

Maharashtra Central Famine Relief Committee

Report of the Survey of Ghod Valley

1955

**Maharashtra Central Famine Relief Committee,**

## **Report of the Survey of Ghod Valley**

*A Pilot Plan for preventing scarcities and famines and for  
maximum utilization and development of land and water  
resources of river valleys in the Bombay Deccan.)*

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**1955**

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## CHAPTER I

### INTRODUCTION

The spectre of famine visits some part or other of Maharashtra once in three years on an average. Recurrence of famines so frequently entails heavy loss to the Government exchequer by way of administration of relief, remission of land revenue etc. But the loss sustained by the people in the famine tract is many times more than this, not to speak of the great privations and hardships suffered by them. Disrupting the almost entire agricultural economy of the tract, it leaves hardly any time to agriculturists to recover and it reduces them to a state of more or less perpetual poverty, indebtedness and distress. As a result, the economy of the famine tract, admeasuring about 26,000 sq. miles, has all along remained backward and unstable. This situation is all the more regrettable in view of the fact that Maharashtra does possess resources in land and water adequate enough to meet it squarely but which have so far remained unutilised properly and fully.

It was, therefore, urged upon the Maharashtra Central Famine Relief Committee that it should prepare a comprehensive plan for the maximum utilization of land and water resources in Maharashtra, with a view to preventing or at least minimising the recurrence of scarcities and famines in future. Accordingly, the Executive Committee of the Central Famine Relief Committee entrusted this important work of preparing such a plan to the Technical Sub-Committee of experts, consisting of the following members :

- (1) Shri. R. G. Sule, C. I. E., Retd. Chief Engineer, Bombay.
- (2) Shri. P. S. Sharangpani, I. S. E., Retd. Dy. Chief Engineer, Central Provinces.
- (3) Shri. C. G. Kale, C. I. E., I. S. E., Retd. Chief Engineer, Bombay.
- (4) Shri. D. L. Sathe, I. F. S., Retd. Chief Conservator of Forest, Madras.

- (5) Dr. N. V. Kanitkar, Retd. Soil Physicist to Government of Bombay.
- (6) Rao Bahadur R. B. Karandikar, Retd. Executive Engineer, Bombay.
- (7) Shri. K. V. Joshi, Retd. Deputy Director of Rural Development, Bombay.
- (8) Shri. B. R. Sardesai, Retd. Executive Engineer, Bombay.
- (9) Rao Bahadur G. G. Shembekar, Agriculturist, Baramati.
- (10) Rao Bahadur N. S. Borawke, Agriculturist, Kopargaon.

The Technical Sub-Committee submitted a general outline of the Plan for Bombay Maharashtra, indicating in a broad manner the measures calculated, in its opinion, to achieve the desired objective. This general outline of the Plan was approved by the Central Committee at its meeting held on the 4th October, 1953. However, the Central Committee referred the Plan back to the Technical Sub-Committee with a direction that it should suggest ways and means for permanently preventing the recurrence of scarcities and famines on the basis of a general survey of a typical river valley in Bombay Maharashtra. It is gratifying to note that the Maharashtra Central Famine Relief Committee was able to enlist the whole-hearted co-operation of the Deccan Agricultural Association in all the stages of the Committee's work. For, the latter organization was itself thinking for some time before the formation of the Central Committee to undertake such a survey in Poona district.

The main river valleys and sub-valleys of the Bombay Maharashtra have been formed by the same natural agencies. They are, therefore, almost similar (except for minor changes due to local differences in environments) or comparable to each other in so far as their physical features, climatological conditions, vegetative cover, agricultural practices, cropping patterns etc. are concerned. Consequently, any valley is as good as another for studying potentialities of developing all its natural resources. In the circumstances, other factors

such as its distance from the Committee's headquarters, its accessibility and communications, probable duration and cost of its survey assumed importance while making the selection of the valley. After considering all the relevant factors carefully the Technical Sub-Committee selected the Ghod valley as a representative valley of Bombay Maharashtra for its survey.

The actual work of the survey was entrusted to a party of four field-workers. The comprehensive nature of the survey required men who had previous knowledge of at least one of its aspects and who had long experience of field work. Accordingly, a retired Deputy Engineer, Shri. D. K. Atre, was appointed to take care of the engineering aspect of the work. Shri. R. M. Parande, a borrowed hand from the Working Plan Section of the Forest Department of the Government of Bombay, was entrusted with the survey of forest conditions in the valley. Shri. Lalji Upadhye, an experienced worker of the Maharashtra Sewa Sangh, and Shri. K. N. Rajguru, a retired Mamlatdar with knowledge of local conditions, were jointly put in charge of the agricultural section of the survey. The Sub-Committee prepared elaborate questionnaires, one for each aspect of the survey, and sent the party of observers to the Ghod valley to collect factual information with the help of the questionnaires. The Sub-Committee takes this opportunity to put on record its appreciation of the work done by these field-workers under difficult conditions.

The Technical Sub-Committee thought it desirable from the point of view of detailed study of properly represented villages to subdivide the Ghod valley into small zones with more or less homogeneous physical, climatological and economic conditions within each zone. The whole length of the valley was thus divided into 11 zones from west to east, each having a span of 10,000 yards or about  $5\frac{1}{2}$  miles lengthwise, while the width varied between watersheds of each zone. In consultation with the Statistician of the Gokhale Institute of Politics and Economics, a certain number of villages were selected by the random method from each zone for sample survey. But it was realised in the initial stages of the work that owing to difficult terrain of the valley and lack of com-



munications it was not possible to complete the survey of even all the sample villages before rains set in. The entire work had, therefore, to be re-planned by cutting down the sample number to a manageable figure. It may be mentioned that the observations made by the party could not but be of a very general and reconnoitring nature. Even, then the survey took about four months from February to May 1954 to be completed.

It was also thought desirable to take advantage of the presence of the field-workers in the tract to extract factual information regarding all the villages in the tract from the village records. One person was specially put in charge of this work. But the work did not prove to be as easy as was anticipated in the beginning. Co-operation from the Revenue Department was sought for getting the information and it is gratifying to note that it was received in full measure. But the information had to be extracted from village records kept by talathis for a group of villages in their charge. A number of talathis had to be approached for the purpose. All this involved considerable time and financial cost to the Committee. The information so obtained has, however, brought out again in bold relief the defects and deficiencies of the village records.

Thanks of the Technical Sub-Committee are due to all those, officials and non-officials, who had extended their sincere co-operation and help to it through different stages of its work.

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## CHAPTER II

### DESCRIPTION OF BOMBAY MAHARASHTRA

**Relief and Physical Features:—**The Maharashtra divides itself into two unequal parts—the Konkan and the Desh or Deccan plateau. The Konkan comprises the districts of Thana, Kolaba, Ratnagiri and a part of North Kanara, while the Desh covers all the Marathi-speaking areas in Bombay, Madhya Pradesh and Hyderabad States.

The main chain of the Sahyadris, separating the Konkan from the rest of the Maharashtra, constitutes the principal feature of relief. Separated from the Satpuras by the Tapi valley, it runs almost parallel to the coastline for many hundred miles right upto the southern border of the Bombay State. The crestline, which is really a succession of high and low plateau tops, varies in height between 2,000 and 3,000 feet, though there are individual peaks like Mahabaleshwar, Harischandragad, Kalsubai etc., of greater height (over 4,500 feet).

The western or seaward face of the Sahyadris is steep. The descent is broken by a succession of terraces. It is further marked by low off-shoots projecting into the Konkan coastland and making it highly hilly and forming numerous deep and parallel valleys running from east to west.

The eastern slope on the plateau is gentle and falls in broad terraces, giving a wavy and undulating appearance to the land-scape. From this flank several spurs and ridges of varying lengths stretch out in eastern direction, the average height of which is about 1000 to 1500 feet from the plateau base. These are residual hills left after denudation. They present a weathered appearance and demarcate the basins of several rivers and streams rising from the ghats. The prominent among these mountain spurs are the Satmala, the Balaghat and Mahadeo ranges. The Satmala or Ajantha range, separating Khandesh from the Nizam's territory on the south, forms the natural division between the valley of Girna on the North and Godavari on the south. It forms the northern slope of the plateau of the Deccan. The Bala-

ghat range starts from Harischandragad in Nasik and extends towards the east in the Hyderabad State. It separates the basin of Bhima river from that of Godavari. The Bhima basin, in its turn, is separated from that of Krishna river in the south by the Madadeo range.

Broadly speaking, the Deccan plateau has a tilt from the west to the east and slopes gradually from an average elevation of 2000 ft. at the crest of the ghats to about 1400 feet on the eastern boundary of the Bombay State. The northern section of the plateau covering the Khandesh districts stands out in great contrast. It slopes towards the Tapi valley. The Khandesh districts form an upland basin with an elevation of about 600 to 700 feet above sea-level. South of Khandesh is the Malegaon plateau which also forms an auxiliary region of of the Tapi basin.

For the first few miles from the crest of the Ghats the country towards the east throughout its length is mountainous and highly hilly. These high and low hills branch off in different directions but steadily develop regular valleys running west-east or south-east through which streams and rivers flow. The valleys broaden, engulfing a number of sub-valleys on way and ultimately open into extensive plains in the eastern half of the plateau. The alternate recurrence of ridges and valleys forms a basic feature of the geography of the Deccan plateau in the Bombay State.

**Rainfall:**—The relief of land influences the quantity and distribution of annual precipitation. Broadly stated, the rainfall declines from the west to east on the Deccan plateau. All along the Konkan coast the rainfall is about 100 inches. This increases considerably towards the interior where the south-west monsoons are obstructed by the steep-sided face of the Sahyadris. The Konkan rivers suffer from the intense monsoonal periodicity in their flow. This coastal area has too much water during the rainy season and too little during the rest of the year.

Rainfall on the crest of the Sahyadris and in the adjoining strip of 5 to 10 miles to the east is even more heavy and assured. It is of the order of 100 to 200 inches or more and

is received from the south-west monsoon in a short season of 4 months. It, however, rapidly declines towards the east and within a distance of about 35 to 40 miles from the Ghats it is as low as 25". Further east, the rainfall is scanty, precarious and erratic, especially during the south-west monsoon and the average goes below 20". But towards the eastern boundary of the Bombay State, the rainfall tends to increase slightly due to some precipitation of the north-east monsoon. Broadly speaking, the Khandesh basin is an exception, as the rainfall is more favourable and certain, being of the order of 30" to 40".

The drainage of the heavy and assured rainfall received on the western ghats throughout its entire length naturally gives rise to countless streams and rivulets which coalesce in their eastern course and form rivers of considerable size. These traverse the plateau and drain away colossal volumes of rain water. All the plateau rivers, unlike those of the Konkan, are graded streams. Outside the Sahyadrian zone they develop shallow and meandering courses. The monsoonal periodicity persists. During the rainy season the flood waters entail much soil erosion. During the dry part of the year they resume a slender course in a large bed. Only in this sense are the major rivers and their tributaries perennial. All other water courses, particularly in the drier east, are markedly seasonal in their flow.

**River Basins :—**The Deccan plateau has four major river basins formed by the Ghat-fed rivers, the Girna, the Godavari, the Bhima and the Krishna. There are several other ghat-fed tributaries of these four big river systems which bring down large volume of water.

**Girna Basin :—**This forms an important part of the Tapi river basin. The river Girna rises in the Ghats at Hatgad in Kalwan taluka of Nasik district where the annual rainfall is more than 100". It is a long and large river and collects the water of several tributaries and after running west to east for several miles it takes a sudden turn to the north and meets the Tapi river. The Girna and its tributaries have worn wide basins within a short distance from their sources,

many of which derive the benefit of irrigation by means of a series of bandharas. Even then the river has a copious supply of water, which is estimated to be 32,000 M. C. Ft.\*

**Godavari Basin :—**The Godavari rises in the ghat at Trimbak in Nasik district. The Godavari river has comparatively a short course in Bombay State. A number of tributaries join the main river, the most important of them from the point of view of water supply being the Pravara and the Mula. The Godavari, the Darna and the Pravara have already been harnessed for irrigational purposes. It is estimated that over 1,00,000 M. C. Ft. of water is available in the Godavari basin, a large portion of which still awaits exploitation.

**Bhima Basin :—**Although the Bhima river is a tributary of the Krishna, in the Bombay part of the plateau its drainage area is as long as that of Krishna. The Bhima, one of the largest rivers of the Bombay State, is potentially an important river, flowing through the chronically-liable famine tract of Maharashtra. The main stream, taking its origin at Bhimashankar hills in Poona district, runs for a considerable distance through the Sholapur district. It is supplied by the fanshaped system of tributary streams rising in the western ghats. These are from north to south, the Kukdi, the Mina, the Ghod and the Sina on the left; and the Bhama, the Indrayani, the Pauna, the Mutha and the Nira on the right. The broad end of this fan-shaped system, including the Nira, is about 175 miles long. The number of rivers in the Bhima basin is large and their water supply is abundant. The total normal supply of water in this basin is estimated to be about 2,00,000 M. C. Ft.

**Krishna Basin :—**The south-eastern part of the Maharashtra plateau is drained by the Krishna river. A number of ghat-fed rivers meet the Krishna on the right flank. The water supply is abundant. The normal supply of water in these tributary rivers is estimated to be over 1,61,000 M. C. Ft.

**Soils :—**It is known that the Deccan plateau has been formed by series of volcanic eruptions from long fissures in the then-existing rocks. This lava material consolidated into

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\*These and similar figures of normal annual supply of water of other rivers are taken from Beale's Report.

basalt or popularly known as the Deccan Trap on account of the step-like appearance of the hills. It covers nearly 2,00,000 square miles of the peninsular India including the entire area of Maharashtra. Although when originally laid down it formed a more or less uniform level plateau with the approximate height of 5,000 to 6,000 feet above sea-level, its present topography is the result of the weathering and the disintegration of the surface rock through geological times. The soils in Maharashtra trace their origin to the Deccan Trap. But according to relief and different climatic factors including rainfall, different types of soils are formed like clayey, sandy, silty or even lateritic. The degree of erosion changes the original nature of the soil giving rise to a variety of composite or mixed soils with varying fertility and depths.

**Climatological Regions:**— Maharashtra may be divided into five regions according to the quantity and distribution of rainfall and similarity of other climatic factors. The Konkan or the coast is a distinct region by itself. The other four regions are on the plateau. Three of them run more or less parallel to the Sahyadri range of mountains from north to south throughout its entire length of the Deccan plateau. They are: (1) the region of heavy and assured rainfall occupying the ridge of the Sahyadris and its neighbouring country of 10-15 miles towards the east, (2) the region of moderate rainfall which is from 20 to 25 miles broad, situated next to the region of heavy rainfall and (3) the region of low and precarious rainfall with a width of about 90 to 100 miles in the east. (4) The fourth and last region is the upland basin of the Khandesh. It is bounded in the north by the Satpura range and by the Satmala range in the south. There, as in other regions, the rainfall is received during the south-west monsoon.

(1) **Konkan:**—This coastal region, varying in width from 30 miles in the south to above 50 miles in the north, receives an assured rainfall of about 100". Though there is too much of water in the rainy season, the Konkan suffers from scarcity of water in the hot season. The hill ranges and the laterite plateau very much restrict the agricultural industry to fertile

alluvial basins carved out by the parallel flowing streams from east to west. Large areas of swamp (Khajan), formed by the silted estuaries, also restrict the agricultural activity. Besides paddy and coarse millets, the Konkan produces a variety of fruits the gardens of which are found in the coastal strip. Fishing is another important occupation of the people. The forests are restricted to the slopes of the Sahyadris. But in north Konkan considerable forest growth exists on the various spurs and hills throughout. Forest exploitation forms an industry of great importance in North Konkan. In south Konkan in addition to the coastal coconut and betelnut gardens extensive areas are under grafted mangoes, cashewnut and betelnut in valleys irrigated by natural hill streams.\*

(2) **Heavy Rainfall Tract** :—The heavy rainfall tract of the Deccan with rainfall ranging from 50 inches to 250 inches is mountainous and hilly and cultivable land is comparatively less for the growing of crops which are restricted to the floor of valleys and the lower slopes of hills which are turned into terraced rice fields. The staple crops are rice and hill millets, which latter are cultivated on slopes of hills with long fallows. This tract grows superior kinds of paddy, like Ambe Mohar, Kamod, Raibhog and Jiresal. The hills are covered with forest growth but on the whole the jungle is not dense enough. The most important of the forest produce is the hirda fruit (Myrobolan) which forms the raw material for tanin. The country being extremely hilly, means of communications have not been much developed. Although the rainfall is heavy in the rainy season, the whole of the water is drained down and in the hot season there is great scarcity of even drinking water. But there are numerous potential sites for the construction of large water reservoirs. The hill sides were once clad with forest growth but with the growing population these forests were exploited but have not been recouped and are, therefore, more or less bare. Another reason for the deterioration of the forest is the indiscriminate cutting of shrubs and trees for burning rice and millets' seed beds. This region covers nearly one-fifth of the total area of

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\* See Note on Konkan in Appendix I for lines of development.

the Deccan plateau and is known as Dang, Maval or Dongari.

