva-Patidar		3 2 5
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,550
Subsidiary occupation	: Agricultural labour	Land-holding	: 8.83 acres
Livestock	:		
Working	Milch 2	Young -	Total 2
		Home-collected manure	: 8 cart-loads

The owned land-holding of this cultivator is of 14.16 acres. In 1963-64, however, he leased-out two of his fragments having a total area of 5.33 acres. Therefore, the area of land-holding which remained under the cultivation of the cultivator for the entire period of four years was 8.83 acres only. This land-holding comprises of two fragments, of which one (2.83 acres) is in the village and the other (6.00 acres) in the neighbouring village (Savkhed). The details of these fragments and the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.83	1.1	2.83	Light	G-J
2	6.00	2.1	2.80	Light	G-J
		2.2	3.20	Medium-black	G-C-J

The details of the two fragments which were leased-out in 1963-64 are given below:

1	3.50	1.1	3.50	Medium-black	G-J-C
2	1.83	2.1	1.83	Medium-black	G-C-J

It may be noted that the rotation-plan formulated by the cultivator shows a marked emphasis on the cultivation of jowar. He follows the rotations with jowar on all the fragments of his land-holding. This is mainly because he has a big family of 12 members and requires about 50 maunds of jowar to meet the food needs of the family. The area allotted to jowar, averaged over a rotation-cycle, comes to 5.66 acres. This much area is enough to meet the yearly food needs of the family. The area under other crops, averaged over a rotation-cycle, comes to 5.65 acres under groundnut and 2.85 acres under cotton.

The crops grown on different plots of the holding in the four years and the areas devoted to each of these are given below:

Plot	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.83	G-J	Jowar	Groundnut	Jowar	Groundnut
2.1	2.80	G-J	Groundnut	Jowar	Jowar (Groundnut)	Jowar (Groundnut)
2.2	3.20	G-C-J	Jowar	Groundnut	Cotton	Jowar
Total : Jowar			6.03	2.80	5.63	6.00
Groundnut			2.80	6.03	-	2.83
Cotton			-	-	3.20	-

The crops grown on the two fragments, leased-out in 1963-64 are given below:

			1960-61	1961-62	1962-63	1963-64
1.1	3.50	G-J-C	Jowar	Cotton	Groundnut	-
2.1	1.83	G-C-J	Cotton	Jowar	Groundnut	-

It may be seen from the cropping that the cultivator had taken his crops mostly according to the rotation-plan. He was required to deviate on the plot of 2.80 acres in the last two

years (1962-63 and 1963-64). In the year 1962-63, the deviation was necessitated by the rotation-plan itself. According to the rotation-plan itself, a large portion of the land-holding was due only for cash-crops in 1962-63. Only one plot of 2.83 acres was due for jowar in this year. The cultivator reported that this much area was not adequate to meet the yearly food needs of his family. He was, therefore, required to deviate on one of his other plot to make provision for jowar. He deviated on the plot of 2.80 acres and took jowar instead of groundnut which was due on it. In the following year also (1963-64) he deviated on the same plot and once again from groundnut to jowar. This deviation, however, was caused by the inadequate rainfall during the sowing season of that year. The cultivator reported that in this year he had sown groundnut on this plot according to the rotation-plan. But the rains after sowing were very inadequate and hence the groundnut-seeds did not sprout properly. The crop came up in a very scattered way. The cultivator had to re-sow the land. He could not re-sow groundnut as he had no stock of groundnut seeds and could not purchase it because of its high price. In the circumstances he preferred to deviate to jowar on this plot. In this year, the area devoted to jowar was also short as he had leased-out two of his fragments.

CASE STUDY K 24

Name	: D. B. C.	Family size	: 8 members
Age	: 48 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.2,550
Subsidiary occupation	: Agricultural labour	Land-holding	: 8.32 acres
Livestock	:		
Working	2	Milch	1
		Young	1
		Total	4
		Home-collected manure	: 15 cart-loads

The total land-holding cultivated by the cultivator is of 8.32 acres which he owns. The land-holding consists of six fragments. The details of the fragments and the rotation-plan formulated by the cultivator are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.15	1.1	1.15	Medium-black	G-J
2	1.93	2.1	1.93	Medium-black	G-C
3	1.48	3.1	1.48	Medium-black	G-C
4	0.98	4.1	0.98	Medium-black	C-J
5	1.85	5.1	1.85	Medium-black	G-J-C
6	0.93	6.1	0.93	Medium-black	G-J-C

It may be noted that the entire land-holding of the cultivator is of medium-black land. In the case of this cultivator, it is interesting to see how he has formulated his rotation-plan giving only the required area to jowar, and the rest to the cash-crops. He has taken a composite view of all the basic factors like land-holding, different grades of medium-black land,

supply of home-collected manure and the food and fodder requirements. It may be noted that on the medium-black land which is nearer to light he has followed the two-year rotation of G-J (Plot 1.1) and on the medium-black land which is nearer to deep-black he follows the two-year rotation of C-J (Plot 4.1). The area allotted to different crops, averaged over the rotation-cycle, comes to 3.20 acres under groundnut; 3.12 acres under cotton; and 1.99 acres under jowar. His annual requirement of jowar for the family consumption is of 35 maunds. The area allocated to jowar in the rotation-plan is, in fact, not adequate to meet the total food needs of the family. The cultivator, however, leases-in land almost every year and grows jowar on it. If he does not get any land to lease-in he grows jowar as a mixed crop along with cotton, to meet the yearly requirement of jowar.

The crops grown on different plots and the areas devoted to these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.15	G-J	Groundnut	Jowar	Groundnut	Cotton (Jowar)
2.1	1.93	G-C	Cotton	Groundnut	Cotton	Jowar (Groundnut)
3.1	1.48	G-C	Groundnut	Cotton	Groundnut	Cotton
4.1	0.98	C-J	Jowar (Cotton)	Jowar (Cotton)	Cotton	Jowar
5.1	1.85	G-J-C	Jowar	Cotton	Groundnut	Cotton (Jowar)
6.1	0.93	G-J-C	Groundnut	Jowar	Cotton	Groundnut
Total : Jowar			2.83	3.06	-	2.91
Groundnut			3.56	1.93	4.48	0.93
Cotton			1.93	3.33	3.84	4.48

The cultivator has grown his crops as per the rotation-plan, on a major portion of the land-holding. He was required to deviate on some plots in different years. In 1960-61 he deviated on a small plot of 0.98 acre, as he could not manure the land in that year. The cultivator reported that he could not transport the manure to this plot as one of his bullocks died accidentally in that year. He could not arrange for another bullock immediately. As he could not apply manure to the land, he was required to deviate from cotton and took jowar on the plot. In the following year also (1961-62), he deviated on the same plot and once again from cotton to jowar. In this year also he could not manure the plot as the home-collected manure was inadequate to manure all the area due for cotton. The cultivator reported that 4.31 acres of land were due for cotton in this year and he had a supply of only 15 cart-loads of home-collected manure. He, therefore, manured only two plots of relatively larger size (Plots 3.1 and 5.1) and took cotton on them. He did not manure the small plot of 0.98 acre and hence had to repeat jowar on it instead of growing cotton which was due.

In the year 1963-64, he was required to deviate on three of his plots (Plots 1.1, 2.1 and 5.1). On two of the plots (Plots 1.1 and 5.1) he deviated from jowar to cotton. In this year he was in need of more cash income to pay his share of the cash-rent of the leased-in land. He reported that he along with his two cultivator friends had jointly leased-in 17.00 acres of land for the cash-rent of Rs.2,900. Because of such cash need he preferred to devote larger area of his land-holding to the

cash-crops and deviated from jowar to cotton on these two plots having a total area of 3.00 acres. The deviation on the third plot (Plot 2.1) was caused by the inadequate rainfall in the sowing season of that year. On this plot of 1.93 acres he had, in fact, sown groundnut according to the rotation-plan but seeds did not germinate properly as there was very inadequate rainfall after its sowing. The crop came up in a very scattered way and withered away within a fortnight. The cultivator could not re-sow groundnut as he had no stock of groundnut seeds. He, therefore, preferred to deviate to jowar on this plot.

This cultivator would have deviated in 1961-62 and 1962-63, but for the leased-in land. According to the rotation-plan, a very small area (1.93 acres) was due for groundnut in the year 1961-62. In this year deviations on some of the plots to devote larger area to groundnut were inevitable, but he averted those as he could jointly 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. In this year, all the area of his land-holding was due for cash-crops and there was no plot left to grow jowar. But in this year also, he along with his cultivator friends leased-in the same land of 17.00 acres and devoted a major portion of it to jowar. Thus, 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.

CASE STUDY K 25

Name	: L. C. J.	Family size	: 4 members
Age	: 38 years		
Education	: 4th standard	Earners	: Male Female Total
Caste	: Leva-Patidar		1 1 2
Main occupation	: Agriculture	Total income (1962-63)	: Rs.2,150
Subsidiary occupation	: -	Land-holding	: 13.03 acres
Livestock	:		
Working	Milch	Young	Total
2	1	1	4
			Home-collected manure
			: 14 cart-loads

The total land-holding cultivated by this cultivator is of 13.03 acres, of which 7.18 acres are owned and the rest (5.85 acres), is leased-in. The land-holding comprises of five fragments. Of these, three fragments having an area of 8.28 acres are in the village and the remaining two having an area of 4.75 acres are in the two neighbouring villages (Janori and Rozode). The details of the fragments and the rotation-plan formulated by the cultivator are presented below:

Fragment	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.43	1.1	2.43	Medium-black	G-C-J
2	3.75	2.1	1.75	Light	G-J
		2.2	2.00	Light	G-J
3	1.00	3.1	1.00	Medium-black	C-J
4	3.85	4.1	2.25	Medium-black	G-C
		4.2	1.60	Medium-black	G-C
5	2.00	5.1	2.00	Medium-black	G-C

The rotation-plan formulated by the cultivator has a marked bias towards the cultivation of cash-crops. It may be noted that

on three plots of medium-black soil, having a total area of 5.85 acres (Plots 4.1, 4.2 and 5.1), he follows the rotations of cash-crops alone. In fact the land in these plots is most suited to the three-year rotation of G-C-J. But in order to restrict the area under jowar and to allocate larger areas to the cash-crops he prefers to practise the rotations of cash-crops alone. On the remaining two plots of medium-black soil (Plots 1.1 and 3.1), he follows the rotations with jowar. On the two plots having lighter type of land (Plots 2.1 and 2.2) he is constrained to follow the two-year rotation of G-J. His annual requirement of jowar for family consumption is about 18 maunds. The averaged area allocated to jowar in the rotation-plan is 3.19 acres. It is higher in relation to the food needs of his family. This is largely because of the two fragments of lighter soil where he is required to follow the G-J rotation. The area allocated to the cash-crops, averaged over rotation cycle, comes to 5.61 acres under groundnut; and 4.23 acres under cotton.

The crops grown on different plots in the four years and the areas put under these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.43	G-C-J	Jowar	Groundnut	Cotton	Groundnut (Jowar)
2.1	1.75	G-J	Jowar	Groundnut	Jowar	Groundnut
2.2	2.00	G-J	Groundnut	Jowar	Groundnut	Jowar
3.1	1.00	C-J	Cotton (Jowar)	Jowar	Cotton	Cotton (Jowar)
4.1	2.25	G-C	Groundnut	Cotton	Groundnut	Cotton
4.2	1.60	G-C	Groundnut	Cotton	Groundnut	Jowar (Cotton)

5.1	2.00	G-C	Cotton	Groundnut	Cotton	Groundnut
Total :	Jowar		4.18	3.00	1.75	3.60
	Groundnut		5.85	6.18	5.85	6.18
	Cotton		3.00	3.85	5.43	3.25

The cultivator had grown his crops mostly as per the rotation-plan in all the four years. He was required to deviate on one plot (Plot 3.1) in 1960-61 and on three plots (Plots 1.1, 3.1 and 4.2) in 1963-64. In the year 1960-61, he deviated because of manuring. He reported that in this year, two acres only were due for cotton according to the plan. The supply of home-collected manure was of 14 cart-loads. Thus, the manure supply in this year was in excess to the area due for cotton. He, therefore, preferred to manure the small plot of 1.00 acre and deviated to cotton instead of growing jowar which was due on it. In 1963-64 also he deviated from jowar to groundnut on one plot (Plot 1.1) and to cotton on another plot (Plot 3.1). The cultivator reported that he had heavily manured the land in these two plots in the preceding year and put it under cotton. But the cotton crop failed because of some fungoid disease. In the following year, therefore, he decided to devote these two plots to the cash-crops to utilize fully the residual benefits of the manure applied. He, thus, deviated to groundnut on the plot of 2.43 acres (Plot 1.1) and repeated cotton on the other plot of 1.00 acre (Plot 3.1). In 1963-64 the cultivator was required to deviate on one more plot (Plot 4.2). The deviation was caused mainly because of the inadequate rainfall during the sowing season of that year. In fact the cultivator had sown cotton on this plot as it was due according to the rotation-plan.

But because of the insufficient rains after sowing the crop came up in a scattered way and withered away in the dry spell of June. Thus, the first sowing of cotton on this plot failed and the cultivator was required to re-sow the land. By the time he decided to re-sow the land, the sowing season of all the kharif crops except jowar, had elapsed. In the circumstances, therefore, he preferred to deviate to jowar which can be sown as late as the end of July.

CASE STUDY K 26

Name	: C. D. C.	Family size	: 9 members
Age	: 44 years	Earners	: Male Female Total
Education	: 6th standard		2 1 3
Caste	: Leva-Patidar	Total income	: Rs.3,250
Main occupation	: Agriculture	(1962-63)	
Subsidiary occupation	: Agricultural labour	Land-holding	: 15.64 acres
Livestock	:	Home-collected manure	: 22 cart-loads
Working	2	Milch	2
Young	2	Total	6

The owned land-holding of this cultivator is of 16.72 acres. In 1962-63, however, he leased-out his one fragment of land having an area of 1.08 acres. Therefore, the total area of land-holding, which remained under his cultivation for all the four years is 15.64 acres. Of this, 3.66 acres only are in the village and the remaining area of 11.98 acres, in the two neighbouring villages (Savkhed and Lohara). The cultivated holding of the cultivator consists of five fragments. The rotation-plan

formulated by the cultivator on different plots of the holding is presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	3.23	1.1	3.23	Medium-black	C-J
2	0.43	2.1	0.43	Medium-black	C-J
3	7.00	3.1	2.50	Medium-black	G-J
		3.2	4.50	Medium-black	G-C
4	4.98	4.1	4.98	Medium-black	G-J

It may be noted that the entire land-holding of the cultivator is of medium-black land. The rotation-plan of the cultivator is interesting in the sense that he follows two-year rotations on all the plots of his land-holding even though his land is most suited to the three-year rotation of G-C-J. It may be seen that in the rotation-plan there is a slightly more emphasis on the cultivation of jowar. This is mainly because of his high requirement of jowar to meet the food needs of the family. His yearly requirement of jowar for family consumption is about 40 maunds. The area under different crops, averaged over the rotation-cycle, comes to 5.57 acres under jowar; 5.99 acres under groundnut; and 4.08 acres under cotton. The area allocated to jowar is slightly higher than required to meet the annual food needs. This is largely because of his heavy fodder needs of his livestock. The area allocated to cotton is also high as he has a large supply of home-collected manure. In the case of this cultivator, it is interesting to see how he has taken a composite view of his resources and requirements while formulating the rotation-plan.

The crops grown on different plots of the land-holding and the areas devoted to these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	3.23	C-J	Jowar	Cotton	Jowar	Cotton
2.1	0.43	C-J	Wheat (Jowar)	Cotton	Jowar	Groundnut (Cotton)
3.1	2.50	G-J	Jowar	Groundnut	Jowar	Jowar (Groundnut)
3.2	4.50	G-C	Cotton	Groundnut	Cotton	Groundnut
4.1	4.98	G-J	Groundnut	Jowar	Groundnut	Jowar
Total : Jowar			5.73	4.98	6.16	7.48
Groundnut			4.98	7.00	4.98	4.93
Cotton			4.50	3.66	4.50	3.23
Wheat			0.43	-	-	-

The cultivator was required to deviate on one plot (Plot 2.1) in 1960-61 and on two plots (Plots 2.1 and 3.1) in 1963-64. The rest of the plots were put under different crops strictly according to the rotation-plan in all the four years. In 1960-61 he deviated on the small plot of 0.43 acre and took wheat instead of jowar to meet his family's consumption needs of wheat. In the year 1963-64, he deviated on the same plot, but this time the deviation was from cotton to groundnut. This deviation was mainly caused by the inadequate rainfall in the sowing season of the year. In fact he had sown cotton on it but because of scanty rains the crop did not come up well. It came up in a very scattered way and had to be removed ultimately. He removed it within a fortnight after sowing and re-sowed groundnut, the seeds of which were available with him. He took the decision of

re-sowing quite early and hence he could re-sow groundnut on it. In the same year he was required to deviate on one more plot of 2.50 acres (Plot 3.1) for the same reason. He had sown groundnut on this plot but it did not germinate properly and the crop came up in a scattered way. The cultivator retained the crop till the middle of July, hoping that it will improve. But the crop remained stunted and he had to remove it ultimately. By the time he took the decision of removing it, the sowing season of all the kharif crops except jowar had passed out. In the circumstances, therefore, he had to deviate to jowar.

CASE STUDY K 27

Name	: K. L. C.	Family size	: 2 members
Age	: 55 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,950
Subsidiary occupation	: -	Land-holding	: 12.78 acres
Livestock :			
Working	Milch	Young	Total
-	1	3	4
		Home-collected manure	: 10 cart-loads

The cultivator cultivates only his owned land of 12.78 acres. His land-holding consists of two fragments. The details of these fragments and the crop-rotations followed on different plots are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	7.33	1.1	3.00	Light	G-J
		1.2	4.33	Medium-black	G-J
2	5.45	2.1	5.45	Medium-black	C-C-C-J

The rotation plan of this cultivator is much influenced by the type of soil available in the land-holding. Thus, he is required to follow the two-year rotation of G-J on the first plot of 3.00 acres as the land is of lighter type. In the second plot of 4.33 acres also, the land though reported as medium-black, is nearer to lighter type. The cultivator, therefore, prefers to practise the same rotation of G-J on this plot as well. In the third plot of 5.45 acres, however, the land though medium-black, is superior in quality. The cultivator manures this land heavily and follows the four-year rotation of C-C-C-J. This is the only cultivator in the whole sample of Khirode, who grows cotton repeatedly for three years on the same land. The cultivator has a small family and his annual requirement of jowar for the family consumption is as low as 10 maunds. The area under different crops, averaged over the rotation-cycle, comes to 5.02 acres under jowar; 3.67 acres under groundnut; and 4.09 acres under cotton. The area allocated to jowar is considerably high in relation with his yearly food needs. This is mainly because of the lighter type of land where he is constrained to follow the G-J rotation.

The crops grown on different plots and the areas devoted to these in the four years are as follows:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	3.00	G-J	Jowar	Groundnut	Jowar	Groundnut
1.2	4.33	G-J	Groundnut	Cotton (Jowar)	Groundnut	Jowar
2.1	5.45	C-C-C-J	Cotton	Jowar	Groundnut (Cotton)	Cotton
Total : Jowar			3.00	5.45	3.00	4.33
Groundnut			4.33	3.00	9.78	3.00
Cotton			5.45	4.33	-	5.45

The cultivator has grown his crops in the four years mostly as per the rotation-plan. He was required to deviate on one plot each in 1961-62 and 1962-63. In the year 1961-62, the deviation was necessitated by the rotation-plan itself. In this year, because of the rotations only, the balance of area between the three crops got disturbed--more than three-fourths of the land (9.78 acres) becoming due for jowar alone. In the case of this cultivator, this happens every fourth year when jowar becomes due on two of his plots (Plots 1.2 and 2.1) according to the rotation-plan. Such was the case in 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. 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 deviate from jowar on one of the plots. He preferred to deviate from the G-J rotation on the plot of 4.33 acres and took cotton on it instead of jowar. He deviated to cotton so as to maintain the usual balance of area between the three crops. In

1962-63, he was required to deviate from cotton to groundnut on the plot of 5.45 acres. The cultivator reported that according to the rotation-plan, the next round of the four-year rotation was to begin on the plot in 1962-63 and it was due for cotton. He was to manure the land in this year. But he fell seriously ill and could not manure it. He could not transport even the home-collected manure to his land. He, therefore, could not put it under cotton and had to deviate. In the circumstances he preferred to deviate to groundnut which could be satisfactorily grown without manure.

CASE STUDY K 28

Name	: D. L. I.	Family size	: 9 members
Age	: 39 years	Earners	: Male Female Total
Education	: 6th standard		2 2 4
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.4,250
Subsidiary occupation	: -	Land-holding	: 20.91 acres
Livestock :		Home-collected manure	: 20 cart-loads
Working	Milch	Young	Total
2	2	1	5

This is a large cultivator, cultivating a land-holding of 20.91 acres. It is all owned by him. The land-holding comprises of four fragments comparatively of larger size. Of these, two fragments having an area of 9.78 acres are in the village and the remaining two, having an area of 11.13 acres are in the

neighbouring village (Janori). The details of the fragments and the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	7.03	1.1	5.83	Medium-black	G-C-J
		1.2	1.20	Light	G-C-B
2	2.75	2.1	2.75	Medium-black	G-C-J
3	3.48	3.1	2.28	Medium-black	G-C-J
		3.2	1.20	Light	G-C-B
4	7.65	4.1	6.45	Medium-black	G-C-J
		4.2	1.20	Light	G-C-B

The rotation-plan of this cultivator is very simple but interesting. The whole plan is of two types of rotations--G-C-J and G-C-B. He follows the three-year rotation of G-C-J on all his plots of medium-black land and the three-year rotation of G-C-B on all the plots of lighter land. It may be noted that even on the light soil he follows the rotation with cotton as one of the crops. This is possible mainly because he has a relatively large supply of home-collected manure. His rotation-plan is such that he devotes every year about one-third of his land-holding each to cotton, groundnut and jowar and bajara. The area allocated to these crops, averaged over the period of rotation-cycle, comes to 6.97 acres each under cotton and groundnut; and 5.77 acres under jowar; and 1.20 acres under bajara. He grows bajara every year mainly for fodder. The cultivator reported that the husk of bajara is very nutritive and is mainly given to the working cattle. His annual requirement of jowar for the family consumption is of 40 maunds. The area allocated to jowar is relatively larger than the area required by him to meet the food needs of the family.

The crops grown on different plots of the holding and the areas devoted to these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	5.83	G-C-J	Groundnut	Cotton	Jowar	Groundnut	
1.2	1.20	G-C-B	Groundnut	Cotton	Bajara	Groundnut	
2.1	2.75	G-C-J	Jowar	Groundnut	Cotton	Jowar	
3.1	2.28	G-C-J	Jowar	Groundnut	Cotton	Jowar	
3.2	1.20	G-C-B	Bajara	Groundnut	Cotton	Bajara	
4.1	6.45	G-C-J	Cotton	Jowar	Groundnut	Cotton	
4.2	1.20	G-C-B	Cotton	Bajara	Groundnut	Cotton	
Total :			Jowar	5.03	6.45	5.83	5.03
			Groundnut	7.03	6.23	7.65	7.03
			Cotton	7.65	7.03	6.23	7.65
			Bajara	1.20	1.20	1.20	1.20

It is important to note that in all the four years the cultivator had grown his crops on all the plots of the landholding strictly as per the rotation-plan. He did not deviate on any plot in any of the years. The cultivator reports that he prefers to practise his rotation-plan in the strict order. If a crop grown as per the rotation-plan fails in a year, he repeats the same crop invariably, and does not deviate from the rotation. So much so that if the repeated crop also fails, he keeps the land fallow for that year and takes next crop in the sequence in the following year. He is very particular in following the rotation-plan and the sequence of crops in the rotations. He has been practising this rotation-plan since long (15 to 20 years).

CASE STUDY K 29

Name	: S. J. C.	Family size	: 7 members
Age	: 25 years	Earners	: Male Female Total
Education	: 10th standard		3 1 4
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.4,040
Subsidiary occupation	: -	Land-holding	: 23.14 acres
Livestock	:		
Working	Milch 2	Young 2	Total 5
		Home-collected manure	: 18 cart-loads

This is a large cultivator, having a land-holding of 23.14 acres. It is entirely owned by him. The land-holding consists of seven fragments, of which six having a total area of 13.54 acres are in the village and one, having an area of 9.60 acres in the neighbouring village (Savkhed). In 1963-64, the cultivator sold one of his fragments having an area of 2.80 acres and bought two other fragments of 2.43 and 2.38 acres. However, the total area which was under his cultivation for all the four years was 23.14 acres. The details of the fragments of his land-holding and the rotation-plan formulated by him are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	4.55	1.1	4.55	Medium-black	G-C-J
2	2.40	2.1	2.40	Medium-black	C-J
3	1.63	3.1	1.30	Medium-black	W-J
		3.2	0.33	Medium-black	W-J
4	3.65	4.1	3.65	Medium-black	C-J
5	9.60	5.1	9.60	Medium-black	G-C
6	0.93	6.1	0.93	Medium-black	P-P-P
7	0.38	7.1	0.38	Medium-black	J-J-J

The cultivator reports that irrigation facilities are available on his third and fourth fragments. In the third fragment there is an old well jointly owned by the cultivator and his cousin brothers. His share in the ownership is one-fourth. But as the water supply in the well is limited, he mostly grows the light irrigated crops like wheat, gram, etc. Cultivation of the heavily irrigated crops is not possible at all on this land. More or less the same is the case of the other fragment. The well in this fragment, however, is wholly owned by the cultivator. But the supply of water in it is much limited and it is not possible to grow any irrigated crops on this land.

It may be noted that the entire land-holding of the cultivator is of medium-black land. In the case of this cultivator it is interesting to see how he has taken a composite view of all the factors like the land-holding, different grades of medium-black land in different plots, supply of the home-collected manure and the food, fodder requirements. It may be seen that on the plots having medium-black land tending more towards deep-black, he follows the rotations of C-J and W-J and on the plots having the ordinary type of medium-black land, he follows the rotations of G-C and G-C-J. The area under different crops averaged over the rotation-cycle, comes to 9.34 acres under cotton; 6.31 acres under groundnut; 5.86 acres under jowar; and 0.81 acre under wheat. The area allocated to jowar is considerably higher than required to meet the yearly food needs of the family. His annual requirement of jowar for family consumption is about 32 maunds. The cultivator reports that he is

required to allocate larger area to jowar mainly because of the constraint of manure supply.

The cultivator could not practise any crop-rotation on two of his plots (Plots 6.1 and 7.1) having comparatively smaller area. Both these plots have some peculiarities of their own, inhibiting the cultivator from following any rotation. Thus, the plot of 0.93 acre (Plot 6.1) has a peculiar topography of land. The cultivator reported that this plot is situated in the low lying area where the rain water from the neighbouring fields accumulates. The land remains under water intermittently till the end of August. Because of such situation of the land, he cannot grow any of the major kharif crops and follow any rotation. To utilize the peculiar situation of the plot to his advantage, the cultivator prefers to put it under continuous cropping of paddy. The other plot of 0.38 acre (Plot 7.1) is peculiar in its situation. It is very near to the village. Besides, it is a crematory ground for the Leva-Patidar caste. Because of its proximity to the village the cultivator cannot grow groundnut on it. He cannot grow cotton either because of two factors. Firstly, it is very small in size and hence uneconomical to put under cotton. Secondly, it is a crematory ground where females are reported to be rather afraid of going for picking. In the circumstances, the cultivator is required to put it under single cropping of jowar.

The crops grown on different plots of the land-holding and the areas devoted to these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	4.55	G-C-J	Cotton	Jowar	Groundnut	Cotton	
2.1	2.40	C-J	Cotton	Jowar	Cotton	Jowar	
3.1	1.30	W-J	Wheat	Wheat (Jowar)	Jowar	Jowar (Wheat)	
3.2	0.33	W-J	Wheat	Wheat (Jowar)	Jowar	Chillies (Wheat)	
4.1	3.65	C-J	Jowar	Cotton	Jowar	'Nawati' Banana (Cotton)	
5.1	9.60	G-C	Cotton	Groundnut	Cotton	Groundnut	
6.1	0.93	P-P-P	Paddy	Paddy	Paddy	Paddy	
7.1	0.38	J-J-J	Jowar	Jowar	Jowar	Jowar	
Total :			Jowar	4.03	7.33	5.66	4.08
			Groundnut	-	9.60	4.55	9.60
			Cotton	16.55	3.65	12.00	4.55
			Wheat	1.63	1.63	-	-
			Paddy	0.93	0.93	0.93	0.93
			'Nawati' banana	-	-	-	3.65
			Chillies	-	-	-	0.33

It can be seen from the cropping that the cultivator had grown his crops mostly as per the rotation-plan in all the four years. He deviated on two plots only (Plots 3.1 and 3.2) in 1961-62 and on three plots (Plots 3.1, 3.2 and 4.1) in 1963-64. In 1961-62, he deviated from jowar to wheat on both the plots having a total area of 1.63 acres. The cultivator reported that the wheat crop taken on these plots in the preceding year (1960-61) had completely failed. He, therefore, decided to repeat the same crop in the following year (1961-62). This caused deviation from jowar to wheat on the two plots. In 1963-64 also, the deviations occurred on the same two plots.

However, on one plot (Plot 3.1) he deviated from wheat to jowar and on the other (Plot 3.2) from wheat to chillies. The deviation from wheat to jowar was necessitated by the rotation-plan itself. It may be seen that according to the plan, only one plot of 2.40 acres was due for jowar in this year. This area was inadequate to meet the annual food needs of the family. He had to deviate for jowar on some plots of the holding. He preferred to deviate on the plot of 1.30 acres as it had irrigation facility, and was convenient to irrigate the jowar crop whenever needed. In 1963-64 particularly, because of the inadequate rains 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. On the second plot of 0.33 acre, he deviated to chillies to meet family's consumption needs of it. Because of the considerable rise in the prices of chillies, he thought it is better to produce it on one's own farm to meet the family consumption needs. This plot being nearer the well was very convenient to grow chillies. The third deviation reported in this year (1963-64) was from cotton to 'Nawati' banana on the plot of 3.65 acres (Plot 4.1). As pointed out earlier, in 1963 the cultivator purchased one fragment of 2.43 acres in which irrigation from a well was available. This fragment was nearer to his other fragments and it was possible for him to extend irrigation to these as well. In 1963-64, therefore, he deviated on the 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 land and was under jowar in the preceding year. It is generally believed that banana grown after jowar gives better yield.

CASE STUDY K 30

Name	: L. W. M.	Family size	: 7 members
Age	: 33 years	Earners	: Male Female Total
Education	: 10th standard		2 1 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.5,000
Subsidiary occupation	: -	Land-holding	: 35.54 acres
Livestock :		Home-collected manure	: 22 cart-loads
Working	2	Milch	2
Young	3	Total	7

The entire land-holding cultivated by this cultivator is his own. It consists of three fragments, comparatively of larger size and are situated within the village. The details regarding each of these fragments and the crop-rotations practised on these are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	6.03	1.1	6.03	Medium-black	G-C
2	12.23	2.1	5.00	Medium-black	G-C
		2.2	5.00	Medium-black	G-J-C
		2.3	2.23	Light	J-J-J
3	17.28	3.1	5.40	Medium-black	C-J

3.2	5.38	Medium-black	G-C
3.3	3.25	Light	J-B
3.4	3.25	Light	J-B

The second fragment of the land-holding suffers from erosion caused by a big stream which runs on its western portion. The land in this portion of the fragment (Plot 2.3; 2.23 acres) has become so poor that no other crop except jowar can be grown on it. He, therefore, does not follow any crop-rotation on this land, but grows jowar as a fodder crop year after year. The third fragment is also intersected by a big stream on its western side. About a third portion of this fragment as well (Plots 3.3 and 3.4; 6.50 acres) suffers erosion and is of inferior type of soil. On this area, therefore, he prefers to follow the two-year rotation of J-B and grows these crops largely for fodder.

The rotation-plan formulated by the cultivator shows a marked bias towards cash-crop cultivation. Thus, it may be seen that on three of his plots (Plots 1.1, 2.1 and 3.2; 16.43 acres) he follows the two-year rotations of cash-crops alone. In fact the land in these plots being medium-black, is most suited to the three-year rotation of G-C-J. But in order to restrict the area under jowar and to devote more area to cash-crop he prefers to follow the rotations of cash-crops alone on these plots. On the remaining two plots of medium-black land (Plots 2.1 and 3.1; 10.40 acres) he practises the rotations with a food-crop, jowar. The three plots of light soil (Plots 2.3, 3.3 and 3.4; 8.73 acres) are devoted to jowar and bajara, mostly grown as fodder-crops. Between the two cash-crops grown by him,

he appears to have a clear preference for cotton as it is relatively more profitable and as he has sufficient quantity of home-collected manure from the owned livestock. It can be seen that the area under different crops averaged over the period of rotation-cycle, comes to 12.57 acres under cotton; 9.87 acres under groundnut; 9.84 acres under jowar and 3.25 acres under bajara every year. Much of the area is devoted to jowar because of the soil restraint operating in the case of his two fragments. The area under jowar, grown for food as such is 4.36 acres every year; and it is slightly more than required to meet his food requirement, which is 30 maunds per year.

The crops grown and the areas allotted to different crops during the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	6.03	G-C	Cotton	Groundnut	Cotton	Groundnut	
2.1	5.00	G-C	Groundnut	Cotton	Groundnut	Cotton	
2.2	5.00	G-J-C	Cotton	Groundnut	Jowar	Cotton	
2.3	2.23	J-J-J	Jowar	Jowar	Bajara (Jowar)	Jowar	
3.1	5.40	C-J	Cotton	Jowar	Cotton	Groundnut (Jowar)	
3.2	5.38	G-C	Groundnut	Cotton	Groundnut	Cotton	
3.3	3.25	J-B	Jowar	Bajara	Jowar	Bajara	
3.4	3.25	J-B	Bajara	Jowar	Bajara	Jowar	
Total :			Jowar	5.48	10.88	8.25	5.48
			Groundnut	10.38	11.03	10.38	11.43
			Cotton	16.43	10.38	11.43	15.38
			Bajara	3.25	3.25	5.48	3.25

It can be seen that in the four years the area under cotton was never less than 10.00 acres; while the area put to

groundnut, never exceeded 11.05 acres. The area under jowar varied between 5.48 and 11.88 acres. However, the area under jowar grown for food-grains as such was between 5.00 and 5.40 acres. It may be noted from the cropping that the cultivator grew crops mostly as per his rotation-plan. In the four-year period he was required to deviate twice, on one plot each in 1962-63 and 1963-64. In 1962-63, he deviated on the plot of 2.23 acres, from jowar to bajara, on an experimental basis to see how far bajara can be profitably grown on this land, where he was practising single cropping of jowar for years. Secondly, in this particular year, the area under jowar was comparatively large. He, therefore, thought of diverting some of its area to bajara to get a different type of fodder for his livestock. He reported that the husk of bajara is good, particularly for bullocks. In 1963-64, he deviated from jowar to groundnut on the plot of 5.40 acres. He reported that in the two years preceding to 1963-64, jowar had claimed comparatively larger area and its production was also much in excess of his annual food needs. In 1962-63, therefore, he had enough stocks of jowar to meet his total food requirements of the next year. So, in the next year, he reduced the area due for jowar and diverted it to cash-crops. This led to deviation on one of his plots of 5.40 acres, where he grew groundnut instead of jowar. Considering the restraint of manure supply and the type of land in the plot, he had to deviate to groundnut.

CASE STUDY V 1

Name	: P. S. W.	Family size	: 10 members
Age	: 55 years	Earners	: Male Female Total
Education	: Illiterate		4 4 8
Caste	: Dhangar		
Main occupation	: Agricultural labour	Total income (1962-63)	: Rs.2,025
Subsidiary occupation	: Agriculture	Land-holding	: 1.13 acres
Livestock	:		
Working	Milch	Young	Total
2	1	2	5
			Home-collected manure
			: 16 cart-loads

This is a small cultivator having land-holding of 1.13 acres only. The details of the land and the rotation-plan are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.13	1.1	1.13	Medium-black	J-J-J

Jowar is a subsistence crop both for food and fodder. This cultivator, therefore, prefers to practise single cropping of jowar, instead of any rotation on his entire land. He grows jowar every year, even though its produce is not adequate to meet his yearly needs of food and fodder. His annual requirement of jowar for family consumption is about 45 maunds. His yearly requirement of fodder as well, is considerably high as he has a large livestock. The two factors have a major influence on his cropping. Because of these factors only, he prefers to grow jowar every year, to get at least the minimum assured supply of jowar and its fodder. The cultivator is aware of the fact that continuous cropping of jowar on the same land brings down its

fertility. He, therefore, applies a light dose of farmyard manure (3 to 4 cart-loads) to the land, once in two to three years.

The crops grown by the cultivator in the four years are as follows:

Plot No.	Acres	Crop rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.13	J-J-J	Jowar	Jowar	Jowar	Jowar
Total : Jowar			1.13	1.13	1.13	1.13

The cultivator had grown jowar strictly as per his plan in all the four years. As his annual requirement of jowar for family consumption is quite high, the home produced jowar falls short to a great extent. He collects about 12 maunds of jowar as kind wages. He is required to purchase about 20 maunds of jowar every year. He is required to purchase a major portion of fodder requirement as well. He owns a pair of bullocks to hire out its services and thus to supplement his income from agricultural labour. His annual income is high mainly because of his three sons employed as attached servants with the big cultivators in the village.

CASE STUDY V 2

Name	: G. H. S.	Family size	: 3 members
Age	: 40 years	Earners	: Male Female Total
Education	: Illiterate		1 1 2
Caste	: Mali		
Main occupation	: Agricultural labour	Total income (1962-63)	: Rs.750
Subsidiary occupation	: Agriculture	Land-holding	: 1.48 acres
Livestock	:	Home-collected manure	: 5 cart-loads
Working	Milch 1 Young - Total 1		

This is also a small cultivator cultivating only his owned land of 1.48 acres. Below are given the details of the land and the rotation-plan followed by the cultivator.

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.48	1.1	0.75	Deep-black	C-J
		1.2	0.73	Deep-black	C-J

The cultivator follows the two-year rotation of C-J on both the plots of his land-holding as the entire land is of deep-black soil. He has arranged the rotation on the two plots in such a way that both the crops are grown every year--cotton on one plot and jowar on the other. He does not grow groundnut mainly because the deep-black land does not suit it. The cultivator reports that on such land the harvesting of groundnut, goes very difficult. In the case of this cultivator, the annual requirement of jowar for family consumption is about 14 maunds. It is entirely met from the home production of jowar, grown as

the main crop in one plot and as the subsidiary crop along with cotton on another plot. Besides, he collects 3 maunds of jowar as kind wages.

The crops grown on the two plots in the four years are given below:

Plot	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.75	C-J	Cotton	Jowar	Cotton	Jowar
1.2	0.73	C-J	Jowar	Cotton	Jowar	Cotton
Total : Jowar			0.73	0.75	0.73	0.75
Cotton			0.75	0.73	0.75	0.73

The cultivator had grown the crops on his two plots strictly as per the rotation-plan in all the four years. He did not deviate on any plot in any year. He grows both the crops every year in order to meet his both the types of needs--food and cash. Besides, he considers cotton as the most risky crop and does not prefer to put his entire land under it in any year. He does not prefer to put the whole land under jowar either, firstly because he does not require that much jowar for his family consumption, and secondly because, it is less profitable than cotton.

CASE STUDY V 3

Name	: N. S. P.	Family size	: 2 members
Age	: 42 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Maratha		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.850
Subsidiary occupation	: Agricultural labour	Land-holding	: 1.50 acres
Livestock	:		
Working	Milch Young Total	Home-collected manure	: -
-	- - -		

This cultivator has a small land-holding of 1.50 acres. It is a single fragment. The details of the fragment and the crop-rotation practised on it are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.50	1.1	1.50	Deep-black	C-J

The cultivator prefers to practise the two-year rotation of C-J on the entire land of his fragment, mainly because of its deep-black soil, which is most suited to such rotation. He devotes the entire area of his land to a single crop every year. He does not prefer to divide the fragment to grow both the crops every year. He reports that as the total area of the fragment is small, there is no point in dividing it further. His annual requirement of jowar for family consumption being small, he is not required to devote any area mainly for jowar. He, therefore, grows cotton on his entire land in alternate years and takes jowar as a mixed crop along with cotton to meet his

family consumption needs. He reports that his annual requirement of jowar for the family, is as small as 9 maunds. It is entirely met from the home production of jowar.

The crops grown on the entire area of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.50	C-J	Wheat (Cotton)	Cotton	Jowar	Cotton
Total : Jowar			-	-	1.50	-
Cotton			-	1.50	-	1.50
Wheat			1.50	-	-	-

Except in the first year (1960-61) the cultivator had grown the crops on his entire land strictly as per the rotation. In 1960-61 he was required to deviate because of heavy rainfall and the accumulation of rain water in his fragment for a fairly long period. He reported that in this year because of heavy rains, he could not sow any kharif crop on his land. The land was under the accumulated water till the end of July. He, therefore, kept the land fallow for the whole kharif season and put it under wheat in the rabi season. He, thus, deviated from cotton which was due on it according to the rotation and grew wheat in this year.

CASE STUDY V 4

Name	: K. S. C.	Family size	: 6 members
Age	: 40 years	Earners	: Male Female Total
Education	: 7th standard		2 - 2
Caste	: Muslim		
Main occupation	: Vendor	Total income (1962-63)	: Rs.1,050
Subsidiary occupation	: Agriculture	Land-holding	: 1.50 acres
Livestock	:		
Working	Milch Young Total	Home-collected manure	: -
-	- - -		

The cultivator cultivates only his owned land of 1.50 acres. It is a single fragment situated at a distance of two miles from the village. Below are given the details of the fragment and the crop-rotation followed on it.

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.50	1.1	1.50	Deep-black	C-J

This cultivator is mainly a vendor dealing in spices and condiments. He looks upon agriculture as a subsidiary source of income. He, however, prefers to practise the two-year rotation of C-J on his entire land as it is of heavy black soil where groundnut cannot be profitably grown. He generally devotes the entire area of the land-holding to one main crop every year. He reports that as the total area of the fragment is small, its further division makes cultivation more difficult and inconvenient. Secondly, as he is all the while engaged in his main profession it is more convenient for him to put the entire

land under one main crop every year. His annual requirement of jowar for family consumption is about 25 maunds. It is not met from the home production of jowar, even when it is taken as the main crop on the entire land-holding. He is, therefore, not wholly dependent on his land for his food requirement.

The crops grown on the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.50	C-J	Cotton	Jowar	Cotton	Cotton (Jowar)
Total : Jowar			-	1.50	-	-
Cotton			1.50	-	1.50	1.50

It can be seen that the cultivator had grown crops strictly according to the rotation, except in the last year (1963-64). In this year he deviated from jowar, which was due as per the rotation and repeated cotton. He reported that in this year he wanted more cash income to clear off the dues accumulated with the trader in Bhusawal from whom he purchased the spices and condiments for his business. He, therefore, preferred to repeat cotton in 1963-64 and deviated from jowar which was due according to the rotation.

CASE STUDY V 5

Name	: S. W. G.	Family size	: 6 members
Age	: 55 years	Earners	: Male Female Total
Education	: Illiterate		1 1 2
Caste	: Nava-Budha		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.975
Subsidiary occupation	: Vendor	Land-holding	: 2.20 acres
Livestock	:	Home-collected manure	: 12 cart-loads
Working Milch	1	Young	4
Total			5

The cultivator cultivates a land-holding of 2.20 acres. It is comprised of two fragments of rather small sizes. The details of these fragments and the crop-rotation practised on them are presented below:

Fragment No.	Acres	Plot	Acres	Soil type	Crop-rotation
1	1.45	1.1	1.45	Medium-black	C-J
2	0.75	2.1	0.75	Deep-black	C-J

It may be noted that the cultivator practises the two-year rotation of C-J on his entire land-holding, even on the first fragment of medium-black soil. This is mainly because of the sufficiently large supply of the home-collected manure. Compared to his land-holding, the supply of the home-collected manure is quite large. He, therefore, prefers to apply it to his land every year and put the land under the C-J rotation. He has arranged the rotation on the two fragments in such a way that both the crops are taken every year--cotton on one fragment and jowar on the other. He finds this sort of arrangement very

convenient as it provides him with jowar to meet his family consumption needs, with jowar stalks to meet the fodder needs and with cotton produce to meet his annual cash needs. He reports that his annual requirement of jowar for the family consumption is about 26 maunds. It is entirely met from the home production of jowar and from the jowar collected as kind wages.

The crops grown on the two fragments in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.45	C-J	Jowar	Cotton	Jowar	Cotton
2.1	0.75	C-J	Cotton	Jowar	Cotton	Jowar
Total : Jowar			1.45	0.75	1.45	0.75
Cotton			0.75	1.45	0.75	1.45

It may be noted that in all the four years the cultivator had taken the crops on both the fragments strictly as per the rotation. He did not deviate on any fragment in any of the years.

CASE STUDY V 6

Name	: O. W. T.	Family size	: 7 members
Age	: 45 years	Earners	: Male Female Total
Education	: Illiterate		2 3 5
Caste	: Mali		
Main occupation	: Agricultural labour	Total income (1962-63)	: Rs.1,350
Subsidiary occupation	: Agriculture	Land-holding	: 2.41 acres
Livestock	:		
Working	Milch 2 Young 2 Total 4	Home-collected manure	: 14 cart-loads

The land-holding cultivated by this cultivator consists of two fragments, having a total area of 2.41 acres. The details of these fragments and the rotations practised by the cultivator are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.78	1.1	1.03	Medium-black	C-J
		1.2	0.75	Light	G-J
2	0.63	2.1	0.63	Deep-black	C-J

In the case of this cultivator, it is interesting to see how he has taken a composite view of all the basic factors like the land-holding, the soil type, the supply of home-collected manure and the food needs. It may be noted that as he has a sufficiently large supply of the home-collected manure, he prefers to practise the C-J rotation even on the plot of medium-black soil. He is constrained to follow the G-J rotation on the plot of lighter soil as cotton cannot be profitably grown on such land. It may be seen that in the rotation-plan there is a slightly more emphasis on the cultivation of jowar. This is mainly because his annual requirement of jowar for the family consumption is fairly large--30 maunds. The area under jowar, averaged over the period of rotation-cycle, comes to 1.21 acres per year. This much area under jowar is not enough to meet his yearly requirement of food. He is required to purchase jowar every year.

The crops grown on different plots of the land-holding and the areas devoted to these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.03	C-J	Jowar	Jowar (Cotton)	Cotton	Wheat (Jowar)	
1.2	0.75	G-J	Groundnut	Jowar	Jowar (Groundnut)	Jowar (Groundnut)	
2.1	0.63	C-J	Cotton	Cotton (Jowar)	Jowar	Jowar (Cotton)	
Total :			Jowar	1.03	1.78	1.38	1.38
			Groundnut	0.75	-	-	-
			Cotton	0.63	0.63	1.03	-
			Wheat	-	-	-	1.03

The cultivator was required to deviate on two plots (Plots 1.1 and 2.1) in 1961-62; on one plot (Plot 1.2) in 1962-63 and on all the three plots in 1963-64. In the year 1961-62, he deviated from jowar to cotton on the plot of 0.63 acre. He reported that this deviation was necessitated because of failure of the cotton crop in the preceding year. In 1960-61 he had manured the land heavily and devoted it to cotton but the crop failed as it was severely attacked by a fungous disease. In the following year (1961-62), therefore, he decided to repeat the same crop of cotton to utilize fully the residuals of the manure applied. He, thus, deviated from jowar to cotton on this plot. As an interaction of this deviation, he was required to deviate on the other plot of 1.03 acres. As he could not grow jowar on the plot of 0.63 acre, he had to deviate on the plot of 1.03 acres and grow jowar instead of cotton, to get some supply of jowar to meet his yearly food needs. In 1962-63, he deviated from groundnut to jowar on the plot of 0.75 acre (Plot 1.2).

He reported that in this year he had no stock of groundnut seeds and could not purchase it as its price was considerably high. In the circumstances, he preferred to deviate from groundnut and repeated jowar on the plot. The same was the case in the next year (1963-64). Because of non-availability of groundnut seeds, he could not grow it in this year as well and preferred to repeat jowar even for the third year. In this year he was required to deviate on his other two plots also (Plots 1.1 and 2.1). The deviations on both these plots were necessitated because of inadequate rainfall during the sowing season of the year. In fact, he had sown crops on both the plots as per the rotation-plan, but these crops withered away and the cultivator had to re-sow. He kept the plot of 1.03 acres fallow for the whole kharif season and re-sowed wheat on it in the rabi season. On the other plot of 0.63 acre which was of deep-black soil, he made a second attempt to grow cotton by repeating it in the second sowing. But it also failed. This time the crop came up well but remained stunted in its growth. The cultivator had retained it till the middle of July; but it did not show any improvement in its growth. The cultivator had to remove it ultimately and sow the land for the third time. In the third sowing, he had to deviate to jowar as it was the only crop which he could sow so late. The sowing season of all the other kharif crops had elapsed. He was, thus, required to deviate to jowar, even after making two attempts to grow cotton.

CASE STUDY V 7

Name	: C. N. P.	Family size	: 2 members
Age	: 40 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.900
Subsidiary occupation	: Agricultural labour	Land-holding	: 2.58 acres
Livestock	:		
Working	Milch	Young	Total
-	2	1	3
		Home-collected manure	: 12 cart-loads

The cultivator cultivates only his owned land of 2.58 acres. It is a single fragment. The details of the fragment and the crop-rotation followed on it are as follows:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.58	1.1	0.18 to 1.50	Medium-black	G-C-J
		1.2	0.18 to 1.50	Medium-black	G-C-J
		1.3	0.18 to 1.50	Medium-black	G-C-J

The cultivator prefers to follow the three-year rotation of G-C-J on his entire land-holding mainly because of its medium-black soil which is most suited to such rotation. He reports that he divides his fragment of land into three plots every year and grows three crops included in the rotation. Of the three crops, however, he has a clear preference for cotton. He prefers to devote larger area to cotton every year. Because of such a preference for one of the crops in the rotation, he cannot keep the division of the plots uniform in all the years. In order to put larger area under cotton every year, he is

required to change it. This can be seen from his cropping in the four years. The cultivator has a small family of two members only and hence his yearly requirement of jowar for consumption is as low as 9 maunds. It is entirely met from the home production of jowar.

The crops grown in the four years and the areas devoted to each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.18 to 1.50	G-C-J	Groundnut (0.18)	Cotton (1.50)	Jowar (0.90)	-
1.2	0.18 to 1.50	G-C-J	Jowar (0.90)	Groundnut (0.18)	Cotton (1.50)	Jowar (1.08)
1.3	0.18 to 1.50	G-C-J	Cotton (1.50)	Jowar (0.90)	Groundnut (1.18)	Cotton (1.50)
Total : Jowar			0.90	0.90	0.90	1.08
Groundnut			0.18	0.18	0.18	-
Cotton			1.50	1.50	1.50	1.50

It may be noted that in all the four years, the area devoted to cotton is larger than that of the other crops. Such a preference for one of the three crops included in the rotation had given rise to all sorts of deviations on the three plots of the fragment. The deviations were of the same type as we have seen in the Case Studies K 14 and K 15. It can be seen that the accepted rotation of G-C-J was strictly followed on a very minor area (0.36 acre) of the total land-holding. The rest of the area was subjected to deviations both of cross-cropping and the interplay of the other rotations.

CASE STUDY V 8

Name	: K. K. P.	Family size	: 5 members
Age	: 55 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Maratha		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.900
Subsidiary occupation	: Agricultural labour	Land-holding	: 2.61 acres
Livestock	:		
Working	Milch	Young	Total
1	-	-	1
			Home-collected manure
			: 4 cart-loads

The land-holding of this cultivator consists of two fragments, having a total area of 2.61 acres. The details of these fragments and the rotation followed by the cultivator are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.23	1.1	1.23	Deep-black	C-J
2	1.38	2.1	1.38	Deep-black	C-J

The cultivator prefers to practise a single rotation of C-J on both of his fragments. He has arranged the rotation on the two fragments in such a way that he can grow both the crops every year--cotton on one fragment and jowar on the other. The supply of home-collected manure is just enough to manure the two fragments alternately. The annual requirement of jowar for the family consumption is about 23 maunds. It is entirely met from the home production of jowar.

The crops grown on the two fragments in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.23	C-J	Jowar	Cotton	Jowar	Cotton
2.1	1.38	C-J	Cotton	Jowar	Cotton	Jowar
Total : Jowar			1.23	1.38	1.23	1.38
Cotton			1.38	1.23	1.38	1.23

It may be noted from the cropping that the cultivator had grown the crops strictly as per the rotation in all the four years.

CASE STUDY V 9

Name	: C. P. M.	Family size	: 7 members
Age	: 34 years	Earners	: Male Female Total
Education	: Illiterate		2 3 5
Caste	: Mali		
Main occupation	: Agricultural labour	Total income (1962-63)	: Rs.1,300
Subsidiary occupation	: Agriculture	Land-holding	: 2.65 acres
Livestock	:		
Working	2	Milch	1
		Young	2
		Total	5
		Home-collected manure	: 15 cart-loads

The cultivator cultivates only his owned land-holding of 2.65 acres. It comprises of two fragments, one having an area of 2.60 acres and the other, only 0.05 acre. The details of the fragments are given below along with the rotation-plan formulated by the cultivator.

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.60	1.1	1.25	Medium-black	C-J
		1.2	1.30	Medium-black	C-J
		1.3	0.05	Medium-black	C-J
2	0.05	2.1	0.05	Medium-black	J-J-J

It may be noted that the entire land-holding of the cultivator is of medium-black soil, which is most suited to the three-year rotation of G-C-J. However, the cultivator prefers to practise the C-J rotation on a major portion of his land. This is firstly because, his land though reported as medium-black, is nearer to deep-black and is not suited to groundnut. Secondly, he has a sufficiently large supply of home-collected manure which he prefers to apply to his own land and put it under cotton. The second fragment of his land-holding suffers from locational disadvantages and is not suited for any rotation. It is situated along the Yawal-Raver road where the villagers bring their cattle for rearing. These cattle generally spoil the crop grown in the neighbouring fields. Because of this nuisance and also because of the small size of the fragment, the cultivator prefers to put it under single cropping of jowar. The annual requirement of jowar for the family consumption is about 32 maunds. The area allocation to jowar, averaged over the period of rotation cycle comes to 1.35 acres. It is not enough to meet the total food needs of the family. The cultivator, therefore, is not wholly dependent on his land for his yearly food needs. He is required to purchase about 10 maunds of jowar every year.

The crops grown on different plots of the land-holding and the area devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.25	C-J	Cotton	Jowar	Cotton	Jowar
1.2	1.30	C-J	Jowar	Cotton	Jowar	Wheat (Cotton)
1.3	0.05	C-J	Cotton	Groundnut (Jowar)	Cotton	Jowar
2.1	0.05	J-J-J	Jowar	Jowar	Jowar	Jowar
Total : Jowar			1.35	1.30	1.35	1.35
Groundnut			-	0.05	-	-
Cotton			1.30	1.30	1.30	-
Wheat			-	-	-	1.30

It may be seen that the cultivator had grown his crops according to the rotation-plan in all the four years. He was required to deviate on a small area of 0.05 acre in 1961-62 and on 1.30 acres in 1963-64. In the year 1961-62, he deviated from jowar on the plot of 0.05 acre (Plot 1.3) and grew groundnut in order to meet the consumption needs of the family. In 1963-64, he deviated from cotton to wheat on the plot of 1.30 acres (Plot 1.2). This deviation was necessitated because of the inadequate rainfall during the sowing season of the year. In fact, the cultivator had sown cotton on this plot, but it did not come up. He re-sowed the same crop, but did not succeed. This time the crop came up but there was no satisfactory 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 removed ultimately. By the time he removed the cotton crop, the sowing season of all the kharif crops had elapsed. He, therefore, kept the land fallow in the kharif season and took wheat

on it 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.

CASE STUDY V 10

Name	: D. D. B.	Family size	: 5 members
Age	: 35 years	Earners	: Male Female Total
Education	: Illiterate		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Service	Total income (1962-63)	: Rs.1,000
Subsidiary occupation	: Agriculture	Land-holding	: 2.73 acres
Livestock	:		
Working	Milch	Young	Total
-	-	-	-
		Home-collected manure	: -

The cultivator cultivates a land-holding of 2.73 acres, jointly owned by him and his two younger brothers, who are employed as attached servants in the village. He is required to give half of the total produce to his brothers. The land-holding is of a single fragment situated near the village. The details of the fragment and the rotation followed on it are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.73	1.1	1.73	Deep-black	C-J
		1.2	1.00	Deep-black	C-J

The cultivator prefers to practise the two-year rotation of C-J on his entire land-holding, mainly because it is of deep-black soil. He divides the fragment into two plots and follows

the same rotation on both of them. He has arranged the rotation in such a way that he can grow both the crops every year--cotton on one plot and jowar on the other. The annual requirement of jowar for the family consumption is about 23 maunds. It is generally met from the home production of jowar grown as the main and as the subsidiary crop along with cotton.

The crops grown and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.73	C-J	Cotton	Jowar	Cotton	Jowar
1.2	1.00	C-J	Jowar	Jowar (Cotton)	Cotton	Cotton (Jowar)
Total : Jowar			1.00	2.73	-	1.73
Cotton			1.73	-	2.73	1.00

It may be seen that the cultivator had mostly grown his crops as per the rotation-plan. However, he was required to deviate on one plot each in 1961-62 and 1963-64. These deviations were caused by the change in the usual practice of following the accepted rotation. As pointed out earlier, the cultivator divided the fragment into two plots and practised the same rotation on them. In 1961-62, however, he gave up this practice of dividing the fragment and put the entire land under a single crop of the same rotation. This caused deviation on one of his plots of 1.00 acre. As he devoted the entire fragment to jowar in this year, jowar got repeated on the plot of 1.00 acre. In 1963-64, he reverted to his old practice of dividing the fragment

and growing the two crops every year. Because of this change as well, he had to repeat cotton on the plot of 1.00 acre. In this year he was required to deviate from jowar to cotton. The deviations in both the years were necessitated because of the change in the usual practice of following the rotation.

CASE STUDY V 11

Name	: R. G. B.	Family size	: 6 members
Age	: 45 years	Earners	: Male Female Total
Education	: Illiterate		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.950
Subsidiary occupation	: Agricultural labour	Land-holding	: 3.18 acres
Livestock	:		
Working	Milch 1 Young 1 Total 2	Home-collected manure	: 6 cart-loads

The total land-holding cultivated by the cultivator is of 3.18 acres. It comprises of two fragments. The details of these fragments and the rotation-plan of the cultivator are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.68	1.1	0.93	Medium-black	C-J
		1.2	0.75	Medium-black	C-J
2	1.50	2.1	0.75	Deep-black	C-J
		2.2	0.75	Deep-black	C-J

The cultivator reports that irrigation facility is available on his first fragment of 1.68 acres. There is an old well on it,

jointly owned by the cultivator, his brother and cousin brothers. The cultivator's share in the ownership of the well is one-third. The water supply in the well is fairly good but the cultivator does not utilize it to raise irrigated crops, as he has no equipments for lifting water. He does not have even a pair of bullocks to operate a bullock-drawn water lift. He, therefore, prefers to put this land under the dry crops only. The cultivator practises a single rotation of C-J on his entire land-holding, even on the fragment having medium-black soil. In fact, the three-year rotation of G-C-J would have given him better results on this fragment. But, as his manure supply is fair in comparison with his land-holding, he prefers to practise the C-J rotation on his entire land. The yearly requirement of jowar for the family consumption is about 25 maunds. The area allocated to jowar in the rotation-plan is about 1.59 acres. It is just enough to meet the yearly food needs of the family. Besides, he grows jowar as a subsidiary crop along with cotton.

The crops grown on different plots of the land-holding in the four years and the areas devoted to these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.93	C-J	Jowar	Cotton	Cotton (Jowar)	'Nawati' banana (Jowar)
1.2	0.75	C-J	Wheat (Jowar)	Cotton	Cotton (Jowar)	'Nawati' banana (Jowar)
2.1	0.75	C-J	Cotton	Jowar	Jowar (Cotton)	'Nawati' banana (Cotton)
2.2	0.75	C-J	Cotton	Jowar	Cotton	'Nawati' banana (Jowar)
Total :			Jowar	Cotton	Wheat	'Nawati' banana
			0.93	1.50	0.75	-
			1.50	1.68	2.43	-
			0.75	-	-	-
			-	-	-	3.18

It may be seen from the cropping that the cultivator was required to deviate on one plot (Plot 1.2) in 1960-61; on three plots (Plots 1.1, 1.2 and 2.1) in 1962-63; and on all the four plots in 1963-64. In the year 1960-61, he deviated from jowar to wheat on the plot of 0.75 acre (Plot 1.2), in order to meet the extra food needs of his daughter's marriage. He reported that his daughter's marriage was to take place in 1961 and he wanted wheat to give a marriage feast to the villagers. He, therefore, leased-out this plot for the cultivation of wheat to one of his cousin brothers who had all the equipments of irrigation. It was leased-out on the basis of share-rent. The cultivator got half the share in the total production of wheat. In 1962-63, he deviated from jowar to cotton on his two plots (Plots 1.1 and 1.2). He reported that he had manured these plots heavily in 1961-62 and had put these under cotton; but the crop in that year suffered from some fungus disease and failed completely. The manure and other inputs applied to the land were not fully utilized. In order to utilize the residuals of manure etc. in the next year, he repeated cotton on both the plots, and thus deviated from jowar which was due on them. In this year he deviated from cotton to jowar on the plot of 0.75 acre (Plot 2.1). This deviation was an interaction of the deviations on the plots of 0.93 and 0.75 acre (Plots 1.1 and 1.2). As he deviated from jowar to cotton on these two plots, he had to deviate on some other plot to make provision for jowar to meet the yearly food needs of the family. He, therefore, preferred to deviate on the small plot of 0.75 acre and took

jowar on it instead of cotton. In 1963-64, he leased-out his entire land for the cultivation of banana, to his brother who had arranged for the equipments of irrigation in this year. This caused deviation from jowar to 'Nawati' banana on his three plots (Plots 1.1, 1.2 and 2.2) and from cotton to 'Nawati' banana on the remaining plot (Plot 2.1).

CASE STUDY V 12

Name	: D. K. R.	Family size	: 2 members
Age	: 52 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,350
Subsidiary occupation	: Agricultural labour	Land-holding	: 3.53 acres
Livestock	:		
Working	Milch Young Total	Home-collected manure	: 4 cart-loads
-	1 - 1		

The total land-holding cultivated by this cultivator is of a single fragment, having an area of 3.53 acres. The details of the fragment and the rotation-plan formulated by the cultivator are given below:

Fragment	Acres	Plot No.	Acres	Soil type	Crop rotation
1	3.53	1.1	1.63 to 2.00	Deep-black	C-C-J
		1.2	0.78 to 1.90	Deep-black	C-C-J
		1.3	0.75	Deep-black	C-C-J

It is interesting to see how this cultivator has formulated his rotation-plan, giving only the required area to jowar and the

rest to cotton. His annual requirement of jowar for the family consumption is very small (9 maunds) as his family is of two members only. He has, therefore, allocated, on an average, only 1.18 acres of land to jowar and 2.35 acres to cotton. It is obvious from the rotation itself that he has a marked preference for cotton. In each year he prefers to put larger area under cotton. Because of such preference for cotton, he cannot keep the division of the plots the same in all the years. He is required to change the division every year so as to devote larger area to cotton. This can be seen from the cropping in the four years.

The crops grown on different plots and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.63 to 2.00	C-C-J	Jowar (1.63)	Cotton (1.63)	Cotton (2.00)	Jowar (1.63)
1.2	0.78 to 1.15	C-C-J	Cotton (1.15)	Cotton (1.15)	Jowar (0.78)	Cotton (1.15)
1.3	0.75	C-C-J	Cotton (0.75)	Cotton (0.75)	Wheat (0.75)	Cotton (0.75)
Total : Jowar			1.63	-	0.78	1.63
Cotton			1.90	3.53	2.00	1.90
Wheat			-	-	0.75	-

It may be noted that in all the four years the area devoted to cotton was larger than that of jowar. Such a preference for cotton had caused all sorts of deviations on different plots of the land-holding. These deviations were of the same type as we have discussed in the Case Studies K 14 and K 15. It can be

seen from the cropping that in the four years the rotation was strictly followed only on 2.41 acres of the total land. The remaining area of 1.12 acres was subjected to deviations.

CASE STUDY V 13

Name	: G. G. C.	Family size	: 7 members
Age	: 32 years	Earners	: Male Female Total
Education	: 5th standard		2 1 3
Caste	: Maratha		
Main occupation	: Agriculture	Total income	: Rs.1,850 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 4.05 acres
Livestock	:	Home-collected	
Working Milch	Young Total	manure	: 14 cart-loads
- 2	1 3		

The cultivator cultivates only his owned land of 4.05 acres. It is a single fragment. The details of the fragment and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	4.05	1.1	0.75 to 2.50	Deep-black	C-J
		1.2	1.00 to 3.00	Deep-black	C-J
		1.3	0.30 to 0.55	Medium-black	G-J

In the case of this cultivator a major portion of the land-holding is of deep-black soil. He prefers to practise the two-year rotation of C-J on this land. The remaining portion is of medium-black soil, where the two-year rotation of G-J is followed.

Between the crops included in the two rotations, the cultivator has a marked preference for cotton. He invariably devotes larger area to cotton every year. Because of this kind of preference to one of the crops in the rotation-plan, he cannot keep the division of the plots uniform in all the years. In order to provide larger area to cotton, he is required to change the division of plots every year. This can be seen from his cropping in the four years. The annual requirement of jowar for the family consumption is about 30 maunds. The cultivator, therefore, has allocated, on an average, about 2.03 acres to jowar in his rotation-plan. This much area is adequate to meet his yearly requirement of jowar.

The crops grown and the areas devoted to these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.75 to 2.50	G-J	Cotton (2.50)	Jowar (0.75)	Cotton (2.50)	Jowar (0.75)
1.2	1.00 to 3.00	C-J	Jowar (1.00)	Cotton (3.00)	Jowar (1.00)	Cotton (3.00)
1.3	0.30 to 0.55	G-J	Groundnut (0.55)	Groundnut (0.30)	Groundnut (0.55)	Groundnut (0.30)
Total : Jowar			1.00	0.75	1.00	0.75
Groundnut			0.55	0.30	0.55	0.30
Cotton			2.50	3.00	2.50	3.00

It may be noted from the cropping that in all the four years the area put to cotton was relatively larger than that of jowar and groundnut. Such a preference for one of the crops in the rotation had led to all sorts of deviations on the plots of the land-holding. The deviations were the same as we have seen in

the Case Study K 5. It may be seen that the rotations were strictly followed, only on a minor portion of the land-holding (1.75 acres). The rest of the area (2.50 acres) was under deviations. It may be noted that because of his preference for cotton, the cultivator was required to repeat cotton, continuously on 2.00 acres of his land and groundnut on 0.30 acre.

CASE STUDY V 14

Name	: S. G. P.	Family size	: 4 members
Age	: 22 years	Earners	: Male Female Total
Education	: 7th standard		1 2 3
Caste	: Maratha		
Main occupation	: Agriculture	Total income	: Rs.950 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 4.31 acres
Livestock	:		
Working Milch	Young Total	Home-collected	
- -	1 1	manure	: 3 cart-loads

The total land-holding cultivated by the cultivator is of 4.31 acres, of which 0.68 acre only is owned and the rest (3.63 acres) is leased-in. It is leased-in on the basis of cash-rent of Rs.215 per year. The leased-in fragment is under his cultivation since 1952. The details of the two fragments of the land-holding and the rotations followed on them are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	0.68	1.1	0.68	Deep-black	C-J
2	3.63	2.1	2.00	Deep-black	C-J
		2.2	1.63	Deep-black	C-J

It may be noted that the entire land-holding of the cultivator is of deep-black soil. The cultivator, therefore, prefers to follow the two-year rotation of C-J on his entire land. In fact, his supply of home-collected manure is not adequate to manure all the area due for cotton every year; but he grows cotton on the leased-in land, mostly without applying any farm-yard manure. The annual requirement of jowar for the family consumption is about 18 maunds. It is entirely met from the home production of jowar. It can be seen that, on an average, the cultivator allocates about 2.15 acres of his land to jowar every year.

The crops grown on different plots of the land-holding and the areas devoted to these in the four years are presented below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.68	C-J	Jowar	Cotton	Cotton (Jowar)	Jowar
2.1	2.00	C-J	Cotton	Jowar	Cotton	Jowar
2.2	1.63	C-J	Wheat (Jowar)	Cotton	Jowar	Cotton
Total : Jowar			0.68	2.00	1.63	2.68
Cotton			2.00	2.31	2.68	1.63
Wheat			1.63	-	-	-

It may be seen from the cropping that the cultivator had grown the crops mostly as per the rotation in all the four years. He was required to deviate only on one plot each in 1960-61 and 1962-63. In the year 1960-61, he deviated from jowar to wheat on the plot of 1.63 acres, to meet the extra food needs of his marriage. He reported that his marriage was to take place in

1961 and he had to arrange for wheat required for marriage feast. In view of this requirement, he leased-out this plot on the share-rent basis, for the cultivation of wheat, to his neighbouring cultivator having irrigation facility. Thus the deviation from jowar to wheat occurred on this plot. In 1962-63, he was required to deviate from jowar to cotton on the plot of 0.68 acre. He reported that he had heavily manured this plot in 1961-62 and put it under cotton; but the crop failed in this year because of some disease. The manure inputs applied to the land were not fully utilized. The cultivator, therefore, repeated the same crop of cotton in the next year, to utilize the residuals of manure etc.

CASE STUDY V 15

Name	: H. K. S.	Family size	: 6 members
Age	: 36 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.1,200 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 3.08 acres
Livestock	:	Home-collected	
Working	Milch	Young	Total
2	1	1	4
			manure
			: 14 cart-loads

The owned land-holding of this cultivator is of 4.73 acres. Of this, 1.65 acres were leased-out for the cultivation of banana in 1960-61, 1961-62 and in 1963-64. Therefore, the area of land-holding which remained under the cultivation of the cultivator

for the entire period of four years was 3.08 acres. This land-holding consists of two fragments. The details of these fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	0.53	1.1	0.53	Light	G-J
2	2.55	2.1	1.55	Medium-black	C-C-J
		2.2	1.00	Medium-black	C-C-J

It may be noted that the land-holding of this cultivator is of light and medium-black soil. He does not have any land of deep-black soil. The rotation-plan formulated by this cultivator is largely influenced by the supply of home-collected manure and the food requirement. As the supply of manure is sufficiently large in his case, he prefers to practise the three-year rotation of C-C-J on the major portion of his land-holding. He follows this rotation on his two plots, even though the land in these plots is of medium-black soil. The annual requirement of jowar for the family consumption is about 25 maunds. The area under jowar, averaged over the period of rotation cycle, comes to 1.11 acres. This much area, in fact, is not enough to meet his yearly food needs. But as he grows jowar as a mixed crop along with cotton, the area allocation to jowar is kept low in the rotation-plan. The cultivator is constrained to follow the two-year rotation of G-J on the fragment of 0.53 acre as its land is of lighter type of soil.

The crops grown on different plots of the land-holding and the areas devoted to these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	0.53	G-J	Jowar	Groundnut	Jowar	Groundnut	
2.1	1.55	C-C-J	Cotton	Cotton	Jowar	Cotton	
2.2	1.00	C-C-J	Groundnut (Cotton)	Jowar	Wheat (Cotton)	Jowar (Cotton)	
Total :			Jowar	0.53	1.00	2.08	1.00
			Groundnut	1.00	0.53	-	0.53
			Cotton	1.55	1.55	-	1.55
			Wheat	-	-	1.00	-

It may be seen that the cultivator had grown the crops strictly as per the rotation-plan on a major portion of his land in all the four years. He was required to deviate on one plot each in 1960-61, 1962-63 and 1963-64. In the year 1960-61, he was required to deviate from cotton to groundnut, on the plot of 1.00 acre, in order to meet the consumption needs of the family. In 1962-63 he deviated on the same plot, but this time from cotton to wheat. He reported that he could not transport the manure to this plot as he was seriously ill. As he could not manure the land, he could not put it under cotton and had to deviate. He deviated to wheat as one of his neighbouring cultivators having the irrigation facility, agreed to supply water. In 1963-64 also he deviated on the same plot. But this time the deviation was caused by the rotation-plan itself. It may be seen that according to the plan, no area of his land was due for jowar in this year. He was, therefore, required to deviate on one of his plots to grow jowar in order to meet the annual food needs of his family. He deviated on the plot of 1.00 acre (Plot 2.2) and took jowar instead of cotton which was due on it according

to the rotation-plan. He could not deviate for jowar on his other two plots as it would have caused the repetition of the same crop.

CASE STUDY V 16

Name	: R. B. R.	Family size	: 5 members
Age	: 41 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,050
Subsidiary occupation	: Agricultural labour	Land-holding	: 5.45 acres
Livestock	:	Home-collected manure	: 8 cart-loads
Working Milch	1	Young	-
		Total	1

The total land-holding cultivated by the cultivator is of 5.45 acres. It is comprised of two fragments--one having an area of 1.75 acres and the other, 3.70 acres. The further details of the two fragments and the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.75	1.1	1.75	Medium-black	G-C-J
2	3.70	2.1	1.85	Medium-black	C-C-J
		2.2	1.85	Medium-black	C-C-J

It may be seen that the rotation-plan formulated by the cultivator has a marked bias towards the cultivation of cotton, even though his entire land-holding is of medium-black soil. He

reports that this is largely because of the peculiar situation of his second fragment of 3.70 acres. As it is situated adjacent to the village, he cannot grow groundnut on it. He, therefore, prefers to practise the three-year rotation of C-C-J on the entire area of this fragment. It is to be noted that because of his limited supply of the home-collected manure, he is required to practise a relatively long duration rotation of C-C-J on the entire area of this fragment. The annual requirement of jowar for the family consumption is about 23 maunds. The area under different crops, averaged over the period of rotation cycle, comes to 1.82 acres under jowar; 3.05 acres under cotton; and 0.58 acre under groundnut. The area allocated to jowar is just enough to meet the annual food needs of the family.

The crops grown on different plots of the land-holding in the four years, and the areas devoted to each of these are shown below:

Plot No.	Acres	Crop rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.75	G-C-J	Groundnut	Cotton	Jowar	Cotton (Groundnut)
2.1	1.85	C-C-J	Jowar	Cotton	Cotton	Jowar
2.2	1.85	C-C-J	Cotton	Jowar	Cotton	Cotton
Total : Jowar			1.85	1.85	1.75	1.85
Groundnut			1.75	-	-	-
Cotton			1.85	3.60	3.70	3.60

It may be noted from the cropping that in all the four years the cultivator had mostly grown his crops as per the rotation-plan. He was required to deviate only on one plot in 1963-64. This deviation was caused by the non-availability of

groundnut-seeds. The cultivator reported that in this year he had no seeds of groundnut and could not purchase it from outside as its price was considerably high--Rs.1.50 per seer. As he had not grown groundnut anywhere in the preceding year, he did not preserve the seeds. In the circumstances he could not grow groundnut on the plot of 1.75 acres, even though it was due according to the rotation-plan. He had to deviate from it. He preferred to deviate to cotton as its seeds were comparatively cheap, and the requirement per acre was also small. He, thus, deviated from groundnut to cotton on the plot of 1.75 acres.

CASE STUDY V 17

Name	: K. M. P.	Family size	: 8 members
Age	: 45 years	Earners	: Male Female Total
Education	: Illiterate		1 2 3
Caste	: Leva-Petidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,250
Subsidiary occupation	: Agricultural labour	Land-holding	: 5.58 acres
Livestock	:		
Working	Milch	Young	Total
1	2	2	5
		Home-collected manure	: 17 cart-loads

The land-holding cultivated by the cultivator is of 5.58 acres. The entire area of the holding is leased-in for an annual cash-rent of Rs.97.50 fixed by the Tenancy Mamlatdar of the Raver Taluka. The cultivator does not own any land. He has been leasing-in this land since 1947. The land-holding comprises of two fragments. The details of these fragments and the rotations

practised on them are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.13	1.1	0.50	Deep-black	G-C
		1.2	1.63	Deep-black	C-J
2	3.45	2.1	1.45	Deep-black	C-J
		2.2	1.00	Deep-black	C-J
		2.3	1.00	Deep-black	C-J

It may be noted that the entire land-holding of this cultivator is of deep-black land. In the case of this cultivator, it is interesting to see how he has formulated his rotation-plan, allocating only the required area to jowar, and the rest to the cash-crops. He has taken a composite view of all the basic factors like the land-holding, different grades of deep-black soil, supply of home-collected manure and the food and fodder requirements. It may be seen that on the plot of 0.50 acre (Plot 1.1), where the land, though reported as deep-black, is comparatively of low quality, he prefers to follow the two-year rotation of G-C. On the rest of the area where the land is of superior quality, he practises the two-year rotation of C-J. The area under different crops, averaged over the period of rotation cycle, comes to 2.54 acres under jowar; 2.79 acres under cotton and 0.25 acre under groundnut. The area allocated to jowar is sufficiently large to meet his yearly requirement of jowar (36 maunds) for the family consumption. His supply of home-collected manure (17 cart-loads) is also large enough to manure the entire area becoming due for cotton every year.

The crops grown on different plots of the land-holding and the areas put to each of these in the four years are shown below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.50	G-C	Groundnut	Cotton	Groundnut	Cotton
1.2	1.63	C-J	Jowar	Cotton	Jowar	Cotton
2.1	1.45	C-J	Cotton	Jowar	Cotton	Jowar
2.2	1.00	C-J	Cotton	Wheat (Jowar)	Cotton	Jowar
2.3	1.00	C-J	Jowar	Cotton	Cotton (Jowar)	Wheat (Jowar)
Total : Jowar			2.63	1.45	1.63	2.45
Groundnut			0.50	-	0.50	-
Cotton			2.45	3.13	3.45	2.13
Wheat			-	1.00	-	1.00

It may be seen from the cropping that the cultivator had grown his crops mostly as per the rotation-plan in all the four years. He deviated only on one plot each in 1961-62, 1962-63 and 1963-64. In the year 1961-62, he was required to deviate from jowar to wheat on the plot of one acre (Plot 2.2) in order to meet the extra food needs of his son's marriage. In 1962-63 he was required to deviate from jowar to cotton on another plot of 1.00 acre (Plot 2.3). He reported that in this year he wanted more cash-income to repay the loans borrowed for his son's marriage. In this year, therefore, he devoted a large proportion of his holding (3.45 acres) to cotton. As he preferred to put the entire land of the second fragment under cotton, there occurred a deviation from jowar to cotton on the plot of 1.00 acre (Plot 2.3). In 1963-64, the deviation was caused by the inadequate rains in the sowing season. He reported that on the plot of 1.00 acre (Plot 2.3) he had sown jowar as per the rotation-plan, but as there were no rains after the sowing, the crop came up in a

very scattered way. The cultivator kept the crop till the end of July, thinking that it will improve. But it remained stunted and had to be removed. He removed the jowar crop and kept the land fallow for the whole kharif season. In the rabi season the rains were sufficiently good and hence he put this land under wheat. He, thus, deviated from jowar to wheat on this plot of 1.00 acre.

CASE STUDY V 18

Name	: B. K. B.	Family size	: 7 members
Age	: 45 years	Earners	: Male Female Total
Education	: 6th standard		2 1 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,350
Subsidiary occupation	: Agricultural labour	Land-holding	: 5.71 acres
Livestock	:	Home-collected manure	: 6 cart-loads
Working Milch	Young Total		
-	1 1 2		

The cultivator cultivates his owned land of 5.71 acres. His land-holding comprises of two fragments, one having a small size (1.58 acres), and the other having a relatively larger size (4.13 acres). Of the two fragments, the smaller one is in the village itself; while the other (4.13 acres) is in the neighbouring village--Nandurkhed. The details of these fragments and the rotation-plan formulated by the cultivator are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.58	1.1	0.75	Deep-black	C-J
		1.2	0.73	Deep-black	C-J
		1.3	0.10	Deep-black	Ch-Ch-Ch
2	4.13	2.1	0.50 to 1.88	Deep-black	G-J-C
		2.2	0.75 to 2.00	Deep-black	G-J-C
		2.3	0.75 to 2.00	Deep-black	G-J-C

The entire land-holding of this cultivator is of deep-black soil. The cultivator reports that irrigation facility from an old well is available on the fragment of 1.58 acres cultivated in the village. The well is jointly owned by him and his cousin brothers. His share in its ownership is only one-eighth. The water supply in the well is very limited and hence he cannot grow any irrigated crops on this land. The land in his second fragment, though reported as deep-black, is nearer to medium-black land where groundnut can be profitably grown. Besides, this fragment being in the neighbouring village is not very convenient to manure every year. The cultivator, therefore, prefers to follow the three-year rotation of G-J-C on its entire area. Between the three crops included in the rotation, he has a clear preference for cotton. He devotes larger area to cotton every year. Because of such preference for a crop in the rotation, he cannot keep the division of plots the same in all the years. In order to make provision for the larger area to cotton he is required to change the division of plots every year. It may be seen that the area under different crops, averaged over the period of rotation cycle, comes to 2.21 acres under jowar; 2.12 acres under cotton; and 1.38 acres under groundnut. The area allocated

to jowar is enough to meet his yearly food needs. The annual requirement of jowar for the family consumption is about 30 maunds.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years, are shown below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.75	C-J	Jowar	Cotton	Wheat (Jowar)	Jowar
1.2	0.73	C-J	Jowar	Cotton	Wheat (Jowar)	Cotton
1.3	0.10	Ch-Ch-Ch	Chillies	Chillies	Chillies	Cotton (Chillies)
2.1	0.50 to 1.88	G-J-C	Jowar (1.38)	Cotton (1.88)	Groundnut (0.50)	'Nawati' banana (1.38) (Jowar)
2.2	0.75 to 2.00	G-J-C	Cotton (2.00)	Groundnut (0.75)	Jowar (1.63)	'Nawati' banana (2.00) (Cotton)
2.3	0.75 to 2.00	G-J-C	Groundnut (0.75)	Jowar (1.50)	Cotton (2.00)	'Nawati' banana (0.75) (Groundnut)
Total:Jowar			2.86	1.50	1.63	0.75
Groundnut			0.75	0.75	0.50	-
Cotton			2.00	3.36	2.00	0.83
Chillies			0.10	0.10	0.10	-
'Nawati' banana			-	-	-	4.13

It can be seen that the cultivator had grown the crops mostly as per the rotation-plan in the four years. He deviated on two plots (Plots 1.1 and 1.2) in 1962-63 and on four plots (Plots 1.3, 2.1, 2.2 and 2.3) in 1963-64. In the year 1962-63,

he deviated from jowar to wheat on his two plots of 0.75 and 0.73 acre as he wanted wheat to meet the food needs of his daughter's marriage. In 1963-64, he leased-out his fragment of land in the Nandurkhed village for the cultivation of banana. He reported that one of his neighbouring cultivator had sunk a new well in the adjoining field, from where the irrigation can be extended to his fragment as well. He, therefore, leased-out his land for banana cultivation on the basis of share-rent. Because of this lease there occurred deviations on all the three plots of the fragment. The leasing-out of this land necessitated deviation on the small plot of 0.10 acre as well in the village. As he had leased-out the bigger fragment of his land, he had to make provision for both food and cash requirements on the fragment of 1.58 acres in the village. In such circumstances he could not devote any area to chillies which he used to grow every year. He divided the fragment into two plots and took jowar and cotton on them. Thus, the deviation from chillies to cotton occurred on a small plot of 0.10 acre.

CASE STUDY V 19

Name	: D. K. R.	Family size	: 6 members
Age	: 57 years	Earners	: Male Female Total
Education	: 7th standard		1 2 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.1,050 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 5.95 acres
Livestock	:		
Working Milch	Young Total	Home-collected manure	: 6 cart-loads
-	1 1 2		

The cultivator cultivates only his owned land of 5.95 acres. It is a single fragment situated on the right bank of a big stream, at a distance of about two miles from the village. The cultivator reports that about half the land of the fragment suffers from constant erosion and is of inferior quality. The rest of the land, however, is of good quality. The details of the fragment and the rotations practised by the cultivator on its different plots are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	5.95	1.1	2.32 to 2.45	Light	G-J
		1.2	1.07 to 1.75	Medium-black	G-C
		1.3	0.70 to 1.00	Medium-black	C-W
		1.4	1.00 to 1.75	Deep-black	C-J

The rotation-plan formulated by the cultivator is much influenced by the types of soil available in his land-holding. He prefers to practise the rotations which are most suited to the type of land in different parts of his holding. Between the crops included in the rotations, he has a clear preference for cotton. As far as possible he devotes larger area of deep-black land to this crop every year. Because of such preference he cannot retain the division of plots uniform in all the years. He is required to change it in each year. The area under different crops, averaged over the period of rotation cycle, comes to 1.66 acres under jowar; 1.82 acres under cotton; and 1.73 acres under groundnut. The area allocated to jowar is just enough to meet his yearly food needs of 28 maunds.

The crops grown on different plots of the land-holding and

the areas devoted to each of these in the four years are presented below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.32 to 2.45	G-J	Jowar (2.32)	Groundnut (2.45)	Jowar (2.43)	Groundnut (2.45)
1.2	1.07 to 1.50	G-C	Groundnut (1.13)	Cotton (1.75)	Groundnut (1.07)	Cotton (1.50)
1.3	0.70 to 1.00	C-W	Wheat (0.75)	Wheat (0.75) (Cotton)	Wheat (0.70)	Wheat (1.00) (Cotton)
1.4	1.00 to 1.75	C-J	Cotton (1.75)	Jowar (1.00)	Cotton (1.75)	Jowar (1.00)
Total : Jowar			2.32	1.00	2.43	1.00
Groundnut			1.13	2.45	1.07	2.45
Cotton			1.75	1.75	1.75	1.50
Wheat			0.75	0.75	0.70	1.00

It can be seen that the cultivator had devoted larger area of the deep-black land to cotton in all the four years. Such a preference for cotton had led to all sorts of deviations on the different plots of his land-holding. These deviations were of the same type as we have noticed in the Case Studies K 14 and K 15. It may be noted that the accepted rotations were strictly followed on 4.39 acres of his land. The rest of his land was subjected to the deviations both of cross-cropping and the inter-play of the other unaccepted rotations. It may be noted that wheat got repeated on the same plot of 0.70 to 1.00 acre in all the four years. This was mainly because of his preference given to one crop in the rotation-plan.

CASE STUDY V 20

Name	: V. R. J.	Family size	: 2 members
Age	: 53 years	Earners	: Male Female Total
Education	: 5th standard		1 - 1
Caste	: Brahmin		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,350
Subsidiary occupation	: Religious services	Land-holding	: 6.38 acres
Livestock	:		
Working Milch	Young Total	Home-collected manure	: 6 cart-loads
-	1 1 2		

The land-holding cultivated by this cultivator is of two fragments, having a total area of 6.38 acres. The details of these fragments and the rotation-plan formulated by the cultivator are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	4.18	1.1	1.13	Light	G-J
		1.2	1.55	Medium-black	C-J
		1.3	1.50	Medium-black	C-J
2	2.20	2.1	2.20	Deep-black	C-C-C-J

The rotation-plan formulated by the cultivator shows a marked bias towards the cultivation of cotton. It is important to note that he prefers to put larger areas under cotton, even though his annual supply of home-collected manure is low and inadequate to manure all the land becoming due for cotton every year. He reports that every year he purchases manure (10 to 12 cart-loads) to apply to his land and puts it under cotton. The

rotation-plan of this cultivator appears to be much influenced by the type of land available in his holding. The area under different crops, averaged over the period of rotation-cycle, comes to 2.64 acres under jowar; 3.17 acres under cotton; and 0.56 acre under groundnut. The area allocated to jowar is far more than required to meet his annual food needs. His family being of two members only, the annual requirement of jowar for family consumption is as small as 9 maunds. However, because of the superior land in the major portion of his holding, he is required to allocate larger area to jowar. In fact, he has restricted the area under jowar to some extent, by practising the four-year rotation of C-C-C-J on one of his fragment. He cannot follow the similar rotation on the other plots as the land is of comparatively inferior type.

The crops grown on different plots of the land-holding in the four years and the areas devoted to each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.13	G-J	Groundnut	Jowar	Groundnut	Jowar
1.2	1.55	C-J	Cotton	Wheat (Jowar)	Cotton	Jowar
1.3	1.50	C-J	Cotton	Jowar	Cotton	Jowar
2.1	2.20	C-C-C-J	Cotton	Cotton	Cotton	Wheat (Jowar)
Total : Jowar			-	2.63	-	4.18
Groundnut			1.13	-	1.13	-
Cotton			5.25	2.20	5.25	-
Wheat			-	1.55	-	2.20

It may be noted from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the years, except in 1961-62 and 1963-64. In the year 1961-62, he was required to deviate from jowar to wheat on the plot of 1.55 acres (Plot 1.2), in order to meet the extra food needs of his daughter's marriage. In 1963-64 also, he was required to deviate from jowar to wheat, but on a different plot (Plot 2.1), and for a different reason. This deviation was mainly caused by the inadequate rainfall in the sowing season of that year. He reported that, he had, in fact, deviated to cotton on this plot in the first sowing. But as there was no rains after the sowing, the crop came up in a very scattered way and withered away in the draught spell of June. He then re-sowed jowar on this plot. The jowar crop came up well but its further growth was not satisfactory. It remained stunted and had to be removed ultimately. He removed it at the end of July. By this time the sowing season of all the kharif crops had elapsed. He, therefore, had to keep it fallow for the kharif season. In the rabi season he took wheat on it, thus deviating from jowar which was due as per the plan.

CASE STUDY V 21

Name	: T. R. P.	Family size	: 8 members
Age	: 40 years	Earners	: Male Female Total
Education	: Illiterate		1 2 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,960
Subsidiary occupation	: Agricultural labour	Land-holding	: 8.13 acres
Livestock	:		
Working Milch	1	Young 3	Total 4
		Home-collected manure	: 16 cart-loads

The land-holding cultivated by this cultivator is of two fragments, having a total area of 8.13 acres. The details of the fragments and the rotations practised on different plots of the holding are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	3.98	1.1	2.48	Deep-black	C-J
		1.2	1.50	Deep-black	C-J
2	4.15	2.1	2.50	Deep-black	C-J
		2.2	0.58	Deep-black	C-J
		2.3	0.07	Deep-black	C-J
		2.4	1.00	Deep-black	C-J

It may be noted that the entire land-holding of the cultivator is of deep-black soil. In the case of this cultivator, it is interesting to see how he has taken a composite view of the factors like the land-holding, the soil-composition, the supply of home-collected manure and the food needs of the family. Considering all these factors, he prefers to practise the C-J rotation on the entire area of his land-holding. His supply of

home-collected manure (16 cart-loads) is just enough to manure the area becoming due for cotton every year. The annual requirement of jowar for the family consumption is relatively large (36 maunds) as he has a big family of eight members. He is, therefore, required to devote larger area to jowar every year. The areas under the two crops, averaged over the period of rotation cycle, come to 4.06 acres each under cotton and jowar. The area allocated to jowar is slightly more than required to meet the yearly food needs of the family. He is required to devote larger area to jowar, because of the constraints from the supply of home-collected manure and the soil type available in the entire land-holding.

The crops grown on different plots of the holding in the four years, and the areas put under each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	2.48	C-J	Jowar	Jowar (Cotton)	Cotton	Jowar	
1.2	1.50	C-J	Jowar	Jowar (Cotton)	Cotton	Wheat (Jowar)	
2.1	2.50	C-J	Cotton	Cotton (Jowar)	Jowar	Cotton	
2.2	0.58	C-J	Cotton	Cotton (Jowar)	Wheat	Cotton	
2.3	0.07	C-J	Cotton	Cotton (Jowar)	Groundnut (Jowar)	Cotton	
2.4	1.00	C-J	Jowar	Jowar (Cotton)	Wheat (Cotton)	Cotton	
Total :			Jowar	4.98	4.98	2.50	2.48
			Groundnut	-	-	0.07	-
			Cotton	3.15	3.15	3.98	4.15
			Wheat	-	-	1.58	1.50

The cultivator was required to deviate on all his plots in 1961-62, on three plots (Plots 2.2, 2.3 and 2.4) in 1962-63, and on one plot (Plot 1.2) in 1963-64. In 1961-62, his whole crop-plan was disturbed because of the failure of cotton grown on the three plots in the preceding year. The cultivator reported that because of the crop failure in this year, the manure applied to the land was not fully utilized. In such conditions, he could not grow jowar on these plots as per the rotation as it would have resulted in more vegetative growth and given very low yield. He, therefore, decided to repeat cotton in the next year as well to utilize fully the residuals of the manure. He was, thus, required to deviate from jowar to cotton on the three plots (Plots 2.1, 2.2 and 2.3). As an interaction of these deviations, he was required to deviate on the remaining three plots also (Plots 1.1, 1.2 and 2.4). As he could not grow jowar as per the rotation-plan, he had to make provision for it through deviations. He, thus, deviated from cotton on the three plots and took jowar on them to meet his family's food needs. In 1962-63, he deviated from jowar to groundnut on one plot (Plot 2.3); from jowar to wheat on the second plot (Plot 2.2); and from cotton to wheat on the third plot (Plot 2.4). He reported that he was required to deviate on these plots in order to meet the family's consumption needs of groundnut and wheat. Similar was the case in 1963-64. In this year as well, he deviated from jowar to wheat on the plot of 1.50 acres (Plot 1.2) to meet the annual requirement of wheat for the family consumption. He reported that as the price of wheat in these years had

considerably gone up, he thought it is better to produce wheat on his own land rather than purchasing it.