(3) **Region of Moderate Rainfall:**—With a range of 40" to 25" of rainfall, this tract is also known as Transition tract. It is traversed by several defined streams and rivers and has a fairly good soil mantle as there is comparatively less soil erosion due to moderate precipitation and more or less level character of land. Agriculturally, it is a bajri tract and a variety of pulse crops and groundnut are also grown. A special feature of this tract is that it has a number of irrigation wells which facilitate growing of garden crops, like potatoes, onions, chillies, tobacco and vegetables. Crops are also irrigated in small patches by diverting the water of streams and rivers by the construction of kachcha and pucca bandharas at suitable sites. A regular system of constructing a series of pucca bandharas on rivers with more or less perennial flow is in vogue in the districts of Nasik and West Khandesh. This is known as the "Baglan" System of irrigation.\*

(4) **Region of low and precarious rainfall:**—This tract is known as Desh. This is by far the most extensive region occupying more than 50 per cent of the total area of the plateau. Valleys of different rivers and tributaries become wide and open and the land is subjected to severe soil erosion during the rainfall of the north-east monsoon which is generally intensive and of stormy nature. The staple crop of this tract is rabi jowar but if the kharif rains are received bajri, pulses and groundnut occupy the lighter lands. One or other of the oilseeds, like safflower and linseed, are always sown mixed with rabi jowar. Wheat also is a crop of considerable importance particularly in heavy soils. As the tract is liable to chronic famine some protective irrigation systems like the Godavari and Pravara in Ahmednagar district and Nira in Poona and Sholapur districts have been constructed by Government. This tract possesses some minor tanks for irrigation but the water supply cannot be relied upon in years of scarcities and famines. There are also a large number of wells scattered all over the tract, but the water is deep and liable to fail in years of drought. As a result of frequent

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\* See note on the Baglan system of irrigation in Appendix II for details.



recurrence of scarcities and famines, the agricultural economy in the tract is unstable and the peasant poor and indebted.

(5) **Khandesh Tract**:—The topography and general physical features of Khandesh basin does not differ in a marked degree from those of the Deccan plateau. It is only on both the banks of the Tapi river for a distance of 4 to 5 miles that level plane of alluvial soils occur where wheat forms an important crop. In the rest of the tract the land is undulating and shows the characteristic features of ridges and valleys with shallow soils towards the ridge and deep soils lower down in each valley. The staple crops of the tract are jowar, cotton and groundnut and they occupy the alluvial lands. The sub-soil water is generally adequately available over most of the tract and plantain and mosambi are extensively grown, particularly in East Khandesh, on well irrigation. Mango is also found all over East Khandesh. The system of bandhara irrigation, as is found in Baglan, is met with in Sakri and Dhulia talukas of West Khandesh and number of kachcha and pucca bandharas of small size are constructed for irrigation.

To recapitulate, the Sahyadri range forms the backbone of the Bombay Maharashtra, dividing it into Konkan on the west and the Desh to the east. The low-lying coastal belt of Konkan is a region of heavy rainfall while the high level Desh plateau, gradually sloping towards the east, has three belts running parallel to the Sahyadris from north-south. The first mountainous belt receives heavy rainfall and is largely covered with forests. The second belt with broader valleys is less hilly and receives moderate rainfall. The third belt is wide undulating plain with low and erratic rainfall. The plateau is cut up into a number of river valleys running from west to east. These constitute the essential physical features of the Maharashtra plateau.

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## CHAPTER III

### THE GHOD RIVER BASIN

The Ghod is one of the important tributaries of the Bhima river in the northern division of Poona district. The Ghod basin, running from west to east and south-east, is situated between  $18^{\circ}-30''$  and  $19^{\circ}-13''$  north of the latitude and between  $73^{\circ}-32''$  and  $74^{\circ}-35''$  east of the longitude. Its western boundary is formed by the main ridge and tableland of the Sahyadri proper, its average altitude being 3,300 ft. above sea-level. On the north, the valley is bounded by the long Durg Killa spur which separates the Ghod valley from that of the Mina in the north for about 35 miles. It also marks the dividing line between the Ambegaon taluka (through which the Ghod river flows) and the Junnar taluka of Poona district. The spur starting from Bhimashankar and running to the east (known as Pokhari Pather range) for about 25 to 30 miles forms the southern boundary of the valley. This spur divides the Ghod valley from the Bhima valley in the south. The valley opens out in the Shirur taluka in the east. The high and over 30 miles long spurs in the north and south and running almost parallel to each other towards the east make the first part of the Ghod valley look like a deep ditch closed in from the west by the Sahyadri range. The sides of the river basin slope down towards the river bed in steps. The average width of the valley is about 10 miles for the initial stretch of about 35 miles. In the upper reaches of the valley the country is extremely rugged and presents an appearance of one confused mass of hills and dales, plateaus and ravines. But the topography gradually changes as the valley extends towards east and south-east. Both valleys and plateaus grow wider and more level. The hills likewise go on losing much of their height and boldness till they sink into the plains, maintaining an average elevation of about 1700 ft. above the mean sea-level. It is the extensive table-land on the Balaghat range (locally known as the Kanhur Pathar in Parner taluka of Ahmednagar district) that forms the northern side of the Ghod basin in its lower reaches. Excepting

some low and detached hills that demarcate valleys and sub-valleys of water streams in the north and south, the tract of the basin is very open and the lie of the land is undulating as a result of differential erosion. The total length of the valley from the rise of the Ghod to its confluence with the Bhima is about 90 miles.

**Rainfall and Climate :—** As in other valleys of the Deccan Plateau, the rainfall in the Ghod basin goes on diminishing from the west to the east. The average annual rainfall at Bhimashankar ( the source of Bhima river ) and Ahupe ( the source of the Ghod ) is recorded to be 207·54 and 178·29 inches respectively. As these are the extreme points of the western boundary of the Ghod valley it may safely be said that the average rainfall on the crest of the Sahyadris is not less than 180 inches per year. Very often it goes up to 200 inches or more. The rainfall declines very rapidly within a distance of about 5 miles towards the east as evidenced by the rainfall at Asane which is about 90 inches. Ambegaon, 12 miles to the east of the Sahyadris, records an average rainfall of about 50 inches. At Ghodegaon, 13 miles further east of Ambegaon and 25 miles away from the Western Ghats, it goes down to 30 inches. Further down in the basin, the rainfall at Shirur comes to about 22 inches on an average, which further declines to as low a figure as 18 to 20 inches near the junction of the Ghod with the Bhima in the Shrigonda taluka of Ahmednagar district. Table No. 1\* clearly brings out how the rainfall declines from the western to the eastern end of the Ghod basin and how its precipitation varies from season to season in a year.

The Ghod basin divides itself from west to east into three distinct belts in so far as the nature and total quantity of rainfall are concerned. In the first belt, stretching from the Sahyadri range to about 20 miles in the east, the rainfall is heavy and assured. Though it varies from about 200 inches in the Ghats to about 70 inches towards the easternmost point of the belt, the average annual rainfall

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\* This and all the other tables are given at the end of appropriate chapters.

at various points on the same longitude varies within narrow limits. This belt is locally known as the Maval and covers the first two zones of the basin. The second belt commences roughly from a distance of about 20 miles from the Sahyadri range and extends eastwards for a distance of about 20 to 25 miles. In this belt the general state of precipitation is fairly steady in that it suffers little variation from normal in the record of its rainfall, although the wet period in a season experiences some shifts now and again. Local averages of rainfall in the belt vary between 40" and 25". This belt of moderate but more or less assured rainfall marks the transition from the heavy rainfall belt in the west to the belt of low rainfall in the east. This transition belt is hereafter described as Deshi Maval and includes the third, fourth and fifth zones of the survey tract. The third belt comprises the entire tract beginning from a distance of about 40-45 miles from the crest of the Sahyadris and extending upto, and beyond, the point where the Ghod meets the Bhima river. Rainfall from place to place in this belt may vary from 25" to 10". Similarly, the rainfall in a given place may also vary to the same extent from year to year. The distribution of rainfall from month to month is uncertain and erratic. Unlike the first two belts, it largely depends upon late north-east rains or returning monsoons. The third belt constitutes the notorious famine tract, referred to in this report as the Desh, and comprises all the remaining zones from the sixth onwards.

The climate of the Maval during the rainy season from June to October is very chill and damp. The sub-tropical evergreen forests keep down the temperature in the rest of the year, making the belt somewhat malarious. In the Deshi Maval the elevation above sea-level and the prevalence of westerly breezes make the climate dry and invigorating. The air is lighter, the cold more bracing and the heat less oppressive than in most parts of western India. The Desh belt has dry and hot, but healthy, climate owing to very scanty rainfall. The mean temperature range increases progressively from west to east.

**Rivers and Streams:**—Heavy and unfailing rainfall in the upper reaches of the valley gives rise to numerous streams

and rivers. The Ghod, the main river after which the valley is named, rises near Ahupe on the crest of the Sahyadris at an altitude of over 3,300 feet above sea-level about 9 miles to the north of Bhimashankar on the crest. Its course is meandering and picturesque near the Ghats, the streams dashing over the rocky ledges or lying in long still pools between woody banks. A steep course in the southern direction brings the Ghod 8 miles downwards to Mahalunge where Gohiri meets it. Gohiri, a rivulet 6 miles in length, starts from Nigdale on the Bhimashankar-Pokhari spur but drains the water of the southern spur of the Ghod basin. A few miles further down-stream another river, Bubra, joins the Ghod at Vachape. The Bubra, taking its origin from Hatwij (3,358 ft.), north of Asane on the Durg Killa spur, is about 10 miles long and carries the water of the Borghar nalla on the left and Pokhari nalla on its right bank. Within a distance of about 14 miles upto Vachape the Ghod river records a bed-fall of about 1,300 feet from its source. From Ambegaon it runs first to the south and then to the south-east carrying the waters of a large number of nallas or streams joining it on the left and right banks, such as, Gangapur nalla, Amondi nalla, Sal nalla, Girwali nalla, Mahalunge nalla, Manchar nalla. After flowing for about 45 miles, the Ghod is joined by the Mina on its left bank at Pargaon. Hereafter, the Ghod valley changes into level plains of Kavatha, about 10 miles wide, through which it flows over a rocky bed between bare banks. About 25 miles down-stream from Pargaon, it receives the Kukdi at Annapur near Shirur. With a winding course, the Ghod keeps, on the whole, south-east along the Poona-Ahmednagar boundary and falls into the Bhima River at Sangavi from the north, the river bed height at the point being 1,680 feet above sea-level. Sangavi is about 20 miles down-stream of Annapur.

**Water Resources of the Basin :—** The Ghod river as well as many of its tributaries have extensive ghat-catchments with heavy and assured rainfall. During its course of about 90 miles large number of nallas or river streams directly fall into it from either of the banks, draining down the rain-water falling over their respective catchment areas. River

gauge stations were established by Government at Nirgudsar and Kathapur on the river from the year 1906 to 1926 but were then discontinued till 1946. From the year 1947, a river gauge station is again established at Kalamb at mile No. 41 of Poona-Nasik Road. The importance of collecting continuously primary data of run-off in all the ghat-fed rivers, just like that of rain gauges, cannot be overemphasised.

**Soils :—** In Maval near the crest of the Sahyadris, on account of heavy annual rainfall and the warm and humid climate, the disintegration of the trap finally results in giving what is known as lateritic red soils. These soils are neither very deep nor fertile but under controlled conditions can allow successful growth of a water-loving crop like paddy. Where the process of laterite formation is not complete intermediate types of soils with yellow or red tinge are formed which are used also for paddy cultivation. Large portions of this mountainous and rocky tract are under reserved forests under State management. Where the stand of the forest trees is good the soils formed are deep, absorbant and fertile. Where the stand is sparse or covered only by grass growth the soils are shallow, coarse and sandy and they can support only scrub jungle. Where organic matter is received from washings from forest area dark colour soils with medium clay are formed which can grow even rabi crops like wheat and gram. Slopes of hills with coarser but clayey soils are used for growing hill millets in rotation with long fallows.

In the second belt of Deshi Maval (transition tract) the types of soil found are either the medium black soil or light shallow soil with good underground drainage. These are formed by disintegration of the trap under moderate and well-distributed rainfall and their level character make them less liable to erosion. They are, therefore, more clayey and fertile and have a greater proportion of organic matter. The tract is favoured with good supply of underground water. Numerous wells are, therefore, found useful for raising a variety of irrigated crops, like potatoes, onions, peas, etc. and allow raising of both kharif and rabi crops.

In the Desh or eastern belt the soils are deep, medium and murmad (or mal) depending upon the degree of erosion that had taken place for years past. The deep black soil might have been formed either by the disintegration of the trap *in situ* and by its retention there on account of level character or by accumulations of soil material deposited as a result of erosion from higher levels. The medium black soils are formed by the partial removal of surface layer from the deep black soil; where the degree of erosion is very high the murmad soils are obtained. The deep and medium black soils are clayey and can hold and retain sufficient moisture to grow late or rabi crops of jowar, wheat etc. The lighter or murmad soils are capable of growing only kharif crops, which require frequent precipitation on account of their shallow character. But all the types of soils in this zone are capable of growing one or two bumper crops under irrigation.

It may, however, be pointed out that the soil types described above, as obtained in the different belts of the tract, are not to be found exclusively in one belt alone. One or more types may be found mixed up in any belt. Even in one village it is possible to come across two or three types side by side.

It may be useful to note that all these lands were classified at the time of the original survey of the talukas concerned. The classification indicates the degree of erosion to which the lands have been subjected. The depth of the soil is the most potent factor that is taken into account along with the colour, the slope, the presence of sand and lime and other factors. The best soil is classed as 16 annas and is capable of yielding a good crop under normal rainfall. As the soil depth decreases and the other ingredients increase the value of the land becomes lower and lower, such as 12 as., 8 as., 4 as. etc. Lands classified below 4 as. are practically worthless for cultivation of crops. Table No. 2 is compiled from the available data to indicate the anna valuation of the soils in the three belts. The best soil (16 annas) is assessed at a maximum rate for a particular group of villages lying in a soil-climate zone. The maximum rate for dry crops in the various groups of villages under study has varied from Re. 1/- to Rs. 2-8-0.

The maximum rate for garden (bagayat) crops varied from Rs. 2/- to Rs. 10-0-0 while that for the paddy crop from Rs. 5/- to Rs. 9/- per acre. But the average assessment actually paid per acre was far below these maximum rates. For example, the third belt of Desh has about 91,000 acres under cultivation. If all this land was classed as 16 annas it would have yielded about Rs. 1,80,000 as assessment; but actually it pays Rs. 57,700,\* giving an average rate per acre of 10 annas 2 pies only instead of Rs. 1-14-2. This shows the great deterioration (from annas 16 to annas five) or the impoverishment of the soil. The poverty of the soil influences its capacity to yield various crops that may be grown on it.

Against the background of common features of the Deccan plateau described in the previous chapter it will be seen that the Ghod valley selected for study is fairly representative in most respects.

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\* This includes a small area under bagayat crop which is assessed at higher rate.



**Table No. 1**

**Distribution of Total Rainfall at certain places in the Ghod Valley and the Total Rainy Days.**

Name of Place	Distance from the Sahyadris (Miles)	Rainfall in inches					Total Rain (inches)	No. of Rainy Days
		Early (1-1 to 10-4)	Anti-Monsoon (11-4 to 4-6)	Monsoon Kharif (5-6 to 14-8)	Monsoon Rabi (15-8 to 21-10)	Late Rains (22-10 to 31-12)		
Asane	5	...	...	57.07	29.88	0.10	87.05	...
Ambegaon	13	...	...	30.94	12.25	0.24	43.43	...
Ghodegaon	25	.13	1.68	18.79	7.94	1.91	30.45	51
Shirur	70	.30	1.62	9.03	8.41	2.65	22.01	36
Shrigonda	...	.34	1.71	7.95	9.44	2.15	21.59	34

**Table No. 2**  
**Anna Valuation of Soils by Belts and Zones**

Belts and Zones	Keerdasar or assessed Area (Acres)	Total amount of assessment Ra.	Average assessment per acre	Average Maximum assessment rate per acre	% of actual assessment rate to the Maximum rate
<b>Maval</b>					
Zone No. I	6575	1644- 8-3	0- 4- 0	1- 0- 0	25.0
Zone No. II	10307	4614- 8-0	0- 7- 2	1- 3- 0	30.0
<b>Total ...</b>	<b>16882</b>	<b>6259- 0-3</b>	<b>0- 5-11</b>	<b>1- 1- 10</b>	<b>33.1</b>
<b>Deshi Maval</b>					
Zone No. III	8244	6133- 6-3	0-11-10	1-13- 4	48.4
Zone No. IV	12722	15148-15-0	1- 3- 0	2- 4- 0	52.8
Zone No. V	11313	16800- 6-0	1- 7- 0	2- 8- 0	60.0
<b>Total ...</b>	<b>32279</b>	<b>38082-11-3</b>	<b>1- 2-10</b>	<b>2- 3- 1</b>	<b>54.2</b>
<b>Deshi</b>					
Zone No. VI	15993	19826-14-9	1- 3- 7	2- 4- 0	55.5
Zone No. VII	25543	15599-11-6	0- 9- 9	1-15- 0	31.4
Zone No. VIII	6960	2966-11-0	0- 6-10	1-13- 0	22.0
Zone No. IX	15760	6084- 1-0	0- 6- 2	1-12- 8	21.5
Zone No. X	26692	13234-13-6	0- 7-11	1-10- 0	30.7
<b>Total ...</b>	<b>90948</b>	<b>57712- 3-9</b>	<b>0-10- 2</b>	<b>1-14- 2</b>	<b>33.7</b>

## CHAPTER IV

### EXISTING AGRICULTURAL CONDITION IN GHOD VALLEY

**Zones and sample villages :—**As stated earlier, the Ghod basin has been empirically divided into 11 zones from west to east in order to facilitate as detailed a study as possible of the existing use or otherwise of the land and water resources obtaining in it. Though the length (west to east) of each zone (excepting the first which abuts on the Western Ghats) is the same, viz,  $5\frac{1}{2}$  miles, its breadth varies according to the distance between the northern and southern watersheds. These watersheds do not correspond to administrative boundaries of villages which have been taken as basis for the survey. But this does not materially affect the validity of the data presented, because the excluded areas of some inside villages near the watersheds would roughly compensate for included areas of some outside villages. We have used in this report the data of villages lying within the boundaries mentioned above. Again, the northern watershed could not serve as boundary of the zones below the points where Mina and Kukdi rivers fall into the Ghod. They have cut separate elongated valleys for themselves from the crest of the Ghats before their confluence and the Sub-Committee has had to decide whether to include these two sub-valleys of the Ghod in our survey or not. The considerations of time and cost involved in such a survey ruled out their inclusion. The northern boundaries of the zones concerned were, therefore, arbitrarily drawn on the map connecting the outside points in the Ghod watershed that was broken by the valleys of the Mina and the Kukdi. Another point that needs be mentioned here relates to the eleventh zone. This last zone presents two-fold difficulties. Stretching out into extensive and almost plain tract, it does not easily lend itself to be demarcated on all the three sides in terms of broad physiographical features. Still more important, this zone includes within its bounds the site of the new Ghod Bandhara (already under construction) which is expected to irrigate fairly large portions of its area. This

possibility of irrigation raises a host of socio-economic problems of far-reaching importance which merit special detailed study. It was, therefore, thought advisable to defer the study of these peculiar problems to a suitable future date and to drop this zone from the present survey. As a result, data for the first ten zones only will be presented in this report.

Subject to the peculiarities regarding the boundaries of the zones mentioned above, it may be said that the sample villages, selected with the help of the Statistician of the Gokhale Institute of Politics and Economics, are fairly representative of the tract. Table No. 3 shows the coverage of the sample in respect of the number of villages, gross area and population out of each zone. It will be seen from the table that about 30 per cent of the villages, covering 42.2 per cent of the gross area and about half of the population in the tract under survey are included in the sample, which may be considered as fairly large and representative. Though the percentage of sample villages is almost the same in the three belts, the percentages of gross area and population in the second belt are comparatively much higher than those in other two belts.

**Area of the sample villages:—** The total area of the 41 sample villages measures 1,93,687 acres or 305.3 square miles. The Maval and the Deshi Maval, the first two belts of assured rainfall, together account for 23 villages and about 41 per cent of the total area, while the remaining 59 per cent falls in the Desh belt with 18 villages. The average size of a village in the tract under survey was about 4,725 acres. Generally speaking, the villages in the first two belts were smaller in size than this average. A reference to Table No. 5 will bring out this fact very clearly. Besides, all this area of the sample villages was not assessed or keerdasar, much less cropped. Table No. 4 is prepared to show the assessed and non-assessed area and their respective proportions to the gross area. It will be seen from the table that roughly about three fourths of the total area in the sample survey tract was under assessment and classified as keerdasar. The proportion of the assessed to the non-assessed area in different belts and zones, however, varied to a large extent. The first zone in the Maval belt, with about 70 per cent

nakeerdasar land, stands out conspicuously. This higher percentage indicates the highly hilly and rugged character of the extensive forest and pasture land in that zone. Barring this exception, the assessed or keerdasar land in different zones varied from about 68% in the fourth zone to about 90% in the ninth zone and its proportion to the gross area shows a general increase as we go towards the east. As the character of the country changes from hilly to more or less plain the proportion of cultivable land generally goes on increasing.

All the assessed (keerdasar) cultivable land was not used for raising crops. More than three-fourths of the assessed cultivable land was found in normal years to be under crops at least once. This proportion varied from zone to zone. Less than one-third of the assessed land in the eighth zone was net-cropped, being the lowest of all, as against 90 per cent in some others. The proportion of the net-cropped area to gross area came to about 60 percent for the entire tract under survey, though it varied from about 12 per cent to about 80 percent in individual zones. Generally speaking, the proportion of the net-cropped area to both assessed (keerdasar) area and gross area increases as one proceeds from west to east as will be seen from Table No. 5. The proportion, however, varied from zone to zone according to the terrain, character of the soil, lie of the land or such other physical features. The favourableness or otherwise of the rainy season greatly influenced the extent of land that would actually be cropped in a particular year. It will be seen from Table No. 5 that only 10 per cent of the total cropped area was used for raising more than one crop. The proportion of the double cropped area, varying from zone to zone, went on increasing from the Maval to Desh belt. In Maval, for instance, hardly two per cent of the land was double-cropped in spite of assured rainfall of over 70 inches per annum. This can be attributed to paucity of moisture-retentive soils, fear of stray cattle and to loss of rabi season due to late varieties of kharif crops. The lack of proper arrangements to exploit the potential water resources is another important reason. Further, the actual proportion of the double cropped area to the gross area in any particular year would be determined by seasonal factors,

**Keerdasar land in sample villages:—**The assessed or keerdasar land, forming the bulk of the total area of the survey tract, is not all used for raising crops as shown earlier in this chapter. Portions of it are put to different uses and the classification in the year under review is shown in Table No. 6. The sub-head 'other' in the table is a composite group and includes (a) grazing land, (b) rotational fallow, (c) fallow and (d) reserve kuran etc. All these categories of land-use have been clubbed together for the sake of convenience. About one-fifth of the total assessed or keerdasar land in the entire survey tract fell in this composite group, though this proportion varied considerably in the different belts and zones. About 70 per cent of the land in the Maval, 30 per cent in the Deshi Maval and 8 per cent in the Desh belt falls in the 'other' non-cropped category, and its proportion to total keerdasar declines from west to east. Among the cropped land the jirayat or dry area stands out conspicuously, claiming about three-fourths of the total keerdasar land in the sample villages. The proportion of jirayat land goes on increasing from 23 per cent in the Maval to about 89 per cent in the Desh. As against this, the proportion of paddy lands goes on diminishing from the first to the third belt, so much so that the Desh has practically no lands falling in that category. The position in regard to bagayat or irrigated lands was quite different from this. The overall percentage of bagayat land is only 4.12 of the total keerdasar, ranging from 2.32 in the Maval belt to 6.84 in the Deshi Maval. In the Desh belt it is only 3.48.

**Size of the holding or unit of production:—** The available data, though unsatisfactory in some respects, go to show that there were 9,751 khatedars or landholders in the tract under survey and they held 1,25,280 acres of land. This works out at 11.8 acres per khatedar. In the Maval and the Deshi Maval belts the size of the cultivated holding is nearly equal (about 10 acres) whereas the size of the holding in the Desh belt is about 15 acres or 50 per cent higher. This may be due to rice cultivation in the Maval, irrigation farming in the Deshi Maval and jirayat cultivation in the Desh belt. But this overall picture fails to give a clearer idea about

the size of individual holdings. Table No. 8 is prepared to shed more light on this point. It would be interesting to note that half of the total khatedars or landholders have a holding of below 5 acres. This proportion varied from about 41 per cent in the Desh to 67 per cent in the Deshi Maval. Coming to the next group of 5 to 10 acre-holders it was seen that they formed about 17 per cent of the total khatedars in the survey tract. This proportion was the highest (20 per cent) in the Maval and the lowest (12.4 per cent) in the Deshi Maval belt, the Desh almost conforming to the overall average. It is a curious coincidence that in all the three belts the proportion of khatedars holding from above 10 acres to 15 acres was almost the same, viz. 12. Khatedars with holdings of more than 15 and less than 25 acres account for about 11 per cent. It may be noted that the percentage of the khatedars in this group is the lowest in the Deshi Maval viz. 5. Bigger holders than the previously mentioned groups constitute only 11 per cent for the whole tract.

The average area of over 11 acres held by a khatedar may not be found in a contiguous block but in small fragments scattered over different parts of the village. But the actual area cultivated by a khatedar may differ both in size and number of fragments from the area held by him under occupancy rights. But for want of reliable statistical data it is not possible to indicate the number and proportion of such small fragmented holdings in the tract under survey.

Before we pass on to other topics it will be of some interest to see what proportion the net cropped area bears to the population in the tract under survey. The tract under survey had a population of 69,991 and 1,15,912 net cropped acres. Assuming that all this land was equitably distributed among the entire population, the net cropped area that may fall to the share of each person comes to 1.6 acres inclusive of dry and wet land. But this proportion goes up to 2.33 acres if it is distributed among people depending upon agriculture. Table No. 7 is compiled to present data regarding population, net cropped area etc. for different belts and zones. The double cropped area, the actual acreage of which depends upon seasonal factors, is left out while working out the per capita cropped area,

This is because, unlike the net cropped area, it is uncertain and varying. The acreage per head of the population depending upon agriculture varies from belt to belt and from zone to zone in the same belt. It is the lowest viz. 1.44 acres in the Deshi Maval belt or 7.20 for an average family of 5 persons. The corresponding areas for the Maval belt are 1.91 and 9.55 acres. The per capita net cropped area for the Desh comes to 3.14 acres or say 16 acres for a family.

**Crops of the sample villages:—** The total area under different crops in the sample villages measured 1,11,422 acres in the year 1951 for which the figures were available. Out of this, 1,05,656 acres or 95.88 per cent of the total were sown with jirayat or dry crops and 5,766 acres or 4.12 per cent were under bagayat or irrigated crops.\* About 47 per cent of the total jirayat lands in the tract were used for kharif (monsoon) crops. This proportion of land under kharif crops ranged from 95 percent in the Maval, 78 percent in the Deshi Maval to about 37 percent in the Desh. About 53 per cent of the total cropped land in the tract was under rabi crops. The proportion of the land under rabi crops varied from 5 per cent in the first belt, about 22 in the second to 63 percent in the third belt of Desh. The jirayat crops in the tract have been classified under five broad groups, viz. cereals, pulses, oilseeds, condiments and fibres, as will be seen from Table No. 9. About 98,000 out of 1,05,000 acres i. e. 93 per cent of the total jirayat lands were under cereals ( mostly consisting of millets ) and pulses which are very often grown in mixtures. The percentage for the combined crops of cereals and pulses goes on increasing from about 84 in the Maval, 91 in the Deshi Maval to about 95 in the Desh. Of these, the proportion of cereals goes on increasing, and that of pulses decreasing, as one moves down from the Maval to the Desh belt. Only 6,770 acres were under oilseeds and constituted about 6.5 per cent of the total jirayat lands. This proportion goes on falling from

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\*The bagayat crops, as distinguished from jirayat or dry crops, are the crops which are not grown on rain water alone but which have been upto maturity or to save them from parching consequent upon a long dry spell. They also include crops raised mainly on irrigation water.



the Maval belt in the west to the Desh in the east. The acreages under condiments and fibres were negligible and were sown only in the kharif season. 93 acres of the condiment group were under chillies and the remaining one under corriander. Out of the 122 acres under fibres, 31 acres were under ambadi and the remaining under cotton, both of which crops were grown in the Desh belt.

The jirayat crop-groups of cereals, pulses and oilseeds have been further analysed, showing the relative importance and position of individual crops constituting the respective groups, in Table Nos. 10, 11 and 12. These tables, read together, disclose the following.

**The Maval:—** Rice is the important crop of the belt. Jiresal, Tambkudai and Raibhog are some of the early maturing (*halve*) varieties while Ambe Mohor was the principal variety of late maturing (*garve*) paddy normally harvested in the month of Kartik after Diwali. Coarse hill millets (classified under the heading 'others') occupied about 70 per cent of the total land under cereals in the belt and included sava, nachani, wari, bhagli and kodra. They were grown by following what is known as *kumari* or shifting cultivation. In this system of cultivation, the land is prepared by cutting down the scrub jungle and burning it *in situ* and thus exposing it to erosion by heavy showers of rain during the monsoon. The normal practice followed in the belt was to grow nachani or nagli in the first year, sava in the second and khorasani (nigerseed) in the third year by which time most of the loose soil is washed away which makes it compulsory to allow the land rest for a period varying from 6 to 8 years. The *kumari* lands, situated on the slopes of hills, were prepared for cultivation by common endeavours of the people, locally known as the system of *padkai*.\* Variety of pulses (hulga, math and udid being prominent) are also grown mostly in combination with other crops. Personal enquiries showed that the average yield of paddy amounted to about 1200 lbs. per acre which usually

\* In this system about 30 persons prepare one acre of *kumari* land in a day. On this day they are given by the owner of the land free meal and headload of firewood.

gives 800 lbs. of husked rice. The average yield of nachani and wari per acre was of the order of 400 to 500 lbs. according to the lie of the land. Sava and khorasani, however, yielded about 200 lbs. per acre. All kinds of legumes together occupied about 900 acres of land.

**The Deshi Maval ( Transition Tract ):**—Bajri is the most important of all the cereal crops in this belt. Its average yield per acre amounted to less than 300 lbs. Pulses were grown in combination or in separate strips with bajri in the proportion of about 1:7. Hulga, math and udid being prominent among them. Gram held the highest position amongst the pulses in regard to acreage and was grown as a rabi crop. Groundnut and nigerseed were the oilseeds produced in the belt and they shared among themselves almost the entire acreage in equal proportions, with an almost negligible sprinkling of sesamum. The crop of shalu or rabi jowar, which claims over 20 per cent of the total acreage for this belt, was raised to provide grain for the family and fodder for the cattle. Rice claimed about 4 per cent of the total cereal acreage in the belt, mostly in the western part.

**The Desh:**—Shalu was the principal crop of the Desh belt as evidenced by the high percentage, viz. 66, of the total cereal acreage in the belt. The average yield of shalu was about 240 lbs. per acre. Bajri occupied the second place in regard to acreage, grown in combination with various pulses—hulga, math, mug and tur etc., all of which formed about 20 per cent of the acreage under this mixture. It may be noted that the areas under jowar and bajri taken together are usually fairly constant but the proportions of the two vary according to the seasonableness of the rainfall. With early rains properly set in there is a tendency for bajri mixtures to occupy larger acreage but when the monsoons are delayed and late rains are received these along with deep and medium black soils are sown with shalu or rabi jowar with safflower or kardi as its subsidiary oilseed crop. About 2 per cent of the total cereal area was under wheat in the year for which the figures were available. The average yield of wheat per acre varied from about 240 to 280 lbs. Among the rabi crops, gram was the only important

pulse crop usually grown as a second crop after bajri or as a rotation crop with shalu. The gram yield per acre amounted to 200 lbs. The main purpose of this pulse crop is to recuperate the land exhausted by the cereals as far as the nitrogen content of the soil is concerned.

**Bagayat Crops :—**The total acreage under bagayat crops is analysed in Table No. 13. The following deductions can be drawn from careful scrutiny of the figures given in the table.

**The Maval :—**It is peculiar that in spite of heavy rainfall of over 70 inches the number of wells found in this belt is insignificant. It is computed that there is only one well met with in one square mile. An area of about 400 acres was found irrigated. This irrigation facility supplies one or two seasonal waterings to save cereal and pulse crops in an unfavourable season.

**The Deshi Maval :—**There are over 2,200 acres under bagayat crops which gives an average of 6.84 per cent of the total keerdasar land in the belt. Of these, 1,558 acres or about 71 per cent were under regular garden crops and the remaining 29 per cent under cereals and pulses which are given a limited number of waterings. Restricting ourselves to the garden crops alone, it will be seen that 1,031 acres or about 47 per cent of the total acreage under bagayat in this belt were under potatoes alone, and a small area of 61 acres was under leafy and other vegetables. This crop lends considerable importance to this belt in the whole of the Bombay State and involves transactions of several lakhs of rupees by way of purchase, transport and sale of seed and fertilizers which are required in large quantities. Potato crop requires a high seed rate, viz. 1200 lbs. per acre, and yields 5-6 times the seed used. It is mainly a rabi crop except in few villages situated on Satgaon Pathar range where it is grown in kharif season. It is interesting to note that most of this crop was raised by lifting water from wells for irrigation. The number of wells in this belt was comparatively large i. e. about 20 per square mile. The potato crop, which is manured heavily, is usually followed by the important cereal crop of bajri, which is benefited by the residual manure and consequently gives about 1200 lbs. per acre of bajri grain.

All this results in establishing a good husbandry and more stable economy. Money crops like sugarcane and citrus fruit (mosambi) occupied 182 and 181 acres respectively.

**The Desh :—**The total acreage under bagayat crops in this belt was 3,166 acres, which works out at 3.48 percent of the total keerdasar or assessed area. About 47 percent of it was under cereals and pulses and the remaining 53 per cent under garden crops. 513 acres were under the potato crop, which were mostly found in the western zones of the belt. The agricultural economy of the zones was almost the same as that mentioned in the second belt. Equally important was the crop of sugarcane which occupied an area of 387 acres interspersed in the potato crop. Vegetables and condiments which included mostly chillies and onions together formed quite an important group accounting for about 16 per cent of the irrigated land in the belt and contributed to the higher standard of agricultural practice. Citrus (mosambi) gardens claimed about 6 per cent of the irrigated area and being a perennial orchard was a good source of income to the cultivator.

**Livestock and Agricultural implements in the survey tract :—**The motive power required for carrying on the agricultural industry is still derived from cattle. This is amply borne by the fact that not a single tractor or other machine was known to have operated in the survey tract. The number of working cattle, however, seems to be adequate as seen from the Table Nos. 14, 15 and 16. Area per pair of working cattle amounts to 13.17 acres in the Maval, 9.33 acres in the Deshi Maval and 19.37 acres in the Desh belt. A large area under shifting cultivation accounts for the greater proportion of cultivated area per pair of cattle in the Maval belt. The intensive nature of agriculture in the Deshi Maval explains the smaller area per pair of cattle, while the dry crop cultivation is responsible for a comparatively larger area per pair of cattle in the Desh. There is no one special breed of cattle that is reared in the tract. The cattle population is mongrel. In the Maval belt the number of young stock is comparatively larger. It is understood that grown up calves are taken to the fair at Mhase below Ghats in the Konkan for sale every

year. The cows and buffaloes are not known to produce surplus quantities of milk for sale and are not, therefore, of much economic importance.