CASE STUDY V 22

Name	: A. M. T.	Family size	: 7 members
Age	: 40 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.2,450 (1962-63)
Subsidiary occupation	: Grocery shop	Land-holding	: 8.71 acres
Livestock	:		
Working	Milch Young Total	Home-collected	
1	1 - 2	manure	: 12 cart-loads

The cultivator cultivates only his owned land of 8.71 acres. His land-holding consists of three fragments. The details of these fragments and the crop-rotations followed on different plots are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	3.28	1.1	0.75	Light	G-J
		1.2	1.78	Medium-black	C-J
		1.3	0.75	Medium-black	C-J
2	2.05	2.1	2.05	Medium-black	C-C-J
3	3.38	3.1	1.13	Deep-black	C-C-C-J
		3.2	1.13	Deep-black	C-C-C-J
		3.3	0.74	Deep-black	C-C-C-J
		3.4	0.38	Deep-black	C-C-C-J

It can be seen that the land-holding of the cultivator comprises of all the three types of land. A major portion of the total land is of medium-black and light soils. The cultivator,

however, has a marked preference for cotton in his rotation-plan. It appears that, on an average, he puts more than half of his entire land-holding under cotton every year. This is largely because two of his fragments have superior quality land where cotton can be grown repeatedly for two or three years. His supply of home-collected manure is relatively small, particularly in relation to his preference for cotton; but he purchases manure (10 to 12 cart-loads) every year to apply to the land due for cotton. The annual requirement of jowar for the family consumption is about 30 maunds. The areas under different crops, averaged over the period of rotation cycle, come to 3.17 acres under jowar; 5.17 acres under cotton; and 0.37 acre under groundnut. It may be seen how the cultivator allocates to jowar only the required area by growing cotton repeatedly on some plots, following the three and four-year rotations of C-C-J and C-C-C-J.

The crops grown on different plots of the holding and the areas put under each of these in the four years, are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.75	G-J	Jowar	Cotton (Groundnut)	Groundnut	Groundnut (Jowar)
1.2	1.78	C-J	Cotton	Cotton (Jowar)	Jowar	Groundnut (Cotton)
1.3	0.75	C-J	Jowar	Cotton	Groundnut (Jowar)	Groundnut (Cotton)
2.1	2.05	C-C-J	Cotton	Jowar	Cotton	Cotton
3.1	1.13	C-C-C-J	Cotton	Cotton	Cotton	Jowar
3.2	1.13	C-C-C-J	Cotton	Cotton	Cotton	Groundnut (Jowar)
3.3	0.74	C-C-C-J	Cotton	Cotton	Cotton	Wheat (Jowar)
3.4	0.38	C-C-C-J	Groundnut (Cotton)	Cotton	Cotton	Wheat (Jowar)

Total : Jowar	1.50	2.05	1.78	1.13
Groundnut	0.38	-	1.50	4.41
Cotton	6.83	6.66	5.43	2.05
Wheat	-	-	-	1.12

It can be seen from the cropping that the cultivator had grown the crops mostly as per the rotation-plan in all the four years. He was required to deviate on a minor proportion of his land. In 1960-61, he deviated from cotton to groundnut on a small plot of 0.38 acre (Plot 3.4) in order to meet the family's consumption needs of groundnut. In 1961-62, he deviated from groundnut and jowar to cotton on two plots having an area of 0.75 and 1.78 acre/s respectively. The deviations on both the plots were necessitated as he wanted more cash-income in that year to repay the loans borrowed to open the grocery shop. It may be noted that in this year the area devoted to cotton was as high as 6.66 acres--more than three-fourths of the total land-holding. The same was the case in the next year as well (1962-63). In this year also he deviated from jowar to groundnut on one plot of 0.75 acre (Plot 1.3) as he wanted cash-income to clear off the dues accumulated with the wholesale traders in Bhusawal from whom he purchased the materials required for his grocery shop. In this year, he put 6.93 acres of his total land under the two cash-crops. In 1963-64, he was required to deviate on most of his plots because of the inadequate rainfall during the sowing season of the year. He deviated on two plots each, from cotton to groundnut (Plots 1.2 and 1.3); from jowar to groundnut (Plots 1.1 and 3.2); and from jowar to wheat (Plots 3.3 and 3.4). All the deviations in this year were necessitated as

the crops taken in the first and second sowing failed completely because of inadequate rains after sowing.

CASE STUDY V 23

Name	: P. P. B.	Family size	: 5 members
Age	: 28 years	Earners	: Male Female Total
Education	: 10th standard		1 2 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.2,810 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 10.91 acres
Livestock	:	Home-collected manure	: 20 cart-loads
Working Milch	Young Total		
- 2	3 5		

The total land-holding cultivated by the cultivator is of 10.91 acres. The entire land-holding is owned. It consists of three fragments, the details of which are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.55	1.1	1.18	Deep-black	C-J
		1.2	1.17	Deep-black	C-W
		1.3	0.20	Light	J-J-J
2	6.05	2.1	1.30	Medium-black	G-C
		2.2	0.75	Medium-black	G-C
		2.3	2.50	Deep-black	C-J
		2.4	1.50	Deep-black	C-W
3	2.31	3.1	1.56	Deep-black	C-W
		3.2	0.75	Medium-black	G-C

In the case of this cultivator, it is interesting to see how he has formulated his rotation-plan, allocating only the

required area to jowar and the major portion of the land-holding to the cash-crops. His annual requirement of jowar is comparatively small (22 maunds) as his family is of five members. He, therefore, follows the two-year rotation of cash-crops alone (G-C) on three of his plots (Plots 2.1, 2.2 and 3.2) having a total area of 2.80 acres. On the remaining portion of his land which is of deep-black soil, he practises the two-year rotations of C-J and C-W. He does not practise any crop-rotation on the small plot of 0.20 acre as it is under "neem" trees. Besides, it is of lighter soil. He, therefore, puts it under single cropping of jowar grown as a fodder crop. The areas under different crops, averaged over the period of rotation-cycle, come to 2.04 acres under jowar; 5.35 acres under cotton; 1.40 acres under groundnut; and 2.11 acres under wheat. These averages show the cultivator's clear preference for the cultivation of cotton in the rotation-plan. The preference for cotton is largely because of the deep-black land predominantly available in the land-holding and the sufficiently large supply of home-collected manure. The case of this cultivator provides a good example to show how a cultivator takes a composite view of all the factors, while deciding upon his rotation-plan.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years, are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.18	C-J	Cotton	Jowar	Cotton	Cotton (Jowar)
1.2	1.17	C-W	Cotton	Wheat	Cotton	Cotton (Wheat)
1.3	0.20	J-J-J	Jowar	Jowar	Jowar	Jowar
2.1	1.30	G-C	Cotton	Groundnut	Cotton	Jowar (Groundnut)
2.2	0.75	G-C	Groundnut	Cotton	Groundnut	Jowar (Cotton)
2.3	2.50	C-J	Jowar	Cotton	Jowar	Cotton
2.4	1.50	C-W	Wheat	Cotton	Wheat	Cotton
3.1	1.56	C-W	Wheat	Cotton	Cotton (Wheat)	Wheat
3.2	0.75	G-C	Groundnut	Cotton	Groundnut	Groundnut (Cotton)
Total : Jowar			2.70	1.38	2.70	2.25
Groundnut			1.50	1.30	1.50	0.75
Cotton			3.65	7.06	5.21	6.35
Wheat			3.06	1.17	1.50	1.56

It may be noted from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the years, exceptⁱⁿ 1962-63 and 1963-64. In the year 1962-63, he was required to deviate on one plot of 1.56 acres (Plot 3.1) and in 1963-64, on five plots (Plots 1.1, 1.2, 2.1, 2.2 and 3.2). In 1962-63, he deviated from wheat to cotton because of the crop failure in the preceding year. The cultivator reported that as the cotton crop grown on this land failed because of the fungous disease, the manure applied could not be fully utilized. In order to utilize the residuals of manure in the next year, he was required to repeat the cotton crop. He was, thus, required to deviate from wheat to cotton on this plot (Plot 3.1) in

1962-63. In the year 1963-64, the deviations were necessitated because of the insufficient rainfall in the sowing season. The cultivator reported that he had anticipated the unfavourable conditions of rainfall and re-arranged his cropping on different plots, to suit the rainfall conditions in the year. As per the rotation-plan cotton was due on his four plots. Of these, two each were of deep-black (Plots 2.3 and 2.4) and of medium-black soil (Plots 2.2 and 3.2). 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 other crops on the two plots of the medium-black soil. He took jowar on one (Plot 2.2) and groundnut on the other (Plot 3.2). On his other two plots of deep-black soil (Plots 1.1 and 1.2) where jowar and wheat were due according to the plan, he deviated to cotton. 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. He, thus, tried to suit his cropping to the rainfall conditions in the year.

CASE STUDY V 24

Name	: B. L. R.	Family size	: 9 members
Age	: 35 years	Earners	: Male Female Total
Education	: Illiterate		2 3 5
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.2,550 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 14.63 acres
Livestock	:	Home-collected manure	: 8 cart-loads
Working	2		
Milch	-		
Young	-		
Total	2		

The total land-holding cultivated by this cultivator is of 14.63 acres, of which 2.38 acres only are owned, and the rest (12.25 acres) are leased-in on the basis of cash-rent. The land-holding comprises of three fragments. The details of these fragments and the rotation-plan formulated by the cultivator are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	2.38	1.1	1.20	Deep-black	C-C-J
		1.2	1.18	Deep-black	C-C-W
2	7.00	2.1	2.00	Medium-black	G-C-J
		2.2	2.00	Medium-black	G-C-J
		2.3	2.00	Light	G-J
		2.4	1.00	Light	G-J
3	5.25	3.1	1.50	Deep-black	C-J
		3.2	1.10	Deep-black	C-W
		3.3	0.75	Deep-black	C-W
		3.4	0.75	Deep-black	J-W
		3.5	0.75	Deep-black	J-W
		3.6	0.40	Deep-black	C-J

The rotation-plan formulated by this cultivator appears to be much influenced by the soil types of land available in his holding. He, thus, prefers to practise the three-year rotation of G-C-J on the two plots of medium-black soil and the two-year rotation of G-J on the two plots of lighter soil. On the lands having deep-black soil, however, he follows varied types of rotations of cotton, jowar and wheat. The areas under different crops, averaged over the period of rotation cycle, come to 4.93 acres under jowar; 4.79 acres under cotton; 2.83 acres under groundnut and 2.07 acres under wheat. The area allocated to jowar is large compared to his annual requirement of jowar (40 maunds)

for the family consumption. This is largely because of the constraint from the supply of home-collected manure. His supply of home-collected manure is as low as 8 cart-loads. Considering the lower supply of home-collected manure and the larger requirement of jowar for the family consumption, he is required to allocate more area to jowar in his rotation-plan.

The crops grown on different plots of the land-holding in the four years, and the areas devoted to each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.20	C-C-J	Cotton	Jowar	Cotton	Cotton	
1.2	1.18	C-C-W	Cotton	Wheat	Cotton	Cotton	
2.1	2.00	G-C-J	Cotton	Cotton (Jowar)	Jowar	Groundnut	
2.2	2.00	G-C-J	Jowar	Cotton (Groundnut)	Jowar	Groundnut	
2.3	2.00	G-J	Groundnut	Jowar	Groundnut	Jowar	
2.4	1.00	G-J	Bajara (Jowar)	Jowar	Groundnut	Jowar	
3.1	1.50	C-J	Cotton	Jowar	Cotton	Jowar	
3.2	1.10	C-W	Wheat	Cotton	Cotton (Wheat)	Wheat	
3.3	0.75	C-W	Wheat	Cotton	Wheat	Cotton	
3.4	0.75	J-W	Jowar	Wheat	Wheat (Jowar)	Cotton (Jowar)	
3.5	0.75	J-W	Jowar	Wheat	Jowar	Wheat	
3.6	0.40	C-J	Cotton	Jowar	Groundnut (Cotton)	Cotton	
Total :			Jowar	3.50	6.10	4.75	4.50
			Groundnut	2.00	-	3.40	4.00
			Cotton	6.28	5.85	4.98	4.28
			Wheat	1.85	2.68	1.50	1.85
			Bajara	1.00	-	-	-

It may be seen from the cropping that in all the four years the cultivator had grown crops strictly as per the rotation-plan on most of the area of his land-holding. He had deviated on one plot each in 1960-61 and 1963-64; on two plots in 1961-62 and on three plots in 1962-63. In the year 1960-61, he deviated from jowar to bajara on the plot of 1.00 acre (Plot 2.4) in order to get a different type of fodder for his working cattle. It is reported that the husk of bajara is very good for bullocks. However, he found that bajara is not profitable and hence continued on this plot with the G-J rotation in the following years. In the year 1961-62, he deviated from jowar and groundnut to cotton on two plots of 2.00 acres each (Plots 2.1 and 2.2) in order to have more cash-income to pay the cash-rent of the leased-in land. In 1962-63, the cultivator was required to deviate from wheat to cotton on the plot of 1.10 acres (Plot 3.2); from jowar to wheat on the plot of 0.75 acre (Plot 3.4); and from cotton to groundnut on the plot of 0.40 acre (Plot 3.6). The deviation from wheat to cotton on the first plot was necessitated because of the failure of cotton crop in the preceding year. He repeated same crop of cotton to utilize the residuals of the manure applied in the preceding year. As an interaction of this deviation, he was required to deviate from jowar to wheat on the second plot. As he could not grow wheat as per the plan on the plot of 1.10 acres, he had to make provision for it on some other plot. He, thus, deviated from jowar to wheat on the plot of 0.75 acre. The deviation from cotton to groundnut on the third plot was caused by the heavy rainfall in the sowing season of the year. Because of heavy rains, water accumulated on this plot and the crop of

cotton grown on it was spoiled. The cultivator had to remove it and re-sow the land. In order to avoid the repetition of the same crop he deviated to groundnut, another cash-crop, and re-sowed it on this plot. In 1963-64, the cultivator deviated from jowar to cotton on the plot of 0.75 acre (Plot 3.4) in anticipation of the unfavourable conditions of rainfall in the sowing season of the year. Because of inadequate rains in the beginning of the sowing season, he thought it is better to grow cotton on the deep-black land which can retain moisture for long. He, therefore, deviated from jowar, which is draught resistant, and took cotton on this plot of deep-black land.

CASE STUDY V 25

Name	: G. M. P.	Family size	: 5 members
Age	: 40 years	Earners	: Male Female Total
Education	: 4th standard		2 1 3
Caste	: Maratha		
Main occupation	: Agriculture	Total income	: Rs.3,250 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 14.64 acres
Livestock	:		
Working	2	Milch	-
		Young	1
		Total	3
		Home-collected manure	: 10 cart-loads

The cultivator cultivates a land-holding of 14.64 acres, which he owns. The land-holding comprises of four fragments. Of these, three fragments having a total area of 11.76 acres are in the village and the remaining one having an area of 2.88 acres

is situated in the neighbouring village (Nandurkhed). The details of these fragments and the rotation-plan of the cultivator are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	3.18	1.1	3.18	Medium-black	G-C-J
2	5.30	2.1	3.50	Deep-black	C-C-C-J
		2.2	1.80	Deep-black	C-C-C-J
3	3.28	3.1	1.50	Deep-black	C-W
		3.2	1.78	Deep-black	C-W
4	2.88	4.1	2.88	Deep-black	C-J

The rotation-plan of the cultivator has a marked bias towards the cultivation of cotton. More than half of the total area of the land-holding (8.14 acres) is allocated to cotton. This is largely because of the fragment of 5.30 acres which has a superior type of land. The cultivator reports that this fragment is nearer to the village and hence very convenient to manure. The cultivator manures it almost every year. Because of continuous manuring the land in this fragment is very rich and therefore the cultivator prefers to put it under the four-year rotation of C-C-C-J. His another fragment of 3.28 acres is situated on the low lying area where rain water accumulates. This fragment, therefore, is found to be most suited to wheat, which is sown in September, by which time the land gets free from the accumulated water. The cultivator, therefore, prefers to practise the C-W rotation on this fragment. He preferred cotton to rotate along with wheat, firstly, because it is more profitable than jowar, and secondly, jowar included in other rotations is more than enough to meet his yearly consumption needs.

The areas under different crops, averaged over the period of rotation cycle, come to 3.85 acres under jowar; 8.14 acres under cotton; 1.06 acres under groundnut; and 1.64 acres under wheat. The area allocated to jowar is more than required to meet the annual food needs of the family. This is mainly because of the constraint from the supply of manure. His supply of home-collected manure is small (10 cart-loads) in relation to his land-holding and it constituted a major constraint on his rotation-plan.

The crops grown on different plots of the land-holding in the four years, and the areas devoted to each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	3.18	G-C-J	Cotton	Jowar	Groundnut	Cotton
2.1	3.50	C-C-C-J	Cotton	Cotton	Cotton	'Nawati' banana (Jowar)
2.2	1.80	C-C-C-J	Cotton	Cotton	Cotton	Wheat (Jowar)
3.1	1.50	C-W	Wheat	Cotton	Wheat	Jowar (Cotton)
3.2	1.78	C-W	Cotton	Wheat	Cotton	Jowar (Wheat)
4.1	2.88	C-J	Jowar	Cotton	Jowar	Wheat (Cotton)
Total : Jowar			2.88	3.18	2.88	3.28
Groundnut			-	-	3.18	-
Cotton			10.26	9.68	7.08	3.18
Wheat			1.50	1.78	1.50	4.68
'Nawati' banana			-	-	-	3.50

It may be seen from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the years except in 1963-64. In 1963-64, he was required to deviate on most of his land because of two factors--irrigation and rainfall.

The cultivator reported that in 1963, he sunk a new well in his large fragment of 5.30 acres. In 1963-64, therefore, there was a major shift in his cropping. He shifted for the first time to the irrigated crops like banana on the plot of 3.50 acres (Plot 2.1) and from jowar to wheat on the plot of 1.80 acres (Plot 2.2) of the same fragment. As an interaction of these deviations, he was required to deviate on two other plots (Plots 3.1 and 3.2). As he could not grow jowar on the two plots (Plots 2.1 and 2.2) where it was due, he had to make provision for it on some other plots. He was, thus, required to deviate from cotton and wheat to jowar on his two plots of 1.78 and 1.50 acres respectively. In this year he had also deviated on the plot of 2.88 acres (Plot 4.1). This deviation was caused by the inadequate rainfall in the sowing season of the year. The cultivator reported that he had, in fact, sown cotton on this plot as per the rotation-plan but it failed because of insufficient rainfall. He had retained the crop till the end of July, hoping that it will improve. But it did not show any good progress and had to be removed. By the time he removed the crop, the sowing season of all the kharif crops had passed out. In the circumstances, he had to keep the land fallow for the whole kharif season, and put under wheat in the rabi season, thus deviating from cotton to wheat.

CASE STUDY V 26

Name	: H. P. R.	Family size	: 8 members
Age	: 42 years	Earners	: Male Female Total
Education	: 6th standard		1 2 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.4,250
Subsidiary occupation	: Agricultural labour	Land-holding	: 15.30 acres
Livestock	:		
Working	2	Home-collected manure	: 27 cart-loads
Milch	2		
Young	3		
Total	7		

The entire land-holding of this cultivator is of leased-in land of 15.30 acres. He does not own any land. He reports that this land is under his cultivation since 1942. The cultivated land-holding comprises of two fragments. The details of these fragments and the rotations practised on different plots of them are presented below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	10.40	1.1	3.00	Deep-black	C-J-W
		1.2	3.00	Deep-black	C-J-W
		1.3	1.50	Deep-black	C-J-W
		1.4	2.90	Deep-black	C-J-W
2	4.90	2.1	3.90	Deep-black	C-C-C-J
		2.2	1.00	Medium-black	G-C-J

It may be noted that the land-holding of this cultivator is predominantly of deep-black soil. His rotation-plan, therefore, has a marked bias towards the cultivation of cotton. This is largely because of his one plot of 3.90 acres (Plot 2.1) having a superior type of land where cotton can be grown repeatedly for two to three years. In the case of this cultivator it is

interesting to see how he has taken a composite view of his resources and requirements while formulating the rotation-plan. His supply of home-collected manure, though sufficiently large (27 cart-loads), operates as a constraint on the area of cotton. Because of manure restraint, he is required to follow the C-J-W rotation on all the plots of the fragment of 10.40 acres. The areas under different crops, averaged over the rotation cycle, come to 4.77 acres under jowar; 6.73 acres under cotton; 3.47 acres under wheat; and 0.33 acre under groundnut. It may be noted that his supply of home-collected manure is just enough to manure the average area becoming due for cotton every year. The area allocated to jowar is comparatively very large than required to meet his annual requirement of jowar (36 maunds) for the family consumption. The cultivator reported that he is required to devote larger area to jowar to meet his fodder requirement which is quite heavy.

The crops grown in the four years and the areas devoted to each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	3.00	C-J-W	Cotton	Jowar	Wheat	Cotton	
1.2	3.00	C-J-W	Wheat	Cotton	Jowar	Wheat	
1.3	1.50	C-J-W	Cotton	Jowar	Cotton (Wheat)	Jowar	
1.4	2.90	C-J-W	Jowar	Wheat	Cotton	Jowar	
2.1	3.90	C-C-C-J	Cotton	Cotton	Cotton	Cotton (Jowar)	
2.2	1.00	G-C-J	Cotton	Jowar	Groundnut	Jowar	
Total :			Jowar	2.90	5.50	3.00	4.40
			Groundnut	-	-	1.00	-
			Cotton	9.40	6.90	8.30	7.90
			Wheat	3.00	2.90	3.00	3.00

It may be noted that in all the four years the cultivator had grown crops strictly as per the rotation-plan on most of his land-holding. He was required to deviate on one plot each in 1962-63 and 1963-64. In both the years, the deviations were necessitated by the rotation-plan itself. In these years, the rotation-plan itself developed an imbalance in the area allocation of different crops. In 1962-63, the area due for wheat was in excess at the cost of the area under cotton. In order to correct this area imbalance, he deviated from wheat to cotton on the plot of 1.50 acres (Plot 1.3). The same was the case in the next year. In this year the area under jowar was far in excess than required. The area under cotton, on the other hand, was far short than the average area. He, therefore, deviated from jowar to cotton on the plot of 3.90 acres (Plot 2.1) and corrected the area imbalance. He brought down the area due for jowar from 8.30 to 4.40 acres and pushed up the area of cotton from 4.00 to 7.90 acres.

CASE STUDY V 27

Name	: S. M. P.	Family size	: 10 members
Age	: 49 years	Earners	: Male Female Total
Education	: Illiterate		2 1 3
Caste	: Maratha		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.3,750
Subsidiary occupation	: -	Land-holding	: 18.86 acres
Livestock	:	Home-collected manure	: 40 cart-loads
Working	2	Milch	5
		Young	4
		Total	11

The cultivator cultivates a land-holding of 18.86 acres. The entire land-holding is owned. It consists of seven fragments, which are all situated in the village. The details of these fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	1.50	1.1	1.50	Deep-black	C-C-J
2	1.60	2.1	1.60	Deep-black	C-C-J
3	1.50	3.1	1.50	Deep-black	C-C-J
4	2.58	4.1	2.58	Deep-black	C-C-J-W
5	3.57	5.1	3.20	Deep-black	C-C-J-W
		5.2	0.37	Deep-black	C-C-J-W
6	2.58	6.1	2.58	Deep-black	C-C-J-W
7	5.53	7.1	4.00	Deep-black	C-C-J-W
		7.2	1.53	Deep-black	J-J-J

It may be noted that the entire land-holding of this cultivator is of deep-black soil. The cultivator, therefore, has a marked preference for cotton in his rotation-plan. It can be seen that, on an average, he devotes about half of his total land to cotton every year. This is largely because, his entire holding is of superior type of land where cotton can be grown repeatedly. Besides, he has a large supply of home-collected manure (40 cart-loads). The case of this cultivator is far similar to that of the cultivator discussed in Case Study V 26. In the case of this cultivator as well, the supply of home-collected manure, though large, operates as a constraint and he is required to practise the C-C-J-W rotation on five of his plots. He cannot practise any rotation on the plot of 1.53 acres (Plot 7.2), because of the mango grove. He reports that under the shade of the mango trees,

no crop can be profitably grown. He, however, grows jowar continuously on this plot as a fodder crop. The areas under different crops, averaged over the period of rotation cycle, come to 6.25 acres under jowar; 9.44 acres under cotton; and 3.18 acres under wheat. The area allocated to jowar is considerably large, in relation to his annual food needs of the family. His annual requirement of jowar for the family consumption is about 45 maunds. However, he has a relatively big livestock and hence his fodder requirement is considerably heavy. He is, therefore, required to make provision for fodder by allocating a large area to jowar in the rotation plan. In this case it is interesting to see how the cultivator balances his resources and requirements and tries to attain the stable maximum income over years.

The crops grown on different plots of the land-holding and the area devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.50	C-C-J	Cotton	Jowar	Cotton	Jowar (Cotton)
2.1	1.60	C-C-J	Jowar	Cotton	Cotton	Jowar
3.1	1.50	C-C-J	Jowar	Cotton	Cotton	Jowar
4.1	2.58	C-C-J-W	Cotton	Jowar	Wheat	Cotton
5.1	3.20	C-C-J-W	Jowar	Wheat	Cotton	Cotton
5.2	0.37	C-C-J-W	Jowar	Groundnut (Wheat)	Cotton	Cotton
6.1	2.58	C-C-J-W	Wheat	Cotton	Cotton	Cotton (Jowar)
7.1	4.00	C-C-J-W	Cotton	Cotton	Jowar	Wheat
7.2	1.53	J-J-J	Jowar	Jowar	Jowar	Jowar
Total : Jowar			8.20	5.61	5.53	6.13
Groundnut			-	0.37	-	-
Cotton			8.08	9.68	10.75	8.73
Wheat			2.58	3.20	2.58	4.00

It can be seen from the cropping that in all the four years the cultivator had grown the crops, strictly as per the rotation-plan on almost all the area of his land-holding. He was required to deviate on one plot in 1961-62 and on two plots in 1963-64. In the year 1961-62, he deviated from wheat to groundnut on the plot of 0.37 acre (Plot 5.2) in order to meet the family's consumption needs of groundnut. In 1963-64, the deviations were necessitated because of unfavourable conditions of rainfall in the sowing season of the year. He was required to deviate from cotton to jowar on the plot of 1.50 acres (Plot 1.1). In fact he had sown cotton on this plot, but because of insufficient rainfall after sowing the crop came up in a scattered way and withered away. He was required to re-sow the land. As the land in this plot was of deep-black soil, he made another attempt to grow cotton on it by repeating the same crop in the re-sowing. This time the crop came up well but there was no satisfactory progress in its growth. He had retained the crop till the middle of July, hoping that it improve. But it did not show any improvement and had to be removed ultimately. The cultivator was, thus, required to sow the land for the third time. In the third sowing he had to deviate to jowar as it was the only kharif crop which he could sow so late. The sowing season of all the other kharif crops had passed out. Thus, after making two attempts to grow the crop due as per rotation, he was required to deviate to jowar. The case of his another plot of 2.58 acres (Plot 6.1) was slightly different. On this plot also, he had sown jowar as per the rotation-plan, but as the rains were inadequate the seeds did not germinate and crop did not come up at all. He had to re-sow the land immediately.

He preferred to re-sow cotton on it as the plot had relatively better soil. He was, thus, required to deviate from jowar to cotton on this plot.

CASE STUDY V 28

Name	: L. A. G.	Family size	: 10 members
Age	: 35 years	Earners	: Male Female Total
Education	: Illiterate		1 1 2
Caste	: Mahar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,370
Subsidiary occupation	: Agricultural labour	Land-holding	: 7.17 acres
Livestock	:		
Working	2	Milch	2
		Young	2
		Total	6
		Home-collected manure	: 22 cart-loads

The case of this cultivator is rather peculiar in the sense that he has a large land-holding of 24.19 acres, but a major portion of it is uncultivable. Of the total area of land-holding, the uncultivable area is as large as 17.02 acres. This means only 7.17 acres or a little more than one-third of the total land-holding is cultivated. The cultivated land-holding comprises of five fragments. The details of these fragments and the crop-rotations practised on them are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	0.63	1.1	0.63	Medium-black	C-J
2	0.83	2.1	0.83	Medium-black	G-C-J
3	1.20	3.1	1.20	Medium-black	C-J
4	2.63	4.1	1.50	Medium-black	C-J
		4.2	1.13	Light	J-J-J
5	1.88	5.1	1.88	Light	J-J-J

The rotation-plan of the cultivator appears to have been largely influenced by two factors: (1) the annual requirement of jowar for the family consumption; and (2) the types of soil available in the land-holding. The cultivator has a relatively big family of ten members and hence his yearly requirement of jowar is as large as 45 maunds. In order to meet such a large requirement of jowar, he is required to allocate larger area to jowar in his rotation-plan. He, therefore, prefers to practise the rotations with jowar as one of the crops on all the plots of his land-holding. He could not practise any crop-rotation on two of his plots having light soil (Plots 4.2 and 5.1). He reports that these plots are on the banks of two big streams which cause continuous erosion to the major portion of the land. Because of continuous erosion the land in the plot has become so poor that no other crop except jowar can be grown on it. He is, thus, required to resort to single cropping of jowar on both the plots. However, jowar grown on these plots is largely used as green fodder. The area under jowar grown for food needs, therefore, is considerably low and not at all adequate to meet the annual food requirement of the family. Hence, the cultivator is not wholly dependent on his land for the family's consumption needs. The cultivator has a fairly large supply of home-collected manure (22 cart-loads). But his land-holding is such that he cannot use profitably the entire supply of manure on his own land. He, therefore, prefers to sell a major portion of his home-collected manure.

The crops grown and the areas put under each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.63	C-J	Jowar	Cotton	Jowar	Jowar (Cotton)
2.1	0.83	G-C-J	Groundnut	Cotton	Jowar	Cotton (Groundnut)
3.1	1.20	C-J	Jowar	Cotton	Jowar	Jowar (Cotton)
4.1	1.50	C-J	Cotton	Jowar	Cotton	Jowar
4.2	1.13	J-J-J	Jowar	Jowar	Jowar	Jowar
5.1	1.88	J-J-J	Jowar	Jowar	Jowar	Jowar
Total : Jowar			4.84	4.51	5.67	6.34
Groundnut			0.83	-	-	-
Cotton			1.50	2.66	1.50	0.83

The cultivator had grown the crops strictly as per the rotation-plan on all the plots, except in the last year (1963-64). In the year 1963-64, he deviated on three plots. He was required to deviate from cotton to jowar on two plots (Plots 1.1 and 3.1) and from groundnut to cotton on another plot (Plot 2.1). The deviations from cotton to jowar were necessitated because of the inadequate rains during the sowing season of the year. The cultivator reported that he had, in fact, sown cotton as per the rotation-plan, on both the plots but the crop did not come up well and withered away during the draught spell of June. He had to re-sow the land in both the plots. He could not repeat cotton as its sowing season was over. In the circumstances, he had to re-sow jowar on both the plots. The deviation from groundnut to cotton on the plot of 0.83 acre (Plot 2.1) was necessitated because of the non-availability of groundnut seeds. The cultivator reported that he had no home-preserved groundnut seeds in this year and could not purchase it as its price was quite high.

He, therefore, could not sow groundnut as per the rotation-plan and had to deviate. He preferred to deviate to cotton as its seeds were comparatively very cheap.

CASE STUDY V 29

Name	: D. R. K.	Family size	: 6 members
Age	: 60 years	Earners	: Male Female Total
Education	: 7th standard		2 - 2
Caste	: Brahmin		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.4,000
Subsidiary occupation	: -	Land-holding	: 17.89 acres
Livestock	:		
Working	2	Milch	-
		Young	2
		Total	4
		Home-collected manure	: 12 cart-loads

The total land-holding cultivated by this cultivator is of 17.89 acres. In fact, he had a larger land-holding (24.32 acres) till the year 1962-63 when he sold one of his fragments of 6.43 acres. The land-holding which remained under his cultivation for all the four years, is of 17.89 acres. This holding comprises of four fragments. The details of these fragments and the rotation-plan of the cultivator are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	5.30	1.1	4.00	Deep-black	C-W
		1.2	1.30	Deep-black	C-W
2	1.78	2.1	1.78	Deep-black	C-C-C-J
3	8.68	3.1	2.68	Deep-black	C-W
		3.2	2.00	Deep-black	C-W
		3.3	3.00	Deep-black	C-C-C-J
		3.4	1.00	Deep-black	C-C-C-J
4	2.13	4.1	2.13	Deep-black	C-C-C-J

The entire land-holding of the cultivator is of deep-black soil. His rotation-plan, therefore, has a marked bend towards the cultivation of cotton. More than half of the total area is allocated to cotton. In four of his plots where the land is of superior quality, he grows cotton repeatedly for three years (Plots 2.1, 3.3, 3.4 and 4.1). The areas under different crops, averaged over the period of rotation cycle, come to 1.98 acres under jowar; 10.92 acres under cotton; and 4.99 acres under wheat. The area allocated to jowar is relatively small as he usually grows jowar as a mixed crop along with cotton. The annual requirement of jowar for the family consumption is about 26 maunds. It is entirely met from the home production of jowar. In the case of this cultivator, the supply of home-collected manure is small (12 cart-loads), particularly in relation to the area allocated to cotton. However, he reports that he purchases the required quantity of manure every year to manure the crop of cotton.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	4.00	C-W	Wheat	Cotton	Wheat	Cotton
1.2	1.30	C-W	Groundnut (Cotton)	Wheat	Wheat (Cotton)	Cotton
2.1	1.78	C-C-C-J	Cotton	Cotton	Cotton	Jowar
3.1	2.68	C-W	Cotton	Wheat	Cotton	Wheat
3.2	2.00	C-W	Cotton	Wheat	Cotton	Jowar (Wheat)
3.3	3.00	C-C-C-J	Cotton	Cotton	Cotton	Cotton (Jowar)
3.4	1.00	C-C-C-J	Cotton	Paddy (Cotton)	Paddy (Cotton)	Cotton

4.1	2.13	C-C-C-J	Cotton	Cotton	Cotton	Wheat (Jowar)
Total :	Jowar	-	-	-	-	3.78
	Groundnut	1.30	-	-	-	-
	Cotton	12.59	10.91	11.59	9.30	
	Wheat	4.00	5.98	5.30	4.81	
	Paddy	-	1.00	1.00	-	

It can be seen from the cropping that in the four years, the cultivator had grown the crops mostly as per the rotation-plan. In the first three years (1960-61 to 1962-63) he had grown jowar continuously on the fragment of 6.43 acres which he sold out in 1963. He was required to deviate only on one plot each in 1960-61 and 1961-62, on two plots in 1962-63 and on three plots in 1963-64. In the year 1960-61, he deviated from cotton to groundnut on the plot of 1.30 acres (Plot 1.2) in order to meet the family's consumption needs of groundnut. Similar was the case in the next year. The cultivator reported that as rice was not available in open market and as it was rationed, he thought it is better to grow paddy on his land to meet the consumption needs of his family. He, thus, deviated from cotton to paddy on a small plot of 1.00 acre (Plot 3.4) where irrigation from the adjacent land of the neighbouring cultivator could be arranged. In the next year as well, he deviated from cotton to paddy on the same plot to have rice for the family consumption. In this year he was required to deviate on one more plot (Plot 1.1). He deviated from cotton to wheat on this plot as he could not manure the land in the year. In 1963-64, the deviations on the three plots were necessitated because of inadequate rainfall during the sowing season of the year. He had to rearrange his cropping

on three of his plots, considering the different grades of soil. He, thus, deviated from jowar and took cotton on the plot of 3.00 acres (Plot 3.3) as the land was of superior type. Similarly he deviated from wheat to jowar on the plot of 2.00 acres (Plot 3.2) and from jowar to wheat on the plot of 2.13 acres (Plot 4.1). The land put under jowar was relatively inferior type than the land devoted to wheat.

CASE STUDY V 30

Name	: D. S. K.	Family size	: 7 members
Age	: 60 years	Earners	: Male Female Total
Education	: 5th standard		5 - 5
Caste	: Brahmin		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.8,500
Subsidiary occupation	: -	Land-holding	: 47.30 acres
Livestock	:	Home-collected manure	: 34 cart-loads
Working	4	Milch	2
		Young	1
		Total	7

This is one of the big cultivators in the village. He cultivates only his owned land-holding of 47.30 acres. It is comprised of nine fragments, all situated in the village. The details of these fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Plot No.	Acres	Soil type	Crop-rotation
1	6.88	1.1	6.88	Deep-black	C-J-W
2	1.28	2.1	1.28	Deep-black	C-J-W
3	4.55	3.1	4.55	Deep-black	C-J-W
4	2.08	4.1	2.08	Deep-black	C-C-J-W

5	5.05	5.1	5.05	Deep-black	C-C-J-W
6	7.00	6.1	2.50	Deep-black	C-C-J-W
		6.2	4.50	Deep-black	C-C-J-W
7	6.25	7.1	6.25	Deep-black	C-C-J-W
8	7.83	8.1	7.83	Deep-black	C-C-J-W
9	6.38	9.1	6.38	Deep-black	C-C-J-W

It may be noted that the entire land-holding of this cultivator is of deep-black soil. The rotation-plan formulated by him is very simple, in the sense that he follows only two types of crop-rotations, C-J-W and C-C-J-W, on different plots of his entire land-holding. It can be seen that in his whole rotation-plan he has a marked bend towards the cultivation of cotton. This is largely because of the deep-black soil available on his entire land-holding. The areas under the three crops, averaged over the period of rotation-cycle, come to 12.89 acres each under jowar and wheat; and 21.53 acres under cotton. The cultivator allocates his land through the two rotations in such a way that every year about one-fourth of the land goes under jowar, another one-fourth under wheat and the remaining one-half under cotton. The annual requirement of jowar for the family consumption is about 30 maunds. The area allocated to jowar is larger than the area required to meet his family's annual food needs. He is required to devote larger area to jowar because of manure constraint. His supply of home-collected manure, though large (34 cart-loads) is not sufficient to manure every year all the area becoming due for cotton under the rotation-plan. He is required to purchase manure (30 to 40 cart-loads) every year to manure the cotton crop.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are presented below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	6.88	C-J-W	Wheat	Cotton	Jowar	Wheat
2.1	1.28	C-J-W	Cotton	Jowar	Wheat	Cotton
3.1	4.55	C-J-W	Cotton	Jowar	Cotton (Wheat)	Jowar
4.1	2.08	C-C-J-W	Cotton	Cotton	Wheat (Jowar)	Cotton
5.1	5.05	C-C-J-W	Jowar	Wheat	Cotton	Cotton
6.1	2.50	C-C-J-W	Jowar	Wheat	Cotton	Jowar (Cotton)
6.2	4.50	C-C-J-W	Jowar	Wheat	Cotton	Cotton
7.1	6.25	C-C-J-W	Wheat	Cotton	Cotton	Jowar
8.1	7.83	C-C-J-W	Cotton	Jowar	Wheat	Cotton
9.1	6.38	C-C-J-W	Cotton	Cotton	Jowar	Wheat
Total : Jowar			12.05	13.66	13.26	13.30
Cotton			22.12	21.59	22.85	20.74
Wheat			13.13	12.05	11.19	13.26

It can be seen from the cropping that in all the four years, the cultivator had grown the crops strictly as per the rotation-plan on most of the area of his land-holding. He was required to deviate on two plots only in 1962-63 and on one plot in 1963-64. In both the years the deviations were necessitated by the rotation-plan itself. In these years, the rotation-plan itself disturbed the area balance usually maintained between the three crops. As pointed out earlier, the cultivator generally allocates about one-fourth of his land-holding each to jowar and wheat and the remaining one-half to cotton. In 1962-63, this area balance was disturbed--the area under jowar and wheat coming in excess at the cost of cotton. To correct this imbalance, the cultivator was required to deviate on two plots, from wheat to cotton on

one plot (Plot 3.1) and from jowar to wheat on another (Plot 4.1). By deviating from wheat to cotton on the plot of 4.55 acres he brought the area of cotton to its usual level of 22.00 to 23.00 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 12.00 to 13.00 acres. Similar was the case in 1963-64. In this year as well, the rotation-plan had led to a slight imbalance between the areas of cotton and jowar. The area under cotton was in excess at the cost of jowar. He, therefore, deviated from cotton to jowar on the plot of 2.50 acres (Plot 6.1) and corrected the imbalance.

THE CASE STUDIES OF THE SAMPLE CULTIVATORS

FROM

WAGHODE

CASE STUDY W 1

Name	: R. D. W.	Family size	: 11 members
Age	: 45 years	Earners	: Male Female Total
Education	: Illiterate		3 2 5
Caste	: Maratha		
Main occupation	: Agricultural labour	Total income (1962-63)	: Rs.1,850
Subsidiary occupation	: Agriculture	Land-holding	: 1.38 acres
Livestock	:		
Working	Milch	Young	Total
-	1	2	3
		Home-collected manure	: 12 cart-loads

This is a small cultivator having a land-holding of 1.38 acres only. It is a single fragment situated on the right bank of the Sukhi river. A small portion of its area (0.13 acre) towards the river, suffers erosion and is of very inferior type of soil. The details of the fragment and the crop-rotations practised on it are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.38	Available	1.1	0.55	Medium-black	NB-JB-J
			1.2	0.50	Medium-black	NB-JB-J
			1.3	0.20	Medium-black	NB-JB-J
			1.4	0.13	Medium-black	J-J-J

The cultivator reports that the irrigation facility is available on his land from an old well, jointly owned by him and his brothers. His share in the ownership of the well is one-third. The water supply in the well is satisfactory. The cultivator, however, does not utilize it as his land-holding is very small. Besides, he does not have any equipments of irrigation.

He, therefore, prefers to lease-out his land specifically for cultivation of banana to one of his brothers who has all the equipments of irrigation. He has adjusted the cropping on his land with that of his brother and, therefore, could give a definite place to banana in his rotation-plan. He follows the three-year rotation of NB-JB-J on the major portion of his land-holding. He prefers to rotate jowar along with banana because of the large food needs of his family. He reports that the annual requirement of jowar for the family consumption is about 50 maunds. It is never met from the home-production of jowar. He is required to purchase a major portion of his total requirement every year.

The crops grown on different plots of the holding are as follows:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.55	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	'Nawati' banana (Jowar)
1.2	0.50	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	'Nawati' banana (Jowar)
1.3	0.20	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	'Nawati' banana (Jowar)
1.4	0.13	J-J-J	Jowar	Jowar	Jowar	Jowar
Total : Jowar			1.38	0.13	0.13	0.13
'Nawati' banana			-	1.25	-	1.25
'Junar' banana			-	-	1.25	-

It can be seen that the cultivator had grown the crops strictly as per the rotation, except in the last year (1963-64). In this year he deviated from jowar to banana on the first three plots (Plots 1.1, 1.2 and 1.3) having a total area of 1.25 acres. In this year also, he leased-out the land to his brother, who

also repeated the same crop on the adjacent land. As pointed out earlier, his cropping was adjusted with that of his brother and hence, when his brother decided to repeat banana, he also did the same. He was, thus, required to deviate from jowar to banana on the three plots in this year.

CASE STUDY W 2

Name	: K. K. K.	Family size	: 7 members
Age	: 45 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Maratha		
Main occupation	: Agricultural labour	Total income (1962-63)	: Rs.1,600
Subsidiary occupation	: Agriculture	Land-holding	: 1.33 acres
Livestock	:	Home-collected manure	: 8 cart-loads
Working Milch	1	Young	-
		Total	1

The land-holding owned by the cultivator is of 1.75 acres. Of this, 0.42 acre is uncultivable because of a big stream. The cultivated land-holding of the cultivator, therefore, is of 1.33 acres only. It is a single fragment. The details about this fragment and the crop-rotations practised on it are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.33	Available	1.1	1.00	Medium-black	G-J or NB-JB-J
			1.2	0.33	Medium-black	G-J or NB-JB-J

The irrigation facility is available on the fragment, from an old well, jointly owned by the cultivator and his cousin

brothers. His share in the ownership of the well is one-fourth. However, the water supply in the well is limited and it is possible to raise only the light irrigated crops like wheat, gram etc. The cultivator, however, grows mainly the dry crops on his entire land as he does not have any equipments of irrigation. At times, he leases-out his land for banana cultivation to his neighbouring cultivators having irrigation facility and all the other equipments. But, he has not developed any definite relationship with any of them and hence cannot give a definite place for banana in his rotation-plan. He has to keep his rotation-programme flexible by accepting a dual rotation of G-J or NB-JB-J, so that whenever irrigation is made available, he can switch over from the G-J rotation to the NB-JB-J rotation, and lease-out his land for banana cultivation. However, he basically practises the rotation of dry crops (G-J), which he can grow himself. The area under jowar, averaged over the period of rotation-cycle, varies between 0.44 and 0.66 acre, depending on the rotation he follows. In any case, the area allocated to jowar is not sufficient to meet the yearly food requirement of his family. His annual requirement of jowar for the family consumption is about 30 maunds. He, therefore, does not depend on his land for his family's food needs.

The crops grown in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.00	G-J or NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	'Nawati' banana (Jowar)
1.2	0.33	G-J or NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	'Nawati' banana (Jowar)

Total : Jowar	1.33	-	-	-
'Nawati' banana	-	1.33	-	1.33
'Junar' banana	-	-	1.33	-

The cultivator had grown the crops strictly as per the rotation, except in the last year (1963-64). In this year he deviated from jowar to banana on both the plots of his land-holding. He reported that in this year he could lease-out his land, once again for banana, as one of his neighbouring cultivators was in short of land for banana and hence agreed to lease-in his land and repeat the same crop on it. He, therefore, deviated from jowar and leased-out the land for banana cultivation.

CASE STUDY W 3

Name	: R. K. M.	Family size	: 6 members
Age	: 60 years	Earners	: Male Female Total
Education	: Illiterate		2 1 3
Caste	: Maratha		
Main occupation	: Agricultural labour	Total income (1962-63)	: Rs.1,300
Subsidiary occupation	: Agriculture	Land-holding	: 3.05 acres
Livestock	:	Home-collected manure	: 14 cart-loads
Working	Milch 2	Young 3	Total 5

This is a small cultivator having a land-holding of 3.05 acres. The land-holding is of a single fragment situated on the right bank of the Sukhi river. A small portion of the land (0.55 acre) towards the river gets inundated almost every year. The cultivator, therefore, has planted mango trees on this area of his land-holding. The details of the fragment and the

rotations followed by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	3.05	Available	1.1	2.50	Medium-black	C-J or NB-JB-C
			1.2	0.55	Medium-black	J-J-J

The irrigation facility is available on the fragment, from an old well. It is wholly owned by the cultivator. The water supply in the well is also satisfactory; but the cultivator does not grow any irrigated crops as he has no equipments of irrigation. He reports that because of his small land-holding he cannot have a pair of bullocks even to operate leather water lift. He, therefore, grows mainly the dry crops on his land. At times, he leases-out his land for banana to his neighbouring cultivators who have all the equipments of irrigation. The case of this cultivator is far similar to the cultivator discussed in Case Study W 2. This cultivator also practises the dual rotation of C-J or NB-JB-C and keeps his cropping flexible, so that he can lease-out the land for banana, whenever possible. Basically, he follows the crop-rotation of the dry crops alone (C-J) which he himself can grow. Whenever he leases-out the land for banana, he breaks the basic rotation of C-J, and shifts to the three-year rotation of NB-JB-C. The area under jowar, averaged over the rotation cycle, varies from 0.55 to 1.80 acres depending on the rotation. It is not enough to meet the annual food needs (27 maunds) of his family. He is, therefore, required to buy jowar every year.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.50	C-J or NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton
1.2	0.55	J-J-J	Jowar	Jowar	Jowar	Jowar
Total : Jowar			0.55	0.55	0.55	0.55
Cotton			2.50	-	-	2.50
'Nawati' banana			-	2.50	-	-
'Junar' banana			-	-	2.50	-

It may be seen from the cropping that the cultivator had grown the crops on his land, strictly as per the rotations in all the four years. He could not practise any rotation on his second plot of 0.55 acre, as it was under the mango grove. He reported that under the shade of the mango trees no crop could be profitably grown. However, on this plot he grows jowar continuously as a fodder crop.

CASE STUDY W 4

Name	: M. B. P.	Family size	: 2 members
Age	: 26 years	Earners	: Male Female Total
Education	: Illiterate		1 1 2
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,600
Subsidiary occupation	: Agricultural labour	Land-holding	: 4.33 acres
Livestock	:		
Working Milch	-	Home-collected manure	: -
Young	-		
Total	-		

The land-holding cultivated by this cultivator is of two fragments having a total area of 4.33 acres. The details of the fragments and the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.20	Available	1.1	1.20	Deep-black	NB-JB-J
2	3.13	Not available	2.1	1.50	Medium-black	C-J or NB-JB-J
			2.2	1.63	Medium-black	C-J or NB-JB-J

The irrigation facility is available only on the small fragment of 1.20 acres. The well is jointly owned by the cultivator and his brother. The cultivator's share in its ownership is one-half. The water supply in the well is plenty but the cultivator does not utilize it as he has a small holding and no equipments of irrigation. There is no irrigation facility available on the second fragment of 3.13 acres. The cultivator generally leases-out this land for banana to his neighbouring cultivators who have all the equipments of irrigation. He keeps his rotation-plan flexible by following the dual rotation of C-J or NB-JB-J on the two plots of this fragment (Plots 2.1 and 2.2). On the fragment of 1.20 acres, however, he has adjusted his cropping with that of his neighbour and hence follows the NB-JB-J rotation, giving a definite place for banana. The area under jowar, averaged over the period of rotation-cycle, varies from 1.44 to 1.96 acres. It is more than enough to meet his family's annual consumption needs of 9 maunds of jowar.

The crops grown on different plots of the land and the areas devoted to each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.20	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	Jowar ('Nawati' banana)	
2.1	1.50	C-J or NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	'Nawati' banana (Jowar)	
2.2	1.63	C-J or NB-JB-J	Cotton	Jowar	'Nawati' banana	'Junar' banana	
Total :			Jowar	1.50	1.63	1.20	1.20
			Cotton	1.63	-	-	-
			'Nawati' banana	1.20	1.50	1.63	1.50
			'Junar' banana	-	1.20	1.50	1.63

The cultivator had grown the crops as per the rotation-plan, except in 1963-64. In this year he was required to deviate on two plots (Plots 1.1 and 2.1). On the plot of 1.50 acres (Plot 2.1) he deviated from jowar to banana, as his neighbour cultivator agreed to repeat banana on the same land. As an interaction of this deviation, he was required to deviate on the plot of 1.20 acres (Plot 1.1) and grow jowar instead of banana, to meet the annual food needs of his family.

CASE STUDY W 5

Name	: R. T. P.	Family size	: 4 members
Age	: 36 years	Earners	: Male Female Total
Education	: 6th standard		2 - 2
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.3,900
Subsidiary occupation	: -	Land-holding	: 3.45 acres
Livestock	:		
Working	Milch Young Total	Home-collected manure	: -
-	- - -		

The cultivator had a land-holding of 3.45 acres till 1963. In the year 1963, he sold his entire land and took to the occupation of running a flour-mill in the village. The land-holding, which he cultivated upto 1963, was of a single fragment. The details of this fragment and the rotations practised on it till 1963 are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	3.45	Available	1.1	1.95	Deep-black	C-J or NB-JB-J
			1.2	1.00	Deep-black	C-J
			1.3	0.50	Deep-black	C-J

The cultivator basically follows the two-year rotation of C-J on his entire land-holding, even though irrigation is available on his land, from a jointly owned well. The cultivator reports that his share in the ownership of the well is only one-eighth. Besides he has no irrigation equipments to lift water. His financial condition is also poor and therefore he cannot grow banana himself. He generally leases-out one of his plots (Plot 1.1) having an area of 1.95 acres for banana cultivation to his neighbour cultivator having all the equipments of irrigation. He cannot lease-out the other two plots (Plots 1.2 and 1.3) for banana, as the land is more alkaline and not suited to the banana crop. It may be seen that the average area allocated to jowar varies from 1.40 to 1.70 acres. This much area is more than enough to meet his annual food requirement of 18 maunds of jowar for the family consumption.

The crops grown on the land till 1963 are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.95	C-J or NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Sold
1.2	1.00	C-J	Jowar	Wheat (Cotton)	Wheat (Cotton)	Sold
1.3	0.50	C-J	Jowar	Jowar (Cotton)	Wheat (Cotton)	Sold
Total : Jowar			3.45	0.50	-	-
Cotton			-	-	-	-
'Nawati' banana			-	1.95	-	-
'Junar' banana			-	-	1.95	-
Wheat			-	1.00	1.50	-

As pointed out earlier the cultivator sold his entire land in 1963, and installed a new flour-mill in the village. He switched over from agriculture to a new occupation of running a flour-mill in the village. However, till 1963, he had grown the crops on his land mostly according to his rotation-plan. He was required to deviate on two of his plots (Plots 1.2 and 1.3) in 1961-62 and 1962-63. In the year 1961-62, he deviated from cotton to wheat on the plot of 1.00 acre (Plot 1.2) as the tenant cultivator growing banana on his land agreed to supply water for wheat as well. He deviated from cotton to jowar on the remaining plot of 0.50 acre (Plot 1.3) in order to make provision for jowar to meet the yearly food needs of the family. In the next year, 1962-63, he deviated from cotton to wheat on both the plots (Plots 1.2 and 1.3) as the tenant cultivator agreed to extend the irrigation facility to this portion of the land also.

CASE STUDY W 6

Name	: W. R. P.	Family size	: 6 members
Age	: 40 years	Earners	: Male Female Total
Education	: Illiterate		1 1 2
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,300
Subsidiary occupation	: Agricultural labour	Land-holding	: 1.93 acres
Livestock	:	Home-collected manure	: 6 cart-loads
Working Milch	Young Total		
-	2 1 3		

This is a small cultivator having a land-holding of 1.93 acres only. It is a single fragment. The details of the fragment and the crop-rotation practised on it are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.93	Available	1.1	1.93	Medium-black	C-J or NB-JB-J

The irrigation facility is available on the land from an old well jointly owned by the cultivator and his cousin brothers. The cultivator, however, does not utilize this facility as his land-holding is very small. He reports that because of the small holding he cannot keep a pair of bullocks even to operate a leather-water-lift. In the circumstances, he is required to grow mainly the dry crops on his entire land. At times, he leases-out the land for banana cultivation to one of his cousin brother having the equipments of irrigation. He, therefore, prefers to keep his rotation-plan flexible, by practising the dual rotation of C-J or NB-JB-J, so that whenever possible he can lease-out

the land for banana and switch over to the NB-JB-J rotation. He basically follows the rotation (C-J) of dry crops which he himself can grow. The area under jowar, averaged over the period of rotation-cycle varies from 0.64 to 0.96 acre. It is not enough to meet his family's yearly requirement of jowar (26 maunds).

The crops grown in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.93	C-J or NB-JB-J	Cotton	Cotton (Jowar)	Jowar	'Nawati' banana
Total : Jowar			-	-	1.93	-
Cotton			1.93	1.93	-	-
'Nawati' banana			-	-	-	1.93

The cultivator had grown the crops strictly as per the rotation-plan, except in 1961-62. In this year he was required to deviate from jowar to cotton. The cultivator reported that he had manured his land heavily in 1960-61 and devoted it to cotton. But the cotton crop in this year failed because of the fungous disease, and the manure applied was not fully utilized. In order to utilize the residuals of manure in the next year, the cultivator repeated cotton, instead of growing jowar as per the rotation. He was, thus, required to deviate from jowar to cotton, because of the failure of the cotton crop in the preceding year.

CASE STUDY W 7

Name	: R. G. P.	Family size	: 5 members
Age	: 45 years	Earners	: Male Female Total
Education	: Illiterate		2 1 3
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income	: Rs.1,200 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 3.20 acres
Livestock	:	Home-collected manure	: -
Working Milch	-		
Young	-		
Total	-		

The land-holding cultivated by this cultivator is of two fragments, having a total area of 3.20 acres. The details of the two fragments and the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop rotation
1	1.95	Available	1.1	1.95	Deep-black	C-J or NB-JB-C
2	1.25	Not available	2.1	1.25	Deep-black	C-J or NB-JB-J

In spite of the irrigation facility available on the fragment of 1.95 acres, the cultivator himself does not grow the crops like banana. This is largely because of his small land-holding and his poor financial condition. However, he leases-out both of his fragments for the cultivation of banana to his neighbouring cultivators. He, therefore, prefers to have a flexible rotation-plan by following the dual rotations on both the fragments. Basically he follows the two-year rotation of C-J which he himself can grow; but, whenever irrigation is made available to him he

switches over to the rotation with banana and leases-out his land for that crop. It can be seen that the areas under different crops, averaged over the period of rotation-cycle, vary from 0.63 acre to 1.40 acres under jowar; from 0.84 acre to 1.30 acres under banana; and from 0.97 acre to 1.27 acres under cotton. The annual food requirement for the family consumption is about 23 maunds. The area allocated to jowar in the rotation-plan is just enough to meet his yearly requirement of food for the family.

The crops grown on the land in the four years are as follows:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.95	C-J or NB-JB-C	Cotton	Jowar	Cotton	'Nawati' banana	
1.2	1.25	C-J or NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Cotton (Jowar)	
Total :			Jowar	1.25	1.95	-	-
			Cotton	1.95	-	1.95	1.25
			'Nawati' banana	-	1.25	-	1.95
			'Junar' banana	-	-	1.25	-

It may be noted that the cultivator had mostly grown the crops as per the rotation-plan in all the four years. In the last year only (1963-64) he was required to deviate from jowar to cotton on the plot of 1.25 acres (Plot 1.2). The cultivator reported that he wanted more cash-income in this year to repay the loans borrowed for his daughter's marriage. He, thus, deviated from jowar and took cotton on the plot of 1.25 acres. In this year he grew jowar as a mixed crop along with cotton to meet his family's consumption needs.

CASE STUDY W 8

Name	: L. B. N.	Family size	: 8 members
Age	: 42 years	Earners	: Male Female Total
Education	: 7th standard		3 3 6
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,225
Subsidiary occupation	: Agricultural labour	Land-holding	: 6.50 acres
Livestock	:		
Working	2	Milch	4
		Young	3
		Total	9
		Home-collected manure	: 35 cart-loads

The land-holding cultivated by the cultivator is of 6.50 acres. It consists of three fragments situated near the village. The details of these fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.05	Available	1.1	1.05	Medium-black	G-C-J or NB-JB-C
2	3.20	Not available	2.1	1.75	Medium-black	NB-JB-C
			2.2	1.45	Medium-black	G-J
3	2.25	Not available	3.1	1.50	Medium-black	NB-JB-C
			3.2	0.75	Medium-black	J-J-J

It may be noted that the entire land-holding of the cultivator is of medium-black soil. He has irrigation facility only on one fragment of 1.05 acres. In spite of the availability of irrigation, he himself does not grow banana, as it is a very costly crop. He prefers to lease-out his land for banana cultivation on the basis of share rent. Thus, he takes banana on three of his plots (Plots 1.1, 2.1 and 3.1) only by leasing-out the land specifically for the cultivation of banana to his neighbouring

cultivators. In the case of two plots (Plots 2.1 and 3.1) he has adjusted his cropping with that of the neighbouring cultivators and has given a definite place for banana in the rotation-plan. The case of the remaining plot (Plot 1.1) was different. In its case, he is required to practise a dual-rotation as he has not developed definite relationship with any of his neighbouring cultivators. He does not practise any rotation on the plot of 0.75 acre (Plot 3.2) as it is under the mango grove. He reports that because of the thick shadow of the mango trees, no crop can be profitably grown on this land. He is, therefore, required to resort to single cropping of jowar on it. Even jowar is grown mainly as a fodder crop. The areas under different crops averaged over the rotation-cycle vary from 1.48 to 1.83 acres under jowar; from 2.16 to 2.88 acres under banana; from 0.72 acre to 1.07 acres under groundnut and 1.43 acres under cotton. The area allocated to jowar is just enough to meet the yearly food needs (35 maunds) of his family.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.05	G-C-J or NB-JB-C	Groundnut	Cotton	'Nawati' banana	'Junar' banana
2.1	1.75	NB-JB-C	Cotton	Cotton ('Nawati' banana)	'Nawati' banana	'Junar' banana
2.2	1.45	G-J	Groundnut	Wheat (Jowar)	Jowar	Jowar (Groundnut)
3.1	1.50	NB-JB-C	Cotton	Wheat ('Nawati' banana)	'Nawati' banana	'Junar' banana

3.2	0.75	J-J-J	Jowar	Jowar	Jowar	Jowar
Total :	Jowar		0.75	0.75	2.20	2.20
	Groundnut		2.50	-	-	-
	Cotton		3.25	2.80	-	-
	'Nawati' banana		-	-	4.30	-
	'Junar' banana		-	-	-	4.30
	Wheat		-	2.95	-	-

It may be noted from the cropping that in the four years the cultivator had largely grown the crops as per the rotation-plan. He was required to deviate on three plots (Plots 2.1, 2.2 and 3.1) in 1961-62 and on one plot (Plot 2.2) in 1963-64. In the year 1961-62, he deviated from banana to cotton and wheat on two of his plots (Plots 2.1 and 3.1 respectively) because of the disagreement with his tenant cultivator. He reported that in this year he wanted to lease-out the plot of 1.50 acres for "Kandya bāg" banana, but because of his disagreement with the tenant cultivator he could not do it. The tenant cultivator wanted to lease-in his land on the basis of cash-rent, but he rejected. He wanted to lease-out his land on the usual basis of share-rent. Because of this basic disagreement developed in this year, he could not lease-out both the plots for banana cultivation and had to deviate from that crop. He, thus, deviated from banana to cotton on the plot of 1.75 acres (Plot 2.1) and to wheat on the plot of 1.50 acres (Plot 3.1). In this year he deviated from jowar to wheat on one more plot of 1.45 acres (Plot 2.2). This deviation was necessitated because of heavy rainfall during the sowing season of the year. The cultivator reported that because of heavy rainfall the plot situated in the low lying area, was

under the accumulated water for a long period and therefore he could not sow jowar in its sowing season. He had to keep the land fallow for the whole kharif season. In the rabi season, however, he devoted it to wheat, thus deviating from jowar to wheat. In 1963-64, he was required to deviate on the same plot but this time from groundnut to jowar. This deviation was necessitated because of the non-availability of groundnut seeds. As he had not grown groundnut on any of his plots in the preceding year, he did not preserve groundnut seeds. He could not purchase it either, as its price was considerably high. In the circumstances he preferred to deviate from groundnut to jowar, the seeds of which were available with him.

CASE STUDY W 9

Name	: L. F. N.	Family size	: 6 members
Age	: 46 years	Earners	: Male Female Total
Education	: 7th standard		1 2 3
Caste	: Nhavi		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,300
Subsidiary occupation	: Agricultural labour	Land-holding	: 4.18 acres
Livestock	:		
Working	Milch 2	Young	Total 2
	-	-	-
		Home-collected manure	: 8 cart-loads

The cultivator cultivates a land-holding of two fragments, having a total area of 4.18 acres. The details of these fragments and the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.63	Available	1.1	1.63	Medium-black	NB-JB-C
2	2.55	Not available	2.1	1.30	Medium-black	C-J
			2.2	1.25	Medium-black	C-J

The cultivator does not grow banana himself even though irrigation is available on his first fragment of 1.63 acres. He always prefers to lease-out the land for banana cultivation. This is mainly because, his holding is very small and he cannot afford to grow the costly crop like banana. He has adjusted his cropping on the plot of 1.63 acres (Plot 1.1) with that of his tenant cultivator to whom he always leases-out this plot for banana cultivation. He, thus, gives a definite place for banana in his rotation-plan. He grows only the dry crops on the remaining portion of his land-holding as there is no irrigation available on or around it. In the case of this cultivator, it is interesting to see how he has formulated his rotation-plan, giving only the required area to jowar and the rest to the cash-crops like cotton and banana. The areas under different crops, averaged over the rotation-cycle, come to 1.27 acres under jowar; 1.10 acres under banana; and 1.82 acres under cotton. He reports that his annual requirement of jowar for the family consumption is about 26 maunds. The area allocated to jowar is just enough to meet the yearly food needs of his family. Besides, he usually grows jowar as a mixed crop along with cotton every year.

The crops grown on different plots of the land and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.63	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton
2.1	1.30	C-J	Jowar	Jowar (Cotton)	Cotton	Jowar
2.2	1.25	C-J	Jowar	Cotton	Jowar	Cotton
Total : Jowar			2.55	1.30	1.25	1.30
Cotton			1.63	1.25	1.30	2.88
'Nawati' banana			-	1.63	-	-
'Junar' banana			-	-	1.63	-

It may be seen from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the years, except in 1961-62. In the year 1961-62 he was required to deviate from cotton to jowar on the plot of 1.30 acres (Plot 2.1). This deviation was caused by the rotation-plan itself. In this year, the rotation-plan itself had developed an imbalance in the areas of food and cash-crops. All the area of his land-holding was due for the cash-crops only, and there was no land for jowar. In order to correct this imbalance in the area allocation and to make provision for jowar to meet the food needs of his family, he was required to deviate from cotton to jowar on the plot of 1.30 acres.

CASE STUDY W 10

Name	: R. S. C.	Family size	: 5 members
Age	: 38 years	Earners	: Male Female Total
Education	: 5th standard		2 1 3
Caste	: Leva-Gujar	Total income	: Rs.1,400
Main occupation	: Agriculture	(1962-63)	
Subsidiary occupation	: Agricultural labour	Land-holding	: 4.50 acres
Livestock	:	Home-collected manure	: 14 cart-loads
Working Milch	Young Total		
- 2	1 3		

The land-holding cultivated by this cultivator is of 4.50 acres. It comprises of two fragments. The details of the two fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	2.00	Available	1.1	2.00	Medium-black	NB-JB-C
2	2.50	Not available	2.1	2.25	Medium-black	C-J
			2.2	0.25	Medium-black	G-J

The case of this cultivator is similar to that of the cultivator discussed in Case Study W 9. In his case irrigation facility is available on one of the fragments of 2.00 acres but he does not utilize it to grow banana himself. He is a small cultivator and hence cannot afford to raise the costly crops like banana. However, he prefers to lease-out his land for banana cultivation on the basis of share-rent. He has adjusted his cropping on this fragment with that of his tenant cultivator and leases-out the land regularly to him for banana cultivation. He grows the dry crops only, on the second fragment as there is no irrigation

available. It may be noted how the cultivator formulates his rotation-plan, allocating only the required area for jowar and the rest to the cash-crops. It can be seen that the average areas allocated to different crops, come to 1.25 acres under jowar; 1.35 acres under banana; and 1.79 acres under cotton. The area allocated to jowar is just enough to meet his yearly requirement of food (22 maunds) for the family.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	2.00	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton	
2.1	2.25	C-J	Jowar	Cotton	Jowar	Cotton	
2.2	0.25	G-J	Jowar	Groundnut	Jowar	Cotton (Groundnut)	
Total :			Jowar	2.50	-	2.50	-
			Groundnut	-	0.25	-	-
			Cotton	2.00	2.25	-	4.50
			'Nawati' banana	-	2.00	-	-
			'Junar' banana	-	-	2.00	-

It may be seen that the cultivator had grown the crops strictly as per the rotation-plan in all the years, except in the last year (1963-64). In this year he was required to deviate on a small plot of 0.25 acre (Plot 2.2). On this plot, he deviated from groundnut to cotton, as he could manure it in this year. Because of manuring he could not grow groundnut as he feared that it would lead to poor yield.

CASE STUDY W 11

Name	: G. L. P.	Family size	: 5 members
Age	: 50 years	Earners	: Male Female Total
Education	: Illiterate		1 1 2
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,300
Subsidiary occupation	: Agricultural labour	Land-holding	: 6.61 acres
Livestock	:		
Working	Milch 3	Young 3	Total 6
		Home-collected manure	: 30 cart-loads

The land-holding cultivated by this cultivator is of 6.61 acres. It comprises of three fragments. The details of these fragments and the crop-rotations practised on them are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.78	Not available	1.1	1.78	Medium-black	G-C-J or NB-JB-C
2	2.25	Available	2.1	1.00	Deep-black	C-J or NB-JB-C
			2.2	1.00	Deep-black	C-J or NB-JB-C
			2.3	0.25	Deep-black	C-J
3	2.58	Not available	3.1	2.58	Medium-black	G-C-J or NB-JB-C

The cultivator himself does not grow banana, even though irrigation is available on one of his fragments of 2.25 acres. He always prefers to lease-out his land for banana cultivation on the basis of share-rent. However, he has not developed any definite relationship with his tenant cultivators and hence does not give any definite place for banana in his whole rotation-plan.

He is required to keep his rotation-plan flexible, by accepting dual rotations so that whenever irrigation is made available he can lease-out his land. Thus, he follows dual rotations on almost all the area of his land-holding. His basic rotation-plan, however, is of dry crops alone which he himself can grow. It appears that the basic rotations are much influenced by the soil types available in his land-holding. The areas under different crops, averaged over the rotation-cycle, vary from 1.13 to 1.58 acres under jowar; from 1.33 to 2.90 acres under banana; from 2.25 to 2.58 acres under cotton; and 1.45 acres under groundnut. He reports that his annual requirement of jowar for the family consumption is about 23 maunds. It is entirely met from the home production of jowar. The average area allocated to jowar is enough to meet adequately the yearly food needs of his family.

The crops grown on different plots of the land in the four years are as follows:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.78	G-C-J or NB-JB-C	Jowar	Groundnut	Cotton	'Nawati' banana	
2.1	1.00	C-J or NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton	
2.2	1.00	C-J or NB-JB-C	Wheat (Jowar)	Cotton	Jowar	Jowar (Cotton)	
2.3	0.25	C-J	Wheat (Jowar)	Cotton	Groundnut (Jowar)	Groundnut (Jowar)	
3.1	2.58	G-C-J or NB-JB-C	Groundnut	Cotton	'Nawati' banana	'Junar' banana	
Total :			Jowar	1.78	-	1.00	1.00
			Groundnut	2.58	1.78	0.25	0.25
			Cotton	1.00	3.83	1.78	1.00

'Nawati'				
banana	-	1.00	2.58	1.78
'Junar'				
banana	-	-	1.00	2.58
Wheat	1.25	-	-	-

It may be seen that in all the four years the cultivator had mostly grown the crops as per the rotation-plan. He deviated on two plots each in 1960-61 and 1963-64 and on one plot in 1963-64. In the year 1960-61, he was required to deviate from jowar to wheat on two plots (Plots 2.2 and 2.3) to meet the extra food needs of his daughter's marriage. In 1962-63, he deviated from jowar to groundnut on the small plot of 0.25 acre (Plot 2.3) in order to meet his family's consumption needs of groundnut. In this year, no other plot was due for groundnut and hence he was required to deviate to make provision for groundnut to meet the family's consumption needs. The same was the case in the next year (1963-64) and he was required to deviate once again for groundnut on the same plot. The other deviation reported in this year was from cotton to jowar on the plot of 1.00 acre (Plot 2.2). This deviation was necessitated by the inadequate rainfall during the sowing season of the year. The cultivator reported that he had, in fact, sown cotton on this plot as per the rotation-plan; but the crop did not come up well and withered away as there were no rains after the sowing for about one month. He had to re-sow the land. He preferred to re-sow jowar on this land as its sowing season had not yet elapsed. He was, thus, required to deviate from cotton to jowar on this plot.

CASE STUDY W 12

Name	: M. S. K.	Family size	: 5 members
Age	: 45 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Brahmin		
Main occupation	: Grocery shop	Total income (1962-63)	: Rs.1,500
Subsidiary occupation	: Agriculture	Land-holding	: 4.51 acres
Livestock	:		
Working Milch	Young Total	Home-collected manure	: 20 cart-loads
-	3 2 5		

The cultivator cultivates a land-holding of 4.51 acres. It consists of three fragments, of which two, having a total area of 2.48 acres are in the village, and the remaining one, having an area of 2.03 acres is in the neighbouring village (Kumbharkhed). The details of the three fragments and the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.10	Available	1.1	1.10	Deep-black	NB-JB-C
2	1.38	Not available	2.1	1.38	Deep-black	NB-JB-C
3	2.03	Not available	3.1	2.03	Medium-black	C-J

The irrigation facility is available on the fragment of 1.10 acres, from a jointly owned well. The cultivator's share in the ownership is about one-fourth. However, he does not grow banana himself as he has a very small area of irrigable land. He prefers to lease-out this land to his neighbouring cultivator on the basis of share-rent. He has adjusted his cropping on both

the fragments in the village with that of the tenant cultivators and thus, leases-out these fragments for banana cultivation, following the three-year rotation of NB-JB-C. It may be noted that the rotation-plan of this cultivator has a marked bias towards the cultivation of cash-crops. He practises the rotation of cash-crops alone (NB-JB-C) on both the fragments of land in the village. This is largely because his food requirement for the family consumption is relatively small (22 maunds). The averaged areas under different crops, come to 1.02 acres under jowar; 1.65 acres under banana; and 1.84 acres under cotton. It may be noted that more than three-fourths of his total land is allocated to the two cash-crops. The area allocated to jowar is slightly inadequate to meet the entire food requirements of his family. However, he supplements the production of jowar by growing it as a mixed crop along with cotton every year.

The crops grown on different plots of the land and the areas put under these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.10	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana
2.1	1.38	NB-JB-C	'Junar' banana	Jowar (Cotton)	'Nawati' banana	'Junar' banana
3.1	2.03	C-J	Jowar	Cotton	Jowar	Cotton
Total : Jowar			2.03	1.38	2.03	-
Cotton			-	2.03	1.10	2.03
'Nawati' banana			1.10	-	1.38	1.10
'Junar' banana			1.38	1.10	-	1.38

The cultivator had grown the crops strictly as per the rotation-plan in all the years, except in 1961-62. In the year 1961-62, he was required to deviate from cotton to jowar on the plot of 1.38 acres (Plot 2.1). This deviation was necessitated because of the rotation-plan itself. According to the rotation-plan, jowar was not due on any portion of his land in this year. The entire land-holding was due for the cash-crops. In order to make provision for jowar to meet the consumption requirement of his family, he had to deviate from cotton. In the circumstances, he preferred to deviate on the small plot of 1.38 acres and took jowar on it.

CASE STUDY W. 13

Name	: N. T. C.	Family size	: 9 members
Age	: 37 years	Earners	: Male Female Total
Education	: 5th standard		2 2 4
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.3,700
Subsidiary occupation	: Agricultural labour	Land-holding	: 5.00 acres
Livestock	:	Home-collected manure	: 22 cart-loads
Working	2		
Milch	2		
Young	1		
Total	5		

The land-holding cultivated by this cultivator is of 5.00 acres. It is a single fragment. The details of the fragment and the rotation-plan formulated by the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	5.00	Available	1.1	2.50	Medium-black	NB-JB-C
			1.2	1.50	Medium-black	NB-JB-J
			1.3	1.00	Medium-black	NB-JB-J

The irrigation facility is available on the land from an old well, jointly owned by the cultivator and his brother. The cultivator's share in the ownership of the well is one-half. The cultivator has all the equipments of irrigation and he utilizes the irrigation facility mainly to grow banana. He grows banana himself and never leases-out his land for that crop. On the other hand, he at times leases-in the lands of other cultivators for banana cultivation. It may be seen that the rotation-plan formulated by the cultivator has a marked preference for banana cultivation. More than half of his total land is allocated to banana. The areas under different crops, averaged over the rotation-cycle, come to 2.34 acres under banana; and 0.83 acre each under jowar and cotton. The area allocated to jowar in the rotation-programme is considerably low to meet the yearly food needs (40 maunds) of his family. He is required to buy every year, a major portion (about 20 maunds) of his annual requirement of jowar.

The crops grown on different plots of the land in the four years are presented below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.50	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Jowar (Cotton)
1.2	1.50	NB-JB-J	Cotton ('Nawati' banana)	Jowar	'Nawati' banana	'Junar' banana

1.3	1.00	NB-JB-J	Jowar	Cotton ('Nawati' banana)	'Nawati' banana	'Junar' banana
Total :	Jowar		1.00	1.50	-	2.50
	Cotton		4.00	1.00	-	-
	'Nawati' banana		-	2.50	2.50	-
	'Junar' banana		-	-	2.50	2.50

The cultivator was required to deviate on one plot each in 1960-61, 1961-62 and 1963-64. In the year 1960-61, he deviated from cotton to banana on the plot of 1.50 acres (Plot 1.2). This deviation was caused because of the leased-in land for banana cultivation. The cultivator reported that in this year he could lease-in a big fragment of land (5.25 acres) for the cultivation of banana. As it was very economical to grow banana on the large area, he thought, it is better to deviate from banana on his own land and grow it on the leased-in fragment. He could not grow banana on both the lands because of financial restraints. In the circumstances, he preferred to deviate from banana on his own land and took cotton on it. The same was the case in the next year as well. In this year also he deviated from banana to cotton on the plot of 1.00 acre (Plot 1.3), because of the same leased-in land. In 1963-64, he was required to deviate from cotton to jowar on the plot of 2.50 acres (Plot 1.1). This deviation was necessitated because of the inadequate rainfall during the sowing season of the year. He had, in fact, sown cotton on this plot but as there were no rains after the sowing, the crop came up in a very scattered way. The cultivator retained it for some period hoping that it will improve.

But it did not show any improvement and had to be removed ultimately. By the time he removed the cotton crop, the sowing season of all the kharif crops, except jowar, had elapsed. In the circumstances, he was required to re-sow jowar on this plot, thus, deviating from cotton to jowar.

CASE STUDY W 14

Name	: K. P. P.	Family size	: 6 members
Age	: 35 years	Earners	: Male Female Total
Education	: 7th standard		1 2 3
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,500
Subsidiary occupation	: -	Land-holding	: 5.96 acres
Livestock	:		
Working	2	Milch	2
		Young	3
		Total	7
		Home-collected manure	: 30 cart-loads

The cultivator cultivates a land-holding of 5.96 acres. It comprises of four fragments of land. The details of these fragments and the rotation-programme of the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	0.80	Not available	1.1	0.80	Medium-black	NB-JB-C
2	1.08	Available	2.1	1.08	Medium-black	C-J or NB-JB-C
3	1.08	Available	3.1	1.08	Medium-black	C-J or NB-JB-C
4	3.00	Available	4.1	1.50	Deep-black	NB-JB-J
			4.2	1.50	Deep-black	NB-JB-C

The cultivator does not grow banana himself, even though irrigation is available on three fragments of his land. He always prefers to lease-out the land for banana cultivation. This is largely because he is financially poor and cannot incur all the expenses required for the cultivation of banana. Besides, he does not have any equipments of irrigation. It may be seen that he has given a definite place for banana in the cropping programmes on three of his plots (Plots 1.1, 4.1 and 4.2), by adjusting his cropping on these plots with that of the tenant cultivators. In the case of the two remaining plots (Plots 2.1 and 3.1) he has not developed such relationship and hence has to keep the cropping-programme flexible, by following the dual rotations. The areas under different crops, averaged over the rotation-cycle, vary from 0.75 acre to 1.08 acres under jowar; from 2.54 to 2.97 acres under banana; and from 2.24 to 2.35 acres under cotton. The area allocated to jowar is short to meet the yearly food needs of his family (27 maunds). This is mainly because he grows jowar as a mixed crop along with cotton.

The crops grown on different plots of the land-holding and the areas devoted to each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.80	NB-JB-C	'Junar' banana	Cotton	'Nawati' banana	'Junar' banana
2.1	1.08	C-J or NB-JB-C	Cotton	Jowar	Cotton	'Nawati' banana
3.1	1.08	C-J or NB-JB-C	Jowar	Cotton	Jowar	'Nawati' banana
4.1	1.50	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	'Nawati' banana
4.2	1.50	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana

Total : Jowar	1.08	1.08	2.58	-
Cotton	1.08	1.88	2.58	-
'Nawati' banana	3.00	-	0.80	5.16
'Junar' banana	0.80	3.00	-	0.80

It may be noted that in all the four years the cultivator had grown crops strictly as per the rotation-plan. He was not required to deviate on any plot in any of the years.

CASE STUDY W 15

Name	: M. R. M.	Family size	: 6 members
Age	: 38 years	Earners	: Male Female Total
Education	: Illiterate		2 1 3
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.3,000
Subsidiary occupation	: -	Land-holding	: 8.43 acres
Livestock	:		
Working	2	Milch	2
		Young	1
		Total	5
		Home-collected manure	: 22 cart-loads

The cultivator cultivates a land-holding of 8.43 acres. It comprises of four fragments of land. The details of the fragments and the rotations practised on different plots of the land are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.58	Available	1.1	0.75	Medium-black	NB-JB-C
			1.2	0.83	Medium-black	C-J
2	1.65	Available	2.1	1.00	Medium-black	NB-JB-C
			2.2	0.65	Medium-black	NB-JB-J
3	3.75	Not available	3.1	2.30	Medium-black	C-J
			3.2	1.45	Medium-black	C-J
4	1.45	Not available	4.1	1.45	Deep-black	NB-JB-C

The cultivator has irrigation facility from jointly owned wells on two of his fragments of 1.58 and 1.65 acres. He utilizes irrigation mainly to grow banana. He does not have irrigation on the remaining two fragments of 3.75 and 1.45 acres. However, he grows banana on the fragment of 1.45 acres by leasing-in the neighbouring cultivator's land which has irrigation. He has adjusted the cropping on this fragment with that of the neighbouring cultivator. The case of the other fragment is different as no irrigation is available near about this land. In the case of this cultivator it is interesting to see how he has formulated his rotation-plan allocating only the required area to jowar and all the rest to the cash-crops. It is seen that the averaged area is about 2.56 acres under banana; 3.36 acres under cotton and 2.51 acres under jowar. More than three-fourths of the total land is allocated to the two cash-crops. The area allocated to jowar is enough to meet the yearly food needs (27 maunds) of his family.

The crops grown on different plots of the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.75	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	Jowar ('Nawati' banana)
1.2	0.83	C-J	Jowar	Wheat (Cotton)	Cotton	Jowar
2.1	1.00	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton
2.2	0.65	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	'Nawati' banana (Jowar)
3.1	2.30	C-J	Jowar	Cotton	Jowar	Cotton

3.2	1.45	C-J	Cotton	Jowar	Cotton	Jowar	
4.1	1.45	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana	
Total :			Jowar	3.78	1.45	2.30	3.03
			Cotton	2.45	2.30	4.48	3.30
			'Nawati' banana	2.20	1.65	-	2.10
			'Junar' banana	-	2.20	1.65	-
			Wheat	-	0.83	-	-

It may be noted that the cultivator had grown the crops mostly as per the rotation-plan in all the four years. He had deviated only on one plot in 1961-62 and on two plots in 1963-64. In the year 1961-62 he was required to deviate from cotton to wheat on a small plot of 0.83 acre (Plot 1.2) to meet the extra food needs of his sister's marriage. In 1963-64, he deviated from jowar to banana on the plot of 0.65 acre (Plot 2.2). This deviation was necessitated because of the leased-in land for banana cultivation. The cultivator reported that in this year, he could lease-in for banana cultivation about 4.00 acres of land adjacent to this plot, and therefore, he preferred to deviate from jowar and took banana on the entire area. As an interaction of this deviation, he was required to deviate from banana to jowar on the plot of 0.75 acre (Plot 1.1). As he could grow banana on the plot of 0.65 acre he preferred to deviate from banana on the plot of 0.75 acre and grow jowar on it. He could not grow banana on both the plots, because of the financial restraints.

CASE STUDY W 16

Name	: L. D. M.	Family size	: 5 members
Age	: 55 years	Earners	: Male Female Total
Education	: Matriculate		2 1 3
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.6,532
Subsidiary occupation	: Service	Land-holding	: 13.11 acres
Livestock	:		
Working	Milch 1	Young 1	Total 2
	-		
		Home-collected manure	: 10 cart-loads

The land-holding cultivated by the cultivator is of 13.11 acres. It consists of three fragments of land. The details of these fragments and the rotation-plan of the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	9.73	Available	1.1	5.00	Deep-black	NB-JB-C
			1.2	3.98	Deep-black	NB-JB-C
			1.3	0.75	Medium-black	C-J
2	1.10	Not available	2.1	1.10	Deep-black	NB-JB-C
3	2.28	Available	3.1	2.28	Deep-black	NB-JB-C

The irrigation facility is available on major portion of his land-holding. However, the cultivator does not grow banana himself, as there is shortage of male labour in his family. He reports that there is nobody in his family who can look after his land. He is employed as a Secretary in the Raver Taluka Co-operative Fruit Sale Society. His elder son is also in the employment at Poona. In the circumstances, the cultivator prefers to lease-out the land for banana cultivation. He has

adjusted the cropping on his land with that of his tenant cultivators and hence can give a definite place for banana in the rotation-programme. It may be noted that the rotation-plan of this cultivator has a marked bias towards the cultivation of the cash-crops, particularly banana, even though he himself does not grow it. In the rotation-plan he has allocated almost all the area of his land-holding to the cash-crops. Thus, the areas, averaged over the period of rotation-cycle, come to 8.24 acres under banana; 4.49 acres under cotton; and only 0.38 acre under jowar. The area allocated to jowar is far less, to provide him with the required quantity of jowar to meet his annual food needs of 23 maunds. He reports that he grows jowar as a mixed crop along with cotton and has, therefore, allocated a smaller area to it in the rotation-plan.

The crops grown on different plots of the land-holding and the areas devoted to each of these crops are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1.	5.00	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton	
1.2	3.98	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	Groundnut ('Nawati' banana)	
1.3	0.75	C-J	Cotton	Jowar	Cotton	Jowar	
2.1	1.10	NB-JB-C	Jowar (Cotton)	Cotton	'Nawati' banana	'Junar' banana	
3.1	2.28	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana	
Total :			Jowar	1.10	0.75	-	0.75
			Groundnut	-	-	-	3.98
			Cotton	5.75	1.10	7.01	5.00
			'Nawati' banana	6.26	5.00	1.10	2.28
			'Junar' banana	-	6.26	5.00	1.10

It may be noted from the cropping that the cultivator had grown the crops mostly as per the rotation-plan in all the four years. He deviated only on one plot each in 1960-61 and 1963-64. In 1960-61, he was required to deviate from cotton to jowar on the plot of 1.10 acres (Plot 2.1). This deviation was necessitated because of deep sowing of cotton. The cultivator reported that he had in fact sown cotton on this plot as per the rotation, but the cotton seeds were sown very deep and the crop did not come up properly. It came in a very scattered way. The cultivator had to remove it after some time and re-sow the land. He could not re-sow cotton as its sowing season had passed out. In the circumstances he preferred to re-sow jowar and thus, deviated from cotton to jowar. In 1963-64, he was required to deviate from banana to groundnut on the plot of 3.98 acres (Plot 1.2). On this land he wanted to grow 'Kandya bāg' banana as its prices are usually higher and so devoted the land to groundnut in the kharif season of the year. However, he could not grow banana on it ultimately, as the tenant cultivator did not agree. Thus, the deviation from banana to groundnut occurred on this plot.

CASE STUDY W 17

Name	: D. S. M.	Family size	: 9 members
Age	: 48 years	Earners	: Male Female Total
Education	: 7th standard		2 3 5
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income	: Rs.1,500 (1962-63)
Subsidiary occupation	: -	Land-holding	: 9.03 acres
Livestock	:	Home-collected	
Working Milch	Young Total	manure	: 4 cart-loads
-	- 2 2		

The cultivator cultivates the land-holding of 9.03 acres. It comprises of four fragments. The details of these fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	3.45	Available	1.1	3.45	Medium-black	NB-JB-C
2	1.93	Not available	2.1	1.93	Deep-black	NB-JB-C
3	1.80	Available	3.1	1.80	Medium-black	NB-JB-J
4	1.85	Not available	4.1	1.75	Deep-black	NB-JB-C
			4.2	0.10	Deep-black	C-J

The cultivator has irrigation facility on two of his fragments. However, he does not grow banana himself, as he is financially poor and does not own any equipments of irrigation. He prefers to lease-out his land for banana cultivation. Till 1962, he used to lease-out all his land for banana to one big banana trader-cum-cultivator in the village, who had employed him as an accountant. In 1962 he had to give up the service as he developed some serious disagreement with his employer. He then leased-out the land for banana cultivation to his neighbouring cultivators. It may be seen that the rotation-plan formulated by this cultivator is highly dominated by the cash-crops, particularly banana. More than three-fourths of his land-holding is allocated to the cash-crops. The areas under different crops, averaged over the rotation-cycle, come to 5.96 acres under banana; 2.43 acres under cotton; and only 0.65 acre under jowar. The area allocated to jowar is low mainly because he grows jowar as a mixed crop along with cotton. He reports that the annual requirement of jowar for his family consumption is about 40 maunds

and is entirely met from home-production.

The crops grown on different plots of the land and the areas devoted to each of these are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	3.45	NB-JB-C	'Junar' banana	Cotton	Cotton ('Nawati' banana)	'Nawati' banana	
2.1	1.93	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	Wheat ('Nawati' banana)	
3.1	1.80	NB-JB-J	'Junar' banana	Jowar	'Nawati' banana	'Junar' banana	
4.1	1.75	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	Jowar ('Nawati' banana)	
4.2	0.10	C-J	Jowar	Jowar (Cotton)	Cotton	Jowar	
Total :			Jowar	0.10	1.90	-	1.85
			Cotton	-	3.45	7.23	-
			'Nawati' banana	3.68	-	1.80	3.45
			'Junar' banana	5.25	3.68	-	1.80
			Wheat	-	-	-	1.93

The cultivator had grown the crops mostly as per the rotation-plan in all the four years. He deviated only on one plot each in 1961-62, 1962-63 and 1963-64. In the year 1961-62, he was required to deviate from cotton to jowar on the small plot of 0.10 acre (Plot 4.2). As the area of the plot was very small, he did not manure it in this year, and thus, was required to deviate from cotton. In the circumstances, he preferred to repeat jowar on it. In the year 1962-63 he was required to deviate from banana to cotton on the plot of 3.45 acres (Plot 1.1)

as he could not buy an oil-engine operated pumping set. He reported that in this year he wanted to grow banana himself, as his employer had promised him a loan of Rs.3,000 to buy an oil-engine operated pumping set. But it did not materialize because of some disagreement between them and ultimately he had to give up his service. As he could not purchase a pumping set, he could not grow banana himself. He could neither lease-out the land for banana cultivation to any other cultivator, as it was very late to enter into such an agreement. In the circumstances, therefore, he was required to deviate to cotton. In 1963-64, he deviated from banana to wheat and jowar on the two plots of 1.93 and 1.75 acres respectively (Plots 2.1 and 4.1). In this year, the cultivator was to lease-out the plot of 1.93 acres for 'Kandya bāg' banana. But the tenant cultivator changed his decision and did not grow 'Kandya bāg' banana as he could not arrange for a pumping set to irrigate the crop. In such circumstances, the cultivator had no other alternative but to deviate to any dry crops of the rabi season. He, thus, deviated to wheat on this plot. Similar was the case of the other plot as well. He could not lease-out this plot of 1.75 acres for banana cultivation as the tenant cultivator had already leased-in a large area for banana at some other place, and was not interested in leasing-in his land. The cultivator, therefore, had to deviate from banana to any dry crop which he could grow himself. He preferred to deviate to jowar as the total area allotted to jowar in this year was small and would not have met the annual food requirements of his family. Thus, the deviation from banana to jowar occurred in this year on the plot of 1.75 acres of his land.

CASE STUDY W 18

Name	: A. S. N.	Family size	: 10 members
Age	: 55 years	Earners	: Male Female Total
Education	: Illiterate		2 3 5
Caste	: Nhavi		
Main occupation	: Agriculture	Total income	: Rs.1,400 (1962-63)
Subsidiary occupation	: Service	Land-holding	: 8.79 acres
Livestock	:		
Working	Milch	Young	Total
2	3	2	7
		Home-collected manure	: 30 cart-loads

The total land-holding cultivated by the cultivator is of 8.79 acres. It consists of three fragments of land. The details of the fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.33	Available	1.1	1.33	Medium-black	C-J or NB-JB-C
2	1.33	Not available	2.1	1.33	Medium-black	C-J
3	6.13	Not available	3.1	2.00	Medium-black	G-C-J
			3.2	1.50	Medium-black	G-C-J
			3.3	2.63	Medium-black	G-C-J

In the case of this cultivator, the irrigable area forms a very minor portion of his total land-holding. Irrigation is available only on one small fragment (1.33 acres). The remaining two fragments do not have such facility on or around them. The cultivator does not grow banana himself, as he is poor and unable to bear all the cost of its cultivation. Besides, he does not own any equipments of irrigation. In the circumstances he

prefers to lease-out his land for banana cultivation to any of the neighbouring cultivators. He has not developed a definite type of relationship with any tenant cultivators and hence is required to keep his cropping programme flexible, by practising a dual rotation. He is required to follow the rotations of dry crops alone on the remaining area of his land-holding. His rotation-plan is much affected by two factors: (1) the requirement of jowar for his family consumption and (2) the supply of home-collected manure. His annual requirement of jowar is quite large (45 maunds) as he has a big family of 10 members. Because of his large requirement of jowar, he allocates larger area to that crop in his rotation-plan. It may be noted that he practises rotations with jowar as one of the crops on his entire land-holding. His supply of home-collected manure is also as large as 30 cart-loads per year. He, therefore, allocates larger area to cotton in his rotation-plan. It can be seen that the areas under different crops, averaged over the rotation-cycle, vary from 2.71 to 3.37 acres under jowar; from 2.71 to 3.38 acres under cotton; 2.04 acres under groundnut; and 0.89 acre under banana. The area allocated to jowar is enough to meet the annual food needs of his family.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.33	C-J or NB-JB-C	Jowar	Cotton	'Nawati' banana	'Junar' banana
2.1	1.33	C-J	Jowar	Cotton	Jowar	Cotton
3.1	2.00	G-C-J	Jowar	Jowar (Groundnut)	Cotton (Groundnut)	Jowar

3.2	1.50	G-C-J	Cotton	Jowar	Groundnut	Cotton	
3.3	2.63	G-C-J	Cotton	Groundnut (Jowar)	Jowar (Cotton)	Cotton (Groundnut)	
Total :			Jowar	4.66	3.50	3.96	2.00
			Groundnut	-	2.63	1.50	-
			Cotton	4.13	2.66	2.00	5.46
			'Nawati' banana	-	-	1.33	-
			'Junar' banana	-	-	-	1.33

It may be seen that the cultivator had mostly grown the crops as per the rotation-plan in all the four years. He had deviated on only two plots each in 1961-62 and 1962-63 and on one plot in 1963-64. In the year 1961-62, he was required to deviate from jowar to groundnut on the plot of 2.63 acres (Plot 3.3). He reported that he had applied a heavy dose of manure to this plot and put it under cotton in the preceding year. But the cotton crop failed because of some disease and the manure was not fully utilized. In the next year, therefore, he deviated from jowar and took groundnut on it, in order to utilize fully the residuals of the manure applied. As an interaction of this deviation, he was required to deviate from groundnut to jowar on the plot of 2.00 acres (Plot 3.1). As he could not grow jowar on the plot of 2.63 acres, where it was due according to the rotation-plan, he was required to deviate on this plot and grow jowar to meet the annual food needs of his family. In 1962-63, he was required to deviate from cotton to jowar on the plot of 2.63 acres (Plot 3.3). This deviation was necessitated because of the land leased-out for banana cultivation. As he could not grow jowar on the plot of 1.33 acres where it was due as per the

plan, he had to make provision for it on some other plot. In his circumstances in this year, this was only convenient plot to deviate for jowar. On the other plot it would have caused repetition of jowar. Because of this deviation he was required to deviate from groundnut to cotton on the plot of 2.00 acres (Plot 3.1). Thus, in this year, the land leased-out for banana caused a chain of deviations on the other plots of his land-holding. In 1963-64, he deviated from groundnut to cotton on the plot of 2.63 acres (Plot 3.3). This deviation was caused because of manuring. As he could manure this land from the home-collected manure, he preferred to put it under cotton and hence the deviation from groundnut to cotton.