In addition to the working and milch cattle there are non-useful cattle (on account of bad condition) as well as horses, sheeps and goats which are required to be fed on the available land. On an average an area of two acres of cultivated land has to feed one animal which cannot be considered as giving adequate feed. Our enquiries revealed that in the eastern belt the fodder supply becomes so inadequate in early monsoon months that the agriculturists are required to send for 2-3 months part of their cattle on payment of a small amount of Rs. 10/- per head to the westernmost belt where some grazing and water supply are then available.

It was found that several local cultivators in the Desh belt kept a few heads of sheep and goat as a subsidiary occupation. This provided them some milk for the family and manure to their fields. In other tracts Dhangars or shephards as a class are carrying sheep rearing as an independent vocation and derive their income from sale of young stock for mutton and by sale of fleece.

The agricultural implements in use do not show any special feature both in regard to quality and numbers. Table No. 16 shows that the total number of ploughs in use was 5,587 but the number of cultivating families was about 9,000, which means that there were several cultivators without even a wooden plough. There were in all 1,243 iron ploughs, working mostly in the Deshi Maval and the Desh belt. The bullock carts in the 41 sample villages numbered 1,677. The Maval belt had no carts at all due to lack of roads. The progressive nature of the cultivators in the Deshi Maval and the Desh belt is indicated by the presence of not less than 35 oil engines used for lifting water for irrigation.

**Population of Sample Villages :—**The total population of the 41 sample villages numbered about 70,000, the average population per village working out at about 1,700. The villages in the Maval were smaller in size than the average as will be seen from Table No. 18. The average population of a village

in that belt was 425. Only in this belt there were villages with a population of below 100 souls. The villages in the Deshi Maval and the Desh belt were comparatively larger in size than those in the Maval, the average population per village being 3,037 and 1,893 respectively. The villages, thus being unequal in size, do not convey a clear idea as to how thickly or sparsely the different belts were actually populated. Table No. 17 is compiled to show the density of population per square mile and also the average size of a household. Taking the tract as a whole, the density of population per square mile works out at 229.2. It may be of some interest to note that the density of population for the Ambegaon taluka and for the Poona district is recorded to be 246 and 324 respectively. On this background, the density of population of the Deshi Maval belt (409.9) stands out conspicuously, generally indicating the assured character of the means of subsistence in it. The average size of the household in that belt, viz, 5.6 was also bigger than that in the Maval (4.7) or in the Desh (5.2).

**Agricultural classes :—** The population in the sample villages was engaged in different occupations. We have freely drawn upon the District Census Hand Books for Poona and Ahmednagar for the year 1951 in preparing Table No. 19 to present the occupational classification of this population. Agriculture still happens to be by far the most important occupation of about 74 per cent of the people and the remaining 26 per cent depend upon non-agricultural occupations for their subsistence. Peasant proprietors formed the bulk of this population, varying from about 96 per cent in the Maval, 85 per cent in the Deshi Maval to 87 per cent in the Desh belt. The proportion of tenants, landless labourers and rent receivers in the Maval was almost negligible. The proportions of tenants and landless labourers were greater in the Deshi Maval than in the other two belts. The rent receivers in the Desh formed only 5.9 percent and 5.4 percent in the Deshi Maval. It is surprising that the problems of tenancy and of rent receivers do not seem to be of any importance in the survey tract.

**Non-Agricultural classes :—**The non - agricultural classes

taken together formed 11 per cent, about 27 per cent and about 30 per cent of the total population in the respective belts of the Maval, Deshi Maval and Desh. The persons engaged in 'production other than cultivation' (mostly artisans and handicraftsmen) constituted the biggest single group. Commerce, transport, services and other sources absorbed the remaining non-agricultural population.

To sum up, the proportion of keerdasar (cultivable) to the gross area goes on increasing from west to east.

The average net-cropped area per family differs from belt to belt depending upon the kinds of crops grown, incidence of irrigation facility and quantity and distribution of rainfall.

In the first two belts the khariff crops predominate due to early rains. While in the third belt rabi crops occupy major areas as the rains are received from late north-east monsoons. Agriculture does not provide employment for more than half the year as most of the areas grow only one crop annually. The tract lends itself for growing a variety of dry and irrigated crops and fruits, the climate being favourable. The yields of rain-fed crops are generally poor as the rainfall is inadequate and uncertain and the soils poor.

The number of work-cattle is generally adequate. There is no pure breed of cattle reared and the conditions for feeding the cattle are inadequate and unsatisfactory.

The chief occupation of the people in the tract is agriculture and the density of population is governed by the extent of agricultural productivity.

Table No. 3

Table showing comparative figures of Area and Population  
in the zones and in sample villages

Belts and Zones	Group Total			Sample Villages		
	No. of villages	Gross area (Acres)	Population	No. of villages	Gross area (Acres)	Population
<b>Maval</b>						
Zone No. I	18	42483	3515	7	21272	1005
Zone No. II	25	35248	9968	6	12155	4530
<b>Total</b> ...	<b>43</b>	<b>77731</b>	<b>13483</b>	<b>13</b>	<b>34427</b>	<b>5535</b>
Percentage of sample to total	...	...	...	30.2	44.3	41.1
<b>Deshi Maval</b>						
Zone No. III	13	27470	10507	3	11358	5101
Zone No. IV	6	25536	13199	4	18726	10481
Zone No. V	14	38423	27817	3	15457	14792
<b>Total</b> ...	<b>33</b>	<b>91429</b>	<b>51523</b>	<b>10</b>	<b>45541</b>	<b>30374</b>
Percentage of sample to total	...	...	...	30.3	49.8	59.0
<b>Desh</b>						
Zone No. VI	16	68924	26162	4	22916	10434
Zone No. VII	12	50707	13195	6	33792	8716
Zone No. VIII	12	55417	11035	2	8430	925
Zone No. IX	14	49147	11423	3	17538	3752
Zone No. X	10	65133	18754	3	31045	11052
<b>Total</b> ...	<b>64</b>	<b>289328</b>	<b>80569</b>	<b>18</b>	<b>13721</b>	<b>34879</b>
Percentage of sample to total	...	...	...	28.1	39.3	43.3
<b>Grand Total</b> ...	<b>140</b>	<b>458488</b>	<b>145575</b>	<b>41</b>	<b>93689</b>	<b>70788</b>
<b>Overall percentage</b>	...	...	...	<b>29.3</b>	<b>42.2</b>	<b>48.6</b>



Table No. 4

Classification of Gross area into Keerdasar and Nakeerdasar  
in sample villages by Belts and Zones

Belts and Zones	Gross Area	Keerdasar		Nakeerdasar	
		Area in acres	% to gross area	Area in acres	% to gross area
<b>Maval</b>					
Zone No. I	21272	6575	30.91	14697	69.09
Zone No. II	13153	10307	78.36	2846	21.64
<b>Total for 13 villages</b>	<b>34425</b>	<b>16882</b>	<b>49.04</b>	<b>17543</b>	<b>50.96</b>
<b>Average</b>	<b>2648</b>	<b>1299</b>	<b>...</b>	<b>1349</b>	<b>...</b>
<b>Deshi Maval</b>					
Zone No. III	11358	8244	72.58	3114	27.42
Zone No. IV	18726	12722	67.94	6004	32.06
Zone No. V	15457	11313	73.19	4144	26.81
<b>Total for 10 villages</b>	<b>45541</b>	<b>32279</b>	<b>70.88</b>	<b>13262</b>	<b>29.12</b>
<b>Average</b>	<b>4554</b>	<b>3228</b>	<b>...</b>	<b>1326</b>	<b>...</b>
<b>Deah</b>					
Zone No. VI	22916	15993	69.79	6923	30.21
Zone No. VII	33793	25543	75.59	8249	24.41
Zone No. VIII	8430	6960	82.56	1470	17.44
Zone No. IX	17538	15760	89.86	1778	10.14
Zone No. X	31045	26692	85.98	4353	14.02
<b>Total for 18 villages</b>	<b>113721</b>	<b>90948</b>	<b>79.97</b>	<b>22773</b>	<b>20.03</b>
<b>Average</b>	<b>6318</b>	<b>5053</b>	<b>...</b>	<b>1265</b>	<b>...</b>
<b>Grand Total</b>	<b>193687</b>	<b>140109</b>	<b>72.34</b>	<b>53718</b>	<b>27.66</b>
<b>Overall average</b>	<b>4724</b>	<b>3428</b>	<b>...</b>	<b>1296</b>	<b>...</b>

Table No. 5

Percentage of cropped area to Gross and Keerdasar area in sample villages by Belts and Zones

Belts and Zones	No. of villages	Gross area (Acres)	Cropped area			% of Net cropped to		Average area per villages	
			Net (Acres)	Double (Acres)	Total (Acres)	gross area	Keer-dasar area	Gross	Net cropped
<b>Maval</b>									
No. I	7	21272	2491	5	2496	11.71	35.9	3039	356
No. II	6	13153	7612	177	7789	57.87	73.8	2192	1269
Total ...	13	34425	10103	182	10285	29.35	60.0	2648	777
Percentage	...	...	98.23	1.77	100%	...	...	...	...
<b>Deshi Maval</b>									
No. III	3	11358	3558	194	3752	31.33	44.0	3786	1186
No. IV	4	18726	14993	1384	16377	80.07	90.0	4681	3748
No. V.	3	15457	10092	800	10892	65.29	90.00	5152	3364
Total ...	10	45541	28643	2378	31021	62.89	82.3	4554	2864
Percentage	...	...	92.33	7.67	100%	...	...	...	...
<b>Desh</b>									
No. VI	4	22916	13070	1280	14350	57.03	81.0	5729	3267
No. VII	6	33792	24177	2063	26240	71.55	94.0	5632	4029
No. VIII	2	8430	2069	607	2676	24.54	30.0	4215	1034
No. IX	3	17538	13380	2620	16000	76.29	85.0	5846	4460
No. X	3	31045	24470	3157	27627	78.82	91.0	10348	8156
Total ...	18	113721	77166	9727	86893	67.86	85.0	6318	4287
Percentage	...	...	88.81	11.19	100%	...	...	...	...
Overall Percentage	...	...	90.41	9.59	100%	...	...	...	...
Grand Total...	41	193687	115912	12287	128199	59.85	81.0	4724	2827

Table No. 6

Classification of Keerdasar land in sample villages  
by Belts and Zones

Belts and Zones	Acreage under Keerdasar				Total Keerdasar
	Jirayat	Bagayat	Paddy	Other	
<b>Maval</b>					
Zone No. I	765	...	228	5582	6575
Zone No. II	3090	391	593	6233	10307
<b>Total</b>	<b>3855</b>	<b>391</b>	<b>821</b>	<b>11815</b>	<b>16882</b>
<b>Percentage</b>	<b>22.83</b>	<b>2.32</b>	<b>4.86</b>	<b>69.99</b>	<b>100</b>
<b>Desbi Maval</b>					
Zone No. III	2862	508	492	4382	8244
Zone No. IV	8715	508	81	3418	12722
Zone No. V	8123	1193	3	1994	11313
<b>Total</b>	<b>19700</b>	<b>2209</b>	<b>576</b>	<b>9794</b>	<b>32279</b>
<b>Percentage</b>	<b>61.04</b>	<b>6.84</b>	<b>1.78</b>	<b>30.34</b>	<b>100</b>
<b>Desb</b>					
Zone No. VI	12051	885	143	2915	15993
Zone No. VII	24190	1034	6	313	25543
Zone No. VIII	5959	52	1	948	6960
Zone No. IX	15272	303	...	185	15760
Zone No. X	23076	892	7	2717	26692
<b>Total</b>	<b>80548</b>	<b>3166</b>	<b>156</b>	<b>7078</b>	<b>90948</b>
<b>Percentage</b>	<b>88.57</b>	<b>3.48</b>	<b>0.17</b>	<b>7.78</b>	<b>100</b>
<b>Grand Total</b>	<b>104103</b>	<b>5766</b>	<b>1153</b>	<b>28687</b>	<b>140109</b>
<b>Overall percentage</b>	<b>74.30</b>	<b>4.12</b>	<b>1.11</b>	<b>20.47</b>	<b>100</b>

Other Keerdasar includes (a) grazing land (b) rotational fallow (c) fallow and (d) reserve kuran.

**Table No. 7**  
Table showing Population and per capita cropped area  
by Belts and Zones

Belts and Zones	Total Population	Net cropped area (Acres)	Population dependent on Agri.	Percentage	Per capita cropped area.
<b>Maval</b>					
Zone No. I	1005	2491	996	90.1	2.50
Zone No. II	4530	7612	4279	94.5	1.78
<b>Total</b>	<b>5535</b>	<b>10103</b>	<b>5275</b>	<b>...</b>	<b>1.91</b>
<b>Percentage</b>	<b>100%</b>	<b>...</b>	<b>...</b>	<b>96.36</b>	<b>...</b>
<b>Deshi Maval</b>					
Zone No. III	5101	3558	4395	86.2	0.81
Zone No. IV	10481	14993	6289	60.0	2.38
Zone No. V	14792	10092	9234	62.4	1.09
<b>Total</b>	<b>30374</b>	<b>28643</b>	<b>19918</b>	<b>...</b>	<b>1.44</b>
<b>Percentage</b>	<b>100%</b>	<b>...</b>	<b>...</b>	<b>68.94</b>	<b>...</b>
<b>Desh</b>					
Zone No. VI	10434	13070	8748	83.8	1.49
Zone No. VII	8716	24177	6734	77.3	3.59
Zone No. VIII	1106	2069	786	85.0	2.63
Zone No. IX	3707	13380	3211	85.6	4.17
Zone No. X	10119	24470	5064	45.8	4.84
<b>Total</b>	<b>34082</b>	<b>77166</b>	<b>24543</b>	<b>...</b>	<b>3.14</b>
<b>Percentage</b>	<b>100%</b>	<b>...</b>	<b>...</b>	<b>73.53</b>	<b>...</b>
<b>Grand Total</b>	<b>69991</b>	<b>115912</b>	<b>49736</b>	<b>...</b>	<b>2.33</b>
<b>Overall percentage</b>	<b>100%</b>	<b>...</b>	<b>...</b>	<b>71.42</b>	<b>...</b>

Table No. 8

Classification of Landholders in sample villages according to area held by them and by Belts and Zones

Belts and Zone	Classification of Holders according to their area								Assessed area (acres)
	Below 5 Acres	5 to 10 acres	10 to 15 acres	15 to 25 acres	25 to 50 acres	50 to 100 acres	Over 100 acres	Total	
<b>Maval</b>									
No. I	128	97	68	85	37	16	1	432	6575
No. II	633	224	124	118	60	3	...	1162	10307
<b>Total.</b>	<b>761</b>	<b>321</b>	<b>192</b>	<b>203</b>	<b>97</b>	<b>19</b>	<b>1</b>	<b>1594</b>	<b>16882</b>
<b>Percentage</b>	<b>47.70</b>	<b>20.14</b>	<b>12.04</b>	<b>12.73</b>	<b>6.08</b>	<b>1.25</b>	<b>0.06</b>	<b>100%</b>	<b>106</b>
<b>Deshi Maval</b>									
No. III	267	100	69	33	12	9	1	491	8244
No. IV	678	269	...	74	17	9	1	1048	12722
No. V†	1046	...	285	52	32	5	...	1420	6879
<b>Total</b>	<b>1991</b>	<b>369</b>	<b>354</b>	<b>159</b>	<b>61</b>	<b>23</b>	<b>2</b>	<b>2959</b>	<b>27845</b>
<b>Percentage</b>	<b>67.20</b>	<b>12.43</b>	<b>11.90</b>	<b>5.20</b>	<b>2.51</b>	<b>0.70</b>	<b>0.06</b>	<b>100%</b>	<b>9.4</b>
<b>Deshi</b>									
No. VI	919	248	289	117	148	7	2	1730	15993
No. VII*	396	86	142	128	79	59	7	897	15148
No. VIII	56	55	59	43	47	3	...	263	6960
No. IX	215	213	78	155	144	52	12	869	15760
No. X	520	334	45	259	218	52	11	1439	26692
<b>Total</b>	<b>2106</b>	<b>936</b>	<b>613</b>	<b>702</b>	<b>636</b>	<b>173</b>	<b>32</b>	<b>5198</b>	<b>80553</b>
<b>Percentage</b>	<b>40.52</b>	<b>18.03</b>	<b>11.79</b>	<b>13.50</b>	<b>12.23</b>	<b>3.32</b>	<b>0.61</b>	<b>100%</b>	<b>15.5</b>
<b>Grand Total</b>	<b>4858</b>	<b>1626</b>	<b>1159</b>	<b>1064</b>	<b>794</b>	<b>215</b>	<b>35</b>	<b>9751</b>	<b>125280</b>
<b>Overall percentage</b>	<b>42.82</b>	<b>16.68</b>	<b>11.90</b>	<b>10.91</b>	<b>8.14</b>	<b>2.20</b>	<b>0.35</b>	<b>100%</b>	<b>11.8</b>

† Information is for two instead of three villages in the zone.

\* The data relates to three out of six sample villages in the zone.

Table No. 9

Classification of acreage under Jirayat crop-groups in sample villages by seasons and Belts and Zones.