CASE STUDY W 19

Name	: V. S. M.	Family size	: 9 members
Age	: 55 years	Earners	: Male Female Total
Education	: Illiterate		2 1 3
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income	: Rs.3,500 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 9.01 acres
Livestock	:		
Working	2	Milch	3
		Young	1
		Total	6
		Home-collected manure	: 30 cart-loads

The cultivator cultivates a land-holding of five fragments, having a total area of 9.01 acres. The details of the fragments and the rotation-plan of the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	2.20	Not available	1.1	2.20	Medium-black	W-J or NB-JB-J
2	1.50	Available	2.1	1.50	Medium-black	NB-JB-J
3	1.38	Not available	3.1	1.38	Medium-black	NB-JB-C
4	1.05	Available	4.1	0.55	Medium-black	NB-JB-J
			4.2	0.50	Medium-black	NB-JB-J
5	2.88	Available	5.1	2.55	Medium-black	NB-JB-C-G
			5.2	0.25	Medium-black	NB-JB-C-G
			5.3	0.08	Medium-black	J-J-J

In the case of this cultivator the irrigation facility is available on a major portion of his land-holding. He has all the equipments of irrigation also and he prefers to grow banana himself on his own land. It may be seen that his rotation-plan shows a marked bend towards the cultivation of banana. He grows banana even on those plots where irrigation is not available. He does this either by leasing-out his land to the neighbouring cultivators or by leasing-in the neighbouring lands having irrigation. In the case of only one plot (Plot 1.1) he is required to practise dual rotation as he has not developed any definite type of relationship with his neighbouring cultivators. He could not practise any crop-rotation on a small plot of 0.08 acre as it is under the mango grove. He prefers to put it under the single cropping of jowar grown as a fodder crop. The areas under different crops, averaged over the rotation-cycle, vary from 4.06 to 5.53 acres under banana; from 1.58 to 1.95 acres under jowar; 1.18 acres under cotton and 0.72 acres under groundnut. The area allocated to jowar is not enough to meet the yearly requirement of food of his family. The annual

requirement of jowar of his family is about 40 maunds. In order to meet this requirement of jowar he invariably grows jowar as a mixed crop along with cotton every year.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	2.20	W-J or NB-JB-J	Jowar	Jowar (Wheat)	Wheat	'Nawati' banana	
2.1	1.50	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	'Nawati' banana	
3.1	1.38	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana	
4.1	0.55	NB-JB-J	Jowar	Jowar ('Nawati' banana)	Groundnut ('Nawati' banana)	'Nawati' banana	
4.2	0.50	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	'Nawati' banana	
5.1	2.55	NB-JB-C-G	Groundnut	'Nawati' banana	'Junar' banana	Cotton	
5.2	0.25	NB-JB-C-G	Groundnut	'Nawati' banana	'Junar' banana	Paddy (Cotton)	
5.3	0.08	J-J-J	Jowar	Jowar	Jowar	Jowar	
Total :			Jowar	2.83	2.83	2.08	0.08
			Groundnut	2.80	-	0.55	-
			Cotton	-	-	1.38	2.55
			'Nawati' banana	3.38	2.80	-	6.13
			'Junar' banana	-	3.38	2.80	-
			Wheat	-	-	2.20	-
			Paddy	-	-	-	0.25

It may be seen from the cropping that the cultivator had grown the crops mostly as per the rotation-plan in all the four years. He had deviated only on two plots in 1961-62 and on one

plot each in 1962-63 and 1963-64. In the year 1961-62, he was required to deviate from banana and wheat to jowar on two plots (Plots 4.1 and 1.1 respectively). These deviations were necessitated in this year because of his rotation-plan itself. According to his plan, no area was due for jowar in this year. The entire land-holding was to go under banana and wheat. In such circumstances he was required to deviate to correct the imbalance in areas of different crops. He, thus, deviated on these two plots and grew jowar to meet the annual food needs of his family. In the year 1962-63, he was required to deviate once again from banana to groundnut on the same plot of 0.55 acre (Plot 4.1). The cultivator reported that he wanted to grow "Kandya bāg" banana on this plot as its prices are generally high and with this view in mind he put it under groundnut in the kharif season of the year. But as he could not shift his oil-engine operated pumping set to this plot, he ultimately had to drop the plan of growing "Kandya bāg" banana. This led to the deviation from banana to groundnut on this plot. In the year 1963-64, he was required to deviate from cotton to paddy on a small plot of 0.25 acre (Plot 5.2) to meet the family's consumption needs of rice.

In the case of this cultivator, another point to be noted is that he would have deviated in 1963-64 on some other plots as well but the leased-in land averted it. It may be seen that in this year the entire land-holding was due only for banana and cotton. There was no area due for jowar. In order to grow jowar to meet his annual food needs, he would have deviated on some

of his plots, but he got two acres of land on lease in this year which he put under jowar and averted the deviations.

CASE STUDY W 20

Name	: L. R. M.	Family size	: 6 members
Age	: 45 years	Earners	: Male Female Total
Education	: 6th standard		2 1 3
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income	: Rs.4,000 (1962-63)
Subsidiary occupation	: -	Land-holding	: 6.23 acres
Livestock	:		
Working	Milch 2 Young 1 Total 3	Home-collected manure	: 18 cart-loads

The cultivator cultivates a land-holding of 6.23 acres. It is comprised of two fragments. The details of these fragments and the rotation-plan followed by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	5.35	Available	1.1	3.25	Deep-black	NB-JB-C
			1.2	2.00	Deep-black	NB-JB-C
2	0.88	Not available	2.1	0.88	Medium-black	NB-JB-J

The cultivator has irrigation facility available on his large fragment of land. He utilizes the irrigation facility, mainly to grow banana. He does not have irrigation on the other fragment of land, but he grows banana on this land as well, by leasing-in the neighbouring cultivator's area having irrigation. He has adjusted the cropping with that of the neighbouring cultivator and thus, gives a definite place for banana in the rotation-

plan practised on this fragment. It may be noted that the rotation-plan of this cultivator is highly dominated by the cultivation of banana. About three-fourths of his total land-holding is allocated to banana alone. The areas under different crops, averaged over the period of rotation-cycle, come to 4.16 acres under banana; 1.78 acres under cotton; and only 0.29 acre under jowar. It may be noted that almost all the area of his land-holding is devoted to the cash-crops. The area allocated to jowar is far low to meet the yearly requirement of food for his family. His annual requirement of jowar for the family consumption is around 27 maunds. He reports that he invariably grows jowar as a mixed crop along with cotton and gets sufficient quantity of jowar to meet the food needs of his family. He, therefore, allocates relatively very small area to jowar in the rotation-plan.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	3.25	NB-JB-C	'Junar' banana	Cotton	Cotton ('Nawati' banana)	'Nawati' banana	
1.2	2.00	NB-JB-C	'Junar' banana	Cotton	'Nawati' banana	'Junar' banana	
2.1	0.88	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	Jowar ('Nawati' banana)	
Total :			Jowar	-	-	0.88	0.88
			Cotton	-	5.25	3.25	-
			'Nawati' banana	0.88	-	2.00	3.25
			'Junar' banana	5.25	0.88	-	2.00

It may be seen from the cropping that the cultivator had grown the crops mostly as per the rotation-plan in all the four years. He was required to deviate on only one plot each in 1962-63 and 1963-64. In the year 1962-63, he deviated from banana to cotton on the plot of 3.25 acres (Plot 1.1). He reported that he had leased-in about 4.50 acres of land for the cultivation of banana in this year and that led to the deviation on his own land. As he got the land on the basis of cash-rent, which was rather cheap also (Rs.400 per acre per year), he preferred to lease-in and grew banana on it, making some adjustment in the cropping on his own land. He could not grow banana on both the lands because of financial restraints. He, therefore, deviated from banana and grew cotton on the plot of 3.25 acres of his own land. In the year 1963-64, however, the case was entirely different. In this year the deviation was necessitated because of the rotation-plan itself. It may be seen that in this year according to the rotation-plan, the entire land-holding was due for banana alone. There was no area due for jowar. In such circumstances, the cultivator was required to deviate on some plot to grow jowar for the family's consumption needs. He preferred to deviate on a small plot of 0.88 acre and grew jowar on it instead of banana which was due according to the rotation-plan. In this year, therefore, he was required to deviate from banana to jowar because of his rotation-plan itself.

CASE STUDY W 21

Name	: B. R. P.	Family size	: 6 members
Age	: 43 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.5,000
Subsidiary occupation	: -	Land-holding	: 16.86 acres
Livestock	:		
Working	Milch 2	Young 3	Total 7
		Home-collected manure	: 26 cart-loads

The land-holding cultivated by this cultivator is of medium size, having an area of 16.86 acres. It comprises of four fragments, situated near to one another. The details of these fragments and the rotation-plan formulated by the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	6.75	Available	1.1	2.00	Deep-black	NB-JB-C
			1.2	2.00	Deep-black	NB-JB-C
			1.3	1.98	Deep-black	NB-JB-C
			1.4	0.77	Deep-black	NB-JB-C
2	4.58	Not available	2.1	2.60	Deep-black	NB-JB-J
			2.2	1.98	Deep-black	NB-JB-J
3	0.93	Not available	3.1	0.93	Deep-black	NB-JB-C
4	4.60	Not available	4.1	2.30	Deep-black	G-C or NB-JB-C
			4.2	2.30	Deep-black	G-C or NB-JB-C

It may be noted that the entire land-holding of this cultivator is of deep-black soil. The irrigation facility is available

only on one fragment of 6.75 acres, which forms a minor portion of his total land. He does not have irrigation of his own on a major portion of his land-holding. He, therefore, prefers to lease-out his land for banana cultivation to the neighbouring cultivators having irrigation. He has developed definite type of relationship with most of his tenant cultivators, by adjusting his cropping with their cropping patterns. In the case of two plots only (Plots 4.1 and 4.2) he has not developed such relations and is required to practise dual rotations to keep the rotation-plan flexible. It may be noted that the rotation-plan formulated by this cultivator is almost entirely for the cash-crops. More than three-fourths of the total land is devoted to the cash-crops. The averaged areas under different crops, vary from 8.18 to 11.64 acres under banana; from 4.09 to 4.86 acres under cotton; and only 1.53 acres under jowar. He prefers to allocate rather small area to jowar as he invariably grows it as a mixed crop along with cotton. The annual requirement of jowar for his family consumption is about 28 maunds and it is entirely met from the home-production.

The crops grown on different plots of his land-holding and the areas put to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.00	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	Groundnut ('Nawati' banana
1.2	2.00	NB-JB-C	'Nawati' banana	'Junar' banana	Jowar (Cotton)	Cotton
1.3	1.98	NB-JB-C	'Nawati' banana	'Junar' banana	Wheat (Cotton)	Cotton

1.4	0.77	NB-JB-C	'Nawati' banana	'Junar' banana	Paddy (Cotton)	Cotton	
2.1	2.60	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Jowar	
2.2	1.98	NB-JB-J	Wheat (Jowar)	'Nawati' banana	'Junar' banana	Jowar	
3.1	0.93	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Wheat (Cotton)	
4.1	2.30	G-C or NB-JB-C	Groundnut	Cotton	Groundnut	'Nawati' banana	
4.2	2.30	G-C or NB-JB-C	Cotton	Groundnut	Cotton	'Nawati' banana	
Total :			Jowar	2.60	-	2.00	4.58
			Groundnut	2.30	2.30	2.30	2.00
			Cotton	3.23	2.30	4.30	4.75
			'Nawati' banana	6.75	5.51	-	4.60
			'Junar' banana	-	6.75	5.51	-
			Wheat	1.98	-	1.98	0.93
			Paddy	-	-	0.77	-

It may be seen from the cropping that the cultivator had grown the crops mostly as per the rotation-plan in all the four years. He was required to deviate only on one plot in 1960-61, on three plots in 1962-63 and on two plots in 1963-64. In the year 1960-61, he deviated from jowar to wheat on the small plot of 1.98 acres (Plot 2.2) in order to meet the family's consumption needs of wheat. The same was the case of the deviations on two plots (Plots 1.3 and 1.4) in 1962-63. He deviated from cotton to wheat on the plot of 1.98 acres (Plot 1.3) and from cotton to paddy on the plot of 0.77 acre (Plot 1.4) to meet his family consumption needs of these two commodities. He reported that as rice was not available at all in the market he thought of its cultivation on his own land and deviated to it on

a small plot. In the same year he was required to deviate from cotton to jowar on the plot of 2.00 acres (Plot 1.2) because of his rotation-plan itself. According to the rotation-programme, the entire area of his land-holding was due for the cash-crops alone in this year. There was no land due for jowar. In such circumstances he was required to deviate and correct the area imbalance between the food and cash-crops. He, thus, deviated from cotton on the plot of 2.00 acres and took jowar on it in order to meet the yearly food needs of the family. In the year 1963-64, he deviated from cotton to wheat on the small plot of 0.93 acre (Plot 3.1) and from banana to groundnut on the plot of 2.00 acres (Plot 1.1). He reported that both these deviations were necessitated to meet the family consumption needs of wheat and groundnut.

CASE STUDY W 22

Name	: M. D. M.	Family size	: 4 members
Age	: 48 years	Earners	: Male Female Total
Education	: 7th standard		2 1 3
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.3,150
Subsidiary occupation	: -	Land-holding	: 10.30 acres
Livestock	:		
Working	Milch	Young	Total
-	1	2	3
			Home-collected manure
			: 8 cart-loads

The land-holding cultivated by this cultivator is of 10.30 acres. It consists of two fragments. The details of the two fragments and the rotation-plan formulated by the cultivator are

presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	4.30	Not available	1.1	4.00	Medium-black	C-C-C-J
			1.2	0.30	Medium-black	C-J
2	6.00	Available	2.1	2.00	Medium-black	NB-JB-J
			2.2	3.00	Medium-black	NB-JB-G
			2.3	1.00	Medium-black	NB-JB-G

It may be noted that the entire land-holding of this cultivator is of medium-black soil. The irrigation facility is available only on one of his fragments. The first fragment of 4.30 acres does not have irrigation. Besides, the land in this fragment is more alkaline and not suited to the irrigated crop like banana. He, therefore, cannot lease-out this land for banana cultivation even though irrigation is available in its adjacent area. He is required to restrict the cultivation on this fragment to dry crops alone. The case of the other fragment of 6.00 acres is different. It has irrigation facility which the cultivator utilizes mainly to grow banana. The rotation-plan of the cultivator is peculiar, in the sense that on one fragment he concentrates more on cotton and on the other fragment, on banana. It may be noted how he has formulated his rotation-plan, allocating only the required area to jowar, and all the rest, to the cash-crops. In his rotation-plan, more than three-fourths of the total land, is allocated to the cash-crops alone. It can be seen that the areas under different crops, averaged over the period of rotation-cycle, come to 4.00 acres under banana; 3.15 acres under cotton; 1.33 acres under groundnut and 1.82 acres under jowar. The area allocated to

jowar is enough to meet the yearly food needs (18 maunds) of his family.

The crops grown on different plots of the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	4.00	C-C-C-J	Jowar	Cotton	Cotton	Cotton	
1.2	0.30	C-J	Jowar	Paddy (Cotton)	Jowar	Cotton	
2.1	2.00	NB-JB-J	'Junar' banana	Jowar	'Nawati' banana	'Junar' banana	
2.2	3.00	NB-JB-G	'Nawati' banana	'Junar' banana	Groundnut	'Nawati' banana	
2.3	1.00	NB-JB-G	Paddy (Groundnut)	Jowar ('Nawati' banana)	Wheat ('Nawati' banana)	Cotton ('Nawati' banana)	
Total :			Jowar	4.30	3.00	0.30	-
			Groundnut	-	-	3.00	-
			Cotton	-	4.00	4.00	5.30
			'Nawati' banana	3.00	-	2.00	3.00
			'Junar' banana	2.00	3.00	-	2.00
			Wheat	-	-	1.00	-
			Paddy	1.00	0.30	-	-

It is clear from the cropping that the cultivator had grown the crops mostly according to the rotation-plan in all the four years. He had deviated on one plot each in 1960-61, 1962-63 and 1963-64 and on two plots in 1961-62. In the year 1960-61, he was required to deviate from groundnut to paddy on the plot of 1.00 acre (Plot 2.3) in order to meet the family consumption needs of rice. The same was the case in the next year (1961-62) when he deviated from cotton to paddy on the small plot of 0.30

acre (Plot 1.2). In this year he was required to deviate from banana to jowar on the plot of 1.00 acre (Plot 2.3). This deviation was necessitated because of the shortage of water in the well. He reported that the supply of water in the well was limited because of accumulation of silt. He could irrigate only 2.00 to 3.00 acres of banana from the available supply of water. He was, therefore, required to deviate from banana on the plot of 1.00 acre in the last three years. In 1963-64, he had removed the silt but the supply of water was not sufficient to irrigate all the area (6.00 acres) which was due for banana. He, therefore, deviated from banana on the plot of 1.00 acre in this year also and took cotton on it.

CASE STUDY W 23

Name	: B. T. C.	Family size	: 6 members
Age	: 30 years	Earners	: Male Female Total
Education	: 7th standard		1 2 3
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.6,000
Subsidiary occupation	: -	Land-holding	: 20.57 acres
Livestock	:	Home-collected manure	: 22 cart-loads
Working	2	Milch	2
Young	1	Total	5

The cultivator cultivates the land-holding of 20.57 acres. It comprises of five fragments of which four, having the total area of 14.74 acres, are in the village and the remaining one, having an area of 5.83 acres, is in the neighbouring village (Kochur). The details of all these fragments and the rotation-

plan practised by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	4.98	Not available	1.1	4.98	Medium-black	NB-JB-C
2	4.20	Available	2.1	4.20	Deep-black	NB-JB-C
3	3.68	Not available	3.1	3.68	Medium-black	G-C-J or NB-JB-C
4	1.88	Not available	4.1	1.88	Medium-black	J-J-J
5	5.83	Not available	5.1	5.83	Deep-black	C-C-C

It may be noted that the cultivator has irrigation facility, only on one fragment of 4.20 acres. The rest of the area of his land-holding does not have such facility. However, the cultivator grows banana, on a major portion of his total land, either by leasing-in the neighbouring cultivators' land having irrigation or by leasing-out his land to the neighbouring cultivators for banana cultivation. In the case of the fragment of 3.68 acres, he is required to practise a dual rotation as he has not developed any definite relationship with the neighbouring cultivators. Another point to be noted is that on two of his fragments, he does not follow any crop-rotation and prefers to put these under single cropping. He reports that, of these two fragments, one, having an area of 5.83 acres has superior type of deep-black soil. As this fragment is situated near the village it is very convenient for manuring. He manures it almost every year. Because of the superior land and heavy manuring, he prefers to grow cotton on it continuously, without practising any rotation. The case of the other fragment (1.88 acres) is rather different. It is situated adjacent to the village--only

a 'kaccha' road running in between. Because of its proximity to the village, the cultivator cannot take on it the crops like groundnut and cotton. He is required to grow jowar on it continuously. The rotation-plan formulated by the cultivator shows a marked bias towards the cultivation of cotton. It may be seen that nearly half of the total land-holding is allocated to cotton alone. The areas under different crops, averaged over the rotation-cycle, vary from 6.12 to 8.58 acres under banana; from 1.88 to 3.11 acres under jowar; 10.11 acres under cotton; and 1.23 acres under groundnut. The area allocated to jowar is enough to meet the yearly food needs (27 maunds) of his family.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	4.98	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	Cotton ('Nawati' banana)	
2.1	4.20	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana	
3.1	3.68	G-C-J or NB-JB-C	Jowar	'Nawati' banana	'Junar' banana	Cotton	
4.1	1.88	J-J-J	Jowar	Jowar	Jowar	Jowar	
5.1	5.83	C-C-C	Cotton	Cotton	Cotton	Cotton	
Total :			Jowar	5.56	1.88	1.88	1.88
			Cotton	5.83	5.83	15.01	14.49
			'Nawati' banana	9.18	3.68	-	4.20
			'Junar' banana	-	9.18	3.68	-

It can be seen from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the

years, except the last. In the year 1963-64, he was required to deviate from banana to cotton on the plot of 4.98 acres (Plot 1.1). He reported that in this year he could not lease-in for banana cultivation, the land of his neighbouring cultivator, from where he used to irrigate his plot as well. As irrigation facility was not available on his own plot, he had no other alternative, but to deviate from banana. In the circumstances of the year he preferred to deviate to cotton on this plot and thus, the deviation from banana to cotton occurred in this year. In the year 1960-61, he took 'Kandya bāg' banana on the plot of 4.20 acres (Plot 2.1). Before the plantation of banana crop, he had grown groundnut on this plot in the kharif season of the year, thus, deviating from the rotation for that particular season.

CASE STUDY W 24

Name	: T. P. M.	Family size	: 7 members
Age	: 55 years	Earners	: Male Female Total
Education	: 6th standard		2 2 4
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.4,000
Subsidiary occupation	: -	Land-holding	: 10.90 acres
Livestock	:		
Working	Milch	Young	Total
2	3	2	7
		Home-collected manure	: 32 cart-loads

The cultivator cultivates the land-holding of 10.90 acres. It comprises of five fragments of relatively smaller areas. The

details of these fragments and the rotation-programme formulated by the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	2.00	Available	1.1	2.00	Medium-black	NB-JB-C
2	2.95	Available	2.1	1.95	Deep-black	NB-JB-C
			2.2	1.00	Deep-black	NB-JB-C
3	1.15	Not available	3.1	1.15	Medium-black	NB-JB-C
4	3.00	Not available	4.1	3.00	Medium-black	G-C-J or NB-JB-C
5	1.80	Available	5.1	1.80	Medium-black	C-J

The cultivator has irrigation on a major portion of his land-holding and he utilizes it mainly to grow banana. He grows banana himself even on those fragments where he does not have irrigation, by leasing-in the neighbouring lands having the irrigation facility. In the case of one fragment of 3.00 acres, he is required to keep his cropping programme flexible by practising the dual rotation, as he has not developed any definite relation with the neighbouring cultivators. Another point to be noted is that he devotes the fragment of 1.80 acres to the dry crops alone, even though he has his own irrigation available on it. The cultivator reports that, this fragment is far off from the village (3 miles) and it goes rather difficult to grow on it the irrigated crop like banana. The rotation-plan formulated by the cultivator shows a considerable emphasis on the cultivation of cash-crops. More than three-fourths of the total land is allocated to the cash-crops like banana and cotton. The averaged area, over a rotation-cycle, varies from 4.07 to 6.07 acres under banana; and from 0.90 acre to 1.90 acres under

jowar. The averaged area under cotton is 3.93 acres and under groundnut, 1.00 acre. The area allocated to jowar is inadequate to meet the yearly food needs (32 maunds) of his family. However, he invariably grows jowar as a mixed crop along with cotton and meets the annual food needs of the family.

The crops grown on different plots of the land and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	2.00	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	Cotton ('Nawati' banana)	
2.1	1.95	NB-JB-C	Jowar (Cotton)	'Nawati' banana	'Junar' banana	Cotton	
2.2	1.00	NB-JB-C	Wheat (Cotton)	Paddy ('Nawati' banana)	'Nawati' banana	'Junar' banana	
3.1	1.15	NB-JB-C	Cotton	Cotton ('Nawati' banana)	'Nawati' banana	'Junar' banana	
4.1	3.00	G-C-J or NB-JB-C	Cotton	Cotton (Jowar)	Groundnut (Jowar)	'Nawati' banana	
5.1	1.80	G-J	Jowar	Cotton	Cotton (Jowar)	Cotton (Jowar)	
Total :			Jowar	3.75	-	-	-
			Groundnut	-	-	3.00	-
			Cotton	4.15	5.95	3.80	5.75
			'Nawati' banana	2.00	1.95	2.15	3.00
			'Junar' banana	-	2.00	1.95	2.15
			Wheat	1.00	-	-	-
			Paddy	-	1.00	-	-

It may be noted that the cultivator had grown the crops largely according to the rotation-plan in all the four years.

He was required to deviate on two plots each in 1960-61, 1962-63 and 1963-64 and on three plots in 1961-62. In 1960-61 he was required to deviate from cotton to wheat and jowar on the two plots of 1.00 acre and 1.95 acres respectively (Plots 2.2 and 2.1) because of the rotation-plan itself. According to the rotation-programme, the area due for cotton in this year was considerably large (7.10 acres). In order to adjust the area under cotton to its usual level, he had to deviate. He, thus, deviated from cotton and grew jowar on one plot (Plot 2.1) and wheat, on the other plot (Plot 2.2) to meet the consumption needs of his family. In 1961-62, he was required to deviate from banana to cotton on two plots of 1.15 and 3.00 acres (Plots 3.1 and 4.1) as he could not arrange for irrigation by leasing-in the neighbouring lands. In this year, he had also deviated from banana to paddy on the plot of 1.00 acre (Plot 2.2) to meet the family consumption needs of rice. In the year 1962-63, he was required to deviate from jowar to cotton on the plot of 1.80 acres (Plot 5.1). He reported that he had heavily manured this plot and put it under cotton in the preceding year. But the cotton crop failed completely and the manure applied to it was not fully utilized. In 1962-63, therefore, he could not grow jowar on it, as the residuals of manure would have affected it very adversely. He, thus, preferred to deviate to cotton on it, to utilize the residuals of manure applied. In this year, he had also deviated from jowar to groundnut on the plot of 3.00 acres (Plot 4.1) as he wanted more cash-income for his daughter's marriage. It may be noted that in this year he had

devoted his entire land-holding to the cash-crops alone. In 1963-64, he was required to deviate from banana to cotton on the plot of 2.00 acres (Plot 1.1) because of the shortage of water supply in the well. He reported that the inside portion of the well on this fragment fell down in 1963 and affected the supply of water to a great extent. In the circumstances, he preferred to deviate from banana and put the land under cotton. In this year, the second deviation was from jowar to cotton on the plot of 1.80 acres (Plot 5.1). This deviation was necessitated as he had enough stocks of jowar grown as a mixed crop along with cotton and groundnut in the preceding year.

CASE STUDY W 25

Name	: N. Z. M.	Family size	: 5 members
Age	: 55 years	Earners	: Male Female Total
Education	: 2nd standard		1 1 2
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.3,000
Subsidiary occupation	: -	Land-holding	: 6.00 acres
Livestock	:	Home-collected manure	: 15 cart-loads
Working	2	Young	-
Milch	1	Total	3

The cultivator cultivates a small land-holding of 6.00 acres. In fact, he had a large land-holding of 17.05 acres till 1962-63, as he had leased-in 11.05 acres of land since long. However, the tenancy case was settled in 1963 and he had to return the entire leased-in land (11.05 acres) to its owner.

Therefore, the land-holding which was under his cultivation for the entire period of four years was of only 6.00 acres which he owned. The details of this land-holding and the rotation-plan practised by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	4.50	Available	1.1	4.50	Medium-black	G-C or NB-JB-C
2	1.50	Available	2.1	1.50	Medium-black	G-C or NB-JB-C

The cultivator himself does not grow banana, even though irrigation is available on both of his fragments. The main reason for not growing banana himself, is that he does not have any equipments of irrigation. He usually leases-out his land for banana cultivation to his neighbouring cultivators. He, therefore, keeps his cropping programme rather flexible by accepting the dual rotation of G-C or NB-JB-C. He has not developed any definite relationship with any of the neighbouring cultivators and hence could not give a definite place for banana in his rotation-plan. Another point to be noted is that he has devoted his entire land-holding to the cash-crops alone. This is mainly because he used to grow the food crops required for his family consumption on the leased-in land. The entire leased-in land was dry where he could raise the crops like jowar, groundnut and cotton. The areas under different crops, averaged over the period of rotation-cycle, vary from 1.00 acre to 3.00 acres under banana; from 2.25 to 2.75 acres under cotton; and from 0.75 acre to 2.25 acres under groundnut. As he used to grow jowar on the leased-in land he had not allocated any of his

own land to it.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	4.50	G-C or NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana
2.1	1.50	G-C or NB-JB-C	'Junar' banana	'Nawati' banana (Cotton)	'Junar' banana	Jowar (Cotton)
Total : Jowar			-	-	-	1.50
Cotton			-	-	4.50	-
'Nawati' banana			4.50	1.50	-	4.50
'Junar' banana			1.50	4.50	1.50	-

The crops grown on the leased-in land in the first three years were as follows:

	1960-61	1961-62	1962-63
Jowar	5.10	7.10	2.30
Groundnut	3.95	3.95	1.65
Cotton	2.00	-	7.10

The cultivator had grown the crops on his owned holding, mostly as per the rotation-plan in all the four years. He was required to deviate only on one plot each in 1961-62 and 1963-64. In the year 1961-62 he was required to deviate from cotton to banana on the plot of 1.50 acres (Plot 2.1) as the tenant cultivator agreed to repeat banana on the same land. In 1963-64, he was required to deviate from cotton to jowar on the same plot of 1.50 acres (Plot 2.1). This time the deviation was necessitated

as he was required to return all the leased-in land to its owner. As he returned all the leased-in land to its owner, he had to make provision for jowar to meet the family consumption needs, on his own land. He, thus, deviated from cotton and grew jowar on the plot of 1.50 acres to meet the yearly food needs of his family.

CASE STUDY W 26

Name	: S. S. M.	Family size	: 10 members
Age	: 50 years	Earners	: Male Female Total
Education	: 4th standard		3 3 6
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income	: Rs.2,640 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 6.28 acres
Livestock	:		
Working	Milch 2 Young 2 Total 4	Home-collected manure	: 20 cart-loads

The land-holding cultivated by this cultivator is of 6.28 acres. He had, in fact, a land-holding of 7.71 acres till the year 1962-63. In 1963, he sold one of his owned fragments of 1.43 acres. As a result, his land-holding came down to 6.28 acres in 1963-64. This land of 6.28 acres only had remained under his cultivation for the entire period of four years. The details of this land-holding and the rotation-plan practised by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	2.43	Available	1.1	2.43	Medium-black	NB-JB-J
2	2.15	Available	2.1	2.15	Deep-black	NB-JB-C
3	1.70	Not available	3.1	1.70	Light	G-J

It may be noted that the cultivator has irrigation on the major portion of his land-holding. He utilizes the irrigation facility mainly to grow banana. He usually leases-in the lands of the neighbouring cultivators for the cultivation of banana. The cultivator is required to practise the G-J rotation on his fragment of 1.70 acres as its land is of lighter soil where these two crops only can be profitably grown. The rotation-plan formulated by the cultivator is highly dominated by the cash-crops, particularly banana. It may be seen that in his rotation-plan he allocates about three-fourths of the land-holding to the cash-crops. The areas averaged over the rotation-cycle, come to 3.05 acres under banana; 0.72 acre under cotton; 0.85 acre under groundnut; and 1.66 acres under jowar. The area allocated to jowar is too small to meet the yearly food requirements of his family. His annual requirement of jowar for the family consumption is around 45 maunds. It is not met from the home-production of jowar. He is generally required to purchase jowar.

The crops grown on different plots of the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.43	NB-JB-J	'Junar' banana	Jowar	'Nawati' banana	'Junar' banana
2.1	2.15	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	Jowar ('Nawati' banana)

3.1	1.70	G-J	Groundnut	Jowar	Groundnut	Jowar	
Total :			Jowar	-	4.13	-	3.85
			Groundnut	1.70	-	1.70	-
			Cotton	-	-	2.15	-
			'Nawati' banana	2.15	-	2.43	-
			'Junar' banana	2.43	2.15	-	2.43

The crops grown in the first three years, on the fragment of 1.43 acres, sold in 1963, are given below:

	1960-61	1961-62	1962-63
Jowar	-	-	1.43
'Nawati' banana	1.43	-	-
'Junar' banana	-	1.43	-

It may be noted from the cropping that the cultivator had grown the crops strictly as per the rotation-plan, except in 1963-64. In the year 1963-64, he was required to deviate from banana to jowar on the plot of 2.15 acres (Plot 2.1), because of the shortage of water in the well. He reported that the inside portion of the well in this plot gave way in 1962 and this led to accumulation of debris and silt which affected the supply of water in the well to a great extent. The water supply had gone down so much that it was not possible to irrigate the crop like banana. In such circumstances, the cultivator had to deviate from banana and grow jowar to meet the consumption needs of his family. He did not prefer to deviate to cotton as it was grown on this plot in the preceding year.

CASE STUDY W 27

Name	: S. R. P.	Family size	: 9 members
Age	: 45 years	Earners	: Male Female Total
Education	: 4th standard		2 1 3
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.4,000
Subsidiary occupation	: Carting	Land-holding	: 12.18 acres
Livestock	:		
Working	Milch	Young	Total
2	1	1	4
			Home-collected manure
			: 18 cart-loads

The land-holding cultivated by this cultivator is of 12.18 acres. In fact, he had a large land-holding of 21.44 acres till 1962-63, as he had leased-in about 18.86 acres of land since long. In 1963, however, he was required to return half of the leased-in land to its owner, according to the compromise reached between them. His cultivated holding, therefore, came down to 12.18 acres in 1962-63. This area of the land-holding had remained under his cultivation for the entire period of the four years. This land-holding consists of five fragments, of which three, having a total area of 2.58 acres are owned and the remaining two, having a total area of 9.60 acres are leased-in. The details of these fragments and the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.20	Available	1.1	1.20	Medium-black	NB-JB-C-J
2	1.20	Available	2.1	1.20	Medium-black	NB-JB-C-J
3	0.18	Available	3.1	0.18	Medium-black	NB-JB-C

4	4.20	Not available	4.1	2.20	Deep-black	NB-JB-C
			4.2	2.00	Deep-black	NB-JB-C
5	5.40	Not available	5.1	2.20	Medium-black	G-C-J
			5.2	2.20	Medium-black	G-C-J
			5.3	1.00	Medium-black	G-C-J

It may be seen that the cultivator has irrigation, only on his owned land. The entire leased-in land does not have the facility of irrigation. In the case of this cultivator, therefore, the irrigable area formed a very minor proportion of the total cultivated holding. However, the cultivator utilizes the available irrigation mainly to grow banana. He grows banana on one of the leased-in fragments as well (4.20 acres) by leasing-in its neighbouring land having irrigation facility. The other leased-in fragment (5.40 acres) is devoted to the dry crops alone, as there is no irrigation available even in its near about area. The rotation-plan formulated by the cultivator is slightly biased towards the cultivation of banana and cotton. It may be seen that about one-third of his total land is allocated each to banana and cotton. The areas under different crops, averaged ^{of} over the period/rotation-cycle, come to 4.12 acres under banana; 3.86 acres under cotton; 1.80 acres under groundnut; and 2.40 acres under jowar. The area allocated to jowar is just enough to meet the annual food needs (40 maunds) of his family. He grows jowar as a mixed crop also, along with cotton every year. The annual food needs of the family, therefore, are invariably met from the home-production of jowar.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.20	NB-JB-C-J	Jowar	'Nawati' banana	'Junar' banana	Cotton	
2.1	1.20	NB-JB-C-J	'Nawati' banana	'Junar' banana	Paddy (Cotton)	Cotton	
3.1	0.18	NB-JB-C	Chillies (Cotton)	'Nawati' banana	'Junar' banana	Cotton	
4.1	2.20	NB-JB-C	Wheat ('Nawati' banana)	'Nawati' banana	'Junar' banana	Cotton	
4.2	2.00	NB-JB-C	'Junar' banana	Cotton	'Nawati' banana	'Junar' banana	
5.1	2.20	G-C-J	Jowar	Cotton (Groundnut)	Jowar	Cotton (Groundnut)	
5.2	2.20	G-C-J	Cotton	Groundnut (Jowar)	Jowar (Cotton)	Jowar (Groundnut)	
5.3	1.00	G-C-J	Groundnut	Cotton	Groundnut (Jowar)	Groundnut (Cotton)	
Total :			Jowar	3.40	-	4.40	2.20
			Groundnut	1.00	2.20	1.00	1.00
			Cotton	2.20	5.20	-	6.98
			'Nawati' banana	1.20	3.58	2.00	-
			'Junar' banana	2.00	1.20	3.58	2.00
			Wheat	2.20	-	-	-
			Paddy	-	-	1.20	-
			Chillies	0.18	-	-	-

The crops grown in the first three years, on the leased-in land which was returned to its owner in 1963, were as follows:

	1960-61	1961-62	1962-63
Jowar	3.25	6.01	3.25
Groundnut	-	3.25	-
Cotton	6.01	-	6.01

It may be observed from the cropping in the four years that the cultivator had mostly grown crops as per the rotation-

programme. He was required to deviate on two plots each in 1960-61 and 1961-62 and on three plots each in 1962-63 and 1963-64. In the year 1960-61, he deviated from cotton to chillies on the small plot of 0.18 acre (Plot 3.1) to meet the family's consumption needs of chillies. He reported that this plot, being near the well, was very convenient to irrigate and so he preferred to deviate for chillies on it. Another deviation reported in this year was from banana to wheat on the plot of 2.20 acres (Plot 4.1). The cultivator reported that in this year the tenant cultivator did not lease-in the plot for banana cultivation as he got on lease a large area at some other place. The cultivator himself could not grow banana on it as he had no irrigation. In the circumstances, he had no other alternative but to deviate to any dry crop which he himself can grow. He preferred to deviate to wheat as the land of this plot was of deep-black soil. In the year 1961-62, he was required to deviate from groundnut to cotton, and from jowar to groundnut on the two plots of 2.20 acres each (Plots 5.1 and 5.2). Both the deviations were necessitated because of the rotation-plan. According to the rotation-plan itself, the area due for jowar in this year, was considerably high (8.21 acres). As against this the area due for cotton was as low as 3.00 acres. In order to correct this area imbalance, he was required to deviate on the two plots in this year. He deviated from jowar on the plot of 2.20 acres (Plot 5.2) and grew groundnut on it. On the other plot of 2.20 acres (Plot 5.1) he deviated from groundnut to cotton. He, thus, brought down the area under jowar from

8.21 to 6.01 acres and pushed up the area of cotton to 5.20 acres. In order to correct the area imbalance he was required to resort to deviations on two plots. This was mainly because he could not deviate from jowar to cotton on Plot 5.2 as it would have caused the repetition of the same crop. In 1962-63 also, the rotation-plan itself had disturbed the usual area balance between different crops and the cultivator had to deviate to correct it. In this year the area due for cotton was far in excess at the cost of jowar and groundnut. In fact, there was no area due for groundnut in this year. The cultivator, therefore, deviated from cotton to jowar on the plot of 2.20 acres (Plot 5.2); from jowar to groundnut on the plot of 1.00 acre (Plot 5.3) and thus restored the usual area balance between different crops. In this year, he had also deviated from cotton to paddy on the plot of 1.20 acres (Plot 2.1) in order to meet the family's consumption needs of rice. In 1963-64, he was required to deviate from groundnut to cotton and jowar on the two plots of 2.20 acres each (Plots 5.1 and 5.2) and from cotton to groundnut on the plot of 1.00 acre (Plot 5.3). All these deviations were necessitated as he returned half of the leased-in land to its owner in this year. He was required to adjust his cropping on the remaining land. He, thus, deviated from groundnut to jowar on the plot of 2.20 acres, to make provision for the food requirements of the family; from cotton to groundnut on the plot of 1.00 acre, to meet the family's consumption needs of groundnut; and from groundnut to cotton on the plot of 2.20 acres to get more cash-income.

CASE STUDY W 28

Name	: O. L. P.	Family size	: 12 members
Age	: 50 years	Earners	: Male Female Total
Education	: 4th standard		4 4 8
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.7,600
Subsidiary occupation	: Flour mill	Land-holding	: 17.51 acres
Livestock	:		
Working	2	Milch	2
		Young	-
		Total	4
		Home-collected manure	: 20 cart-loads

The cultivator cultivates a land-holding of 17.51 acres owned by him. The land-holding comprises of seven fragments. The details of these fragments and the rotation-programme formulated by the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	3.00	Available	1.1	1.50	Medium-black	NB-JB-J
			1.2	1.50	Medium-black	NB-JB-J
2	0.75	Available	2.1	0.75	Medium-black	NB-JB-C
3	4.13	Available	3.1	3.13	Medium-black	NB-JB-C
			3.2	0.50	Medium-black	NB-JB-C
			3.3	0.50	Medium-black	NB-JB-C
4	1.50	Available	4.1	1.50	Medium-black	NB-JB-C
5	1.75	Available	5.1	1.25	Medium-black	NB-JB-J
			5.2	0.50	Medium-black	NB-JB-J
6	4.95	Available	6.1	2.00	Medium-black	NB-JB-J
			6.2	2.95	Medium-black	NB-JB-J
7	1.43	Not available	7.1	0.73	Medium-black	G-J or NB-JB-J
			7.2	0.70	Medium-black	G-J or NB-JB-J

It may be noted that the entire land-holding of this cultivator is of medium-black soil. He has irrigation facility on

almost all the fragments of his land-holding. He utilizes the facility of irrigation mainly to grow banana. In the case of one fragment (1.43 acres) where he does not have irrigation, he is required to practise dual rotation in order to keep the cropping programming flexible. Whenever possible he leases-out this fragment for banana cultivation to the neighbouring cultivators having irrigation facility. But he has not developed a definite relation with any of the neighbouring cultivators and hence cannot give a definite place for banana in the rotation followed on this fragment. The rotation-plan formulated by the cultivator is highly dominated by the cultivation of banana. More than half of the total land is allocated to banana alone. The average areas allocated to different crops, vary from 10.74 to 11.64 acres under banana; and from 3.68 to 3.90 acres under jowar. The average area under cotton is about 2.12 acres and under groundnut, 0.67 acre. The cultivator reports that the annual requirement of food for his family is quite large (54 maunds) as he has a big family of 12 members. The area allocated to jowar in the rotation-plan is just enough to meet his yearly requirement of jowar for the family consumption.

The crops grown on different plots of the land-holding and the areas put under each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.50	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	'Nawati' banana
1.2	1.50	NB-JB-J	'Junar' banana	Jowar	'Nawati' banana	'Junar' banana

2.1	0.75	NB-JB-C	'Nawati' banana	'Junar' banana	Sugarcane (Cotton)	Sugarcane	
3.1	3.13	NB-JB-C	Sugarcane ('Nawati' banana)	Sugarcane	Sugarcane	Jowar	
3.2	0.50	NB-JB-C	Paddy (Cotton)	'Nawati' banana	'Junar' banana	Wheat (Cotton)	
3.3	0.50	NB-JB-C	Chillies (Cotton)	'Nawati' banana	'Junar' banana	Chillies (Cotton)	
4.1	1.50	NB-JB-C	'Junar' banana	Sugarcane (Cotton)	Sugarcane	Sugarcane	
5.1	1.25	NB-JB-J	'Junar' banana	Jowar	'Nawati' banana	'Junar' banana	
5.2	0.50	NB-JB-J	'Junar' banana	Paddy (Jowar)	'Nawati' banana	'Junar' banana	
6.1	2.00	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	'Nawati' banana	
6.2	2.95	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	Chillies ('Nawati' banana)	
7.1	0.73	G-J or NB-JB-J	Groundnut	Jowar	Groundnut	'Nawati' banana	
7.2	0.70	G-J or NB-JB-J	Jowar	Groundnut	Jowar	'Nawati' banana	
Total :			Jowar	2.70	3.48	5.15	3.13
			Groundnut	0.73	0.70	0.73	-
			Cotton	-	-	-	-
			'Nawati' banana	5.20	3.00	3.25	4.93
			'Junar' banana	4.75	5.20	3.00	3.25
			Sugarcane	3.13	4.63	5.38	2.25
			Wheat	-	-	-	0.50
			Paddy	0.50	0.50	-	-
			Chillies	0.50	-	-	3.45

It is evident from the cropping in the four years that the cultivator had followed his rotation-plan as strictly as possible. He was required to deviate only on a minor portion of his total land in all the four years. In the year 1960-61, he was required

to deviate from banana to paddy and chillies on the two plots of 0.50 acre each (Plots 3.2 and 3.3) in order to meet his family's consumption needs of rice and chillies. In this year he had also deviated from banana to sugarcane on the plot of 3.13 acres (Plot 3.1). The cultivator reported that in 1960 he learnt from one of his relatives in the neighbouring village that sugarcane was more profitable than banana. He wanted to experiment with sugarcane on his farm and so deviated from banana and took sugarcane on the plot of 3.13 acres in 1960-61. He ultimately found that sugarcane gave better returns in comparison with that of banana. In 1961-62, he was required to deviate on two plots, from cotton to sugarcane on one plot of 1.50 acres (Plot 4.1) and from jowar to paddy on the other plot of 0.50 acre (Plot 5.2). The deviation from cotton to sugarcane was undertaken to increase the area under sugarcane as he had found it more profitable than any of his other crops. The deviation from jowar to paddy was necessitated because of the family's consumption needs of rice. In 1962-63 also, he deviated from cotton to sugarcane on still another plot of 0.75 acre (Plot 2.1) and increased the area under sugarcane to 5.38 acres. He deviated to sugarcane on those particular plots where the land was more alkaline and was not much suited to banana. In 1963-64, he was required to deviate on a relatively larger area of his holding. In this year he deviated from cotton to jowar and wheat on the two plots of 3.13 acres and 0.50 acre respectively (Plots 3.1 and 3.2). Both the deviations were necessitated because of the inadequate rainfall in the sowing season of the year. The cultivator reported that

he had, in fact, sown cotton on both the plots, but because of insufficient rains it did not come up well and had to be removed ultimately. He, therefore, re-sowed jowar on the plot of 3.13 acres and wheat on the plot of 0.50 acre. In this year, he had also deviated from banana to chillies and from cotton to chillies on the two plots of 2.95 acres and 0.50 acre respectively (Plots 6.2 and 3.3). Both the deviations were necessitated because of the sharp rise in the prices of chillies. The cultivator reported that in 1962-63, the prices of chillies had shot up to Rs.160 per maund. In order to reap the advantage of such rise in prices, he deviated from banana and cotton and took chillies on two of his plots. As an interaction of the deviation on the plot of 2.95 acres, he was required to deviate on one more plot in this year. Because of the deviation from banana on the plot of 2.95 acres, the area under banana had sunk very low. In order to push up the area of banana, he preferred to deviate from jowar to banana on the plot of 2.00 acres (Plot 6.1). Through this deviation he brought up the area under banana in the year to its usual level.