Belts and Zones	Acreage under Jirayat Crops Groups															
	Kharif Season						Rabi Season				Total					
	Ce.	P	O	CO	F	Total	Ce.	P	O	Total	Ce.	P	O	CO	F	Total
<b>Maval</b>																
Zone No. I	785	80	116	...	...	981	11	1	...	12	796	81	116	...	...	993
Zone No. II	2052	757	647	...	...	3456	199	28	...	227	2251	785	647	...	...	3683
<b>Total</b>	<b>2837</b>	<b>837</b>	<b>763</b>	<b>...</b>	<b>...</b>	<b>4437</b>	<b>210</b>	<b>29</b>	<b>...</b>	<b>239</b>	<b>3047</b>	<b>866</b>	<b>763</b>	<b>...</b>	<b>...</b>	<b>4676</b>
<b>Percentage</b>	63.94 60.67	18.86 17.90	17.20 16.32	...	...	100% 94.89	37.87 4.49	12.13 0.62	...	100% 5.11	65.16 ...	18.52 ...	16.32 ...	...	...	100%
<b>Deshi Maval</b>																
Zone No. III	2044	241	934	...	...	3219	107	28	...	135	2151	269	934	...	...	3354
Zone No. IV	4997	968	727	89	...	6781	1297	718	...	2015	6294	1686	727	89	...	8796
Zone No. V	5361	444	23	1	...	5829	2147	150	...	2297	7508	594	23	1	...	8126
<b>Total</b>	<b>12402</b>	<b>1653</b>	<b>1684</b>	<b>90</b>	<b>...</b>	<b>15829</b>	<b>3351</b>	<b>896</b>	<b>...</b>	<b>4447</b>	<b>15953</b>	<b>2549</b>	<b>1684</b>	<b>90</b>	<b>...</b>	<b>20976</b>
<b>Percentage</b>	78.35 61.17	10.44 8.15	10.64 8.31	0.57 0.44	...	100% 78.07	79.85 17.51	20.15 4.42	...	100% 21.93	78.68 ...	12.57 ...	8.31 ...	0.44 ...	...	100%

1-6

Table No. 9—(Continued)

Belts and Zones	Acreage under Jirayat Crops Groups															
	Kharif Season						Rabi Season				Total					
	Ce.	P	O	CO	F	Total	Ce.	P	O	Total	Ce.	P	O	CO	F	Total
<b>Desh</b>																
Zone No. VI	5712	807	360	...	1	6880	5269	42	2	5313	10981	849	362	...	1	12193
Zone No. VII	7581	1293	660	4	...	9538	13731	814	113	14658	21312	2107	773	4	...	24196
Zone No. VIII	899	339	34	...	89	1361	4240	...	359	4599	5139	339	393	...	89	5960
Zone No. IX	4239	681	197	...	30	5147	9257	...	868	10125	13496	681	1065	...	30	15272
Zone No. X	4672	2029	51	...	2	6754	14650	...	1679	16329	19322	2029	1730	...	2	23083
<b>Total</b>	<b>23103</b>	<b>5149</b>	<b>1302</b>	<b>4</b>	<b>122</b>	<b>29680</b>	<b>47147</b>	<b>856</b>	<b>3021</b>	<b>51024</b>	<b>70250</b>	<b>6005</b>	<b>4323</b>	<b>4</b>	<b>122</b>	<b>80704</b>
<b>Percentage</b>	<b>77.84</b>	<b>17.35</b>	<b>4.39</b>	<b>0.01</b>	<b>0.41</b>	<b>100%</b>	<b>92.40</b>	<b>1.68</b>	<b>5.92</b>	<b>100%</b>	<b>87.05</b>	<b>7.44</b>	<b>5.36</b>	<b>0.04</b>	<b>0.15</b>	<b>...</b>
	20.63	6.38	1.62	0.06	0.15	36.78	58.42	1.06	3.74	63.22	...	...	...	...	...	100%
<b>Grand Total</b>	<b>38342</b>	<b>7639</b>	<b>3749</b>	<b>94</b>	<b>122</b>	<b>49946</b>	<b>50908</b>	<b>1781</b>	<b>3021</b>	<b>55710</b>	<b>89250</b>	<b>9420</b>	<b>6770</b>	<b>94</b>	<b>122</b>	<b>105656</b>
<b>Overall percentage</b>	<b>76.77</b>	<b>15.29</b>	<b>7.51</b>	<b>0.19</b>	<b>0.24</b>	<b>100%</b>	<b>91.38</b>	<b>3.20</b>	<b>5.42</b>	<b>100%</b>	<b>...</b>	<b>...</b>	<b>...</b>	<b>...</b>	<b>...</b>	<b>...</b>
	36.29	7.23	3.55	0.09	0.11	47.27	48.18	1.69	2.86	52.73	84.47	8.92	6.41	0.09	0.11	100%

Ce = Cereals; P = Pulses; O = Oilseeds; Co = Condiments; F = Fibres

Co — Out of 94 acres only one is under corriander and the rest under ohillies.

F — Out of 122 acres, 31 are under Ambadi and the remaining 91 acres under cotton.

Table No. 10.

Classification of acreage under Jirayat Cereal crops in sample villages by seasons and according to Belts and Zones

Belts and Zones	Acreage under Cereal Jirayat crops									Grand Total
	Kharif Season						Rabi Season			
	Rice	Bajri	Maize	Jowar	Others	Total	Wheat	Jowar	Total	
<b>Maval</b>										
No. I	228	...	...	...	557	785	11	...	11	796
No. II	593	66	1	...	1392	2052	88	111	199	2251
<b>Total</b>	<b>821</b>	<b>66</b>	<b>1</b>	<b>...</b>	<b>1949</b>	<b>2837</b>	<b>99</b>	<b>111</b>	<b>210</b>	<b>3047</b>
<b>Percentage</b>	<b>28.94</b> <b>26.95</b>	<b>2.33</b> <b>2.17</b>	<b>0.03</b> <b>0.03</b>	<b>...</b> <b>...</b>	<b>68.70</b> <b>63.96</b>	<b>100</b> <b>93.11</b>	<b>47.14</b> <b>3.25</b>	<b>52.86</b> <b>3.64</b>	<b>100</b> <b>6.89</b>	<b>100</b> <b>100</b>
<b>Deshi Maval</b>										
No. III	492	1197	4	...	351	2044	...	107	107	2151
No. IV	81	4903	...	...	13	4997	73	1224	1297	6294
No. V	3	5358	...	...	...	5361	69	2078	2147	7508
<b>Total</b>	<b>576</b>	<b>11458</b>	<b>4</b>	<b>...</b>	<b>364</b>	<b>12402</b>	<b>142</b>	<b>3409</b>	<b>3551</b>	<b>15953</b>
<b>Percentage</b>	<b>4.64</b> <b>3.61</b>	<b>92.39</b> <b>71.82</b>	<b>0.03</b> <b>0.03</b>	<b>...</b> <b>...</b>	<b>2.94</b> <b>2.28</b>	<b>100</b> <b>77.74</b>	<b>4.00</b> <b>0.89</b>	<b>96.00</b> <b>21.37</b>	<b>100</b> <b>22.26</b>	<b>100</b> <b>100</b>
<b>Desh</b>										
No. VI	142	5542	5	13	10	5712	812	4457	5269	10981
No. VII	6	6752	...	823	...	7581	189	1342	13731	21312
No. VIII	1	898	...	...	...	899	4	4236	4240	5139
No. IX	...	4238	1	...	...	4239	10	9247	9257	13496
No. X	7	4665	...	...	...	4672	102	14548	14650	19322
<b>Total</b>	<b>156</b>	<b>22095</b>	<b>6</b>	<b>836</b>	<b>10</b>	<b>23103</b>	<b>1117</b>	<b>46030</b>	<b>47147</b>	<b>70250</b>
<b>Percentage</b>	<b>0.67</b> <b>0.22</b>	<b>95.64</b> <b>31.46</b>	<b>0.03</b> <b>0.01</b>	<b>3.62</b> <b>1.19</b>	<b>0.04</b> <b>0.01</b>	<b>100</b> <b>32.89</b>	<b>2.37</b> <b>1.59</b>	<b>97.63</b> <b>65.52</b>	<b>100</b> <b>67.11</b>	<b>100</b> <b>100</b>
<b>Grand Total</b>	<b>1553</b>	<b>33619</b>	<b>11</b>	<b>836</b>	<b>2323</b>	<b>38342</b>	<b>1358</b>	<b>49550</b>	<b>50908</b>	<b>89250</b>
<b>Overall Percentage</b>	<b>4.05</b> <b>1.74</b>	<b>87.68</b> <b>37.67</b>	<b>0.03</b> <b>0.01</b>	<b>2.18</b> <b>0.94</b>	<b>6.06</b> <b>2.60</b>	<b>100</b> <b>42.96</b>	<b>2.67</b> <b>1.52</b>	<b>97.33</b> <b>55.52</b>	<b>100</b> <b>57.04</b>	<b>100</b> <b>100</b>

\* Others include (a) Sava (b) Nachani (c) Wari (d) Bhadli (e) Nagli (f) Kodra.



**Table No. 11**  
**Classification of acreage under Jirayat Pulses in sample villages by seasons**  
**and according to Belts and Zones.**

Belts and Zones	Acreage under Jirayat Pulses													Grand Total
	Kharif Seasons									Rabi Seasons				
	Tur	Udid	Math	Mug	Hulga	Watana	Chawli	Others	Total	Wal	Masur	Gram	Total	
<b>Maval</b>														
Zone No. I	40	12	...	...	28	...	...	...	80	1	...	...	1	81
Zone No. II	16	78	160	...	466	5	32	...	757	28	...	...	28	785
<b>Total</b>	<b>56</b>	<b>90</b>	<b>160</b>	<b>...</b>	<b>494</b>	<b>5</b>	<b>32</b>	<b>...</b>	<b>837</b>	<b>29</b>	<b>...</b>	<b>...</b>	<b>29</b>	<b>866</b>
<b>Percentage</b>	<b>6.69</b>	<b>10.75</b>	<b>19.12</b>	<b>...</b>	<b>59.02</b>	<b>0.60</b>	<b>3.82</b>	<b>...</b>	<b>100</b>	<b>100</b>	<b>...</b>	<b>...</b>	<b>100</b>	<b>...</b>
	6.47	10.38	184.8	...	57.04	0.58	3.70	...	96.65	3.35	...	...	3.35	...
<b>Deshi Maval</b>														
Zone No. III	19	33	4	2	163	18	2	...	241	28	...	...	28	269
Zone No. IV	108	157	206	15	414	6	48	14	968	23	...	695	718	1686
Zone No. V	11	2	284	8	46	7	5	81	444	6	...	144	150	594
<b>Total</b>	<b>138</b>	<b>192</b>	<b>494</b>	<b>25</b>	<b>623</b>	<b>31</b>	<b>55</b>	<b>95</b>	<b>1653</b>	<b>57</b>	<b>...</b>	<b>839</b>	<b>896</b>	<b>2549</b>
<b>Percentage.</b>	<b>8.35</b>	<b>11.61</b>	<b>29.89</b>	<b>1.51</b>	<b>37.69</b>	<b>1.87</b>	<b>3.33</b>	<b>5.75</b>	<b>100.00</b>	<b>6.36</b>	<b>...</b>	<b>93.64</b>	<b>100.0</b>	<b>...</b>
	5.41	7.53	19.38	0.98	24.44	1.22	2.16	3.73	64.85	2.24	...	32.91	35.15	100.00

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<b>Desh</b>														
Zone No. VI	75	86	330	18	281	17	...	...	807	2	...	40	42	849
Zone No. VII	46	3	713	52	409	...	30	40	1293	2	...	312	814	2107
Zone No. VIII	11	...	69	4	176	79	...	...	339	...	...	...	...	339
Zone No. IX	53	...	88	321	188	...	...	31	681	...	...	...	...	681
Zone No. X	206	...	248	419	1139	...	4	13	2029	...	...	...	...	2029
<b>Total</b>	<b>391</b>	<b>89</b>	<b>1448</b>	<b>814</b>	<b>2193</b>	<b>96</b>	<b>34</b>	<b>84</b>	<b>5149</b>	<b>4</b>	<b>...</b>	<b>852</b>	<b>856</b>	<b>6005</b>
<b>Percentage</b>	<b>7.59</b>	<b>1.73</b>	<b>28.13</b>	<b>15.81</b>	<b>42.60</b>	<b>1.86</b>	<b>0.66</b>	<b>1.63</b>	<b>100.00</b>	<b>0.47</b>	<b>...</b>	<b>99.53</b>	<b>100.0</b>	
	<b>6.51</b>	<b>1.48</b>	<b>24.11</b>	<b>13.55</b>	<b>36.52</b>	<b>1.60</b>	<b>0.57</b>	<b>1.40</b>	<b>85.74</b>	<b>0.07</b>	<b>...</b>	<b>14.19</b>	<b>14.26</b>	<b>100.00</b>
<b>Overall percentage</b>	<b>7.66</b>	<b>4.86</b>	<b>27.52</b>	<b>10.98</b>	<b>43.33</b>	<b>1.73</b>	<b>1.58</b>	<b>2.34</b>	<b>100</b>	<b>5.05</b>	<b>...</b>	<b>94.95</b>	<b>100</b>	<b>100.00</b>
	<b>6.21</b>	<b>3.94</b>	<b>22.31</b>	<b>8.91</b>	<b>35.14</b>	<b>1.40</b>	<b>1.28</b>	<b>1.90</b>	<b>81.09</b>	<b>0.96</b>	<b>...</b>	<b>17.95</b>	<b>18.91</b>	
<b>Grand Total</b>	<b>585</b>	<b>371</b>	<b>2102</b>	<b>839</b>	<b>3310</b>	<b>132</b>	<b>121</b>	<b>179</b>	<b>7639</b>	<b>90</b>	<b>...</b>	<b>1691</b>	<b>1781</b>	<b>9420</b>

Table No. 12

Classification of acreage under Jirayat Oilseeds in sample villages by seasons and by Belts and Zones

Belts and Zones	Acreage under Jirayat Oilseeds						Grand Total
	Kharif Season				Rabi Season		
	Ground-nut	Sesamum	Niger-seed	Total	Kardi	Total	
<b>Maval</b>							
Zone No. I	...	6	110	116	...	...	116
Zone No. II	27	...	620	647	...	...	647
<b>Total</b>	27	6	730	763	...	...	763
<b>Percentage</b>	3.54	0.79	95.67	100	...	...	100
<b>Deshi Maval</b>							
Zone No. III	254	17	663	934	...	...	934
Zone No. IV	553	...	174	727	...	...	727
Zone No. V	15	8	...	23	...	...	23
<b>Total</b>	822	25	837	1684	...	...	1684
<b>Percentage</b>	48.81	1.49	49.70	100	...	...	100
<b>Desh</b>							
Zone No. VI	355	2	3	360	2	2	362
Zone No. VII	641	19	...	660	113	113	773
Zone No. VIII	31	...	3	34	359	359	393
Zone No. IX	189	6	2	197	868	868	1065
Zone No. X	50½	½	...	51	1679	1679	1730
<b>Total</b>	1266½	27½	8	1302	3021	3021	4323
<b>Percentage</b>	97.27 29.30	2.11 0.63	0.62 0.19	100 30.12	100.0 69.88	100.0 69.88	100.0
<b>Grand Total</b>	2115½	58½	1575	3749	3021	3021	6770
<b>Overall Percentage</b>	56.43 31.25	1.56 0.86	42.01 23.27	100.0 55.38	44.62	44.62	100.0

Table No. 13

Classification of acreage under Bagayat crops in sample villages by groups and according to Belts and Zones

Belts and Zones	Cereals	Pulses	Orchard and Garden Produce					Sugarcane	Condiments	Unclassified	Total
			Vegetables			Fruit Garden	Fodder				
			Potatoe	Fruit	Leafy						
<b>Maval</b>											
Zone No. I	...	...	...	...	...	...	...	...	...	...	
Zone No. II	303	88	...	...	...	...	...	...	...	391	
<b>Total</b>	303	88	...	...	...	...	...	...	...	391	
<b>Percentage</b>	77.49	22.51	...	...	...	...	...	...	...	100.00	
<b>Deshi Maval</b>											
Zone No. III	330	122	30	...	...	7	1	...	10	508	
Zone No. IV	171	27	202	24	11	19	13	7	34	508	
Zone No. V	1	...	791	26	...	155	21	175	24	1193	
<b>Total</b>	502	149	1031	50	11	181	35	182	68	2209	
<b>Percentage</b>	22.73	6.75	46.67	2.26	0.50	8.19	1.58	8.24	3.08	100.00	
<b>Desh</b>											
Zone No. VI	...	...	340	69	...	43	...	387	46	885	
Zone No. VII	161	20	101	222	...	18	71	...	15	276	
Zone No. VIII	30	3	...	4	...	3	3	...	3	52	
Zone No. IX	223	14	...	...	...	12	3	...	14	303	
Zone No. X	637	70	2	13	...	106	30	10	24	892	
<b>Total</b>	1060	107	513	304	...	182	107	397	182	313	
<b>Percentage</b>	33.48	3.38	16.20	9.62	...	5.75	3.40	12.54	5.75	9.88	
<b>Grand Total</b>	1865	344	1544	354	11	363	142	579	250	313	
<b>Overall percentage</b>	32.34	5.97	26.78	6.15	0.19	6.30	2.47	10.04	4.33	5.43	

Cereals include (a) Wheat (b) Paddy (c) Jowar (d) Rala (e) Maize and (f) Batu

Pulses include (a) Gram (b) Masur and (c) Watana.

Condiments include (a) Chillies (b) Turmeric (c) Onions and (d) Garlic

Table No. 14

Classification of cattle in sample villages by Belts and Zones

Belts and Zones	Bullocks	Breeding bulls	Cows	Calves and Heifers	Buffaloes	Total	Horses	Sheeps and Goats	Total	Grand Total	Cocks and Hens.
<b>Maval</b>											
Zone No. I	221	20	461	552	164	1418	1	80	81	1499	580
Zone No. II	1072	21	1012	701	513	3319	4	185	189	3508	1631
<b>Total</b>	<b>1293</b>	<b>41</b>	<b>1473</b>	<b>1253</b>	<b>677</b>	<b>4737</b>	<b>5</b>	<b>265</b>	<b>270</b>	<b>5007</b>	<b>2211</b>
<b>Percentage</b>	<b>27.29</b>	<b>0.87</b>	<b>31.10</b>	<b>26.45</b>	<b>14.29</b>	<b>100%</b>	<b>1.85</b>	<b>98.15</b>	<b>100%</b>		
<b>Deshi Maval</b>											
Zone No. III	1231	4	1027	553	369	3184	8	550	558	3742	2318
Zone No. IV	1770	1	1377	635	711	4494	42	2147	2189	6683	2028
Zone No. V	2661	25	1300	595	732	5313	16	4635	4651	9964	2938
<b>Total</b>	<b>5662</b>	<b>30</b>	<b>3704</b>	<b>1733</b>	<b>1812</b>	<b>12991</b>	<b>66</b>	<b>7332</b>	<b>7398</b>	<b>20389</b>	<b>7284</b>
<b>Percentage</b>	<b>43.59</b>	<b>0.23</b>	<b>28.51</b>	<b>13.72</b>	<b>13.95</b>	<b>100%</b>	<b>0.89</b>	<b>99.11</b>	<b>100%</b>		
<b>Desh</b>											
Zone No. VI	2562	70	1768	716	1261	6377	82	5036	5118	11495	3330
Zone No. VII	1875	2	1172	580	163	3792	103	7389	7492	11284	5378
Zone No. VIII	361	7	200	84	22	674	24	1207	1231	1905	876
Zone No. IX	810	3	1045	745	79	2682	15	1050	1065	3747	1850
Zone No. X	1968	11	1554	1177	607	5317	44	3077	3121	8438	3663
<b>Total</b>	<b>7576</b>	<b>93</b>	<b>5739</b>	<b>3302</b>	<b>2132</b>	<b>18842</b>	<b>268</b>	<b>17759</b>	<b>18027</b>	<b>36869</b>	<b>15097</b>
<b>Percentage</b>	<b>40.21</b>	<b>0.49</b>	<b>30.46</b>	<b>17.52</b>	<b>11.32</b>	<b>100%</b>	<b>1.49</b>	<b>98.51</b>	<b>100%</b>		
<b>Grand total</b>	<b>14531</b>	<b>164</b>	<b>10916</b>	<b>6338</b>	<b>4621</b>	<b>36570</b>	<b>339</b>	<b>25356</b>	<b>25695</b>	<b>62256</b>	<b>24592</b>
<b>Overall Percentage</b>	<b>39.73</b>	<b>0.45</b>	<b>29.85</b>	<b>17.33</b>	<b>12.64</b>	<b>100%</b>	<b>1.32</b>	<b>98.68</b>	<b>100%</b>		

Table No. 15

Proportion of total and net-cropped area to a pair of working cattle in the sample villages by Belts and Zones

Belts and Zones	Working cattle			Total cropped Area. (Acres)	Total Cropped area per pair of W. C. (Acres)	Net cropped area (Acres)	Net cropped area per pair of W. C.
	Bullocks No.	He Buffaloes No.	Total No.				
<b>Maval</b>	...						
Zone No. I	221	69	290	2496	17.21	2491	17.18
Zone No. II	1072	172	1244	7789	12.52	7612	12.24
<b>Total</b>	<b>1293</b>	<b>241</b>	<b>1534</b>	<b>10285</b>	<b>13.41</b>	<b>10103</b>	<b>13.17</b>
<b>Deshi Maval</b>							
Zone No. III	1231	97	1328	3752	5.65	3558	5.36
Zone No. IV	1770	318	2088	16377	15.69	15993	14.36
Zone No. V	2661	65	2726	10892	7.99	10092	7.40
<b>Total</b>	<b>5662</b>	<b>480</b>	<b>6142</b>	<b>31021</b>	<b>10.10</b>	<b>28643</b>	<b>9.33</b>
<b>Desi</b>							
Zone No. VI	2562	114	2676	14350	10.72	13070	9.77
Zone No. VII	1875	27	1902	26240	27.60	24177	25.42
Zone No. VIII	361	5	366	2676	14.62	2069	11.31
Zone No. IX	810	1	811	16000	39.51	13380	33.04
Zone No. X	1968	244	2212	27627	24.98	24470	22.12
<b>Total</b>	<b>7576</b>	<b>391</b>	<b>7967</b>	<b>86893</b>	<b>21.82</b>	<b>77166</b>	<b>19.37</b>
<b>Grand total</b>	<b>14531</b>	<b>1112</b>	<b>15643</b>	<b>128199</b>	<b>16.39</b>	<b>115912</b>	<b>14.82</b>

Table No. 16

Classification of Agricultural Implements in sample villages by Belts and Zones

Belts and Zones	PLOUGHS			Total cropped area (Acres)	Area cultivated by a plough (Acres)	Bullock carts	Oil engines
	Wooden	Iron	Total				
<b>Maval</b>							
Zone No. I	148	...	148	2496	...	...	...
Zone No. II	143	...	443	7789	...	...	...
<b>Total</b>	591	...	591	10285	...	...	...
<b>Deshi Maval</b>							
Zone No. III	503	43	546	3752	...	63	5
Zone No. IV	655	136	791	16377	...	117	6
Zone No. V	1031	92	1123	10822	...	495	2
<b>Total</b>	2189	271	2460	31021	...	675	13
<b>Desh</b>							
Zone No. VI	772	60	832	14350	...	272	...
Zone No. VII	579	486	1065	26240	...	261	3
Zone No. VIII	82	40	122	2976	...	47	...
Zone No. IX	30	155	185	16000	...	127	3
Zone No. X	101	231	332	27627	...	295	16
<b>Total</b>	1564	972	2536	86893	...	1002	22
<b>Grand Total</b>	4344	1243	5587	128199	...	1677	35

Table No. 17

Density of Population and Size of Households in sample villages by Belts and Zones

Belts and Zones	Total area (Sq. Miles)	Total population	Density of population per Sq. Mile	No. of Houses	Persons per house	No. of household	No. of persons per household
<b>Maval</b>							
Zone No. I	33.4	1005	30.1	172	5.8	230	4.4
Zone No. II	17.5	4530	258.9	910	5.0	924	4.9
<b>Total</b>	<b>50.9</b>	<b>5535</b>	<b>108.7</b>	<b>1082</b>	<b>5.1</b>	<b>1154</b>	<b>4.7</b>
<b>Deahi Maval</b>							
Zone No. III	13.9	5101	367.0	901	5.7	950	5.4
Zone No. IV.	33.1	10481	316.6	1857	5.6	1937	5.4
Zone No. V..	29.1	14792	545.8	2536	5.8	2546	5.8
<b>Total</b>	<b>74.1</b>	<b>30374</b>	<b>409.9</b>	<b>5294</b>	<b>5.7</b>	<b>5433</b>	<b>5.6</b>
<b>Deah</b>							
Zone No. VI	38.1	10434	273.9	1803	5.8	1824	5.7
Zone No. VII	52.7	8716	165.4	1446	6.0	1492	5.8
Zone No. VIII	15.4	1106	71.8	152	6.1	196	5.6
Zone No. IX	25.2	3707	147.1	713	5.3	692	5.3
Zone No. X	48.9	10119	206.9	1884	5.8	2325	4.3
<b>Total</b>	<b>180.3</b>	<b>34082</b>	<b>189.0</b>	<b>5998</b>	<b>5.9</b>	<b>6529</b>	<b>5.2</b>
<b>Grand Total</b>	<b>305.3</b>	<b>69991</b>	<b>229.2</b>	<b>12374</b>	<b>5.7</b>	<b>13116</b>	<b>5.3</b>



Table No. 18

Classification of sample villages according to size and  
by Belts and Zones

Belts and Zones.	VILLAGES WITH POPULATION OF									
	Below 100	100 to 250	250 to 500	500 to 750	750 to 1000	1000 to 1500	1500 to 2000	2000 to 2500	2500 to 5000	Over 5000
<b>Maval</b>										
Zone No. I	5	...	2	...	...	...	...	...	...	...
Zone No. II	...	...	1	3	1	1	...	...	...	...
<b>Total</b>	5	...	3	3	1	1	...	...	...	...
<b>Deahi Maval</b>										
Zone No. III	...	...	...	...	...	2	...	1	...	...
Zone No. IV	...	...	...	1	...	1	1	...	...	1
Zone No. V	...	...	...	...	...	...	1	...	...	2
<b>Total</b>	...	...	...	1	...	3	2	1	...	3
<b>Deah</b>										
Zone No. VI	...	...	...	...	...	1	1	...	2	...
Zone No. VII	...	...	1	1	1	...	1	1	1	...
Zone No. VIII	...	...	1	...	1	...	...	...	...	...
Zone No. IX	...	...	...	1	1	...	...	1	...	...
Zone No. X	...	...	...	...	...	1	1	...	...	1
<b>Total</b>	...	...	2	2	3	2	3	2	3	1
<b>Grand total</b>	5	...	5	6	4	6	5	3	3	4

**Table No. 19**  
Occupational classification of the Population in sample villages by Belts and Zones

Belts and Zones	Agricultural classes					Non-agricultural classes					Grand Total
	Cultivators of land wholly or mainly owned and their dependents	Cultivators of land wholly or mainly unowned and their dependents	Cultivating labourers and their dependents	Non-cultivating owners of land; agricultural rent receivers and their dependents	Total	Production other than cultivation	commerce	Transport	Other services and miscellaneous sources		
<b>Maual</b>											
Zone No. I	983	12	1	...	996	...	...	...	9	9	1005
Zone No. II	3739	98	55	52	3944	244	125	21	196	586	4530
<b>Total</b>	<b>4722</b>	<b>110</b>	<b>56</b>	<b>52</b>	<b>4940</b>	<b>244</b>	<b>125</b>	<b>21</b>	<b>205</b>	<b>595</b>	<b>5535</b>
<b>Percentage</b>	<b>95.8</b>	<b>2.1</b>	<b>1.1</b>	<b>1.0</b>	<b>100% 89.0</b>	<b>41.0</b>	<b>21.0</b>	<b>3.6</b>	<b>34.4</b>	<b>100% 11.0</b>	<b>100%</b>
<b>Deshi Maual</b>											
Zone No. III	3781	345	154	44	4324	373	108	11	285	777	5101
Zone No. IV	6276	464	456	311	7507	822	940	49	1163	2974	10481
Zone No. V	9053	193	549	830	10615	1517	1019	177	1464	4177	14792
<b>Total</b>	<b>19110</b>	<b>1002</b>	<b>1159</b>	<b>1175</b>	<b>22446</b>	<b>2718</b>	<b>2067</b>	<b>237</b>	<b>2912</b>	<b>7928</b>	<b>30374</b>
<b>Percentage</b>	<b>85.1</b>	<b>4.4</b>	<b>5.1</b>	<b>5.4</b>	<b>100% 73.3</b>	<b>34.8</b>	<b>26.0</b>	<b>3.1</b>	<b>36.7</b>	<b>100% 26.7</b>	<b>100%</b>

Table No. 19—(Continued)

Belts and Zones	Agricultural classes					Non-agricultural classes					Grand Total
	Cultivators of land wholly or mainly owned and their dependents	Cultivators of land wholly or mainly unowned and their dependents	Cultivating labourers and their dependents	Non-cultivating owners of land; agricultural rent receivers and their dependents	Total	Production other than cultivation	commerce	Transport	Other services and miscellaneous sources		
<b>Desh</b>											
Zone No. VI	8599	22	179	484	9284	619	90	...	441	1150	10434
Zone No. VII	6405	70	282	525	7282	750	229	5	450	1434	8716
Zone No. VIII	949	39	5	9	1002	59	..	...	45	104	1106
Zone No. IX	2490	234	263	190	3177	147	91	8	284	530	3707
Zone No. X	2615	302	263	247	3427	1319	1915	341	3117	6692	10119
<b>Total</b>	<b>21058</b>	<b>667</b>	<b>992</b>	<b>1455</b>	<b>24172</b>	<b>2894</b>	<b>2325</b>	<b>354</b>	<b>4337</b>	<b>9910</b>	<b>34082</b>
<b>Percentage</b>	<b>87.0</b>	<b>2.4</b>	<b>4.7</b>	<b>5.9</b>	<b>100%</b> <b>70.6</b>	<b>29.2</b>	<b>23.3</b>	<b>4.8</b>	<b>42.7</b>	<b>100%</b> <b>29.4</b>	<b>100%</b>
<b>Grand Total</b>	<b>44890</b>	<b>1779</b>	<b>2207</b>	<b>2682</b>	<b>51558</b>	<b>5850</b>	<b>4517</b>	<b>612</b>	<b>7454</b>	<b>18433</b>	<b>69991</b>
<b>Overall Percentage</b>					<b>100%</b> <b>74.3</b>					<b>100%</b> <b>25.7</b>	<b>100%</b>

## CHAPTER V

### USE OF NON-AGRICULTURAL LAND

In the last chapter we have dealt with the keerदार or assessed land which constitutes about 75 per cent of the total land in the Ghod Valley and have described in detail the way in and the extent to which it was utilised for agricultural purposes. It is proposed in the present chapter to consider how the remaining 25 per cent of the land, classified as nakeerदार (unassessed), is being used. The term nakeerदार has a wide connotation and includes all unassessed and uncultivable land used for a variety of purposes. Table No. 20 is prepared to show the composition of the nakeerदार land in the Ghod valley.

It will be seen from the table that 29,000 out of 53,000 acres in the entire survey tract are occupied by rocks, hills and forests. This proportion went up to about 85 per cent in the Maval and to a little less than 70 per cent in the Deshi Maval. Only a quarter of the total nakeerदार land in the Desh was found under forests. The forests afford some grazing facilities and consequently as the forests decreased the proportion of land specially reserved for grazing purposes went on increasing. From about 1 per cent in the Maval the grazing land went up to form 4 per cent in the Deshi Maval and about 12 per cent in the Desh. The waste or *pot-kharab* lands accounted for one-fifth of the total nakeerदार land in the valley. Its proportion was as high as 25 per cent in the Desh belt which cannot be considered negligible. The proportion of land under other-fallows was also the highest (16.43 per cent) in the Desh. The corresponding proportions for the Maval and the Deshi Maval belts were 0.32 and 3.98 respectively.

As forests are of great potential importance, not only to the adjacent but even to the distant areas, and also as they constitute a considerable proportion of the nakeerदार land in the Ghod valley, it is desirable to deal with them in further detail. Of all the districts abutting on the Western Ghats in

Maharashtra, Poona district has the second lowest forest area. Even Ahmednagar, with only one taluka bordering on the Ghats, claims a higher percentage (6.37) of forest area than Poona (4.93) which has 5-6 talukas abutting on the Ghats (vide p. 17 of the Bombay Statistical Atlas, 1950). Ambegaon taluka, forming the bulk of our survey tract, claims 40,000 out of 4,75,000 acres or about 3 percent of the total forest area of the district. All these forests are notified as reserved forest and have been further classified as 'forest proper' and 'pasture forest' in charge of the Forest and Revenue Departments. Table No. 21, presenting the classification of the forest in the sample villages, shows that 24,000 out of 32,600 acres or nearly three-fourths of the total acreage under forests in the survey tract was found in the Maval and the Deshi Maval or transition belt taken together. All this acreage is in charge of the Forest Department and has now been included in the Protection Working Circle of the Revised Working Plan for Poona Forest Division Reserves. The forests in the Desh, constituting only 25 percent of the total forest areas in the tract, are under the control of the Revenue Department. Another interesting fact is that the proportion of pasture forest, found only in the Deshi Maval or transition belt, was very small in the total, viz. 4.5%. The density of forest in the Maval was 0.7, that in the Deshi Maval varied between 0.4 and 0.5 while the density in the Desh belt was almost negligible.

The natural vegetation is greatly influenced by the prevalent moisture conditions in the tract. The physiography having undoubtedly characterised the composition, the luxuriance of tree growth is in its turn governed by the incidence of precipitation, general temperature conditions and elevation. It is, therefore, necessary to study the composition and condition of the forest growth in different belts of the survey tract.

(a) Maval or Western belt :— These forests are of the sub-tropical evergreen type. Their very natural emergence can be attributed to the climatic conditions assuming 'temperate' character under the combined influence of elevation and rainfall. The highest elevation point in this belt is over 3,000 ft. above mean sea-level and it appears to extend

downwards upto about 2,000 ft. above mean sea-level. At higher elevations where it is undisturbed by the axe of man and his cattle and where soil and crop appear to react to set up a stable composition, the formation assumes the character of a truly 'climatic climax' type. The crop conditions along the decending hill slopes are in a lower grade in succession due to interference of man and cattle. The character of these forests is not one of the true 'Rain Forests,' the periodicity of the monsoons being a factor in determining their stature. The dry weather spell of nearly six months in a year considerably influences the vegetation, which remains quite stunted as a rule. Even individual dominant trees hardly attain a height of 70 feet and over.