CASE STUDY W 29

Name	: V. G. C.	Family size	: 10 members
Age	: 40 years	Earners	: Male Female Total
Education	: 6th standard		3 1 4
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income	: Rs.10,000 (1962-63)
Subsidiary occupation	: -	Land-holding	: 21.41 acres
Livestock	:	Home-collected	
Working	2	manure	: 10 cart-loads
Milch	-		
Young	-		
Total	2		

The cultivator cultivates a fairly large land-holding of 21.41 acres. It is entirely owned by him. The land-holding comprises of three fragments. The details of these fragments and the rotation-plan practised by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	11.35	Not available	1.1	6.35	Medium-black	NB-JB-C-C
			1.2	2.00	Medium-black	NB-JB-C-C
			1.3	1.35	Medium-black	NB-JB-C-C
			1.4	1.00	Medium-black	NB-JB-C-C
			1.5	0.65	Medium-black	NB-JB-C-C
2	3.73	Available	2.1	2.73	Deep-black	NB-JB-J
			2.2	1.00	Deep-black	NB-JB-J
3	6.33	Available	3.1	4.50	Deep-black	Oranges
			3.2	1.83	Medium-black	J-J-J

It may be noted that the cultivator has irrigation facility only on two of his fragments. The larger fragment of 11.35 acres does not have such facility. In the case of this cultivator, therefore, the irrigable area forms a small proportion of the total land. He himself grows banana on a major portion of his land-holding. He grows it even on the fragment where he does not have his own irrigation, by leasing-in the neighbouring cultivator's land having irrigation. In order to adjust his cropping with that of his neighbouring cultivator, he practises the four-year rotation of NB-JB-C-C on the fragment of 11.35 acres. It may be noted that this cultivator has devoted about 4.50 acres of his land to the orchard of oranges. He could not practise any rotation on the plot of 1.83 acres as it is under the mango grove. On this plot he grows jowar continuously as a fodder crop. The rotation-plan formulated by him shows a marked bias

towards the cultivation of cash-crops. He allocates only the required area to jowar and all the rest to the cash-crops. The areas under different crops, averaged over the period of rotation cycle, come to 8.16 acres under banana; 5.68 acres under cotton; and 3.07 acres under jowar. The area allocated to jowar is enough to meet the yearly food requirements (45 maunds) of his family.

The crops grown on different plots of the land and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	6.35	NB-JB-C-C	'Nawati' banana	'Junar' banana	Cotton	Cotton
1.2	2.00	NB-JB-C-C	'Junar' banana	Jowar (Cotton)	Groundnut (Cotton)	Jowar ('Nawati' banana)
1.3	1.35	NB-JB-C-C	'Junar' banana	Wheat (Cotton)	Groundnut (Cotton)	Jowar ('Nawati' banana)
1.4	1.00	NB-JB-C-C	'Junar' banana	Paddy (Cotton)	Jowar (Cotton)	Groundnut ('Nawati' banana)
1.5	0.65	NB-JB-C-C	'Junar' banana	Wheat (Cotton)	Groundnut (Cotton)	Groundnut ('Nawati' banana)
2.1	2.73	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Cotton (Jowar)
2.2	1.00	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Paddy (Jowar)
3.1	4.50	Oranges	Oranges	Oranges	Oranges	Oranges
3.2	1.83	J-J-J	Jowar	Jowar	Jowar	Jowar
Total : Jowar			5.56	3.83	2.83	5.18
Groundnut			-	-	4.00	1.65
Cotton			-	-	6.35	9.08
'Nawati' banana			6.35	3.73	-	-

'Junar'				
banana	5.00	6.35	3.73	-
Oranges	4.50	4.50	4.50	4.50
Paddy	-	1.00	-	1.00
Wheat	-	2.00	-	-

It may be seen from the cropping that the cultivator was required to deviate on four plots each in 1961-62 and 1962-63 and on six plots in 1963-64. The deviations reported in the year 1961-62 were all necessitated because of the rotation-plan itself. In this year the usual balance of areas between the food and cash-crops was largely disturbed by the rotation-plan itself. It may be seen that in this year, almost all the area of his land-holding was due for the cash-crops alone. In order to correct the area imbalance he was required to deviate. In the circumstances, he preferred to deviate from cotton on the four plots (Plots 1.2, 1.3, 1.4 and 1.5) and took the food crops like jowar, wheat and paddy to meet the consumption needs of his family. Similar was the case in 1962-63 as well. According to the rotation-plan itself, the area due for cotton in this year was far in excess (11.35 acres) and the cultivator had to bring it down through deviations. He deviated from cotton on the same four plots. He took groundnut on three of these plots (Plots 1.2, 1.3 and 1.5) and jowar on the remaining plot (Plot 1.4). In 1963-64, he was required to deviate from banana on the same four plots as he could not lease-in the neighbouring cultivator's land having irrigation. The cultivator reported that he could not lease-in the neighbouring land as its owner demanded cash-rent at the rate of Rs.600 per acre. He did not agree as the rent was quite high. In such circumstances he had to deviate

from banana as he did not have his own irrigation on these plots. He deviated to jowar on two plots of 2.00 and 1.35 acres (Plots 1.2 and 1.3) and to groundnut on the remaining two plots of 1.00 and 0.65 acre (Plots 1.4 and 1.5). As an interaction of these deviations he was required to deviate on two more plots in this year. As he deviated to jowar on the two plots of 2.00 and 1.35 acres, there was no need of growing jowar on any other plots. He, therefore, deviated from jowar and took cotton and paddy on the two plots of 2.73 acres and 1.00 acre respectively. He deviated to paddy mainly to meet the family's consumption needs of rice.

CASE STUDY W 30

Name	: R. K. M.	Family size	: 15 members
Age	: 35 years	Earners	: Male Female Total
Education	: 7th standard		4 2 6
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.10,733
Subsidiary occupation	: -	Land-holding	: 26.20 acres
Livestock	:		
Working	Milch	Young	Total
-	1	2	3
		Home-collected manure	: 8 cart-loads

The land-holding cultivated by the cultivator is fairly large (26.20 acres). Of this, 10.41 acres are owned and the remaining area of 15.79 acres, is leased-in. In the case of this cultivator, therefore, the leased-in land forms a large proportion of the total land-holding. The leased-in land is under his

cultivation since long. The land-holding comprises of nine fragments, the details of which are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	5.00	Available	1.1	3.00	Medium-black	NB-JB-C
			1.2	1.00	Medium-black	NB-JB-C
			1.3	0.50	Medium-black	NB-JB-C
			1.4	0.50	Medium-black	NB-JB-C
2	2.95	Available	2.1	2.95	Medium-black	NB-JB-J
3	2.38	Available	3.1	2.38	Medium-black	NB-JB-J
4	5.75	Available	4.1	5.75	Deep-black	C-C-C-J
5	4.48	Not available	5.1	4.48	Deep-black	NB-JB-C
6	1.15	Not available	6.1	1.15	Medium-black	C-J
7	0.98	Not available	7.1	0.98	Medium-black	C-J
8	0.80	Not available	8.1	0.80	Medium-black	G-C-J
9	2.71	Not available	9.1	2.71	Medium-black	J-J-J

It may be seen that the cultivator has irrigation facility available on a major portion of his land-holding. The irrigable area is as large as 16.08 acres of the total land. He utilizes his irrigation mainly to grow banana. He grows banana even on the fragment of 4.48 acres where he does not have irrigation, by leasing-in the neighbouring cultivator's land having irrigation. He does not grow banana on the fragment of 5.75 acres even though irrigation is available on it as its land is more alkaline and not suited to banana. He grows only the dry crops on this fragment. Another point to be noted is that he does not practise any crop-rotation on the fragment of 2.71 acres as it is under the mango grove. On this fragment, therefore, he grows jowar

continuously as a fodder crop. In the rotation-plan, the cultivator is required to allocate large area to jowar as he has a joint family of 15 members. The annual food requirement of the family is as high as 65 maunds. On an average he allocates about one-third of the land-holding to jowar alone. The areas under different crops, averaged over the period of rotation-cycle, come to 9.88 acres under banana; 8.80 acres under cotton; and 7.26 acres under jowar. In the case of this cultivator it may be seen that the area distribution of the land-holding is more or less equal between the three crops.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	3.00	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana
1.2	1.00	NB-JB-C	'Nawati' banana	'Junar' banana	Groundnut (Cotton)	'Nawati' banana
1.3	0.50	NB-JB-C	'Nawati' banana	'Junar' banana	Wheat (Cotton)	'Nawati' banana
1.4	0.50	NB-JB-C	'Nawati' banana	'Junar' banana	Paddy (Cotton)	'Nawati' banana
2.1	2.95	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Jowar
3.1	2.38	NB-JB-J	Jowar	Jowar ('Nawati' banana)	'Nawati' banana	'Junar' banana
4.1	5.75	C-C-C-J	Jowar	Cotton	Cotton	Cotton
5.1	4.48	NB-JB-C	'Junar' banana	Cotton	'Nawati' banana	'Junar' banana
6.1	1.15	C-J	Wheat (Cotton)	Jowar	Cotton	Jowar
7.1	0.98	C-J	Jowar	Cotton	Jowar	Wheat (Cotton)
8.1	0.80	G-C-J	Cotton	Jowar	Cotton (Groundnut)	Groundnut (Jowar)
9.1	2.71	J-J-J	Jowar	Jowar	Jowar	Jowar

Total : Jowar	14.77	7.04	3.69	6.81
Groundnut	-	-	1.00	0.80
Cotton	0.80	11.21	10.70	5.75
'Newati' banana	5.00	2.95	6.86	5.00
'Junar' banana	4.48	5.00	2.95	6.86
Wheat	1.15	-	0.50	0.98
Paddy	-	-	0.50	-

It may be noted from the cropping that the cultivator had grown the crops mostly as per the rotation-plan in all the four years. He had deviated on one plot each in 1960-61 and 1961-62; on two plots in 1963-64 and on four plots in 1962-63. In the year 1960-61 he deviated from cotton to wheat on the plot of 1.15 acres (Plot 6.1) in order to meet the extra food needs of his brother's marriage. In 1961-62, he deviated from banana to jowar on the plot of 2.38 acres (Plot 3.1) as he could not lease-in the land of the neighbouring cultivator. In order to adjust his cropping on this plot with that of the neighbouring cultivator, he was required to postpone the cultivation of banana to next year. He preferred to deviate to jowar on this plot as the area due for this crop in the year was small and was inadequate to meet the yearly food needs of his family. In the year 1962-63, he deviated from cotton and took groundnut, wheat and paddy on the three plots (Plots 1.2, 1.3 and 1.4) to meet the consumption needs of his family. In this year, he had also deviated from groundnut to cotton on the plot of 0.80 acre (Plot 8.1) because of manuring. In 1963-64 also, he was required to deviate from cotton to wheat on the plot of 0.98 acre (Plot 7.1) and from

jowar to ground on the plot of 0.80 acre (Plot 8.1) in order to meet the family's consumption needs of wheat and groundnut.

CASE STUDY W 31

Name	: P. R. M.	Family size	: 12 members
Age	: 44 years	Earners	: Male Female Total
Education	: 6th standard		3 3 6
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.11,000
Subsidiary occupation	: -	Land-holding	: 26.37 acres
Livestock	:	Home-collected manure	: 32 cart-loads
Working	4	Milch	2
		Young	1
		Total	7

The cultivator cultivates a fairly large land-holding of 26.37 acres. It is entirely his own. The land-holding consists of nine fragments. The details of these fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	4.50	Available	1.1	3.50	Medium-black	NB-JB-C
			1.2	1.00	Medium-black	NB-JB-C
2	2.10	Available	2.1	2.10	Deep-black	NB-JB-J
3	5.50	Available	3.1	3.50	Medium-black	NB-JB-C-J
			3.2	1.00	Medium-black	NB-JB-C-J
			3.3	1.00	Medium-black	NB-JB-C-J
4	2.20	Available	4.1	2.20	Deep-black	NB-JB-C
5	3.38	Available	5.1	3.00	Medium-black	NB-JB-J
			5.2	0.38	Medium-black	NB-JB-J
6	2.15	Not available	6.1	2.15	Deep-black	C-J
7	2.63	Not available	7.1	2.63	Light	G-J

8	2.93	Not available	8.1	2.93	Light	G-J
9	0.98	Not available	9.1	0.98	Medium-black	J-J-J

It may be noted that the cultivator has irrigation facility on a major portion of his land-holding. More than two-thirds of his total land is irrigable. He utilizes irrigation mainly to grow banana. On one fragment of 0.98 acre, the cultivator does not practise any crop-rotation as it is under the mango grove. He, however, takes jowar continuously on it, as a fodder crop. The rotation-plan of the cultivator is dominated by the cultivation of banana. More than half of his total irrigable land is allocated to banana alone. He is required to allocate a fairly large area to jowar as he has a big family of 12 members. The total annual requirement of jowar for the family consumption is as large as 55 maunds. The areas under different crops, averaged over the rotation-cycle, come to 10.86 acres under banana; 4.68 acres under cotton; 2.78 acres under groundnut; and 8.04 acres under jowar. The area allocated to jowar is much larger than required to meet the yearly food needs of his family. This is largely because of the two fragments of lighter soil where he is required to practise the two-year rotation of G-J.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	3.50	NB-JB-C	'Junar' banana	Wheat (Cotton)	'Nawati' banana	'Junar' banana
1.2	1.00	NB-JB-C	Wheat (Cotton)	'Nawati' banana	'Junar' banana	Jowar (Cotton)

2.1	2.10	NB-JB-J	Wheat (Jowar)	'Nawati' banana	'Junar' banana	Jowar	
3.1	3.50	NB-JB-C-J	Cotton	Jowar	'Nawati' banana	'Junar' banana	
3.2	1.00	NB-JB-C-J	Jowar	Jowar ('Nawati' banana)	'Nawati' banana	'Junar' banana	
3.3	1.00	NB-JB-C-J	Groundnut (Jowar)	Jowar	'Nawati' banana	'Junar' banana	
4.1	2.20	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana	
5.1	3.00	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	'Nawati' banana	
5.2	0.38	NB-JB-J	'Nawati' banana	'Junar' banana	Groundnut (Jowar)	'Nawati' banana	
6.1	2.15	C-J	Cotton	Jowar	Cotton	Cotton (Jowar)	
7.1	2.63	G-J	Jowar	Groundnut	Jowar	Groundnut	
8.1	2.93	G-J	Jowar	Groundnut	Jowar	Cotton (Groundnut)	
9.1	0.98	J-J-J	Jowar	Jowar	Jowar	Jowar	
Total :			Jowar	7.54	8.63	9.54	4.08
			Groundnut	1.00	5.56	0.38	2.63
			Cotton	5.65	-	4.35	5.08
			'Nawati' banana	5.58	3.10	9.00	5.58
			'Junar' banana	3.50	5.58	3.10	9.00
			Wheat	3.10	3.50	-	-

It is evident from the cropping that the cultivator had mostly grown the crops as per the rotation-plan in all the four years. He was required to deviate on a minor area of 4.10 acres in 1960-61; 4.50 acres in 1961-62; 0.38 acre in 1962-63; and 6.08 acres in 1963-64. In the year 1960-61, he deviated from jowar to wheat and groundnut on the two plots of 2.10 acres and 1.00 acre respectively (Plots 2.1 and 3.3) because of the rotation-plan itself. According to the rotation-plan the area due for

jowar in this year was far in excess (10.64 acres) than required. In order to bring down the area under jowar to its usual level, he was required to deviate from it. He preferred to deviate to wheat on the plot of 2.10 acres as it was of deep-black soil and to groundnut on the plot of 1.00 acre as it was of medium-black soil. In this year he had also deviated from cotton to wheat on the plot of 1.00 acre (Plot 1.1). In fact, he had sown cotton on this plot but because of deep sowing done by his attached servant, the crop came up in a very scattered way. He retained the crop for some period, hoping that it will improve. But it remained scattered and he had to remove it ultimately. He could not re-sow cotton as its sowing season had elapsed. In the circumstances of the year, he preferred to put the plot under wheat, thus, deviating from cotton to wheat. In the year 1961-62, he deviated on two plots--from cotton to wheat on the plot of 3.50 acres (Plot 1.1) and from banana to jowar on the plot of 1.00 acre (Plot 3.2). The deviation from cotton to wheat was undertaken in order to meet the consumption needs of his family. The deviation from banana to jowar was necessitated because of the shortage of water in the well. In the year 1962-63, he deviated from jowar to groundnut on a small plot of 0.38 acre, in order to meet the family's consumption needs of groundnut. In 1963-64, he deviated from jowar and groundnut to cotton on the two plots of 2.15 and 2.93 acres respectively (Plots 6.1 and 8.1). Both these deviations were necessitated because of manuring. In this year he had also deviated from cotton to jowar on the plot of 1.00 acre (Plot 1.2). This deviation was caused by the inadequate

rainfall during the sowing season of the year. The cultivator reported that he had, in fact, sown cotton on this plot, but because of insufficient rains, the crop came up in a scattered way and withered away within a fortnight. He had to re-sow the land. He could not repeat cotton as its sowing season had passed out. He, therefore, deviated to jowar as it was the only crop which he could sow so late. The sowing season of all the other crops had elapsed.

CASE STUDY W 32

Name	: T. B. P.	Family size	: 11 members
Age	: 40 years	Earners	: Male Female Total
Education	: Matriculate		4 - 4
Caste	: Leva-Gujar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.80,000
Subsidiary occupation	: Trade (banana)	Land-holding	: 72.58 acres
Livestock	:		
Working	Milch 9	Young 14	Total 34
		Home-collected manure	: 128 cart-loads

This is a big cultivator cultivating a land-holding of 72.58 acres. It is entirely his own. The land-holding consists of eighteen fragments. The details of these fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.98	Available	1.1	1.98	Medium-black	NB-JB-C
2	2.93	Available	2.1	2.93	Medium-black	NB-JB-C
3	6.10	Available	3.1	6.10	Deep-black	NB-JB-C
4	6.00	Available	4.1	6.00	Deep-black	NB-JB-C

5	5.33	Available	5.1	5.33	Deep-black	NB-JB-C
6	6.33	Available	6.1	6.33	Deep-black	NB-JB-C-C
7	3.43	Not available	7.1	3.43	Deep-black	NB-JB-C-J
8	3.10	Not available	8.1	3.10	Deep-black	NB-JB-J
9	3.05	Not available	9.1	3.05	Deep-black	NB-JB-C-J
10	0.88	Not available	10.1	0.88	Medium-black	NB-JB-C-J
11	0.33	Not available	11.1	0.33	Medium-black	NB-JB-C-J
12	2.43	Available	12.1	2.43	Medium-black	NB-JB-C
13	0.63	Available	13.1	0.63	Medium-black	NB-JB-J
14	7.28	Not available	14.1	7.28	Medium-black	W-C-J
15	9.50	Available	15.1	6.50	Medium-black	NB-JB-W-J
			15.2	3.00	Medium-black	Lemons
16	8.75	Available	16.1	8.75	Medium-black	Oranges
17	3.00	Available	17.1	2.50	Medium-black	Oranges
			17.2	0.50	Medium-black	Lucerne
18	1.53	Not available	18.1	1.00	Medium-black	J-J-J
			18.2	0.53	Medium-black	J-J-J

It may be seen that the cultivator has irrigation on a major portion of his land-holding. Of the total land (72.58 acres), the irrigable area is as high as 53.02 acres. He utilizes the irrigation facility mainly to grow banana. He grows banana even on those fragments where he does not have his own irrigation, by leasing-in the neighbouring cultivators' land having irrigation. Besides banana, he grows the perennial crops like oranges and lemons. It is important to note that this cultivator has devoted about one-fourth of his land-holding to these two orchard crops. On one fragment of 1.53 acres, he does not practise any crop-rotation as it is adjacent to the village. Because of its proximity to the village, he cannot grow the crops

like cotton and groundnut on it. He prefers to put it under jowar continuously to meet the fodder requirements of his live-stock. In the case of this cultivator, it is interesting to see how he has formulated the rotation-plan to maintain the required area balance between different crops. On an average, he allocates about one-third of his land-holding to banana, one-fourth each to cotton and the orchard crops and the remaining to jowar. It may be noted that in order to keep the area of banana at the required limits, he practises the four-year rotations of NB-JB-C-C, NB-JB-C-J and NB-JB-W-J on some of his plots. The averaged area allocated to jowar is about 8.75 acres. It is far more than the area required to meet his yearly food needs (50 maunds) of the family. He reports that because of the restraints from finance and manure, he is required to allocate larger area to jowar.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.98	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana
2.1	2.93	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton
3.1	6.10	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton
4.1	6.00	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton
5.1	5.33	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana
6.1	6.33	NB-JB-C-C	Cotton	Cotton	'Nawati' banana	'Junar' banana
7.1	3.43	NB-JB-C-J	Jowar	Jowar ('Nawati' banana)	Cotton ('Nawati' banana)	'Nawati' banana
8.1	3.10	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	'Nawati' banana

9.1	3.05	NB-JB-C-J	Jowar	Jowar ('Nawati' banana)	Cotton ('Nawati' banana)	'Nawati' banana	
10.1	0.88	NB-JB-C-J	Cotton	Jowar	'Nawati' banana	'Junar' banana	
11.1	0.33	NB-JB-C-J	Jowar	Jowar ('Nawati' banana)	'Nawati' banana	'Junar' banana	
12.1	2.43	NB-JB-C	Wheat (Cotton)	Cotton	'Nawati' banana	'Junar' banana	
13.1	0.63	NB-JB-J	Wheat (Jowar)	Jowar	'Nawati' banana	'Junar' banana	
14.1	7.28	W-C-J	Wheat	Cotton	Jowar	Wheat	
15.1	6.50	NB-JB-W-J	'Nawati' banana	'Junar' banana	Wheat	Jowar	
15.2	3.00	Lemons	Lemons	Lemons	Lemons	Lemons	
16.1	8.75	Oranges	Oranges	Oranges	Oranges	Oranges	
17.1	2.50	Oranges	Oranges	Oranges	Oranges	Oranges	
17.2	0.50	Lucerne	Lucerne	Lucerne	Lucerne	Lucerne	
18.1	1.00	J-J-J	Jowar	Jowar	'Nawati' banana	'Junar' banana	
18.2	0.53	J-J-J	Jowar	Jowar	Jowar	Jowar	
Total :			Jowar	8.34	9.85	10.91	7.03
			Cotton	22.24	16.04	13.79	15.03
			'Nawati' banana	16.91	15.03	11.60	16.89
			'Junar' banana	-	16.91	15.03	11.60
			Wheat	10.34	-	6.50	7.28
			Oranges	11.25	11.25	11.25	11.25
			Lemons	3.00	3.00	3.00	3.00
			Lucerne	0.50	0.50	0.50	0.50

It is evident from the cropping in the four years that the cultivator had followed the rotation-plan as strictly as possible. However, he was required to deviate on a minor area of 3.06 acres in 1960-61; on 6.81 acres in 1961-62; on 7.48 acres in 1962-63 and on 1.00 acre in 1963-64. In the first three years he was required to deviate because of the rotation-plan itself. In

these years the usual area balance maintained between different crops was much disturbed by the rotation-plan itself and he had to deviate to correct it. Thus, in 1960-61 the area due for cotton according to the plan was as high as 24.67 acres. More or less the same was the case of jowar. In order to bring down the areas under these two crops to their usual level, he deviated from cotton to wheat on the plot of 2.43 acres (Plot 12.1) and from jowar to wheat, on the plot of 0.63 acre (Plot 13.1). In 1961-62, the area due for banana was far in excess at the cost of jowar. The area due for banana was as high as 21.84 acres. As against this the area due for jowar was as low as 3.04 acres in this year. In order to correct this imbalance between the areas of the two crops, he deviated from banana and took jowar on three plots having a total area of 6.81 acres (Plots 7.1, 9.1 and 11.1). He thus, brought down the area of banana to its normal level of 15.00 acres and pushed up the area of jowar to 9.85 acres in this year. Similar was the case in the next year as well. In this year the area due for 'Nawati' banana was about 17.08 acres. The area due for banana as such, taking 'Nawati' and 'Junar' banana together, was as high as 32.11 acres. As against this the area due for cotton was as low as 7.31 acres. He was required to deviate in this year in order to correct the area imbalance between the two cash-crops. It was not possible for him to grow banana on all the area due for it, because of the restraints from finance and manure. He had to reduce the area under banana. He, therefore, deviated on two plots of 3.43 and 3.05 acres (Plots 7.1 and 9.1) and grew cotton on them instead of

banana. He, thus, brought down the area under 'Nawati' banana to 11.60 acres and pushed up the area of cotton to 13.79 acres. In this year, he had also deviated from jowar to banana on a plot of 1.00 acre (Plot 18.1) as he could lease-out this land for banana cultivation to one of his neighbouring cultivators.

THE CASE STUDIES OF THE SAMPLE CULTIVATORS

FROM

ROZODE

CASE STUDY R 1

Name	: L. B. D.	Family size	: 2 members
Age	: 55 years	Earners	: Male Female Total
Education	: Illiterate		1 1 2
Caste	: Leva-Patidar	Total income	: Rs.850
Main occupation	: Agricultural labour	(1962-63)	
Subsidiary occupation	: Agriculture	Land-holding	: 0.50 acre
Livestock	:	Home-collected manure	: -
Working	Milch Young Total		
-	- - -		

This is a small cultivator having a land-holding of 0.50 acre only. The details of the fragment of land and the crop-rotations practised on it are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	0.50	Available	1.1	0.37	Medium-black	J-J-J or NB-JB-J
			1.2	0.13	Medium-black	J-J-J

The cultivator has irrigation facility on his land from an old well jointly owned by him and his cousin brothers. His share in the ownership of the well is as small as one-sixteenth. He, therefore, does not utilize the irrigation facility himself, to grow any irrigated crops on his land. About one-fourth portion of his land (0.13 acre) suffers erosion from a big stream. Because of constant erosion, the land in this plot is so poor that he cannot grow any other crop than jowar. He grows jowar on it continuously. The remaining portion of the land-holding (0.37 acre) is of good land where different crops can be raised. The cultivator, however, grows mainly jowar on this plot as well,

to meet the food needs of his family. At times, he leases-out this plot for the cultivation of banana, on the basis of cash-rent. He, therefore, prefers to practise a dual rotation on this plot to keep its cropping flexible so that he can lease-out it whenever such a demand arises. The cultivator reports that the annual requirement of jowar for his family is about 9 maunds. It is met from the home production of jowar whenever jowar is grown on the entire land. In other years he is required to purchase jowar to meet the total food needs of the family.

The crops grown in the four years are as follows:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.37	J-J-J or NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Cotton (Jowar)
1.2	0.13	J-J-J	Jowar	Jowar	Jowar	Jowar
Total : Jowar			0.50	0.13	0.13	0.13
Cotton			-	-	-	0.37
'Nawati' banana			-	0.37	-	-
'Junar' banana			-	-	0.37	-

It may be seen that the cultivator had grown the crops strictly as per the rotation-plan in all the years, except in the last year (1963-64). In 1963-64, he deviated from jowar to cotton on the plot of 0.37 acre (Plot 1.1) as he wanted more cash-income to repay the loan which he had borrowed in 1962-63 to meet his household expenses.

CASE STUDY R 2

Name	: R. S. P.	Family size	: 4 members
Age	: 50 years	Earners	: Male Female Total
Education	: Illiterate		2 1 3
Caste	: Leva-Patidar		
Main occupation	: Agricultural labour	Total income	: Rs.800 (1962-63)
Subsidiary occupation	: Agriculture	Land-holding	: 1.88 acres
Livestock	:	Home-collected manure	: 6 cart-loads
Working	Milch 1 Young 1 Total 2		

The cultivator cultivates a small land-holding of 1.88 acres. It is a single fragment of land. The details of the land and the rotation-plan of the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.88	Available	1.1	1.13	Deep-black	C-J or NB-JB-J
			1.2	0.75	Medium-black	C-J

The cultivator reports that he has irrigation facility on his land from the well, jointly owned by him and the other three cultivators. His share in the ownership of the well is one-fourth. However, the cultivator himself does not utilize the irrigation to grow any irrigated crops, as his land-holding is very small. He is very poor to bear the heavy costs of cultivation of the crops like banana etc. In the circumstances, he prefers to lease-out the land for banana cultivation to his neighbouring cultivators. He reports that he can lease-out for banana 1.13 acres only where the land is of better quality and is more suited to the banana crop. The remaining portion of the

land-holding (0.75 acre) is alkaline where banana cannot be profitably grown. He, therefore, grows only the dry crops on it. On the plot of 1.13 acres, he keeps his cropping flexible so that he can lease-out it for banana cultivation whenever such a demand is made. The basic rotation followed on the entire area of his land-holding is of the dry crops alone (C-J) which he can grow himself. The area allocated to jowar varies from 0.74 to 0.94 acre, depending on the rotations practised. This much area is just enough to meet the annual food needs (18 maunds) of his family.

The crops grown on different plots of the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.13	C-J or NB-JB-J	Jowar	Wheat (Cotton)	'Nawati' banana	'Junar' banana	
1.2	0.75	C-J	Jowar	Cotton	Jowar	Jowar (Cotton)	
Total :			Jowar	1.88	-	0.75	0.75
			Cotton	-	0.75	-	-
			'Nawati' banana	-	-	1.13	-
			'Junar' banana	-	-	-	1.13
			Wheat	-	1.13	-	-

The cultivator was required to deviate on one plot each in 1961-62 and 1963-64. In the year 1961-62 he deviated from cotton to wheat on the plot of 1.13 acres (Plot 1.1) in order to meet the extra food needs of his son's marriage. In the year 1963-64, he deviated from cotton to jowar on the plot of 0.75 acre (Plot 1.2). This deviation was necessitated because of the inadequate

rainfall during the sowing season of the year. The cultivator reported that he had, in fact, sown cotton on this plot as per the rotation; but it did not come up as there were no rains after sowing. He re-sowed the land and repeated cotton on it. This time the crop came up in a scattered way and withered away within a fortnight after sowing. He was required to sow the land for the third time. He could not re-sow cotton once again as its sowing season had elapsed. He, therefore, deviated to jowar which can be sown as late as the end of July, He was, thus, required to deviate to jowar, even after making two attempts to grow the rotation crop (cotton).

CASE STUDY R 3

Name	: P. D. N.	Family size	: 6 members
Age	: 48 years	Earners	: Male Female Total
Education	: Illiterate		1 2 3
Caste	: Leva-Patidar		
Main occupation	: Agricultural labour	Total income	: Rs.650 (1962-63)
Subsidiary occupation	: Agriculture	Land-holding	: 1.48 acres
Livestock	:	Home-collected manure	: -
Working	-		
Milch	-		
Young	-		
Total	-		

This is also a small cultivator having a land-holding of 1.48 acres only. It is a single fragment. The details of the fragment and the crop-rotation practised on it are presented

below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.48	Available	1.1	1.48	Medium-black	C-J or NB-JB-J

Irrigation facility is available on the fragment, from an old well, jointly owned by the cultivator and his six cousin brothers. The cultivator's share in the ownership of the well is one-fourth. However, he does not utilize the irrigation facility to grow any irrigated crops as his land-holding is small. Besides, he does not have any equipments of irrigation. He is financially very poor and so the cultivation of the costly crop like banana is never undertaken by him. He usually leases-out his land for banana cultivation to the neighbouring cultivators. However, he does not give a definite place for banana in his rotation-plan as he has not developed such relations with any of the neighbouring cultivators. He practises a dual rotation on the entire fragment and keeps his cropping flexible so that he can lease-out the land for banana whenever the neighbouring cultivator asks for it. Basically he practises the rotation of dry crops (C-J) which he can grow himself. The annual food requirement of the family is about 27 maunds. It is not met entirely from the home-production of jowar. The area allocated to jowar is small varying from 0.49 to 0.74 acre. It is not adequate to meet the yearly food needs of the family. The cultivator, therefore, is not wholly dependent on his land for the food requirements of his family. He is required to purchase 15 to 20 maunds of jowar every year.

The crops grown in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.48	C-J or NB-JB-J	Jowar	Cotton	Jowar	'Nawati' banana
Total : Jowar			1.48	-	1.48	-

Cotton	-	1.48	-	-
'Nawati' banana	-	-	-	1.48

It may be noted that the cultivator had grown the crops strictly as per the rotation-plan in all the four years.

CASE STUDY R 4

Name	: H. D. D.	Family size	: 5 members
Age	: 34 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.1,150 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 5.23 acres
Livestock :		Home-collected	
Working	Milch	Young	Total
1	1	4	6
		manure	: 16 cart-loads

The total land-holding cultivated by this cultivator is of 5.23 acres. It comprises of two fragments. Both the fragments are situated in the neighbouring villages (Chinawal and Savkhed). The cultivator does not cultivate any land in the village. The details of the two fragments and the crop-rotations practised on them are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	3.63	Available	1.1	2.63	Medium-black	G-J or NB-JB-C
			1.2	1.00	Medium-black	G-J or NB-JB-J
2	1.60	Not available	2.1	1.60	Medium-black	G-J

The cultivator has irrigation on the larger fragment situated in the Chinawal village. The well in this fragment, however, is under plural ownership. The cultivator's share in its ownership is one-third. The cultivator reports that he does not put to use the available irrigation facility as he does not have any equipments of lifting water. Besides, the fragment is far off from the native village (3 miles) and so not convenient to grow the crop like banana. He, however, leases-out it for banana cultivation to the cultivators from Chinawal village. He prefers to practise the dual rotations on this fragment so that he can keep the cropping flexible and lease-out the land whenever such a demand arises. On the second fragment of 1.60 acres, he is required to practise the G-J rotation as its land, though medium-black, is of inferior type where only these two crops can be profitably grown. The areas under different crops, averaged over the period of rotation-cycle, vary from 0.67 acre to 1.75 acres under banana; from 0.88 acre to 1.31 acres each under cotton and groundnut; and from 1.30 to 2.45 acres under jowar. The area allocated to jowar is adequate to meet the yearly food needs (23 maunds) of his family.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.63	C-J or NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton
1.2	1.00	G-J or NB-JB-J	Jowar	Groundnut	'Nawati' banana	'Junar' banana
2.1	1.60	G-J	Groundnut	Jowar	Groundnut	Jowar
Total : Jowar			1.00	1.60	-	1.60

Groundnut	1.60	1.00	1.60	-
Cotton	2.63	-	-	2.63
'Nawati' banana	-	2.63	1.00	-
'Junar' banana	-	-	2.63	1.00

It is evident from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the four years. He was not required to deviate on any plot in any year.

CASE STUDY R 5

Name	: P. D. B.	Family size	: 6 members
Age	: 29 years	Earners	: Male Female Total
Education	: Matriculate		1 2 3
Caste	: Léva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,050
Subsidiary occupation	: Service	Land-holding	: 4.93 acres
Livestock	:	Home-collected manure	: -
Working Milch	-		
Young	-		
Total	-		

The land-holding cultivated by this cultivator is of 4.93 acres. It consists of two fragments. Of these, one fragment of 3.33 acres is situated in the village and the other of 1.60 acres, in the neighbouring village (Savkhed). The details of the two fragments of land and the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	3.33	Available	1.1	2.73	Medium-black	NB-JB-C
			1.2	0.60	Medium-black	NB-JB-J
2	1.60	Not available	2.1	1.60	Medium-black	G-J

The cultivator has irrigation facility on his fragment in the village, from an old well, jointly owned by him and the other neighbouring cultivators. His share in the ownership of the well is one-half. The cultivator, however, does not utilize the irrigation to grow the irrigated crops as his land-holding is very small, and he does not have any equipments of irrigation. He, therefore, prefers to lease-out the land specifically for banana cultivation to one of his cultivator friends having all the equipments of irrigation. He has adjusted his cropping with that of his friend and so gives a definite place for banana crop in his rotation-plan. The rotation-plan formulated by the cultivator shows a marked bias towards the cultivation of banana. It may be seen that more than half of the total irrigable land is allocated to banana alone. The average areas under different crops, over a rotation-cycle, come to 2.22 acres under banana; 0.91 acre under cotton; 0.80 acre under groundnut; and 1.00 acre under jowar. The area allocated to jowar is small as he invariably grows jowar as a mixed crop along with cotton and groundnut. The yearly food needs of the family (27 maunds) are generally met from the home-production of jowar.

The crops grown on different plots of the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.73	NB-JB-C	'Junar' banana	Cotton	'Nawati' banana	'Junar' banana
1.2	0.60	NB-JB-J	'Junar' banana	Jowar	'Nawati' banana	'Junar' banana
2.1	1.60	G-J	Jowar	Groundnut	Jowar	Groundnut
Total : Jowar			1.60	0.60	1.60	-

Groundnut	-	1.60	-	1.60
Cotton	-	2.73	-	-
'Nawati' banana	-	-	3.33	-
'Junar' banana	3.33	-	-	3.33

It may be noted from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the four years. He was not required to deviate in any year.

CASE STUDY R 6

Name	: N. H. P.	Family size	: 4 members
Age	: 54 years	Earners	: Male Female Total
Education	: 4th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,150
Subsidiary occupation	: Agricultural labour	Land-holding	: 6.93 acres
Livestock	:	Home-collected manure	: -
Working Milch	Young Total		
-	- -		

The cultivator cultivates a land-holding of 6.93 acres. It comprises of three fragments of land. Of the three fragments, two, having a total area of 3.28 acres, are in the village and the remaining one, having an area of 3.65 acres, is in the neighbouring village (Savkhed). The details of the three fragments and the crop-rotations practised on their different plots are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.40	Available	1.1	1.00	Medium-black	C-J or NB-JB-C

2	1.88	Available	1.2	0.40	Medium-black	C-J
			2.1	0.50	Medium-black	NB-JB-C
			2.2	0.43	Medium-black	C-J
3	3.65	Not available	2.3	0.95	Medium-black	C-J
			3.1	1.83	Medium-black	G-J
			3.2	1.82	Medium-black	G-J

It may be noted that the entire land-holding of this cultivator is of medium-black soil. Irrigation is available on both the fragments cultivated in the village. The irrigable area, however, is small (1.13 acres) as the supply of water in the wells is limited. Because of the limited water supply, the cultivator himself does not raise the irrigated crop like banana. He generally leases-out these two fragments for banana cultivation to his neighbouring cultivators. On one of his plots of 1.00 acre (Plot 1.1) he is required to practise the dual rotation as he has not adjusted his cropping with that of the tenant cultivator to whom he usually leases-out the land for banana cultivation. He follows the G-J rotation on the entire area of his fragment in Savkhed village, even though the land is of medium-black soil. The cultivator reports that he does not grow cotton on this particular land as the tribal people (Bhils and Tadavi-Muslims) from Savkhed and the nearby villages steal the cotton produce to a large extent. As the fragment is situated far from the native village, it goes very difficult to protect the crop. The rotation-plan formulated by the cultivator has greater emphasis on the dry crops like cotton, groundnut and jowar. This is mainly because of the limited water supply in his two wells. The areas under different crops, averaged over the period of rotation-cycle, vary from 0.34 to 1.00 acre under

banana; from 1.39 to 1.55 acres under cotton; and from 2.71 to 3.21 acres under jowar. The averaged area under groundnut is about 1.83 acres. The area allocated to jowar is larger than required to meet the yearly food needs (18 maunds) of his family. This is mainly because of the G-J rotation, which he is required to practise on the entire area of his fragment in the Savkhed village.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.00	C-J or NB-JB-C	Jowar	Cotton	'Nawati' banana	'Junar' banana	
1.2	0.40	C-J	Cotton	Cotton (Jowar)	Jowar	Jowar (Cotton)	
2.1	0.50	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton	
2.2	0.43	C-J	Cotton	Jowar	Jowar (Cotton)	Cotton	
2.3	0.95	C-J	Cotton	Jowar	Jowar (Cotton)	Cotton	
3.1	1.82	G-J	Jowar	Groundnut	Jowar	Groundnut	
3.2	1.83	G-J	Groundnut	Jowar	Groundnut	Jowar	
Total :			Jowar	2.82	3.21	3.60	2.23
			Groundnut	1.83	1.82	1.83	1.82
			Cotton	2.28	1.40	-	1.88
			'Nawati' banana	-	0.50	1.00	-
			'Junar' banana	-	-	0.50	1.00

It may be seen from the cropping that the cultivator had grown the crops as per the rotation-plan on most of his land in all the four years. He was required to deviate on a minor area

of 0.40 acre in 1961-62; on 1.38 acres in 1962-63; and 0.40 acre in 1963-64. In the year 1961-62 he deviated from jowar to cotton on the small plot of 0.40 acre (Plot 1.2) because of manuring. As he could manure the plot in this year, he deviated from jowar and took cotton on it. The opposite was the case in the next year (1962-63). In this year, two plots having a total area of 1.38 acres (Plots 2.2 and 2.3) were due for cotton, but he could not manure these as he had no capital to purchase the required quantity of manure. He does not have any supply of home-collected manure as he does not own any cattle. In the circumstances he preferred to deviate to jowar on both the plots. He was, thus, required to deviate from cotton to jowar on these two plots. In 1963-64 also, he deviated from cotton to jowar on the small plot of 0.40 acre. But this time the deviation was caused by the inadequate rainfall during the sowing season of the year. He had, in fact, sown cotton on the entire area of the fragment of 1.88 acres but it did not come up properly on the plot of 0.40 acre. He was required to re-sow the land in this plot. He could not re-sow cotton as its sowing season had elapsed. He, therefore, preferred to deviate to jowar which could be sown late.

CASE STUDY R 7

Name	: M. K. N.	Family size	: 7 members
Age	: 27 years	Earners	: Male Female Total
Education	: 4th standard		1 2 3
Caste	: Leva-Patidar		
Main occupation	: Agricultural labour	Total income	: Rs.900 (1962-63)
Subsidiary occupation	: Agriculture	Land-holding	: 3.15 acres
Livestock	:		
Working	Milch 1 Young 1 Total 2	Home-collected manure	: 6 cart-loads

This is a small cultivator having a land-holding of 3.15 acres only. The land-holding consists of two fragments. Of these, one fragment of 0.75 acre, is in the village itself and the other, of 2.40 acres, in the neighbouring village (Savkhed). The details of the two fragments along with the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	0.75	Available	1.1	0.75	Deep-black	W-J or NB-JB-C
2	2.40	Not available	2.1	1.20	Light	G-J
			2.2	1.20	Light	G-J

The small fragment of land cultivated in the village has irrigation facility from an old well, jointly owned by the cultivator and his cousin brothers. The cultivator's share in its ownership is only one-eighth. This small fragment of 0.75 acre is the only irrigable area in his total land-holding. Because of such a small irrigable area and the minor share in the ownership of the well, he does not grow any irrigated crops. He

usually leases-out this fragment for banana cultivation to his neighbouring cultivators who have all the equipments of irrigation. But he has not developed a definite relationship with any of these cultivators and hence does not give a definite place for banana in his rotation-plan. He has to keep his cropping programme flexible by practising a dual rotation, so that he can lease-out the land for banana cultivation, whenever such a demand is made by the neighbouring cultivators. On his second fragment of land, cultivated in Savkhed village, he is required to practise the G-J rotation as its entire area is of light soil. The area allocated to jowar in the rotation-plan varies from 1.20 to 1.57 acres. It is not adequate to meet the yearly food requirements of his family. His annual requirement of jowar for the family consumption is about 30 maunds. He, therefore, does not entirely depend on his land for the family food needs.

The crops grown on different plots of the land are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	0.75	W-J or NB-JB-C	Jowar	'Nawati' banana	'Junar' banana	Cotton	
2.1	1.20	G-J	Jowar	Groundnut	Jowar	Groundnut	
2.2	1.20	G-J	Groundnut	Jowar	Groundnut	Jowar	
Total :			Jowar	1.95	1.20	1.20	1.20
			Groundnut	1.20	1.20	1.20	1.20
			Cotton	-	-	-	0.75
			'Nawati' banana	-	0.75	-	-
			'Junar' banana	-	-	0.75	-

It is evident from the cropping that the cultivator had

grown the crops strictly as per the rotation-plan on his entire land-holding, in all the four years.

CASE STUDY R 8

Name	: B. K. D.	Family size	: 5 members
Age	: 35 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Leva-Patidar	Total income	: Rs.650
Main occupation:	Agricultural labour	(1962-63)	
Subsidiary occupation:	Agriculture	Land-holding	: 2.51 acres
Livestock :		Home-collected manure	: 8 cart-loads
Working	Milch 1 Young 2 Total 3		

The cultivator cultivates a small land-holding of 2.51 acres only. It consists of two fragments. Of these, one small fragment of 0.63 acre is cultivated in the village, and the remaining fragment of 1.88 acres, in the nearby village (Chichati). The details of the fragments and the crop-rotations practised on them are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	0.63	Available	1.1	0.63	Medium-black	C-J or NB-JB-J
2	1.88	Not available	2.1	1.88	Light	G-J

The cultivator has irrigation facility on his small fragment of 0.63 acre cultivated in the village. The well in the fragment is jointly owned, his share in the ownership being as small as one-sixteenth. The cultivator does not utilize the available irrigation to raise any irrigated crops as his land-

holding is very small. At times, he and his neighbouring cultivators jointly lease-out their lands for banana cultivation. He alone cannot lease-out his fragment for banana as it is very small in area. He, therefore, cannot give a definite place for banana in his rotation-plan. He keeps his cropping programme on this fragment flexible by practising a dual rotation, so that he can lease-out it along with his neighbouring cultivators whenever such a demand arises. The cultivator is constrained to practise the G-J rotation on his fragment cultivated in the Chichati village as it is entirely of lighter soil. The cultivator reports that the annual requirement of jowar for his family consumption is about 23 maunds. The area allocated to jowar in his rotation-plan varies from 0.94 acre to 1.25 acres. This much area is not sufficient to meet his total requirement of jowar for the family consumption. He reports that he is required to purchase about 10 to 15 maunds of jowar every year.