The main dominant species are jambhul (*Eugenia jambolana*) and anjani (*Memecylon edule*). The latter becomes strongly dominant as one approaches the crest of the Ghats. Along the outer fringes of evergreens anjani tends to lessen and other co-dominants - hirda (*Terminalia chebula*), parjambhul (*Olea Dioica*), mango (*Mangifera indica*) and ain (*Terminalia tomentosa*) gain a relatively higher percentage in the composition. The middle storey is mainly formed of pisa (*Actinodaphane hookerii*), shendri (*Mallotus philippinensis*), chandoda (*Macaranga roxburghii*) moina (*Lannea grandis*), gela (*Randia dumetorum*), kumbhi (*Careya arborea*), pandhri (*Murraya exotica*), kadhinimb (*Murraya Koenighii*), tupa or kande kudal (*Canthium umbellatum*). bamboos (*Dendrocalamus Strictus*) are also found in some places. The undergrowth is made up of karvi (*Strobilanthus callosus*), bhoma (*Glochidion lanceolarium*), kuda (*Holorrhena antidysenterica*), dinda (*Leea macrophylla*), karwand (*Carissa carandus*), tambat (*Flacourtia romontchi*) and honkal (*Gymnosporia montana*).

The preservation of forest areas becomes difficult owing to frequent inroads made by agriculture. It has been possible to preserve most of the evergreen forests lying on the inaccessible slopes of the Western Ghats because the soil obtaining there afford very poor prospects to agriculture. Except in the pockets of narrow valleys, which have already been occupied

almost completely everywhere for rice cultivation, extension of agriculture elsewhere appears impossible. The existence of large *Malki* (privately owned) areas adjoining the forests makes the preservation still more difficult. Practically all such areas, situated on comparatively steep slopes, are at present under *kumri* or shifting cultivation. They have been stripped bare for wood-ash manure and have no vegetation but stunted underwood and dried grass. The cutting of *tahals* was going on in such a reckless and unscientific manner that valuable species like 'ain' (*Terminalia tomentosa*) were found not putting on any quality increment. Even *hirda* (*Terminalia chebula*) and mango (*Mangifera indica*) were not spared. Sacredness (*Devrai*) and remoteness were largely responsible for saving some ancient evergreen forests here and there on the hill side lodges or in deep dells from wanton destruction by human agency. No fellings of any type are prescribed for the forests included in the Protection Working Circle. These forests are, however, allowed to be tapped only for minor forest produce.

Field inspections by our survey party have disclosed that there are certain forest areas (e. g. in Ahupe, Kondhwal, Aghane etc.) that are fit for being used for producing high quality teak. They are situated on plains and some of them are just on the lower boundary of the forests and are not at present yielding any revenue to the Forest Department.

(b) **The Deshi Maval or Central Belt**:—The area of the Reserved Forests accounts for about 19 per cent of the total area in this belt. The forests are of the deciduous forest type. Unlike evergreens which remain in more or less compact blocks of woody vegetation, the deciduous forests which naturally start off from the eastern fringes of the evergreens spread over wide regions of the belt in a broken discontinuous form, following the uncultivated slopes of the chains of hills. There is a belt of moist deciduous in between the evergreens and the dry deciduous forests but this belt is decidedly very narrow. The relegation of the forests to the hills is the result of almost every bit of flat land in the belt having come under the plough.

The main species met with in this belt is teak (*Tectona grandis*) which thrives well in the moist deciduous area. Its usual associates are ain, dhavda (*Anogeissus latifolia*), bondara (*Lagerstroemia parviflora*), tiwas (*Ougenia dalbergioides*), haldu (*Adina Cordifolia*), dhaman (*Grewia tiliifolia*), kalamb (*Mitragyna parviflora*), sawar (*Bombax malabaricum*) and kakad (*Garuga pinnata*). The undergrowth, includes such species as karwand (*Carrissa carandus*), dhaiti (*Woodfordia floribunda*), honkal (*Gymnosporia montana*) kusar (*Jasminum arborescens*). In some parts sandalwood (*santalum album*), mostly young, is conspicuous by its presence.

Grassess grow in more profusion and tall in the moist deciduous localities in the openings but in the dry deciduous region coarser varieties, reduced in size to ground tufts, are obtained. All the forest in between Ghodegaon and Manchar is grass land. However, wherever there is an excess of pasture lands (i. e. over and above the normal grazing incidence which is 50 acres for 100 cattle for the tract) the Working Plan has formed permanent *kurans* for cutting. The grass is sold annually as a cutting *kuran* and no grazing is permitted in such *kurans*.

The forest growth in this Central belt is rendered very open by the apparent past maltreatment, As a consequence, the forest floor has suffered from continued dessication and rapid erosion. This has set in a veritable retrogression as evidenced by the ground flora assuming a thorny zeraphytic character. Lack of humus on the floor in some parts has almost completely nullified the possibility of expecting natural regeneration. The so-called forest areas in some other places are reduced to *mal* areas after the extermination of teak. Even the wooded parts of the forests exhibit a considerable variation in canopy.

In the extremely dry parts of this Deshi Maval or Central belt the thorny and scrub type of vegetation and grass are met with. Some of the species that thrive in these forests are bor (*Zizyphus jujuba*), hivar (*Acacia leucophloea*), hingani (*Balanites roxburghii*) etc. Tarwad (*Cassia auriculata*) is also found profusely in some places where a little soil formation gives it a foothold.



All the forest in the moist deciduous parts of this belt is included in the Protection Working Circle in the Revised Working Plan for Poona Forest Division Reserves. The dry deciduous areas are included in the Main Working Circle and the pasture area are put either in Pasture Working Circle or *Kuran* Working Circle.

Very recently the Government has acquired about 1,600 acres of land, mostly containing pure teak of various age gradations, and has handed them over to the Forest Department for management. In addition to this, an area of about 1,100 acres is in the process of being declared as forest area under the Indian Forests Act.

(c) **The Desh or Eastern Belt**:—This belt commences roughly from Manchar and extends in the east upto the confluence of the Ghod with the Bhima and beyond.

There is no forest area in charge of the Forest Department. All the forest lands are under the control of the Revenue Department and classified into Forest proper and pasture forest. Some of the areas of these forests are given for cultivation by the Revenue Department, while some others serve as folding ground for village cattle. The vast majority of them are bare hills once covered with some vegetation. This was the old Dandakaranya.

No babhul growth is met with along the banks of the Ghod river, which is normally a good source of revenue to the Government in the Forest Department. As a result, fuel shortage is acutely felt in some parts of the Desh belt.

There is no adequate grazing in these forests. Cattle are sent to villages in the west for grazing on payment of fee.

**Exploitation of Forest Produce**:—The first Maval or Western belt having been included in the Protection Working Circle, no fellings of any kind are prescribed therein. However, minor forest produce which includes hirda, shikekai, richa, sawar cotton, mango and phanas fruits, karanja pods, honey, etc., is allowed to be collected. Hirda, the most important of all the produce, is collected by Mahadeo Kolis and others from October to January and sold to merchants at

Ambegaon at a rate varying between as. 2 and as. 3 per *payali* or at Rs. 4 to Rs. 5/- per bag (30 *payalees*) weighting  $1\frac{1}{2}$  to  $1\frac{3}{4}$  maunds. It is estimated by our survey party that about 65,000 bags of hirda fruits are annually collected by Ambegaon alone, involving a transaction of about Rs. 5 lakhs. These bags are sent to Bombay where they fetch about Rs. 9/- per bag and from there they are exported to foreign countries for extraction of tannin. Ambegaon hirda is known for its quality. The Forest Department charges royalty at rates fixed for different kinds of forest produce, the rate for hirda fruits being as. 8 per bag of 30 *payalees*.

The Deshi Maval or Transition belt, bulk of which area is included in the Main Working Circle, produces large and most valuable teak from coppice. The Ghod range of the Working Circle claims about 10,200 or about 20 per cent of the total number of acres in the circle. This acreage is divided into 5 felling series. Each of these series is further divided into 80 more or less equal area (51 acres) coupes which are auctioned out for exploitation during the working period of 40 years at the rate of one coupe per year from each felling series. An acre of the coupe, when its turn comes, fetches a revenue to Government of about Rs. 100/- or so.

No area from the survey tract falls in the Fuel Working Circle of the Forest Department.

The grass *kurans*, newly formed out of the areas in excess of the normal grazing requirements of villages, are sold to village panchayats or other public bodies at a reasonable 'upset' price fixed after taking into consideration the grass rates prevailing in the market. The working period fixed for a *kuran* is 20 years. The sale of grass in these *kurans* fetches a revenue of about Rs. 4/- per acre on an average.

All open lands and grazing lands as are 'pasture forests' (excluding the areas under permanent *kurans*), which are too isolated and patchy for effective management, are included in the 'Pasture Working Circle.' Some areas from this circle are selected for development under what is known as '5-Pasture Rotational Grazing Scheme.' One of the four schemes

sanctioned by Government is being worked out at Norodé in the survey tract of the Ghod valley.

To sum up, the percentage of nakeerdasar (unassessed) to the gross area goes on decreasing from west to east. The major portion of the nakeerdasar land is occupied by forests and grazing areas.

The Western belt is covered by evergreen trees and shrubs and is under the management of the Forest Department. Climatic and soil conditions in this belt are most suitable for forest growth.

In the Central belt the area under forest is comparatively limited and the stand of the forest is sparse.

In the third Eastern belt the area classified as forest is mainly grass and grazing lands managed by the Revenue Department.

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Table No. 20

Classification of Nakeerdasar land in sample villages  
by Belts and Zones.

Belts and Zone	Nakeerdasar Land							Total
	Village site	Roads	Rivers and na-llas	Forest	Grazing land	Waste land	other fallow	
<b>Maval</b>								
Zone No. I	51	21	194	13246	80	1105	...	14697
Zone No. II	35	30	195	1561	85	884	56	2846
<b>Total</b>	<b>86</b>	<b>51</b>	<b>389</b>	<b>14807</b>	<b>165</b>	<b>1989</b>	<b>56</b>	<b>17543</b>
<b>Percentage</b>	<b>0.49</b>	<b>2.29</b>	<b>2.22</b>	<b>84.40</b>	<b>0.94</b>	<b>11.34</b>	<b>0.32</b>	<b>100</b>
<b>Deshi Maval</b>								
Zone No. III	24	31	76	2456	23	500	4	3114
Zone No. IV	58	81	181	4520	95	908	161	6004
Zone No. V	94	129	306	2097	422	737	359	4144
<b>Total</b>	<b>176</b>	<b>141</b>	<b>563</b>	<b>9073</b>	<b>540</b>	<b>2145</b>	<b>524</b>	<b>13162</b>
<b>Percentage</b>	<b>1.34</b>	<b>1.07</b>	<b>4.28</b>	<b>68.93</b>	<b>4.10</b>	<b>16.30</b>	<b>3.98</b>	<b>100</b>
<b>Desh</b>								
Zone No. VI	129	307	477	3980	527	1228	276	6924
Zone No. VII	144	526	1041	581	1301	2007	2649	8249
Zone No. VIII	62	66	180	191	271	461	239	1470
Zone No. IX	80	129	109	486	91	872	10	1777
Zone No. X	221	303	871	279	577	1535	567	4353
<b>Total</b>	<b>636</b>	<b>1331</b>	<b>2678</b>	<b>5517</b>	<b>1767</b>	<b>6103</b>	<b>3741</b>	<b>22773</b>
<b>Percentage</b>	<b>2.79</b>	<b>5.84</b>	<b>11.76</b>	<b>24.23</b>	<b>12.15</b>	<b>26.80</b>	<b>16.43</b>	<b>100</b>
<b>Grand total</b>	<b>398</b>	<b>1523</b>	<b>3630</b>	<b>29397</b>	<b>3472</b>	<b>10237</b>	<b>4321</b>	<b>53478</b>
<b>Overall percentage</b>	<b>1.68</b>	<b>2.85</b>	<b>6.79</b>	<b>54.97</b>	<b>6.49</b>	<b>19.14</b>	<b>8.08</b>	<b>100</b>

**Table No. 21**  
**Classification of Forest Area in sample villages by Administrative Control and also**  
**according to Belts and Zones.**

Belts and Zones	Total Area (Acres)	Forest Department		Revenue Department		Total		Grand Total for Forests (Acres)	Percentage of Forest to total Area	Density of Forest
		Reserved Forest (Acres)	Pasture Forest (Acres)	Reserved Forest (Acres)	Pasture Forest (Acres)	Reserved Forest (Acres)	Pasture Forest (Acres)			
<b>Maval</b>										
Zone No. I	21272	13246	...	...	...	13246	...	13246	...	0.7
Zone No. II	13155	1861	...	...	...	1861	...	1861	...	0.7
<b>Total for 13 villages</b>	<b>34427</b>	<b>15107</b>		...	...	<b>15107</b>	...	<b>15107</b>	<b>43.9</b>	...
<b>Averages</b>	...	<b>1162.2</b>	...	...	...	<b>1162.2</b>	...	<b>1162.0</b>	<b>1162.0</b>	...
<b>Deshi Maval</b>										
Zone III	11358	2439	...	...	...	2439	...	2439	...	0.4-0.5
Zone IV	18726	4362	159	...	...	4362	159	4521	...	0.4-0.5
Zone V	15457	703	1394	...	...	703	1394	2097	...	0.4-0.5
<b>Total for 10 villages</b>	<b>45541</b>	<b>7504</b>	<b>1553</b>	...	...	<b>7504</b>	<b>1553</b>	<b>9057</b>	<b>19.8</b>	...
<b>Averages</b>	...	<b>750.4</b>	<b>155.3</b>	...	...	<b>750.4</b>	<b>155.3</b>	<b>905.7</b>	...	...

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Dehs										
Zone No. VI	22916	...	...	3538	...	3538	...	3538	...	...
Zone No. VII	33792	...	...	3188	...	3188	...	3188	...	...
Zone No. VIII	8430	...	...	560	...	560	...	560	...	...
Zone No. IX	17538	...	...	459	...	459	...	459	...	...
Zone No. X	31045	...	...	740	...	740	...	740	...	...
<b>Total for 18</b>	<b>113721</b>	<b>...</b>	<b>...</b>	<b>8485</b>	<b>...</b>	<b>8485</b>	<b>...</b>	<b>8485</b>	<b>7.4</b>	<b>...</b>
<b>Average</b>	<b>...</b>	<b>...</b>	<b>...</b>	<b>471.4</b>	<b>...</b>	<b>471.4</b>	<b>...</b>	<b>471.4</b>	<b>...</b>	<b>...</b>
<b>Grand total</b>	<b>193687</b>	<b>22611</b>	<b>1553</b>	<b>8485</b>	<b>...</b>	<b>31096</b>	<b>...</b>	<b>32649</b>	<b>16.8</b>	<b>...</b>
<b>Overall average for 41 villages</b>	<b>...</b>	<b>551.5</b>	<b>37.9</b>	<b>206.9</b>	<b>...</b>	<b>758.4</b>	<b>...</b>	<b>796.3</b>	<b>...</b>	<b>...</b>

## CHAPTER VI

### WATER RESOURCES OF THE GHOD VALLEY

Table No. 22 gives volume of; total average; precipitation in each of the six zones upto the point where the Mina joins the Ghod river at Pargaon. Below this point large volumes of water flow down in the Ghod from the Mina and the Kukdi rivers and the proposed Storage Reservoir of 30,000 M. Cft. on the Ghod at a site near Annapur, a couple of miles upstream of Shirur, (now under investigation of Government) as; well as the; Ghod Weir near Chinchani below Shirur (now under actual construction) with its proposed storage of 5,000 M. Cft. in Stage No. II will utilize almost all the available supply from these two rivers. Besides, precipitation and available run-off from zones VI to X on areas arbitrarily fixed are of very small and local value only. Observations will, therefore, be restricted to zones from I to V only.       :       :       :       :       :

From the statement given on page 30 of the Technical Paper No. 30 by Ingle and DeSouza on the Critical study of Run-off and Floods of catchments in the Bombay Presidency, it is seen that at Shirapur, a few miles upstream of the junction of the Kukdi with the Ghod, an average annual run-off of 32,124 M. Cft. was observed during 24 years upto 1926 over a catchment area of 464 sq. miles of the Kukdi river alone with average annual rainfall of 41". Similarly, the Mina river, as gauged at Vadgaon, 4 miles upstream of Narayangaon, with a catchment area of 78 sq. miles and 56" average rainfall, gave an actual average annual run-off of 6,397 M. Cft. Below Shirapur two fairly big tributaries, viz. the Padal Nadi and the Sidheshwar Nadi, join the Kukdi on the north and hence the run-off from the Kukdi into the Ghod will be appreciably more than 32,124 M. Cft. The large catchment area of the Mina river below Wadgaon till its junction with the Ghod at Pargaon will also add to the gauged average run-off of 6,397 M. Cft. at Vadgaon. This is particularly mentioned here to show that the available run-off from the Mina and the Kukdi alone will be capable

of providing for the newly proposed storages at Annapur and Chinchani. The storage of 20,000 M. Cft. proposed by Beale for Sakora site on the Ghod river for use at Pimpalwandi. Weir would still be available in addition.

The river gauge results at Nirgudsar upto 1926 and at Kalamb since 1947 show that a separate storage capacity of about 20,000 M. Cft. on the Ghod river either at Sakora as proposed by Mr. Beale or at another suitable site above Nirgudsar can still be a practical proposition, without encroaching upon the requirements of the Annapur Storage Reservoir and the Ghod Weir up and down stream of Sihzur.