The crops grown on the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	0.63	C-J or NB-JB-J	Jowar	Jowar (Cotton)	Groundnut (Jowar)	'Nawati' banana	
2.1	1.88	G-J	Jowar	Jowar (Groundnut)	Groundnut	Jowar	
Total :			Jowar	2.51	2.51	-	1.88
			Groundnut	-	-	2.51	-
			'Nawati' banana	-	-	-	0.63

The cultivator had grown the crops mostly as per the rotation-plan in all the four years. He was required to deviate from

the rotation-plan only in 1961-62 and 1962-63. In the year 1961-62, he deviated from cotton to jowar, on the plot of 0.63 acre (Plot 1.1) as he could not manure the land in this year. In this year he deviated on the other plot of 1.88 acres (Plot 2.1) also. On this plot he deviated from groundnut to jowar, as he had no sufficient quantity of groundnut seeds. He reported that as he had not grown groundnut anywhere on his land in the preceding year he did not preserve groundnut seeds. He could not either purchase groundnut seeds as its price was considerably high (Rs.1.25 to 1.50 per seer). In the circumstances he was required to deviate from groundnut. He preferred to deviate to jowar as its seeds were comparatively very cheap. In the year 1962-63, he deviated from jowar to groundnut on the plot of 0.63 acre (Plot 1.1) 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. In this year as well, he did not have groundnut seeds, but one of his cultivator friends helped him by giving a loan of groundnut seeds required for his land.

CASE STUDY R 9

Name	: N. T. D.	Family size	: 7 members
Age	: 26 years	Earners	: Male Female Total
Education	: 6th standard		2 2 4
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.950
Subsidiary occupation	: Agricultural labour	Land-holding	: 2.85 acres
Livestock	:		
Working	Milch 2 Young - Total 2	Home-collected manure	: 12 cart-loads

This is a small cultivator having a land-holding of 2.85 acres only. It consists of two fragments. Of the two fragments, one having an area of 0.45 acre is in the village, and the other, having an area of 2.40 acres, in the neighbouring village (Savkhed). The details of the two fragments of land and the crop-rotations practised on them are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	0.45	Available	1.1	0.45	Medium-black	C-J or NB-JB-J
2	2.40	Not available	2.1	2.40	Light	G-J

The cultivator has irrigation on the small fragment of land in the village, from an old well jointly owned by him and the other neighbouring cultivators. His share in the ownership of the well is one-eighth. However, he does not utilize this facility to grow the irrigated crops as his land under irrigation is very small--0.45 acre. Generally he leases-out this fragment of land for banana cultivation to his neighbouring cultivators. He, therefore, keeps its cropping programme flexible by practising a dual rotation, so that he can lease-out it, whenever such a demand arises. The other fragment of 2.40 acres is entirely of lighter soil where the rotation of G-J only can be profitably practised. The rotation-plan formulated by this cultivator is largely influenced by the type of land available in his land-holding. As a major portion of his total land is of lighter soil, he is required to allocate larger areas to groundnut and jowar. The averaged area under jowar varies from 1.35 to 1.43 acres. The averaged area under groundnut is about 1.20 acres.

The area allocated to jowar is not adequate to meet the yearly food needs (30 maunds) of his family. He is required to purchase jowar almost every year.

The crops grown on the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	0.45	C-J or NB-JB-J	Jowar	Wheat (Cotton)	Jowar	'Nawati' banana	
2.1	2.40	G-J	Groundnut	Jowar	Groundnut	Jowar	
Total :			Jowar	0.45	2.40	0.45	2.40
			Groundnut	2.40	-	2.40	-
			'Nawati' banana	-	-	-	0.45
			Wheat	-	0.45	-	-

It may be seen from the cropping that the cultivator had mostly grown the crops as per the rotation-plan in all the four years. He was required to deviate on only one plot in 1961-62. In this year he deviated from cotton to wheat on the small plot of 0.45 acre (Plot 1.1) as he wanted wheat for his sister's marriage.

CASE STUDY R 10

Name	: O. P. B.	Family size	: 4 members
Age	: 29 years	Earners	: Male Female Total
Education	: 10th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,450
Subsidiary occupation	: Service	Land-holding	: 5.68 acres
Livestock	:	Home-collected manure	: 3 cart-loads
Working	-		
Milch	-		
Young	1		
Total	1		

The land-holding cultivated by this cultivator is of 5.68 acres. It comprises of two fragments, of which, one having an area of 2.53 acres is in the village, and the other, having an area of 3.15 acres, in the nearby village (Chinawal). The details of the two fragments along with the crop-rotations practised on them are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	2.53	Available	1.1	1.40	Deep-black	C-J or NB-JB-C
			1.2	1.13	Deep-black	C-J or NB-JB-C
2	3.15	Not available	2.1	3.15	Deep-black	C-J

It may be noted that the entire land-holding of the cultivator is of deep-black soil. He has irrigation facility on one fragment cultivated in the village. But he does not utilize it to grow the irrigated crops as he has no equipments of irrigation. He reported that as his land-holding is very small, he cannot have even a bullock-drawn water lift. In such circumstances, he prefers to lease-out the land specifically for banana cultivation to his neighbouring cultivators. He, therefore, practises the dual rotations on both the plots of this fragment and keeps his cropping flexible, so that he can lease-out the land for banana whenever such a demand is made by any of the neighbouring cultivators. The second fragment of his land, being of deep-black soil, is put under the two-year rotation of C-J. The cultivator basically follows the rotation of C-J on his entire land-holding as it is of deep-black soil. The area allocated to jowar in the rotation-plan varies from 1.57 to 2.84 acres. It

is larger than required to meet the yearly food needs (18 maunds) of his family. This is mainly because of the deep-black soil available on his entire land-holding.

The crops grown on different plots of the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.40	C-J or NB-JB-C	Cotton	Cotton (Jowar)	'Nawati' banana	'Junar' banana
1.2	1.13	C-J or NB-JB-C	Cotton	Wheat (Jowar)	'Nawati' banana	'Junar' banana
2.1	3.15	C-J	Cotton	Jowar	Cotton	Jowar
Total : Jowar			-	3.15	-	3.15
Cotton			5.68	1.40	3.15	-
'Nawati' banana			-	-	2.53	-
'Junar' banana			-	-	-	2.53
Wheat			-	1.13	-	-

The cultivator had grown the crops strictly as per the rotation-plan in all the years, except in 1961-62. In this year he was required to deviate on two of his plots. The deviations on both the plots were necessitated because of his rotation-plan itself. It may be seen that according to the rotation-plan, the entire land-holding had become due, only for jowar in this year. This much area under jowar was not required at all. He, therefore, deviated from jowar on two plots and took cotton on one of them (Plot 1.1) and wheat, on the other (Plot 1.2). In 1960-61 also, his entire land-holding was due for cotton alone and there was no area due for jowar. In this year, however, he did not deviate for jowar as he could grow it as a mixed crop along with cotton and meet the yearly food needs of his family.

CASE STUDY R. 11

Name	: P. H. S.	Family size	: 6 members
Age	: 40 years	Earners	: Male Female Total
Education	: 7th standard		1 1 2
Caste	: Wani		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,300
Subsidiary occupation	: Agricultural labour	Land-holding	: 4.78 acres
Livestock	:		
Working	Milch	Young	Total
2	1	1	4
		Home-collected manure	: 14 cart-loads

The cultivator cultivates a land-holding of two fragments having a total area of 4.78 acres. Of the fragments, one having an area of 1.58 acres is in the village and the other, having an area of 3.20 acres, in the Savkhed village, which is about three miles from Rozode. The details of the two fragments of land along with the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.58	Available	1.1	1.00	Deep-black	NB-JB-J-C
			1.2	0.58	Deep-black	NB-JB-J-C
2	3.20	Not available	2.1	1.60	Medium-black	G-J
			2.2	1.60	Light	G-J

The cultivator has irrigation from a jointly owned well on the small fragment cultivated in the village. The irrigable area, however, is very small (0.58 acre) as the water supply in the well is very limited. The cultivator does not utilize the facility of irrigation to grow the irrigated crops as he is poor and cannot bear the high cost of cultivation of the crop like

banana. He generally leases-out the land for banana cultivation to one of his neighbouring cultivators. He has adjusted the cropping on this particular fragment with that of the neighbouring cultivator and gives a definite place for banana in his rotation-plan. It may be seen that the rotation-plan formulated by the cultivator is highly dominated by the cultivation of jowar and groundnut. This is mainly because of the G-J rotation which he is required to practise on the entire fragment of 3.20 acres in the Savkhed village. He reports that he does not grow cotton on this fragment as it goes very difficult to protect its produce from the Tribal people residing in the nearby villages. The averaged area, over a rotation-cycle, is about 1.99 acres under jowar; 1.60 acres under groundnut; 0.80 acre under banana; and 0.39 acre under cotton. The area allocated to jowar is enough to meet the yearly food needs (27 maunds) of his family.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.00	NB-JB-J-C	Jowar	Jowar (Cotton)	'Nawati' banana	'Junar' banana	
1.2	0.58	NB-JB-J-C	Jowar	Cotton	'Nawati' banana	'Junar' banana	
2.1	1.60	G-J	Groundnut	Jowar	Groundnut	Jowar	
2.2	1.60	G-J	Jowar	Groundnut	Jowar	Groundnut	
Total :			Jowar	3.18	2.60	1.60	1.60
			Groundnut	1.60	1.60	1.60	1.60
			Cotton	-	0.58	-	-
			'Nawati' banana	-	-	1.58	-
			'Junar' banana	-	-	-	1.58

It may be noted from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the years, except in 1961-62. In this year he deviated from cotton to jowar on the plot of 1.00 acre (Plot 1.1) as he could not manure the land. The cultivator reported that in this year he sold all the home-collected manure as he wanted money to meet the urgent household expenses. In this year he did not manure the other plot of 0.58 acre as well; but as its land is of superior quality he could grow cotton on it without applying any dose of manure. That was not the case of the 1.00 acre plot. The land in this plot, though reported as deep-black, was inferior and, therefore, he could not grow cotton on it without applying any manure. He was, thus, required to deviate from cotton to jowar on this plot.

CASE STUDY R 12

Name	: D. B. N.	Family size	: 8 members
Age	: 50 years	Earners	: Male Female Total
Education	: 7th standard		2 2 4
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.1,250
Subsidiary occupation	: Agricultural labour	Land-holding	: 4.27 acres
Livestock	:	Home-collected manure	: 18 cart-loads
Working	2		
Milch	2		
Young	1		
Total	5		

The cultivator has a small land-holding of 4.27 acres. It consists of two fragments of land. Of the two fragments, one,

having an area of 0.78 acre, is in the village and the other, having an area of 3.49 acres, is in the neighbouring village (Savkhed). The details of these two fragments and the rotation-plan practised by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	0.78	Available	1.1	0.50	Deep-black	C-J or NB-JB-J
			1.2	0.15	Deep-black	Ch-Ch-Ch or NB-JB-J
			1.3	0.13	Deep-black	Ch-Ch-Ch or NB-JB-J
2	3.49	Not available	2.1	1.73	Medium-black	G-J
			2.2	1.00	Medium-black	G-J
			2.3	0.48	Light	G-J
			2.4	0.28	Light	G-J

The cultivator has irrigation, on the small fragment cultivated in the village, from a jointly owned well. His share in the ownership of the well is one-eighth. The cultivator utilizes the irrigation to grow crops like chillies and brinjal etc. which require light irrigation. He does not grow the heavily irrigated crop like banana, firstly because his share in the ownership of the well is very small; and secondly, the area under irrigation is also very limited. However, he leases-out the land for the cultivation of banana to his cousin brother, who has a large share in the ownership of the well. He keeps the cropping programme on this fragment flexible, by practising the dual rotations, so that he can lease-out the land for banana whenever such a demand is made by his brother. The rotation-plan of this cultivator is similar to those of most of the cultivators discussed so far. It comprises of two distinct parts--one of the

irrigated crops, practised on the fragment in the village and the other of dry crops, practised on the fragment in the neighbouring village. It may be noted that the cultivator concentrates more on the cash-crops on the fragment in the village, by making provision for his food needs on the land cultivated outside the village. This is mainly because of the availability of irrigation, only on the fragment cultivated in the village. In the case of this cultivator, the rotation-plan has a marked emphasis on the cultivation of groundnut and jowar. This is largely because of the land in the neighbouring village. The area allocated to jowar is about 2.05 acres. It is just enough to meet the yearly requirement of jowar (36 maunds) for his family consumption.

The crops grown on different plots of the land in the four years are as follows:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.50	C-J or NB-JB-J	Chillies (Jowar)	'Nawati' banana	'Junar' banana	Jowar
1.2	0.15	Ch-Ch-Ch or NB-JB-J	Brinjal (Jowar)	'Nawati' banana	'Junar' banana	Jowar
1.3	0.13	Ch-Ch-Ch or NB-JB-J	Jowar	Jowar ('Nawati' banana)	'Nawati' banana	'Junar' banana
2.1	1.73	G-J	Groundnut	Jowar	Jowar (Groundnut)	Groundnut
2.2	1.00	G-J	Jowar	Groundnut	Groundnut (Jowar)	Jowar
2.3	0.48	G-J	Jowar	Groundnut	Bajara (Jowar)	Jowar
2.4	0.28	G-J	Jowar	Groundnut	Jowar	Groundnut
Total : Jowar			1.89	1.86	2.01	2.13

Groundnut	1.73	1.76	1.00	2.01
'Nawati' banana	-	0.65	0.13	-
'Junar' banana	-	-	0.65	0.13
Chillies	0.50	-	-	-
Brinjal	0.15	-	-	-

It may be noted from the cropping that the cultivator had grown the crops strictly as per the rotation-plan on most of his land in all the four years. He was required to deviate on a minor area of 0.65 acre in 1960-61, and on 0.13 acre in 1961-62. In 1962-63, he deviated on a major portion (3.21 acres) of his land-holding. In the year 1960-61, he deviated from jowar to chillies and brinjal on two plots of 0.50 and 0.15 acre respectively (Plots 1.1 and 1.2) in order to meet the family's consumption needs of chillies and vegetables. In 1961-62 he deviated from banana to jowar on the small plot of 0.13 acre (Plot 1.3) as irrigation could not be extended to this portion of the land without a pipe line. In this year, his cousin brother to whom he had leased-out the land for banana, could not arrange for a pipe line and, therefore, could not grow banana on this plot. The cultivator, therefore, deviated from banana and grew jowar on it. In 1962-63, he deviated on three plots--from jowar to groundnut on the plot of 1.00 acre (Plot 2.2); from groundnut to jowar on the plot of 1.73 acres (Plot 2.1); and from jowar to bajara on the plot of 0.48 acre (Plot 2.3). The deviation from jowar to groundnut on the one acre plot was necessitated because of the crop failure in the preceding year. The cultivator reported that he had manured this plot in the preceding year and put it under groundnut. But the crop failed completely because of the fungous

disease and the manure applied to the land was not fully utilized. In order to utilize the residuals of the manure applied, he repeated groundnut in the next year, thus deviating from jowar which was due on it. As an interaction of this deviation he was required to deviate from groundnut to jowar on the plot of 1.73 acres. As he could not grow jowar on the two plots of 1.00 and 0.48 acre (Plots 2.3 and 2.4), he had to deviate for jowar on the plot of 1.73 acres, to make provision for the food needs of his family. The deviation from jowar to bajara on the plot of 0.48 acre (Plot 2.3) was undertaken to get different type of fodder for his livestock. Besides, he wanted to experiment whether bajara could be profitably grown on the lighter type of soil available in the plot. He ultimately found that bajara is not as profitable as jowar on the lighter type of soil.

CASE STUDY R 13

Name	: B. S. D.	Family size	: 10 members
Age	: 50 years	Earners	: Male Female Total
Education	: 7th standard		2 3 5
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.2,450 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 6.56 acres
Livestock	:	Home-collected manure	: 22 cart-loads
Working	2	Milch	2
		Young	1
		Total	5

The land-holding cultivated by this cultivator is of 6.56 acres. It consists of three fragments, of which, two, having a total area of 2.81 acres are cultivated in the village and the

remaining one, having an area of 3.75 acres, in the neighbouring village (Khirode). The details of these three fragments are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.03	Available	1.1	1.03	Medium-black	NB-JB-J
2	1.78	Available	2.1	1.78	Medium-black	NB-JB-J
3	3.75	Not available	3.1	3.75	Medium-black	G-J

The entire land-holding of the cultivator is of medium-black soil. He has irrigation facility on both the fragments cultivated in the village--the irrigable area being 2.81 acres. However, the cultivator does not avail himself of this facility as he does not have any equipments of irrigation. The cultivator reports that he cannot install an oil engine operated pumping set on his well as his land-holding is small and his share in the ownership of the well is also very limited. In such circumstances, he prefers to lease-out the land specifically for banana cultivation to the neighbouring cultivator. He has adjusted his cropping with that of the tenant cultivator and therefore gives a definite place for banana in the rotation-plan. The cultivator has a large family of 10 members, the yearly requirement of jowar for the family consumption being as large as 45 maunds. In order to meet such a large requirement of jowar, he is required to practise the rotations with jowar on the entire area of his land-holding. It may be seen that, on an average, the area allocated to jowar is the highest (2.80 acres) of all the crops grown by him. The average area under banana and groundnut is about 1.88 acres each. The area allocated to jowar is slightly lower than

required to meet the total food needs of his family. The cultivator, however, meets the shortfall in jowar by growing it as a mixed crop along with cotton.

The crops grown on different plots of the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.03	NB-JB-J	'Junar' banana	Jowar	'Nawati' banana	'Junar' banana
2.1	1.78	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Jowar
3.1	3.75	G-J	Jowar	Groundnut	Jowar	Groundnut
Total : Jowar			5.53	1.03	3.75	1.78
Groundnut			-	3.75	-	3.75
'Nawati' banana			-	1.78	1.03	-
'Junar' banana			1.03	-	1.78	1.03

It is evident from the cropping in the four years that the cultivator had grown the crops strictly as per the rotation-plan on his entire land-holding. He was not required to deviate on any plot in any year.

CASE STUDY R 14

Name	: D. S. B.	Family size	: 6 members
Age	: 42 years	Earners	: Male Female Total
Education	: 5th standard		1 2 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.1,250 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 3.83 acres
Livestock	:	Home-collected manure	: -
Working Milch	Young Total		
-	- -		

This is a small cultivator, having a land-holding of 3.83 acres. It is a single fragment situated in the village. The details of the fragment along with the crop-rotations practised on its different plots are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	3.83	Available	1.1	1.45	Medium-black	C-J or NB-JB-J
			1.2	1.00	Medium-black	C-J or NB-JB-J
			1.3	0.50	Medium-black	C-J or NB-JB-J
			1.4	0.48	Medium-black	C-J or NB-JB-J
			1.5	0.40	Medium-black	C-J or NB-JB-J

It may be noted that the entire land of this cultivator is of medium-black soil. He has irrigation from an old well, jointly owned by him and his cousin brothers. His share in the ownership of the well is one-eighth. Because of his small share in the ownership of the well and because of the limited water supply in the well, the irrigable area of this cultivator is as small as 0.50 acre. He does not utilize the irrigation facility for growing any irrigated crops as his land-holding is very small. He does not have any equipments of irrigation. He reports that because of the small land-holding, he cannot have even a bullock-drawn water lift. He, however, leases-out the land for banana cultivation to one of his brothers who has equipments of irrigation. He keeps the cropping programme on the land flexible by practising a dual rotation, so that he can lease-out it for banana cultivation, whenever such a demand is made by his brother. Basically, he practises the rotation of dry crops alone (C-J)

which he can grow himself. He practises this single rotation on the entire area of his land-holding. In fact, the land being of medium-black soil is suited most to the three-year rotation of G-C-J. But he prefers the C-J rotation, in order to allocate larger area to jowar, to meet the yearly food needs of his family. He reports that his annual requirement of jowar for the family consumption is about 27 maunds. The averaged area under jowar varies from 1.27 to 1.91 acres. The averaged area under banana is 2.56 acres; and under cotton 1.92 acres. The area allocated to jowar is just enough to meet the annual food needs of his family.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.45	C-J or NB-JB-J	'Junar' banana	Jowar	Cotton	Jowar
1.2	1.00	C-J or NB-JB-J	Jowar	Wheat (Cotton)	Jowar	Wheat (Cotton)
1.3	0.50	C-J or NB-JB-J	'Junar' banana	Cotton (Jowar)	Wheat (Jowar)	Cotton
1.4	0.48	C-J or NB-JB-J	Jowar	Cotton	Wheat (Jowar)	Groundnut (Cotton)
1.5	0.40	C-J or NB-JB-J	Groundnut (Jowar)	Cotton	Wheat (Jowar)	Cotton
Total :						
Jowar			1.48	1.45	1.00	1.45
Groundnut			0.40	-	-	0.48
Cotton			-	1.38	1.45	0.90
'Junar' banana			1.95	-	-	-
Wheat			-	1.00	1.38	1.00

The cultivator had grown the crops mostly as per the rotation-plan in all the four years. He had deviated on 0.40 acre

in 1960-61; on 1.50 acres in 1961-62; on 1.38 acres in 1962-63 and on 1.48 acres in 1963-64. The deviations on most of the area in these years were undertaken to meet different types of consumption needs of his family. Thus, in the year 1960-61, he was required to deviate from jowar to groundnut on the plot of 0.40 acre (Plot 1.5) in order to meet the family's consumption needs of groundnut. The same was the case in the next year. In this year he was required to deviate from cotton to wheat on the plot of 1.00 acre (Plot 1.2) in order to meet the family's consumption requirements of wheat. As an interaction of this rotation, he was required to deviate from jowar to cotton on the plot of 0.50 acre (Plot 1.3) in the same year. Because of the deviation from cotton to wheat on the 1.00 acre plot, the area under cotton declined from 1.88 acres to 0.88 acre only. In order to increase the area under cotton to its usual level, he deviated from jowar on the plot of 0.50 acre and took cotton on it. In 1962-63, he once again deviated from jowar to wheat on the three plots having a total area of 1.38 acres (Plots 1.3, 1.4 and 1.5) to meet the consumption needs of the family. The same is the case in the next year as well. In 1963-64, he deviated from cotton to wheat and groundnut on the two plots of 1.00 and 0.48 acre respectively, to meet the food needs of his family.

CASE STUDY R 15

Name	: N. A. D.	Family size	: 7 members
Age	: 33 years	Earners	: Male Female Total
Education	: 4th standard		2 1 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.2,100
Subsidiary occupation	: -	Land-holding	: 7.82 acres
Livestock	:		
Working	2	Milch	4
Young	6	Total	12
		Home-collected manure	: 36 cart-loads

The cultivator cultivates a land-holding of 7.82 acres. It comprises of five fragments, all of these situated in the village itself. The details of these fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	2.86	Available	1.1	0.95	Medium-black	NB-JB-J
			1.2	0.95	Medium-black	NB-JB-C
			1.3	0.48	Medium-black	NB-JB-J
			1.4	0.38	Medium-black	NB-JB-J
			1.5	0.10	Medium-black	NB-JB-J
2	2.96	Available	2.1	1.48	Deep-black	NB-JB-J
			2.2	1.48	Deep-black	NB-JB-C
3	0.45	Not available	3.1	0.45	Deep-black	NB-JB-J
4	0.60	Available	4.1	0.60	Deep-black	NB-JB-C
5	0.95	Available	5.1	0.95	Deep-black	W-J

It may be noted that the cultivator has irrigation on almost all the fragments of his land-holding. In all the fragments having irrigation facility, the wells are jointly owned, the cultivator's share in the ownership ranging from one-fourth

to one-eighth. Because of the small shares in the ownership of the well, his irrigable area in the total land-holding is about 3.34 acres only. On the irrigable area, the cultivator generally grows the light irrigated crops like wheat, chillies etc. He himself does not grow banana as it requires heavy irrigation and he does not have any oil engine operated pumping set to undertake such a heavy irrigation. He, therefore, leases-out the land to his neighbouring cultivators having all the equipments of irrigation. He has adjusted his cropping with that of the neighbouring cultivators and therefore gives a definite place for banana in the rotation-plan. The rotation-plan formulated by him has a marked bias towards the cultivation of banana. It may be seen that more than three-fourths of the total land is allocated to banana alone. The areas under different crops, averaged over the period of a rotation-cycle, come to 4.58 acres under banana; 1.49 acres under cotton; and 1.75 acres under jowar. The area allocated to jowar is just enough to meet the yearly food needs (about 30 maunds) of his family. Besides, he grows jowar as a mixed crop along with cotton. The entire food needs of the family are met from the home-production only.

The crops grown on different plots of the land-holding in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.95	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	'Nawati' banana
1.2	0.95	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana
1.3	0.48	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	'Nawati' banana

1.4	0.38	NB-JB-J	'Nawati' banana	'Junar' banana	Wheat (Jowar)	'Nawati' banana	
1.5	0.10	NB-JB-J	Chillies ('Nawati' banana)	Paddy ('Nawati' banana)	Wheat (Jowar)	'Nawati' banana	
2.1	1.48	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Jowar	
2.2	1.48	NB-JB-C	'Junar' banana	Cotton	'Nawati' banana	'Junar' banana	
3.1	0.45	NB-JB-J	'Junar' banana	Wheat (Jowar)	'Nawati' banana	'Junar' banana	
4.1	0.60	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana	
5.1	0.95	W-J	Wheat	Jowar	Wheat	Jowar	
Total :			Jowar	1.48	0.95	1.43	2.43
			Cotton	-	1.48	1.55	-
			'Nawati' banana	3.36	1.48	1.93	3.46
			'Junar' banana	1.93	3.36	1.48	1.93
			Wheat	0.95	0.45	1.43	-
			Paddy	-	0.10	-	-
			Chillies	0.10	-	-	-

It may be noted that the cultivator had grown the crops as per the rotation-plan on most of the area of his total land, in all the four years. He was required to deviate on a minor portion of his land-holding in the first three years. All the deviations in these years were necessitated in order to meet different types of the consumption needs of his family. Thus, in 1960-61 he was required to deviate from banana to chillies on the small plot of 0.10 acre (Plot 1.5) in order to meet the family's requirement of chillies. The same was the case in the other two years. In 1961-62, he deviated from banana to paddy on the same plot of 0.10 acre (Plot 1.5) and from jowar to wheat on the plot of 0.45 acre (Plot 3.1) to make provision for his family's consumption

needs of rice and wheat. In 1962-63 he deviated from jowar to wheat on the two plots (Plots 1.4 and 1.5) having a total area of 0.48 acre to get wheat for consumption.

CASE STUDY R 16

Name	: N. D. H.	Family size	: 4 members
Age	: 50 years	Earners	: Male Female Total
Education	: 5th standard		2 2 4
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.3,500
Subsidiary occupation	: -	Land-holding	: 5.75 acres
Livestock	:		
Working	2	Home-collected manure	: 20 cart-loads
Milch	2		
Young	-		
Total	4		

The cultivator cultivates a land-holding of 5.75 acres. It consists of four fragments which are all situated in the village. The details of these fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.65	Available	1.1	1.65	Medium-black	NB-JB-G
2	1.55	Available	2.1	0.78	Medium-black	NB-JB-J
			2.2	0.77	Medium-black	NB-JB-G
3	0.95	Available	3.1	0.95	Medium-black	NB-JB-J
4	1.60	Not available	4.1	1.00	Medium-black	NB-JB-G
			4.2	0.60	Medium-black	G-J

It may be seen that the entire land-holding of this cultivator is of medium-black soil. He has irrigation facility on three of his four fragments. He has jointly owned wells on three

fragments. There is no well only on the fragment of 1.60 acres. However, this fragment is situated near the fragment of 0.95 acre, from which the irrigation can be extended to it. Thus, a large portion of his land-holding has the facility of irrigation. More than three-fourths of his total land is irrigable. The cultivator utilizes the irrigation facility mainly to grow banana. The rotation-plan formulated by him is highly dominated by the cultivation of banana. More than half of the total land is allocated to banana alone. The areas under different crops, averaged over the rotation-cycle, come to 3.43 acres under banana; 1.44 acres under groundnut; and 0.88 acre under jowar. He grows jowar as a mixed crop along with groundnut and therefore, allocates smaller area to jowar in the rotation-plan. He reports that the annual requirement of jowar for his family consumption is about 18 maunds. It is entirely met from the home-production.

The crops grown on different plots of the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.65	NB-JB-G	'Nawati' banana	'Junar' banana	Groundnut	'Nawati' banana
2.1	0.78	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Groundnut (Jowar)
2.2	0.77	NB-JB-G	Groundnut	'Nawati' banana	'Junar' banana	Groundnut
3.1	0.95	NB-JB-J	'Junar' banana	Groundnut (Jowar)	'Nawati' banana	'Junar' banana
4.1	1.00	NB-JB-G	'Junar' banana	Groundnut	'Nawati' banana	'Junar' banana
4.2	0.60	G-J	Jowar	Groundnut	Jowar	Jowar (Groundnut)

Total : Jowar	1.38	-	0.60	0.60
Groundnut	0.77	2.55	1.65	1.55
'Nawati' banana	1.65	1.55	1.95	1.65
'Junar' banana	1.95	1.65	1.55	1.95

It may be seen from the cropping that the cultivator had grown the crops as per the rotation-plan on most of his land in all the four years. He was required to deviate on a minor area of 0.95 acre in 1961-62 and on 1.38 acres in 1963-64. In the year 1961-62, he deviated from jowar to groundnut on the plot of 0.95 acre (Plot 3.1). He reported that in this year, he wanted to grow 'Kandya bāg' banana on this plot and with that viewpoint he had put the land under groundnut in the kharif season of the year. However, he could not ultimately grow 'Kandya bāg' banana on it as he could not shift his oil engine operated pumping set from the fragment of 1.65 acres. He was under the impression that the 'Junar' banana in the 1.65 acre plot would be harvested by the end of October and he could take that pumping set to the plot of 0.95 acre for irrigation. But this did not materialize as the harvesting of banana in the plot of 1.65 acres got prolonged and he was required to keep the pumping set there only to irrigate the 'Junar' banana crop. In 1963-64, he deviated on two plots--from groundnut to jowar on the plot of 0.60 acre (Plot 4.2) and from jowar to groundnut on the plot of 0.78 acre (Plot 2.1). Both these deviations were necessitated because of the inadequate rainfall during the sowing season of the year. He reported that he had, in fact, sown jowar and groundnut on the plot of 0.60 and 0.78 acre respectively, as per the rotation-plan

but the crops did not come up properly and he had to re-sow the land in both the plots. In the re-sowing, he did not prefer to repeat the same crop. Instead, he exchanged the two plots and grew groundnut on the plot of 0.78 acre and jowar on the plot of 0.60 acre. He, thus, deviated from jowar to groundnut on the plot of 0.78 acre and from groundnut to jowar on the plot of 0.60 acre.

CASE STUDY R 17

Name	: T. D. L.	Family size	: 6 members
Age	: 30 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.950
Subsidiary occupation	: Agricultural labour	Land-holding	: 2.40 acres
Livestock	:		
Working	2	Home-collected manure	: 8 cart-loads
Milch	-		
Young	-		
Total	2		

The cultivator cultivates a small land-holding of 2.40 acres. He had a relatively larger land-holding of 6.40 acres in 1962-63 and 1963-64 when he had leased-in 4.00 acres of dry land. However, the land which was under his cultivation for all the four years was 2.40 acres only. This land-holding comprises of two fragments, of which one having an area of 1.25 acres is in the village, and the other, having an area of 1.15 acres, is in the neighbouring village (Savkhed). The details of these two fragments and the rotation-plan practised by the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.25	Available	1.1	1.25	Deep-black	NB-JB-J
2	1.15	Not available	2.1	1.15	Medium-black	G-J

The cultivator has irrigation facility on the fragment of 1.25 acres, from a jointly owned well. His share in the ownership of the well is one-fourth. However, he does not utilize irrigation for raising any irrigated crops as his land-holding is very small. He does not have any equipments of irrigation. He reports that as the well is very deep, he does not operate even the bullock-drawn water lift, though he has a pair of bullocks. He prefers to lease-out the fragment for banana to his neighbouring cultivator, who has an oil engine operated pumping set. He has adjusted the cropping on this land with that of the neighbouring cultivator and, therefore, gives a definite place for banana in his rotation-plan. In order to make provision for jowar for the family food needs, he is required to rotate jowar along with banana, even though the land in this fragment is of deep-black soil. Generally cotton is rotated along with banana on such lands. The cultivator reports that he requires about 27 maunds of jowar to meet the yearly food needs of his family. The area allocated to jowar (0.98 acre) is inadequate to meet the total requirement of jowar. He, therefore, grows jowar as a mixed crop along with groundnut.

The crops grown in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.25	NB-JB-J	'Nawati' banana	'Junar' banana	Wheat (Jowar)	'Nawati' banana
2.1	1.15	G-J	Jowar	Groundnut	Jowar	Jowar (Groundnut)
Total : Jowar			1.15	-	1.15	1.15
Groundnut			-	1.15	-	-
'Nawati' banana			1.25	-	-	1.25
'Junar' banana			-	1.25	-	-
Wheat			-	-	1.25	-

On the leased-in land of four acres, the cultivator had grown jowar in 1962-63 and groundnut in 1963-64. It may be seen that on his owned land-holding, he had grown the crops as per the rotation-plan in all the years except in 1962-63 and 1963-64. In 1962-63, he was required to deviate from jowar to wheat on the plot of 1.25 acres (Plot 1.1) in order to meet the extra food needs of his sister's marriage. In the year 1963-64, he deviated from groundnut to jowar on the plot of 1.15 acres (Plot 2.1). This deviation was necessitated because of the inadequate rainfall during the sowing season of the year. He reported that he had, in fact, sown groundnut on this plot, but because of the insufficient rains the crop did not germinate properly and came up in a very scattered way. He had to remove this crop and re-sow the land. He could not re-sow groundnut as he did not have seeds. He was, thus, required to deviate to jowar on this plot.

CASE STUDY R 18

Name	: S. P. S.	Family size	: 8 members
Age	: 45 years	Earners	: Male Female Total
Education	: Illiterate		3 2 5
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.1,600 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 7.80 acres
Livestock	:		
Working	Milch	Young	Total
2	1	-	3
		Home-collected manure	: 14 cart-loads

The cultivator cultivates a land-holding of 7.80 acres. It consists of two fragments. Of these, one fragment of 1.40 acres is in the village and the other of 6.40 acres, in the neighbouring village (Chichati). The details of the two fragments and the rotation-plan of the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.40	Available	1.1	0.70	Deep-black	NB-JB-C
			1.2	0.70	Deep-black	NB-JB-C
2	6.40	Not available	2.1	3.20	Medium-black	G-J
			2.2	3.20	Light	G-J

The cultivator has irrigation facility on the fragment of 1.40 acres cultivated in the village. The old well on this fragment is jointly owned by him and his four brothers. His share in the ownership of the well is one-fourth. However, the water supply in the well is limited. His irrigable area, therefore, is as small as 0.70 acre. Because of the small irrigable area the cultivator does not grow the crop like banana. He does not grow any other irrigated crops even, as he does not have any equipments

of irrigation. He generally leases-out this fragment, for banana cultivation, to one of his brothers who is rich and has all the equipments of irrigation. He has adjusted the cropping on this fragment with that of his brother and, therefore, gives a definite place for banana in his rotation-plan. It may be noted that in the rotation-plan there are two distinct parts--one practised on the land cultivated in the village and the other, on the outside land. He makes provision for food needs of the family on the dry land cultivated outside the village and concentrates on the cash-crops alone, on the irrigated land cultivated in the village. The averaged areas under jowar and groundnut are larger as he is required to practise the G-J rotation on his entire dry land in the Chichati village. He does not grow cotton on it, because of the nuisance from the Tribal people residing in the nearby villages. The average area allocated to jowar (3.20 acres) is more than sufficient to meet the yearly food needs (36 maunds) of his family.

The crops grown on different plots of the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	0.70	NB-JB-C	Cotton	Cotton ('Nawati' banana)	'Nawati' banana	'Junar' banana
1.2	0.70	NB-JB-C	Jowar ('Nawati' banana)	Cotton	'Nawati' banana	'Junar' banana
2.1	3.20	G-J	Groundnut	Jowar	Groundnut	Jowar
2.2	3.20	G-J	Jowar	Groundnut	Jowar	Groundnut
Total :			Jowar	3.90	3.20	3.20
			Groundnut	3.20	3.20	3.20

Cotton	0.70	1.40	-	-
'Nawati' banana	-	-	1.40	-
'Junar' banana	-	-	-	1.40

The cultivator had grown the crops strictly as per the rotation-plan in all the years except in the first two years--1960-61 and 1961-62. In these two years he was required to deviate from banana to jowar (Plot 1.2) and to cotton (Plot 1.1) in 1960-61 and 1961-62 respectively. Both these deviations were necessitated because his brother, to whom he used to lease-out his land regularly for banana, postponed its cultivation for two years. He reported that in 1960-61, his brother got on lease a large plot of 5.00 acres for banana cultivation at some other place. As the area of this plot was large, his brother preferred to grow banana on it and did not lease-in his plot of 0.70 acre (Plot 1.2). In such circumstances, the cultivator had no other alternative but to deviate to a dry crop which he can grow himself. In this year he preferred to deviate to jowar as he could not manure the land. In 1961-62 also, his brother did not lease-in the other plot of 0.70 acre (Plot 1.1) for banana cultivation as he had 'Junar' banana on the leased-in land of 5.00 acres. The cultivator, therefore, deviated from banana to cotton on this plot, as he could manure it from the home-collected manure.

CASE STUDY R 19

Name	: P. U. P.	Family size	: 6 members
Age	: 45 years	Earners	: Male Female Total
Education	: 6th standard		1 1 2
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.2,250 (1962-63)
Subsidiary occupation	: -	Land-holding	: 6.48 acres
Livestock	:	Home-collected manure	: 36 cart-loads
Working	-		
Milch	6		
Young	2		
Total	8		

The land-holding cultivated by this cultivator is of 6.48 acres. It comprises of three fragments, all of these situated in the village. The details of these fragments and the rotation-plan formulated by the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.68	Available	1.1	1.68	Deep-black	NB-JB-C
2	2.95	Available	2.1	1.48	Medium-black	NB-JB-C
			2.2	0.92	Deep-black	NB-JB-C
			2.3	0.30	Medium-black	NB-JB-C
			2.4	0.25	Medium-black	NB-JB-C
3	1.85	Available	3.1	1.00	Deep-black	W-J
			3.2	0.85	Deep-black	W-J

It may be noted that the cultivator has irrigation on all the three fragments of his land-holding. The three wells on these fragments are jointly owned, the cultivator's share in the ownership, ranging from one-eighth to one-fourth. Because of the limited water supply in the two wells and because of the small share in the ownership, the total irrigable area of the cultivator

is about 3.10 acres only. The cultivator utilizes irrigation mainly to grow banana on a major portion of his land-holding. However, the fragment of 1.85 acres where the land is more alkaline, is not suited to the heavily irrigated crop like banana. He, therefore, does not grow banana on this fragment of land. He is required to practise the W-J rotation on this fragment. In the case of this cultivator it is interesting to see how he has formulated his rotation-plan, giving only the required area to jowar and all the rest to the cash-crops like banana and cotton. About three-fourths of his total land is allocated to these two cash-crops only. He grows jowar, only on the fragment having alkaline land and concentrates on banana and cotton on the remaining portion of his land-holding. It can be seen that the areas under different crops, averaged over the rotation-cycle, come to 3.09 acres under banana; 1.54 acres under cotton; and only 0.92 acre under jowar. The area allocated to jowar is deliberately kept low as he grows jowar as a mixed crop along with cotton. The cultivator reports that the annual requirement of jowar for his family consumption is about 27 maunds. It is entirely met from the home-production of jowar grown as main and subsidiary crop.

The crops grown on different plots of the land and the area devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.68	NB-JB-C	'Junar' banana	Cotton	'Nawati' banana	'Junar' banana
2.1	1.48	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana
2.2	0.92	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton

2.3	0.30	NB-JB-C	Groundnut (Cotton)	'Nawati' banana	'Junar' banana	Cotton
2.4	0.25	NB-JB-C	Paddy (Cotton)	'Nawati' banana	'Junar' banana	Cotton
3.1	1.00	W-J	Jowar	Wheat	Jowar	Wheat
3.2	0.85	W-J	Wheat	Jowar	Wheat	Jowar
Total :			Jowar	1.00	0.85	1.00
			Groundnut	0.30	-	-
			Cotton	0.92	1.68	1.48
			'Nawati' banana	1.48	1.47	1.68
			'Junar' banana	1.68	1.48	1.47
			Wheat	0.85	1.00	0.85
			Paddy	0.25	-	-

It is evident from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the four years except in the first year (1960-61). In the year 1960-61, he deviated from cotton to groundnut on the plot of 0.30 acre (Plot 2.3) and to paddy on the plot of 0.25 acre (Plot 2.4) in order to meet the family consumption needs of rice and groundnut.

CASE STUDY R 20

Name	: K. B. J.	Family size	: 10 members
Age	: 35 years	Earners	: Male Female Total
Education	: 3rd standard		2 2 4
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.4,500 (1962-63)
Subsidiary occupation	: -	Land-holding	: 8.25 acres
Livestock	:	Home-collected	
Working	2	manure	: 54 cart-loads
Milch	6		
Young	5		
Total	13		

The total land-holding cultivated by the cultivator is 8.25 acres. It consists of three fragments. Of these, one small fragment of 1.05 acres is in the village and the remaining two, having a total area of 7.20 acres, are in the two neighbouring villages--Kochur and Lohara. The details of the three fragments and the rotation-plan practised on them are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.05	Available	1.1	1.05	Medium-black	NB-JB-J
2	3.20	Available	2.1	1.40	Medium-black	NB-JB-J
			2.2	1.00	Deep-black	NB-JB-C
			2.3	0.80	Deep-black	NB-JB-C
3	4.00	Not available	3.1	2.00	Light	G-J
			3.2	2.00	Light	G-J

The cultivator has irrigation facility on two of his three fragments. The well in the fragment of 1.05 acres cultivated in the village is jointly owned. The cultivator's share in its ownership is one-half. The well in the fragment of 3.20 acres cultivated in the Kochur village is entirely owned by him. The water supply in both the wells is satisfactory and is sufficient to irrigate the entire area of these two fragments. The cultivator, therefore, has an irrigable area of 4.25 acres. He utilizes the facility of irrigation mainly to raise the banana crop. He himself grows it on his entire irrigable land. It may be observed that the rotation-plan formulated by the cultivator, is much influenced by the types of soil available in his land-holding. He, thus, prefers to practise the NB-JB-C rotation on the deep-black soil; the NB-JB-J rotation on the medium-black soil and the G-J rotation on the lighter soil. The areas under different

crops, averaged over a rotation-cycle, come to 2.84 acres under banana; 2.82 acres under jowar; 2.00 acres under groundnut; and 0.60 acre under cotton. The area allocated to jowar is slightly lower than required to meet the yearly food needs (45 maunds) of his family. He is, therefore, required to grow jowar as a mixed crop along with cotton and groundnut.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.05	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	Cotton ('Nawati' banana)	
2.1	1.40	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Jowar	
2.2	1.00	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton	
2.3	0.80	NB-JB-C	Wheat (Cotton)	'Nawati' banana	'Junar' banana	Cotton	
3.1	2.00	G-J	Jowar	Groundnut	Jowar	Groundnut	
3.2	2.00	G-J	Groundnut	Jowar	Groundnut	Jowar	
Total :			Jowar	3.40	2.00	3.05	3.40
			Groundnut	2.00	2.00	2.00	2.00
			Cotton	1.00	-	-	2.85
			'Nawati' banana	1.05	3.20	-	-
			'Junar' banana	-	1.05	3.20	-
			Wheat	0.80	-	-	-

It may be seen that the cultivator had grown the crops as per the rotation-plan on most of his land-holding in all the four years. He was required to deviate only on a minor area of 0.80 acre in 1960-61 and on 1.05 acres in 1963-64. In the year

1960-61, he deviated from cotton to wheat on the plot of 0.80 acre (Plot 2.3) in order to meet the food needs of his younger brother's marriage. In 1963-64, he deviated from banana to cotton, on the plot of 1.05 acres (Plot 1.1). He reported that in this year he could lease-in a large fragment of 6.00 acres for banana cultivation in the Kochur village. Because of this leased-in land, he was required to deviate from banana on his own land of 1.05 acres in the village and took cotton on it. He could not grow banana on both the lands because of the financial constraints.

CASE STUDY R 21

Name	: G. P. I.	Family size	: 8 members
Age	: 41 years	Earners	: Male Female Total
Education	: 4th standard		3 2 5
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.3,200
Subsidiary occupation	: Agricultural labour	Land-holding	: 9.61 acres
Livestock	:		
Working	2	Milch	-
		Young	2
		Total	4
		Home-collected manure	: 12 cart-loads

The cultivator cultivates a land-holding of 9.61 acres. He had a still larger land-holding of 16.11 acres in 1961-62 and 1962-63 when he had leased-in 6.50 acres of land specifically for banana cultivation. However, the land which was under his cultivation for all the four years is of 9.61 acres only. This holding comprises of four fragments of land. Of these, two fragments having a total area of 2.81 acres, are in the village and the remaining two, having a total area of 6.40 acres, in the two

neighbouring villages--Kochur and Savkhed. The details of these fragments and the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.03	Available	1.1	1.03	Medium-black	NB-JB-W
2	1.78	Available	2.1	0.78	Medium-black	NB-JB-J
			2.2	0.50	Medium-black	NB-JB-J
			2.3	0.50	Medium-black	NB-JB-J
3	2.00	Available	3.1	2.00	Deep-black	NB-JB-C
4	4.80	Not available	4.1	2.40	Medium-black	G-J
			4.2	2.40	Medium-black	G-J

The cultivator has irrigation facility on three of his four fragments of land. The entire area of these three fragments (4.81 acres) is irrigable. This means half of the total area of his land-holding is irrigable. The cultivator utilizes his irrigation mainly to grow banana. Thus, on all the three fragments having irrigation, he practises the rotations with banana included as one of the crops. The rotation-plan formulated by the cultivator is dominated by the cultivation of banana alone. On an average, he allocates 3.21 acres or about one-third of his total land to the banana crop only. The average areas allotted to other crops, come to 2.99 acres under jowar; 2.40 acres under groundnut; and 0.66 acre under cotton. The areas under jowar and groundnut are higher mainly because he is required to practise the G-J rotation on the entire land (4.80 acres) cultivated in the Savkhed village. He does not grow cotton on this land, even though it is of medium-black soil, as the Tribal people in and around the Savkhed village steal it to a large extent. The cultivator reports that his annual requirement of jowar for the family

consumption is about 36 maunds. The area allocated to jowar is enough to meet this requirement of his family.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.03	NB-JB-W	'Nawati' banana	'Junar' banana	Wheat	'Nawati' banana	
2.1	0.78	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Jowar	
2.2	0.50	NB-JB-J	'Nawati' banana	'Junar' banana	Brinjal (Jowar)	'Nawati' banana	
2.3	0.50	NB-JB-J	'Nawati' banana	'Junar' banana	Chillies (Jowar)	'Nawati' banana	
3.1	2.00	NB-JB-C	'Junar' banana	Cotton	Groundnut ('Nawati' banana)	Cotton	
4.1	2.40	G-J	Jowar	Groundnut	Jowar	Groundnut	
4.2	2.40	G-J	Groundnut	Jowar	Groundnut	Jowar	
Total :			Jowar	3.18	2.40	2.40	3.18
			Groundnut	2.40	2.40	4.40	2.40
			Cotton	-	2.00	-	2.00
			'Nawati' banana	2.03	0.78	-	2.03
			'Junar' banana	2.00	2.03	0.78	-
			Wheat	-	-	1.03	-
			Chillies	-	-	0.50	-
			Brinjal	-	-	0.50	-

It may be observed from the cropping that the cultivator had strictly followed the rotation-plan on the entire land-holding in all the years except in 1962-63. In the year 1962-63, he was required to deviate on 3.00 acres of his land-holding. In this year, he deviated from jowar to chillies and brinjal on two plots

of 0.50 acre each (Plots 2.2 and 2.3) as there was a considerable rise in the prices of these commodities. He reported that the price of chillies had shot up to Rs.4.50 per seer. The price of brinjal had also gone upto Re.1.00 per seer. In order to take advantage of such a price rise of these commodities, the cultivator deviated from the rotation crop of jowar on his two small plots and grew the two crops. In this year, he had also deviated from banana to groundnut on the plot of 2.00 acres (Plot 3.1). He reported that in this year he wanted to grow 'Kandya bāg' banana on the plot and with that view in mind he had put the land under groundnut in the kharif season of the year. Ultimately he could not grow 'Kandya bāg' banana as the harvesting of the 'Junar' banana in the leased-in land of 6.50 acres got prolonged and he could not shift his oil engine pumping set from this land to the fragment of 2.00 acres. The cultivator, thus, had deviated to groundnut on this plot under such circumstances.

CASE STUDY R 22

Name	: N. B. L.	Family size	: 11 members
Age	: 57 years	Earners	: Male Female Total
Education	: 4th standard		2 3 5
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.3,150 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 9.36 acres
Livestock	:	Home-collected manure	: 32 cart-loads
Working	3		
Milch	3		
Young	2		
Total	8		

The land-holding cultivated by this cultivator is of 9.36 acres. It comprises of four fragments, of which, three having a total area of 3.36 acres, are cultivated in the village and the remaining one, having an area of 6.00 acres, is in the neighbouring village--Chichati. The details of the fragments along with the rotation-plan formulated by the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.05	Available	1.1	1.05	Deep-black	NB-JB-C-J
2	0.68	Available	2.1	0.68	Deep-black	NB-JB-C-J
3	1.63	Available	3.1	1.63	Deep-black	NB-JB-C
4	6.00	Not available	4.1	3.00	Medium-black	G-J
			4.2	3.00	Medium-black	G-J

The cultivator has irrigation facility on all the three fragments cultivated in the village. The two wells in the fragments of 1.05 acres and 0.68 acre are jointly owned by him and the other neighbouring cultivators. His share in the ownership of these wells is one-half. The well in the third fragment of 1.63 acres is entirely owned by him. The water supply in all the wells is satisfactory and he can irrigate the entire area of the three fragments. The area of the three fragments (3.36 acres) constitutes the irrigable area in his total land-holding. The cultivator reports that he utilizes his irrigation entirely to grow banana, which is the most paying crop in the region. He does not grow any other irrigated crop. Thus, more than half of the irrigable area (1.95 acres) is allocated to banana alone. In the case of this cultivator, it is interesting to see how he takes a composite view of his resources and requirements, while formulating the rotation-plan. It may be seen that as he has a big family of 11 members, he is required to provide larger area to jowar by

practising the four-year rotation of NB-JB-C-J on the two fragments of 1.05 acres and 0.68 acre. The cultivator reports that his annual requirement of jowar for the family consumption is around 50 maunds. The averaged area allocated to jowar (3.43 acres) is just enough to meet the yearly requirement of jowar of his family. Besides, he grows jowar as a mixed crop along with cotton and groundnut.

The crops grown on different plots of the land and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	1.05	NB-JB-C-J	Jowar	'Nawati' banana	'Junar' banana	Cotton	
2.1	0.68	NB-JB-C-J	Jowar	'Nawati' banana	'Junar' banana	Cotton	
3.1	1.63	NB-JB-C	'Junar' banana	Cotton	'Nawati' banana	'Junar' banana	
4.1	3.00	G-J	Groundnut	Jowar	Groundnut	Jowar	
4.2	3.00	G-J	Jowar	Groundnut	Jowar	Groundnut	
Total :			Jowar	4.73	3.00	3.00	3.00
			Groundnut	3.00	3.00	3.00	3.00
			Cotton	-	1.63	-	1.73
			'Nawati' banana	-	1.73	1.63	-
			'Junar' banana	1.63	-	1.73	1.63

It is evident from the cropping that the cultivator had grown the crops strictly as per the rotation-plan on his entire land-holding in all the four years. He was not required to deviate on any plot of his land in any year.

CASE STUDY R 23

Name	: H. T. S.	Family size	: 12 members
Age	: 32 years	Earners	: Male Female Total
Education	: Matriculate		3 3 6
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.2,700 (1962-63)
Subsidiary occupation	: -	Land-holding	: 12.25 acres
Livestock	:		
Working	2	Home-collected manure	: 24 cart-loads
Milch	1		
Young	3		
Total	6		

The cultivator cultivates a land-holding of 12.25 acres. It comprises of five fragments, all of these situated in the village itself. The details of these fragments and the rotation-plan practised by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	0.90	Available	1.1	0.90	Medium-black	NB-JB-C
2	0.83	Available	2.1	0.83	Medium-black	NB-JB-C
3	0.98	Not available	3.1	0.98	Medium-black	NB-JB-J
4	1.30	Not available	4.1	1.30	Medium-black	C-J
5	8.24	Not available	5.1	1.78	Medium-black	G-C
			5.2	1.23	Medium-black	G-C
			5.3	2.23	Medium-black	G-J
			5.4	3.00	Medium-black	G-J

It may be noted that the entire land-holding of this cultivator is of medium-black soil. He has irrigation facility only on two small fragments of 0.90 and 0.83 acre. The two wells in these fragments are under plural ownership of six to eight cultivators. His share in the ownership of the two wells is one-fourth

each. As irrigation is available on the two small fragments only, the irrigable area of the cultivator is very small--1.73 acres or about 15 per cent of the total area of his land-holding. The cultivator does not grow any irrigated crops as his irrigable area is very limited and as he does not have any equipments of irrigation. He usually leases-out these fragments for banana cultivation to one of his brothers, who has all the equipments of irrigation. He has adjusted the cropping on these fragments with that of his brothers and thus, gives a definite place for banana in his rotation-plan. The rotation-plan of this cultivator is largely dominated by the dry crops, as a major portion of his land-holding is dry. He grows dry crops alone on his larger fragment of 8.24 acres, even though irrigation is available in its adjacent land. He reports that he does not have good relations with the neighbouring cultivators of this land and so cannot lease-out it to any one of them for banana cultivation. However, the cultivator has sunk a new well in this fragment in 1962-63; but its work is still incomplete because of lack of funds. He is yet to sink it deep to get sufficient supply of water. He hopes to complete the work within a year or two and shift to the cultivation of irrigated crops on the entire area. On this fragment, the cultivator practises two crop-rotations (G-C and G-J) after considering the different grades of the medium-black soil available on its area. The cultivator is required to devote larger area to jowar as he has a big family of 12 members. He reports that his annual requirement of jowar for the family consumption is as large as 54 maunds. In order to meet such a large requirement of jowar, he allocates, on an average, about 3.60 acres to jowar alone.

Besides, he grows jowar as a mixed crop along with cotton and groundnut. Thus, the entire food needs of the family are met from the home-production only.

The crops grown on different plots of the land in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	0.90	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana	
2.1	0.83	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana	
3.1	0.98	NB-JB-J	Bajara (Jowar)	'Nawati' banana	'Junar' banana	Jowar	
4.1	1.30	C-J	Jowar	Cotton	Jowar	'Nawati' banana (Cotton)	
5.1	1.78	G-G	Cotton	Groundnut	Cotton	Groundnut	
5.2	1.23	G-C	Cotton	Jowar (Groundnut)	Cotton	Groundnut	
5.3	2.23	G-J	Jowar	Groundnut	Jowar	Groundnut	
5.4	3.00	G-J	Groundnut	Jowar	Groundnut	Jowar	
Total :			Jowar	3.53	4.23	3.53	3.98
			Groundnut	3.00	4.01	3.00	5.24
			Cotton	3.01	1.30	4.74	-
			'Nawati' banana	1.73	0.98	-	3.03
			'Junar' banana	-	1.73	0.98	-
			Bajara	0.98	-	-	-

It may be noted that the cultivator had grown the crops as per the rotation-plan on most of his land in all the four years. He was required to deviate only on a minor portion of his land in 1960-61, 1961-62 and 1963-64. In the year 1960-61, he deviated from jowar to bajara on the small plot of 0.98 acre (Plot 3.1) in

order to get a different type of fodder for his young bullocks. He reported that the husk of bajara is more nutritive and therefore it is generally given to the working cattle. In 1961-62, he deviated from groundnut to jowar on the plot of 1.23 acres (Plot 5.2). This deviation was necessitated because of the rotation-plan itself. It may be seen that according to the rotation-plan itself, the area due for groundnut in this year was in excess at the cost of jowar. The area due for groundnut was 5.24 acres, while the area due for jowar was only 3.00 acres. In order to correct the imbalance in the areas of the two crops, he deviated on the plot of 1.23 acres and grew jowar instead of groundnut. He, thus, brought down the area under groundnut to 4.01 acres and pushed up the area under jowar to 4.23 acres. In the year 1963-64, he deviated from cotton to banana on the plot of 1.30 acres (Plot 4.1) as he could lease-out the land for banana cultivation to one of the neighbouring cultivators.

CASE STUDY R 24

Name	: T. D. W.	Family size	: 10 members
Age	: 46 years	Earners	: Male Female Total
Education	: 4th standard		3 3 6
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.4,250
Subsidiary occupation	: -	Land-holding	: 6.33 acres
Livestock	:	Home-collected manure	: 32 cart-loads
Working	2	Milch	3
Young	2	Total	7

The land-holding cultivated by this cultivator is of 6.33

acres. In fact he had a larger cultivated holding in all the four years as he had leased-in lands for banana cultivation. He reported that he had leased-in 5.26 acres in 1960-61; 6.61 acres in 1961-62; 6.20 acres in 1962-63 and 7.96 acres in 1963-64. His cultivated land-holding, therefore, was of 11.59 acres in 1960-61; of 12.94 acres in 1961-62; of 12.53 acres in 1962-63; and of 14.29 acres in 1963-64. The leased-in lands, however, were specifically for the cultivation of banana and, therefore, remained under his cultivation for two years only. The land which was under his cultivation for the entire period of four years was of 6.33 acres only. In the case study we are mainly concerned with this land-holding. It consists of three fragments, all of these situated in the village. Of these, one fragment of 1.65 acres is leased-in since 1957, on a long-term lease of ten years. The other two fragments, however, are owned by him. The details of these fragments and the rotation-plan practised by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	3.05	Available	1.1	2.75	Deep-black	NB-JB-C
			1.2	0.10	Deep-black	NB-JB-C
			1.3	0.20	Deep-black	NB-JB-C
2	1.63	Available	2.1	1.63	Medium-black	G-J or NB-JB-J
3	1.65	Not available	3.1	1.65	Medium-black	G-C-J

The cultivator has irrigation on his two owned fragments of 3.05 and 1.63 acres. The two wells in these fragments are entirely owned by him. The water supply in both the wells is quite sufficient to irrigate the entire area of the two fragments. The

irrigable area of the cultivator, therefore, is 4.68 acres or about three-fourths of his total cultivated holding. Irrigation is not available, only on the leased-in fragment of 1.65 acres. The cultivator utilizes the available irrigation mainly to grow banana, which is the most profitable crop in the region. As his land-holding is small, he generally leases-in lands for banana cultivation, from the neighbouring or other cultivators in the village. He has two oil engine operated pumping sets, of which one is used to irrigate his own fragment of 3.05 acres and the other, is kept mobile to irrigate the leased-in lands for banana cultivation. Every two years he shifts this pumping set from one leased-in land to another. The area of leased-in lands in the four years are given earlier. It may be noted that, on the fragment of 1.63 acres the cultivator practises a dual rotation and keeps its cropping flexible. He reports that it is uneconomical to grow banana, on this fragment alone as it has a very small area. He grows banana on it whenever he gets on lease its neighbouring lands for banana cultivation. In other years he puts it under the dry crops only. He, therefore, prefers to practise a dual rotation on this fragment. The rotation-plan formulated by the cultivator has a marked bias towards the cultivation of banana. More than three-fourths of the irrigable area is devoted to banana alone. It may be seen that the areas under different crops, averaged over the rotation-cycle, vary from 2.04 to 3.12 acres under banana; 1.57 acres under cotton; from 0.55 acre to 1.36 acres under groundnut and from 1.09 to 1.36 acres under jowar. The area allocated to jowar is inadequate to meet the total food

requirement (45 maunds) of his big family. He is, therefore, required to grow jowar as a mixed crop along with cotton and groundnut. At times, he is also required to purchase jowar to meet the yearly food needs of his family.

The crops grown on different plots of the land and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	2.75	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton	
1.2	0.10	NB-JB-C	Paddy (Cotton)	'Nawati' banana	'Junar' banana	Jowar (Cotton)	
1.3	0.20	NB-JB-C	Groundnut (Cotton)	'Nawati' banana	'Junar' banana	Jowar (Cotton)	
2.1	1.63	G-J or NB-JB-J	Jowar	Groundnut	Jowar	'Nawati' banana	
3.1	1.65	G-C-J	Jowar	Cotton (Groundnut)	Groundnut (Jowar)	Cotton	
Total :			Jowar	3.28	-	1.63	0.30
			Groundnut	0.20	1.63	1.65	-
			Cotton	2.75	1.65	-	4.40
			'Nawati' banana	-	3.05	-	1.63
			'Junar' banana	-	-	3.05	-
			Paddy	0.10	-	-	-

It may be observed from the cropping that the cultivator had taken the crops as per the rotation-plan on most of his land in all the four years. He was required to deviate on a minor area of 0.30 acre each in 1960-61 and 1963-64 and on 1.65 acres each in 1961-62 and 1962-63. He reported that in the year 1960-61, he deviated from cotton to paddy and groundnut on the two plots of 0.10 and 0.20 acre respectively (Plots 1.2 and 1.3) in order to

meet the family consumption needs of rice and groundnut. In 1961-62, he deviated from groundnut to cotton on the plot of 1.65 acres (Plot 3.1) because of the rotation-plan itself. In this year the area due for groundnut according to the rotation-plan itself, was in excess (3.28 acres). As against this there was no area due for cotton and jowar. In order to bring the area balance between different crops, the cultivator deviated on the plot of 1.65 acres and took cotton. He, thus, brought down the area under groundnut to its normal level and devoted some area at least, to cotton in this year. He did not deviate to jowar as he had some old stocks of jowar with him. In this year he preferred to grow jowar, only as a mixed crop along with groundnut and cotton to supplement the old stocks. In the next year also, he deviated on the same plot of 1.65 acres. But this time the deviation was from jowar to groundnut. This deviation was also necessitated because of the rotation-plan. It may be seen that in this year the area due for jowar was in excess. There was no area due for cotton and groundnut. He, therefore, deviated on the plot of 1.65 acres and grew groundnut instead of jowar. He, thus, achieved the usual area balance between the two crops. He did not deviate to cotton as he could not manure the land. In the year 1963-64, he deviated from cotton to jowar on the two small plots of 0.10 and 0.20 acre (Plots 1.2 and 1.3) as there was not adequate rainfall during the sowing season of the year. The cultivator reported, that he had in fact, sown cotton on both these plots along with the plot of 2.75 acres. But the crop in these two plots came up in a very scattered way as there were no rains after sowing. He retained the crops for a long period, hoping that it will improve. But it did not show any

improvement and had to be removed. The cultivator removed it by the end of July and re-sowed jowar as no other kharif crop could be sown so late. He was, thus, required to deviate to jowar on these two plots.

CASE STUDY R 25

Name	: R. Z. P.	Family size	: 7 members
Age	: 50 years	Earners	: Male Female Total
Education	: Illiterate		2 2 4
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.2,550
Subsidiary occupation	: Agricultural labour	Land-holding	: 12.64 acres
Livestock	:		
Working	2	Milch	2
		Young	2
		Total	6
		Home-collected manure	: 24 cart-loads

The cultivator cultivates a land-holding of 12.64 acres. It consists of six fragments. Of these, three fragments, having a total area of 6.58 acres are cultivated in the village, and the remaining fragments, having a total area of 6.06 acres, in the neighbouring two villages--Chinawal and Savkhed. The details of these fragments and the rotation-plan formulated by the cultivator are given below:

Frag-ment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	2.90	Not available	1.1	2.90	Medium-black	NB-JB-J
2	2.50	Available	2.1	1.25	Medium-black	NB-JB-C-J
			2.2	1.25	Medium-black	NB-JB-C-J
3	1.18	Not available	3.1	1.18	Medium-black	G-J or NB-JB-C

4	1.50	Not available	4.1	1.50	Medium-black	G-C-J
5	4.13	Not available	5.1	2.13	Medium-black	G-J
			5.2	2.00	Medium-black	G-J
6	0.43	Not available	6.1	0.43	Medium-black	G-J

It may be noted that the entire land-holding of this cultivator is of medium-black soil. He has irrigation facility, only on one fragment of 2.50 acres, cultivated in the village. The irrigable area in his land-holding, therefore, is very small--2.50 acres or less than one-fourth of the total land. He utilizes his irrigation facility mainly to grow banana. He grows banana, even on the remaining two fragments cultivated in the village, by leasing-out these, to the neighbouring cultivators. It may be observed that the land-holding of this cultivator is of two distinct parts--one, cultivated in the village and the other, outside. Likewise we find two parts in his rotation-plan as well. He concentrates mainly on banana on the land cultivated in the village and on the dry crops, on the land cultivated outside. The areas under different crops, averaged over the rotation-cycle, vary from 3.18 to 3.97 acres under banana; from 1.52 to 1.72 acres under cotton; and from 4.37 to 4.96 acres under jowar. The averaged area devoted to groundnut is 2.78 acres. The area allocated to jowar is larger than required to meet the yearly food needs (32 maunds) of his family. This is largely because he is constrained to practise the G-J rotation on the entire area of his fragment (4.13 acres) in the Savkhed village. He does not grow cotton on this fragment as it is difficult to protect its produce from the tribal people in Savkhed and nearby villages.

The crops grown on different plots of the land and the

areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	2.90	NB-JB-J	'Nawati' banana	'Junar' banana	Groundnut (Jowar)	Jowar
2.1	1.25	NB-JB-C-J	'Junar' banana	Wheat (Cotton)	Cotton	'Nawati' banana
2.2	1.25	NB-JB-C-J	Cotton	Jowar	Cotton ('Nawati' banana)	'Nawati' banana
3.1	1.18	G-J or NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Wheat (Cotton)
4.1	1.50	G-C-J	Cotton	Jowar	Groundnut	Cotton
5.1	2.13	G-J	Jowar	Groundnut	Jowar	Groundnut
5.2	2.00	G-J	Jowar	Groundnut	Jowar	Groundnut
6.1	0.43	G-J	Cotton (Jowar)	Groundnut	Jowar	Groundnut
Total : Jowar			4.13	2.75	4.56	2.90
Groundnut			-	4.56	4.40	4.56
Cotton			3.93	-	2.50	1.50
'Nawati' banana			2.90	1.18	-	2.50
'Junar' banana			1.25	2.90	1.18	-
Wheat			-	1.25	-	1.18

It may be noted from the cropping that the cultivator had grown the crops as per the rotation-plan, on most of his land in all the four years. He was required to deviate only on one plot each in 1960-61 and 1961-62 and on two plots each in 1962-63 and 1963-64. In the year 1960-61, he deviated from jowar to cotton on the small plot of 0.43 acre (Plot 6.1) as he could manure this land in this year. In 1961-62, he deviated from cotton to wheat on the plot of 1.25 acres (Plot 2.1) in order to meet the family consumption needs of wheat. In the year 1962-63, he

deviated from jowar to groundnut on the plot of 2.90 acres (Plot 1.1) because of the rotation-plan itself. It may be seen that according to the rotation-plan, the area due for jowar in this year was far in excess (7.46 acres) than required. As against this there was no area due for groundnut. In order to correct this area imbalance between the two crops he was required to deviate from jowar on the plot of 2.90 acres and took groundnut on it. He could not deviate to groundnut on any other plots of jowar as it would have caused the repetition of the same crop. In this year he had also deviated from banana to cotton on the plot of 1.25 acres (Plot 2.2) as he could not arrange for an oil engine operated pumping set. In fact, he had applied for the Taccavi loan to purchase an oil engine operated pump. The loan was sanctioned but he did not get the amount in time i.e. before June to purchase a pumping set. He was, therefore, required to deviate from banana on the plot of 1.25 acres. He preferred to deviate to cotton as the area due for it according to the rotation-plan was considerably low in this year. In the year 1963-64, he deviated from jowar to banana on the plot of 1.25 acres (Plot 2.1). In this year he bought an oil engine operated pump and installed it on his well in the fragment of 2.50 acres and put the entire area of the fragment under banana. This led to the deviation from cotton to banana on one plot of 1.25 acres of the fragment. The second deviation in the year was from cotton to wheat on the plot of 1.18 acres (Plot 3.1). This was necessitated because of the inadequate rainfall during the sowing season of the year. He had, in fact, sown cotton on this plot, but the

crop came up in a scattered way. He had retained the crop till the middle of July, hoping that it will improve. But the crop remained stunted and there was no improvement in its growth. He had to remove it ultimately. By the time he removed the crop, the sowing season of all the kharif crops had elapsed. He was, therefore, required to keep the land fallow for the remaining period of the kharif season. In the rabi season he put it under wheat, as the rains were satisfactory. He, thus, deviated from cotton to wheat on the plot of 1.18 acres in this year.

CASE STUDY R 26

Name	: L. R. S.	Family size	: 7 members
Age	: 40 years	Earners	: Male Female Total
Education	: 7th standard		2 1 3
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.1,550 (1962-63)
Subsidiary occupation	: Agricultural labour	Land-holding	: 15.66 acres
Livestock	:	Home-collected manure	: 8 cart-loads
Working	2		
Milch	-		
Young	-		
Total	2		

The land-holding cultivated by this cultivator is of 15.66 acres. It comprises of four fragments. Of these, two fragments having a total area of 3.61 acres are cultivated in the village and the other fragments, having a total area of 12.05 acres, in the neighbouring two villages--Chichati and Savkhed. The details of the four fragments and the rotation-plan practised by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	0.83	Available	1.1	0.83	Medium-black	NB-JB-C
2	2.78	Available	2.1	2.78	Medium-black	NB-JB-J
3	5.80	Not available	3.1	5.80	Light	G-J
4	6.25	Not available	4.1	1.50	Medium-black	G-C
			4.2	2.50	Light	G-J
			4.3	2.25	Light	G-J

The cultivator has irrigation facility, only on the two fragments cultivated in the village. The well in the fragment of 0.83 acre is jointly owned, his share in its ownership being one-sixth. The well in the second fragment of 2.78 acres, is entirely owned by him. As irrigation is available on the two small fragments, the irrigable area of this cultivator is limited to 3.61 acres only. It forms a small proportion (less than one-fourth) of his total land-holding. However, the cultivator utilizes the available irrigation mainly to grow banana crop, which occupies nearly three-fourths of his irrigable land. The rotation-plan formulated by him, naturally has two distinct parts, one, for the irrigable land and the other for the dry land. On the irrigable land, banana is dominating, while on the dry land, groundnut and jowar claim most of the area. His rotation-plan as a whole, is highly dominated by jowar and groundnut. This is mainly because he is constrained to practise the G-J rotation on most of the area of his two fragments (5.80 and 6.25 acres) in Savkhed and Chichati. A major portion of the land in the two fragments is of lighter soil where cotton cannot be profitably grown. Besides, there is the nuisance from the tribal people in the

nearby villages. Because of these two factors he prefers to put most of the area under groundnut and jowar only. In the case of this cultivator, the areas under different crops, averaged over the rotation-cycle, come to 6.20 acres under jowar, 6.03 acres under groundnut; 2.41 acres under banana; and only 1.02 acres under cotton. The area allocated to jowar is considerably large in relation to his annual food needs of the family (32 maunds). This is mainly because he is required to practise the G-J rotation on his entire dry land.

The crops grown on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	0.83	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana	
2.1	2.78	NB-JB-J	'Junar' banana	Jowar	'Nawati' banana	'Junar' banana	
3.1	5.80	G-J	Jowar	Groundnut	Jowar	Jowar (Groundnut)	
4.1	1.50	G-C	Cotton	Cotton (Groundnut)	Groundnut	Jowar (Cotton)	
4.2	2.50	G-J	Groundnut	Jowar	Groundnut	Jowar	
4.3	2.25	G-J	Jowar	Groundnut	Jowar	Groundnut	
Total :			Jowar	8.05	5.28	8.05	9.80
			Groundnut	2.50	8.05	4.00	2.25
			Cotton	1.50	1.50	0.83	-
			'Nawati' banana	0.83	-	2.78	0.83
			'Junar' banana	2.78	0.83	-	2.78

It may be seen from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the years

except in 1961-62 and 1963-64. In the year 1961-62, he deviated from groundnut to cotton on the plot of 1.50 acres (Plot 4.1) because of the failure of the crop in the preceding year. The cultivator reported that he had manured this plot in the preceding year and put under cotton. But the crop failed completely because of the fungous disease and the manure applied was not fully utilized. In order to utilize fully the residuals of manure applied, he repeated the same crop of cotton in the next year. This led to the deviation from groundnut to cotton on the plot in this year. In 1963-64, he deviated from groundnut and cotton to jowar on two plots of 5.80 and 1.50 acres respectively (Plots 3.1 and 4.1) because of the inadequate rainfall during the sowing season of the year. He had, in fact, sown groundnut on the plot of 5.80 acres and cotton on the plot of 1.50 acres according to the rotation-plan. But as there were insufficient rains after sowing the crops came up in a scattered way. The cultivator had retained the crops for some period, hoping that they will improve. But there was no improvement and he had to remove both the crops and re-sow the land. He re-sowed jowar on both the plots as the sowing season of all the other kharif crops had elapsed. He was, thus, required to deviate from groundnut and cotton to jowar on both the plots in this year.

CASE STUDY R 27

Name	: R. S. P.	Family size	: 10 members
Age	: 45 years	Earners	: Male Female Total
Education	: 4th standard		3 2 5
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.4,600
Subsidiary occupation	: -	Land-holding	: 20.51 acres
Livestock	:	Home-collected manure	: 22 cart-loads
Working	2	Milch	2
Young	3	Total	7

The cultivator cultivates a fairly large land-holding of 20.51 acres. It consists of five fragments. Of these, two fragments having a total area of 3.63 acres are in the village and the remaining three fragments having a total area of 16.88 acres, are cultivated in two neighbouring villages--Lohara and Chichati. The details of each of these fragments and the rotation-plan formulated by the cultivator are given below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	1.20	Available	1.1	1.20	Medium-black	NB-JB-C
2	2.43	Available	2.1	2.43	Medium-black	NB-JB-C-W
3	10.63	Not available	3.1	3.00	Medium-black	G-C-J
			3.2	7.63	Light	G-J
4	4.00	Not available	4.1	4.00	Light	G-J
5	2.25	Not available	5.1	2.25	Light	G-J

The case of this cultivator is far similar to the cultivator discussed in Case Study R 26. This cultivator also has irrigation, only on the two small fragments cultivated in the village.

His irrigable area, therefore, is limited to 3.63 acres only. It forms a small proportion (about 20 per cent) of the total area of his land-holding. The cultivator himself does not utilize his irrigation to grow any irrigated crops as his irrigable portion of the land-holding is small. He prefers to lease-out the irrigable land for banana cultivation, to his brother who has relatively larger land under irrigation. He has adjusted the cropping on the two irrigable fragments with that of his brother and thus, gives a definite place for banana in his rotation-plan. It may be seen that the rotation-plan formulated by this cultivator is highly dominated by groundnut and jowar. This is mainly because a major portion of his total land-holding (13.88 acres) is of lighter type of soil, where he is constrained to practise the two-year rotation of G-J. As pointed out in the earlier Case Studies no other crop can be profitably grown on such lands. The areas under different crops, averaged over the rotation-cycle, come to 7.94 acres each under jowar and groundnut; 2.02 acres each under banana and cotton and 0.61 acre under wheat. The area allocated to jowar is considerably large in relation to his yearly requirement of jowar (45 maunds) for the family consumption. This is mainly because of the predominance of the lighter soil in his land-holding.

The crops taken on different plots of the land-holding and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	1.20	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana
2.1	2.43	NB-JB-C-W	Wheat	'Nawati' banana	'Junar' banana	Cotton
3.1	3.00	G-C-J	Jowar	Groundnut	Cotton	Groundnut (Jowar)
3.2	7.63	G-J	Jowar	Groundnut	Jowar	Groundnut
4.1	4.00	G-J	Groundnut	Jowar	Groundnut	Jowar
5.1	2.25	G-J	Jowar	Groundnut	Groundnut (Jowar)	Jowar
Total : Jowar			12.88	4.00	7.63	6.25
Groundnut			4.00	12.88	6.25	10.63
Cotton			-	-	4.20	2.43
'Nawati' banana			1.20	2.43	-	1.20
'Junar' banana			-	1.20	2.43	-
Wheat			2.43	-	-	-

It may be noted that the cultivator has mostly grown the crops as per the rotation-plan in all the four years. He was required to deviate only on a small area of 2.25 acres in 1962-63 and of 3.00 acres in 1963-64. In the year 1962-63, he deviated from jowar to groundnut on the plot of 2.25 acres (Plot 5.1) because of the crop failure in the preceding year. He reported that he had manured this plot in the preceding year and devoted it to groundnut. But the groundnut crop failed and the manure was not fully utilized. In order to utilize the residuals of manure in the next year at least, he repeated groundnut in 1962-63. This led to the deviation from jowar which was due on the plot for this year according to the rotation-plan. Similar

was the case in 1963-64 also. In this year, he deviated once again from jowar to groundnut on the plot of 3.00 acres (Plot 3.1). This deviation was also necessitated because of the failure of the cotton crop in the preceding year. In order to utilize fully the residuals of the manure in the next year, he deviated to groundnut instead of growing jowar as per the rotation. He preferred to deviate from jowar as he was afraid that the residuals of manure would adversely affect the jowar crop.

CASE STUDY R 28

Name	: M. S. D.	Family size	: 14 members
Age	: 50 years	Earners	: Male Female Total
Education	: Illiterate		3 2 5
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income (1962-63)	: Rs.5,600
Subsidiary occupation	: -	Land-holding	: 12.00 acres
Livestock	:	Home-collected manure	: 10 cart-loads
Working	2	Milch	-
		Young	1
		Total	3

The land-holding cultivated by this cultivator is of 12.00 acres. He had, in fact, a bigger land-holding of 21.10 acres in 1962-63 and 1963-64, as he had bought a large fragment of land (9.10 acres) in the Lohara village in 1962. However, the land which was under his cultivation for all the four years was 12.00 acres only. In the case study we are more concerned with this land. This land-holding comprises of two fragments, of which one, having an area of 5.60 acres is cultivated in the village and the

other, having an area of 6.40 acres, in the neighbouring village--Lohara. The details of these fragments along with the rotation-plan of the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	5.60	Available	1.1	3.00	Medium-black	NB-JB-J
			1.2	2.60	Medium-black	NB-JB-J
2	6.40	Not available	2.1	6.40	Medium-black	G-J

It may be noted that the cultivator has a land-holding entirely of medium-black soil. Irrigation facility is available only on one fragment cultivated in the village. The fragment cultivated in the Lohara village does not have such facility. The cultivator, therefore, has about half of his holding of the irrigable land and the other half, of the dry land. On the irrigable portion of his land-holding, he mainly grows banana. About two-thirds of his irrigable land is allocated to banana alone. It may be seen that the rotation-plan of this cultivator is much influenced by the food requirement of his family. He has a big family of 14 members, requiring more than 60 maunds of jowar per year. In order to meet such a large requirement of jowar for the family consumption, he is required to devote larger areas to jowar. He, therefore, practises the crop-rotations with jowar as one of the crops, on the entire area of his land-holding. On an average, he allocates about 5.06 acres of his land to jowar every year. Besides, he grows jowar as a mixed crop along with groundnut on his dry land. He, thus, meets his entire food requirement from the home-production only.

The crops grown on different plots of the land and the areas

put to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	3.00	NB-JB-J	'Junar' banana	Jowar	'Nawati' banana	'Junar' banana	
1.2	2.60	NB-JB-J	Jowar	'Nawati' banana	'Junar' banana	Jowar	
2.1	6.40	G-J	Groundnut	Groundnut (Jowar)	Jowar	Groundnut	
Total :			Jowar	2.60	3.00	6.40	2.60
			Groundnut	6.40	6.40	-	6.40
			'Nawati' banana	-	2.60	3.00	-
			'Junar' banana	3.00	-	2.60	3.00

The crops grown on the fragment of 9.10 acres, bought in 1962, are given below:

Crop	1962-63	1963-64
Groundnut	9.10	-
Cotton	-	9.10

It may be seen from the cropping in the four years that the cultivator had grown the crops strictly as per the rotation-plan in all the four years except in 1961-62. In this year he was required to deviate from jowar to groundnut on the plot of 6.40 acres (Plot 2.1) because of the rotation-plan itself. It may be observed that in this year, the area balance usually maintained between the food and cash-crops got disturbed by the rotation-plan itself. The area due for jowar was far in excess at the cost of the area under groundnut. The cultivator reported that this happens in two years in the six-year period of the rotation-cycle, when jowar becomes due on two of his plots. In 1961-62,

jowar was due on the plot of 6.40 acres according to the G-J rotation and on the plot of 3.00 acres according to the NB-JB-J rotation. This much area under jowar (9.48 acres) was not required to meet his annual requirement of food and fodder. He was, therefore, required to deviate on one of the two plots, to bring about the usual balance in the areas of different crops. He preferred to deviate on the plot of 6.40 acres and took groundnut instead of jowar. He, thus, brought down the area under jowar from 9.48 acres to 3.00 acres and devoted 6.40 acres to groundnut. He preferred to deviate on the plot of 6.40 acres as it has no irrigation facility and was of lighter soil. He did not prefer to deviate and disturb the rotation of NB-JB-J on the other plot of the irrigated land.

CASE STUDY R 29

Name	: P. Z. D.	Family size	: 7 members
Age	: 56 years	Earners	: Male Female Total
Education	: 4th standard		4 - 4
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.14,500 (1962-63)
Subsidiary occupation	: -	Land-holding	: 22.21 acres
Livestock	:		
Working	Milch	Young	Total
2	3	2	7
		Home-collected manure	: 32 cart-loads

The cultivator cultivates a fairly large land-holding of 22.21 acres. It consists of six fragments. Of these, four fragments having a total area of 12.21 acres are cultivated in the village, and the remaining two fragments, having a total area of

10.00 acres, in the Savkhed village. The details of these fragments and the rotation-plan formulated by the cultivator are presented below:

Frag- ment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop- rotation
1	5.00	Available	1.1	2.50	Deep-black	NB-JB-J-C
			1.2	2.50	Deep-black	NB-JB-C-W
2	1.48	Available	2.1	1.48	Medium-black	NB-JB-J
3	4.20	Available	3.1	2.10	Deep-black	NB-JB-J
			3.2	2.10	Deep-black	NB-JB-C-W
4	1.53	Not available	4.1	1.53	Deep-black	W-J
5	6.00	Not available	5.1	6.00	Medium-black	G-J
6	4.00	Not available	6.1	4.00	Medium-black	G-J

The cultivator has irrigation on three of the four fragments cultivated in the village. The wells in these fragments are entirely owned by him. The water supply in the wells is sufficient to irrigate the entire area of the three fragments. The irrigable area of the cultivator, therefore, is as large as 10.68 acres, or about 50 per cent of the total area of his land-holding. The cultivator utilizes his irrigation mainly to grow the banana crop. More than half of the total irrigable area is devoted to banana alone. On the two fragments of dry land cultivated in the Savkhed village, he is constrained to practise the G-J rotation, because of the nuisance of the tribal people. In fact, the land in these two fragments being medium-black is most suited to the G-C-J rotation. But he cannot practise this rotation on the two plots as it goes very difficult to protect the cotton produce. It may be noted that the rotation-plan of the cultivator is highly dominated by the three crops; banana on the irrigable land and

groundnut and jowar on the dry land. The areas under different crops, averaged over the rotation-cycle, come to 5.94 acres under banana; 7.59 acres under jowar; 5.00 acres under groundnut; 1.77 acres under cotton; and 1.92 acres under wheat. The area allocated to jowar is considerably large in relation to his annual requirement of jowar (32 maunds) for the family consumption. This is mainly because he is required to practise the G-J rotation on the entire area of his two large fragments of dry land in the Savkhed village.

The crops grown on different plots of the land and the areas devoted to each of these in the four years are presented below:

Plot No.	Acres	Crop-rotation	Crops grown in				
			1960-61	1961-62	1962-63	1963-64	
1.1	2.50	NB-JB-J-C	'Nawati' banana	'Junar' banana	Jowar	Cotton	
1.2	2.50	NB-JB-C-W	Wheat	'Nawati' banana	'Junar' banana	Cotton	
2.1	1.48	NB-JB-J	'Nawati' banana	'Junar' banana	Jowar	'Nawati' banana	
3.1	2.10	NB-JB-J	'Junar' banana	Jowar	'Nawati' banana	'Junar' banana	
3.2	2.10	NB-JB-C-W	Wheat	'Nawati' banana	'Junar' banana	Cotton	
4.1	1.53	W-J	Jowar	Jowar (Wheat)	Wheat	Jowar	
5.1	6.00	G-J	Jowar	Groundnut	Jowar	Groundnut	
6.1	4.00	G-J	Groundnut	Jowar	Groundnut	Jowar	
Total :			Jowar	7.53	7.63	9.98	5.53
			Groundnut	4.00	6.00	4.00	6.00
			Cotton	-	-	-	7.10
			'Nawati' banana	3.98	4.60	2.10	1.48
			'Junar' banana	2.10	3.98	4.60	2.10
			Wheat	4.60	-	1.53	-

It is evident from the cropping that the cultivator had grown the crops strictly as per the rotation-plan in all the years except in 1961-62. In this year he was required to deviate from wheat to jowar on the plot of 1.53 acres (Plot 4.1) as he had enough stock of wheat with him to meet the yearly requirement of his family. The cultivator reported that in the preceding year he had grown wheat on a relatively larger area (4.60 acres) and, therefore, could store bulk of its produce. From the wheat stored in this year, he had sufficiently large stocks in 1961-62 as well, to meet the family consumption needs. In the year 1961-62, therefore, he preferred to deviate from wheat and grew jowar on the plot of 1.53 acres.

CASE STUDY R 30

Name	: R. I. M.	Family size	: 10 members
Age	: 45 years	Earners	: Male Female Total
Education	: 6th standard		6 - 6
Caste	: Leva-Patidar		
Main occupation	: Agriculture	Total income	: Rs.32,400 (1962-63)
Subsidiary occupation	: -	Land-holding	: 34.30 acres
Livestock	:	Home-collected manure	: 58 cart-loads
Working	Milch	Young	Total
4	5	3	12

This is a big cultivator cultivating a land-holding of 34.30 acres. In fact his land-holding was still bigger (50.80 acres) till 1962, when he sold two of his fragments of dry land having a total area of 16.50 acres, and bought one fragment of 4.48 acres

having irrigation facility. The total area of his land-holding, therefore, came down to 38.78 acres in 1962-63 and 1963-64. However, the land which was under his cultivation for all the four years was 34.30 acres. In the case study we are more concerned with this land-holding. It comprises of six fragments. Of these, four fragments having a total area of 12.96 acres are cultivated in the village and the remaining two fragments having a total area of 21.34 acres, in the two nearby villages--Borkhed-Seem and Chinawal. The details of each of these fragments and the rotation-plan formulated by the cultivator are presented below:

Fragment No.	Acres	Irrigation	Plot No.	Acres	Soil type	Crop-rotation
1	3.53	Available	1.1	3.53	Medium-black	NB-JB-C
2	2.80	Available	2.1	2.80	Deep-black	NB-JB-C
3	4.48	Available	3.1	4.48	Deep-black	NB-JB-M-B
4	2.15	Available	4.1	2.15	Deep-black	NB-JB-M-C
5	11.90	Available	5.1	5.50	Medium-black	NB-JB-C
			5.2	3.40	Medium-black	NB-JB-C
			5.3	3.00	Medium-black	NB-JB-C
6	9.44	Not available	6.1	2.38	Medium-black	G-C-J
			6.2	3.38	Medium-black	G-C-J
			6.3	3.68	Medium-black	G-C-J

It may be noted that irrigation facility is available on five of his six fragments. The wells in all these fragments are wholly owned by him. The water supply in the wells is sufficient to irrigate the entire area of the five fragments. In the case of this cultivator, therefore, the irrigable area is as large as 24.86 acres. This means, nearly three-fourths of the total area of his land-holding is under irrigation. The cultivator utilizes his irrigation mainly to raise the banana crop which is most

paying in the region. It may be observed that the rotation-plan formulated by him, has a marked bias towards the cultivation of banana. More than half of the irrigable land is devoted to the banana crop alone. He reports that because of the restraints from finance and manure, he is required to restrict the area under banana by practising the four-year rotations such as NB-JB-M-B and NB-JB-M-C. In the case of this cultivator it is interesting to see how he has formulated his rotation-plan, allocating only the required area to jowar and all the rest to the cash-crops. It may be noted that he makes provision of jowar for the family consumption, on the dry land and devotes his entire irrigable land to the cash-crops only. The areas under different crops, averaged over the rotation-cycle, come to 15.47 acres under banana; 9.47 acres under cotton; 3.14 acres each under groundnut and jowar and 2.78 acres under other crops like maize and bajara. The area allocated to jowar is just enough to meet the yearly requirement (45 maunds) of his family. It is important to note that this cultivator, unlike the big cultivators discussed in Waghode and the other dry villages, is not constrained to allocate larger area to jowar. He formulates his rotation-plan in such a way that only the required area is devoted to jowar every year.

The crops grown on different plots of the land and the areas devoted to each of these in the four years are given below:

Plot No.	Acres	Crop-rotation	Crops grown in			
			1960-61	1961-62	1962-63	1963-64
1.1	3.53	NB-JB-C	'Nawati' banana	'Junar' banana	Cotton	'Nawati' banana
2.1	2.80	NB-JB-C	'Junar' banana	Wheat (Cotton)	Cotton	'Nawati' banana

3.1	4.48	NB-JB-M-B	'Junar' banana	Maize	Bajara	'Nawati' banana	
4.1	2.15	NB-JB-M-C	Maize	Cotton	'Nawati' banana	'Junar' banana	
5.1	5.50	NB-JB-C	Cotton	'Nawati' banana	'Junar' banana	Cotton	
5.2	3.40	NB-JB-C	'Nawati' banana	'Junar' banana	Groundnut (Cotton)	Cotton	
5.3	3.00	NB-JB-C	'Nawati' banana	'Junar' banana	Groundnut (Cotton)	Cotton	
6.1	2.38	G-C-J	Cotton	Cotton (Jowar)	Jowar	Cotton (Groundnut)	
6.2	3.38	G-C-J	Cotton	Cotton (Jowar)	Jowar	Cotton (Groundnut)	
6.3	3.68	G-C-J	Jowar	Groundnut	Cotton	Groundnut (Jowar)	
Total :			Jowar	3.68	-	5.76	-
			Groundnut	-	3.68	6.40	3.68
			Cotton	11.26	7.91	10.01	17.66
			'Nawati' banana	9.93	5.50	2.15	10.81
			'Junar' banana	7.28	9.93	5.50	2.15
			Wheat	-	2.80	-	-
			Maize	2.15	4.48	-	-
			Bajara	-	-	4.48	-

The crops grown on the two fragments of 16.50 acres, sold in 1962 and on the fragment of 4.48 acres bought in the same year are given below:

Crop	1960-61	1961-62	1962-63	1963-64
Jowar	6.00	10.50	-	-
Groundnut	10.50	6.00	-	-
Cotton	-	-	4.48	-
'Nawati' banana	-	-	-	4.48

It is evident from the cropping in the four years that the cultivator had grown the crops as per the rotation-plan on most of his land in all the years. He was required to deviate from

the rotation-plan on 8.56 acres of his land in 1961-62; on 6.40 acres in 1962-63 and on 9.44 acres in 1963-64. In all the three years, the area under deviations formed a small proportion to the total area of his land-holding. In 1961-62, he deviated from cotton to wheat on the plot of 2.80 acres (Plot 2.1) in order to meet the family consumption needs of wheat. In this year he had also deviated from jowar to cotton on two plots of 2.38 and 3.38 acres (Plots 6.1 and 6.2). The deviations on both the plots were necessitated because of the rotation-plan itself. The cultivator reported that in this year the area due for jowar according to the rotation-plan itself was far in excess. It was as high as 16.26 acres, including the jowar due in this year on the land of 16.50 acres sold in 1962. As against this, the area due for cotton was very small--4.95 acres. In order to correct this imbalance in the areas of the two crops, the cultivator had to deviate on some of the plots due for jowar. He preferred to deviate on the two plots of 2.38 and 3.38 acres as these were of medium-black land where he could grow cotton. The other plot due for jowar in this year was of lighter soil and was not suited to cotton. He, therefore, deviated from jowar to cotton on these two plots and brought down the area under jowar to its usual level of 10.00 acres and pushed the area under cotton to 7.91 acres. The area balance between the two crops was, thus, brought to its normal level maintained by him. In 1962-63 he deviated from cotton to groundnut on the two plots of 3.40 and 3.00 acres (Plots 5.2 and 5.3). Both the deviations in this year were necessitated as he sold out 16.50 acres of his dry land.

According to the rotation-plan, he used to grow groundnut and jowar on the land of 16.50 acres; but as he sold it in 1962, he had to make provision, particularly for groundnut on his other plots. He could not grow groundnut on the land which he bought in the same year as it was of deep-black soil. He, therefore, put this land under cotton and deviated from cotton to groundnut on his two other plots of 3.40 and 3.00 acres, having medium-black soil. He was not required to deviate for jowar on any plot as it was already due according to the plan, on his two plots of 2.38 and 3.38 acres. Thus, because of the sale of his dry land in this year, he was required to deviate from cotton to groundnut on two of his plots. In 1963-64, he deviated from groundnut to cotton on the two plots of 2.38 and 3.38 acres (Plots 6.1 and 6.2) and from jowar to groundnut on the plot of 3.68 acres (Plot 6.3) because of the leased-in land. The cultivator reported that in this year he had leased-in about 7.00 acres dry land where he took jowar and groundnut. Having made the provision of jowar required for the family consumption on the leased-in land, he preferred to deviate from jowar on his own land. He, therefore, grew groundnut on the plot of 3.68 acres, where jowar was due in this year according to the rotation-plan. As an interaction of this deviation and of the leased-in land, he deviated from groundnut on the two plots of 2.38 and 3.38 acres and took cotton on both of them. He was thus, required to deviate on his own land and adjust the cropping in this year, mainly because of the leased-in land.