**Gangapur Budruk Storage Reservoir :—** Our Survey party has located a more suitable site than Sakora (suggested by Beale) at Gangapur Budruk opposite 50th mile of Poona—Bhimashankar Road in Ambegaon taluka. A suitable natural waste-weir site on the right bank is available. The bed of the river is rocky at R. L. 2,140 while the waste-weir gorge is at R. L. 2,342. The length of dam will be about 4,000 feet at top and much less at bottom as ascertained by inspection of the site and from a study of the topo-sheet.

Catchment area above Gangapur Bk, site is 154 sq. miles and is mostly hilly and steep and an annual rainfall of 100 inches is considered to be a safe average as the site is only 15 miles from the crest of the Sahyadris where rainfall is over 175 inches. The total precipitation will be about 35,000 M. Cft. and as a run-off of 80% can be assumed due to rocky and steep nature of hilly catchment above, there should be no difficulty in getting 20,000 M. Cft. on an average for storage. With a dam 210 feet high above river bed at centre, with full supply level at R. L. 2,350 and a water spread of 15 sq. miles in a length of 13 miles the required capacity can be obtained at the proposed site.

The Gangapur Bk. site is considered better than the Sakora site as the cost of land submerged and villages to be shifted will be far less and important towns and villages like Ghodegaon will not be affected by the H. F. L.

The Gangapur Bk. reservoir, if constructed in addition to the lower one at Annapur, can allow 1,330 M. Cft. including loss



on way for irrigation between the Mina and the Ghod rivers by means of a left bank canal instead of the feeder canal proposed by Beale and 3,000 M. Cft. for the Ghod Right Bank Canal leaving the balance of 15,670 M. Cft. for supplementing the storage of Annapur Reservoir. Alternatively it can be taken to the north of the Kukdi through a bigger left bank with an aqueduct over the Kukdi river for irrigating additional land.

The Gangapur Bk. Storage, in addition to these direct advantages of providing irrigational facilities to potential areas under command, will also raise the subsoil water level in the valley between Gangapur Bk. and the western edge of the lower reservoir at Annapur and this will greatly help in increasing the number of present sources of irrigation as shown in Table No. 23 in the valley for irrigation and water supply. It will also afford water-transport facilities to villagers residing in the upstream hamlets as in the Mulshi Lake and provide potentialities for inland fisheries.

The longitudinal section along the bed of the Ghod river shows that there is a steep fall of over 1,000 ft. within the first  $2\frac{1}{2}$  miles from the origin at the hill-crest and the levels of the storage reservoir at Gangapur Bk. are not very favourable for a hydro-electric scheme with a power-house on the western Konkan side as is possible in case of many sites of existing and proposed reservoirs on other ghat-fed rivers in the Deccan. But advantage can be taken of the variable head in the Gangapur Bk. and the lower reservoir at Annapur to generate electric power which will come in handy as a supplementary source for feeding the electric grid for the Deccan area.

A study of the topo-sheet shows that a small tank of about 500 to 1,000 M. Cft. can be constructed just at the top of the hills between Bhimashankar and Ahupe and the water can be led down by a suitable conduit along the hill slopes upto a fore-lay to provide a fall of 800 to 1,000 ft. for producing electric power for cottage industries and water supply for other local uses.

It would be advisable to construct gradually, as funds

permit, small tanks on tributary nallas in the first two zones to solve the problem of the scarcity of drinking water in summer months and to conserve as much of the flood water as possible in the upper reaches with obvious advantages.

The rocky bed exposed at many places along the bed of this river shows that the velocity of the flood water running down the river is more than the critical velocity. A series of bandharas on the 'Baglan' type is indicated to remove this danger. The flow in the river between these bandharas and lower down will be fairly maintained by the appreciable proportion of regenerated water from irrigated tract flowing back to the stream.

To sum up, in the first belt irrigation facilities are very meagre as the terrain is hilly and steep. Even though the rainfall is heavy most of the water runs off unutilized and well sinking is not generally successful.

In the second belt the rainfall is moderate and the valleys are more level and wide. People have harnessed various streams by bandharas and have also sunk numerous wells with fairly good water supply. In addition to the Annapur Storage Reservoir (under active investigation) and the Ghod Weir near Chinchani (now under construction), a more suitable site than Sakora (suggested by Beale) has been proposed at Gangapur Budruk for a storage reservoir.

In the third belt the rainfall being scanty and precarious the number of wells and minor irrigation works are comparatively less.

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Table No. 22

Statement showing the total precipitation of rainfall and its percentage run-off available for use in the Ghod Basin

Belts and Zones	Area by planimeter measurement Sq. Mile	Average annual Rainfall (Inches)	Total precipitation in million Cft.	Nature of catchment area	Percentage Run-off assumed	Available Run-off M. Cft.	Remarks
Maval							
Zone No. I	47.7	125	13800	Very good	80	11,040	Catchment hilly and steeply sloping
Zone No. II	55.1	70	8855	"	70	6,198	
Total ...	102.8		22655			17,238	
Desbi Maval or Transition:							
Zone No. III	50.4	40	4600	Average	28.1	1,292	
Zone No. IV	49.2	25	2850	"	15.4	439	
Zone No. V	63.3	25	3600	"	15.4	554	
Total ...	162.9		11050			2,285	
Desh							
Zone No. VI	65.9	22	3290	Average	12.9	424	
Zone No. VII	78.1	20	3588	Bed	7.5	269	
Zone No. VIII	90.4	20	4140	"	7.5	310	
Zone No. IX	68.0	20	3128	"	7.5	234	
Zone No. X	65.8	20	3036	"	7.5	228	
Total ...	368.2		17182			1,465	
Grand Total	633.9		50887			20,988	

Notes: (1) The figures of percentage in column 6 and nature of catchment in 5 are taken from W.L. Strange's Storage Reservoirs in India, except for zones I and II where slightly higher figures are assumed on the basis of results at other stations.

(2) The zones I to VI upto the point where the Mina river joins the Ghod at Pargaon represent Ghod-valley proper with all tributary nalls on either side. Beyond that point the areas and figures shown are arbitrary and do not take into account large volumes of water coming down from the Mina, Kar and Kukdi rivers.

(3) The actual average discharges as gauged at Nirgudsar station in zone No. VI from 1906 to 1926, is worked out at 25,903 M. Cft. which shows that the assumptions in the above statement are a bit on the lower side. The storage capacity of 20,600 M. Cft. at Sakora Dam is justified by actual observation at Nirgudsar.

Table No. 23

Classification of sources of irrigation and of irrigated area in sample villages by Belts and Zones

Belts and Zones	Sources of Irrigation				Total	Area Irrigated under		
	Tanks	Diversion Canals	Wells	Bud-khis		Bhusar Seasonal (acres)	Bagayat Perrenial (acres)	Total (acres)
<b>Maval</b>								
Zone I	...	...	41	16	57	391	...	391
Zone II	...	...	41	16	57	391	...	391
<b>Total</b>	1.1	...	41	16	57	391	...	391
<b>Percentage</b>	...	...	71.93	28.07	100%	100%	...	100%
<b>Deshi Maval</b>								
Zone III	...	1	79	3	83	452	56	508
Zone IV	...	39	350	29	418	198	310	508
Zone V	1	17	900	61	979	1	1192	1193
<b>Total</b>	1	57	1329	93	1480	651	1558	2209
<b>Percentage</b>	0.07	3.85	89.80	6.28	100%	29.47	70.53	100%
<b>Desh</b>								
Zone VI	...	1	932	...	933	...	885	885
Zone VII	...	2	774	77	853	181*	577	1034
Zone VIII	...	...	65	...	65	276*	10	52
Zone IX	1	1	129	...	131	42	29	303
Zone X	...	...	393	18	411	237*	285	892
<b>Total</b>	1	4	2593	95	2393	707	1686	3166
<b>Percentage</b>	0.04	0.17	95.82	3.97	100%	313*	53.25	100%
<b>Grand Total</b>	2	61	3663	204	3930	2209*	3244	5766
<b>Overall Percentage</b>	0.05	1.55	93.21	5.19	100%	43.74	56.26	100%

\* Unclassified but shown under Bhusar Crops.

## CHAPTER VII

### CONSERVATION AND DEVELOPMENT OF NATURAL RESOURCES

It may be noted at the outset that the scope of our investigation is restricted to the development of natural resources in land and water in the Ghod valley. Other aspects of development, such as, education, public health, communications etc. are equally important but they have not been dealt with here as they did not fall within our terms of reference. The development targets suggested in this report, along with their financial forecasts, are simply illustrative. They are not based on a detailed survey and study of exhaustive data regarding forests, soils, water resources, crop patterns, livestock, local industries etc. in the various zones and belts of the Ghod valley. They are approximations. But, nevertheless they are sufficiently indicative of the potentialities of this and other similar valleys in the Bombay Deccan and also of the way in which comprehensive integrated regional development of these river valleys can be brought about.

A careful study of the existing uses of the land and water resources in the Ghod valley raises a variety of problems that call for prompt solution. The important basic problem common to the whole of the Deccan plateau is that of rational land use. This involves 'evolving a system of balanced and complementary landuse, under which each type of land is allotted to that form of use under which it would produce most and deteriorate least.' It should aim at checking 'denudation in mountainous regions on which depends the perennial water supply of the river system.' It should also prevent the erosion that is progressing apace along the treeless banks of rivers and on vast stretches of undulating wastelands, depriving the adjoining fields of their fertility. Some other problems are of such a general character as to be applicable to all the three belts of this valley and similar valleys in the Bombay Maharashtra; while still others have significance only in relation to particular belts. This does not, however, mean that the development of each belt can be considered as

independent of other belts. It should really form a part of the correlated development of all the three belts taken together. For, the development of one belt influences the development of the others.

The various problems will now be considered against the background of different belts under survey with a view to finding out the extent to which they can be remedied.

**The Maval**—In the first belt, viz., Maval, the physio-graphical features, such as, elevation, character of terrain, lie of the land, heavy and assured rainfall, give rise, among others, to the following important problems :—

(1) Not being properly protected, most of the hill slopes are denuded by soil erosion. The shifting cultivation of hill millets further aggravates the problem by disturbing the land surface :—

The present use of land in the Maval belt for agricultural purposes, especially of shifting cultivation, instead of yielding much, leads to its deterioration by helping soil erosion. Extension of organised afforestation of the entire area (whether private or government) including the hill slopes is evidently the most rational use of the land in this belt. Agriculture should be restricted to the properly terraced and bunded fields. The ploughing of hill slopes for cultivation of hill millets should on no account be allowed. Afforestation, coupled with the adoption of erosion-preventive measures, will check denudation of hill slopes and consequently greatly minimise the silting up of irrigation reservoirs lower down in the valley.

(2) The proportion of areas under actual forest growth is very small :—

This proportion needs be increased considerably and as stated earlier the climatic and soil conditions are very suitable for the same. But while carrying out a programme for the extension of forests preference should be given to economic trees, like hirda, shendri, pisa, khair, agave, cashewnut, mango, bamboo, tapioca, shikekai, and medicinal herbs, all of which should provide in course of time additional source of income to the people and raw materials for industries,

For instance, with additional plantations of hirda it may be possible (even now it is possible if Junnar is bracketed with Ambegaon) to secure adequate quantities of hirda at Ambegaon alone to start a sizable factory there for extracting tannin. The necessity and importance of such a factory will be easily realised if it is mentioned that there are at present few hirda tannin factories in India. Another industry that can be started is of manufacturing kamala dye used for colouring silk out of the kumkum fruit yielded by the shendri plant. Still another industry is indicated by the pisa plant, the seeds of which contain above 80% of lauric acid. The pisa oil is of great importance as a substitute for coconut oil. It may be mentioned that the latter two species are fairly abundant in some of these forests and they can be exploited on co-operative lines as suitable cottage industries in the Maval belt.

Another direction in which prompt action is necessary relates to the abolition of *Maliki* rights in forests. In the long-term national interest it would prove desirable on the part of Government to take over their management and control. It will then be easier not only to stop the shifting cultivation as is now being practised but also to plan and execute a uniform development policy for all the forests in the belt.

By these means, it is estimated, the area under forests would be almost doubled. The density of forest growth should be raised from 7 to one.

(3) The heavy precipitation of annual rain runs to waste in the absence of forest cover over the catchment area.—

The protection forest, as envisaged above, will control rushing torrents and floods and help in conserving the rain water. It will induce underground flow and new springs resulting in longer flows in nallas and rivers. The increased water supplies would be available for use in variety of ways. It will solve the water problem, especially of drinking water, by construction of kachcha and pucca bandharas, small village tanks in the Ghat-regions for the use of cattle and sinking of new wells. Though there is no suitable site in the Ghod valley for a hydro-electric tank to take advantage of the elevation of the Ghats, still there may be several sites in other similar

valleys with Ghat-catchment in Maharashtra and a programme of a systematic exploitation of such sites should be worked out for augmenting power supply and increasing irrigation. Suitable sites for major irrigation reservoirs should also be explored to impound as much proportion of the heavy and assured annual rainfall as may be possible.\*

(4) Unrestricted grazing facility has led to its misuse or abuse by the people and does not allow tree and grass growth:-

For the successful execution of the policy of universal afforestation in this belt grazing will have to be completely prohibited. Cutting of grass for cattle should, however, be encouraged.

(5) The means of communication available at present in the belt are very poor and far from satisfactory. For opening the belt for fuller development also for the transport of forest produce means of communications will have to be extended and improved.

**Deshi Maval :--**Whereas the Maval belt is predominantly suited for forest growth, the Deshi Maval or transition belt is eminently suitable for the development of agriculture. This is evident from the facts that the belt is less hilly, soils more fertile, rainfall moderate and well-distributed, subsoil water supply favourable and within easy reach and that diversified agriculture is already practised. The survey of the tract indicates that some favourable parts have already been developed. But there is still a wide scope for further development. The following are some of the important lines on which further development of this transition belt can be effected :

(1) The forests in this belt are found in broken discontinuous form. The stand is rendered very open by the past maltreatment :—

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\* The underlying idea in Beale's Surveys was to store and take waters from Ghat-fed rivers to the eastern famine-tracts within economic lead and expenditure. The Note in Appendix III below, however, makes out a case for resurvey of all potential storage sites with a view to bringing about overall development of the Bombay-Maharashtra both for power and irrigation purposes.



This deficiency needs immediately to be made up by undertaking a systematic programme for the reconditioning of the hilly regions and for preserving the existing forests. The western parts of the belt, especially the moist deciduous regions in which the terrain is hilly and the rainfall more assured, afford wide scope for the same. The teak and some such timber species of commercial importance which lend themselves for easy regeneration suggest themselves for wide extension. The target should be to push up the density of forest, which stands at present on the lower side of 0.5, to as high a proportion as possible and to make the forests more or less compact blocks of woody vegetation, covering all the base hills and slopes, whether government or private-owned. As in the first belt, all private forest lands should be brought under Government management and control. As in the Maval, the cultivation of hill slopes should be prohibited immediately and all such area should be brought under forest. It is estimated that these measures will increase the area under forests by about 5,000 acres. Grazing must in no case be allowed in areas of regeneration and young plantations. Attention should be directed to stop further deterioration of the grass lands due to indiscriminate grazing. People should be educated to take to stall-feeding of cattle with cut grass and fodder from crops.

(2) The slopes of hills as well as flat agricultural lands are undergoing erosion by rain water for years.—

An immediate and speedy programme of universal contour bunding from ridge to valley suggests itself as a remedial measure to stop this preventable waste of rich soil. Contour trenching of the hill slopes at regular intervals with suitable planting of seeds and master drains at the foot of the hills should be provided with advantage with a view to preventing the spoiling of agricultural lands down below by floods or washings of debris from higher levels. Besides conserving soil, contour bunding conserves the moisture of rain water and serves as a series of percolation tanks on a miniature scale.

(3) The rain water falling in and flowing through the belt has not so far been fully utilised and is allowed to drain down to waste:—

Agriculturists from this transition belt are already accustomed to bagayat cultivation. Any augmentation of water supply even in the existing sources of irrigation is, therefore, sure to result in intensive and diversified agriculture. In these circumstances the problem of increasing the water supply in the belt by harnessing all possible means assumes utmost importance. The construction of a series of bandharas on most of the rivers, nallas and streams flowing through the belt, following the 'Baglan' system, is one of the many ways of increasing the water supply for irrigation in the belt itself. The supply may be almost perennial if feeder and percolation tanks could be constructed higher up on the streams. This belt is eminently suited for such works as the streams have post-monsoon flows for a longer time. Programmes of afforestation and universal contour bunding properly carried out will increase the underground supply of water in the existing wells, further indicating the sinking of new additional wells for irrigation. It is estimated that as a result of all these minor irrigation works the present area under bagayat crops will be doubled. Physically situated as it is, this belt may afford some sites on rivers for constructing storage reservoirs for providing facilities to intensive and extensive irrigation in the famine tract of the Desh belt in the east. Gangapur Budruk has been mentioned by our survey party in place of the Sakora site, suggested by Mr. Beale, as one of such sites for constructing a storage tank on the Ghod river and it is, therefore, suggested that its suitability or otherwise should be further explored.

(4) The agriculture as practised at present needs be further developed and diversified :—

Coming to the problem of agricultural development, the extension of irrigation facilities and adoption of universal contour bunding as envisaged above, will bring about conditions favourable for intensive and diversified agriculture on the majority of lands. The submarginal (lighter) lands are at present used for raising crops. Instead of improving, the lands get further deteriorated in the process. To check this deterioration such land should be put under better types of grasses, including legumes, periodically so as to give them rest and to

build up the soil. No grazing be permitted in such lands but grass be used by cuttings.

The present rotations and mixtures of crops in the belt, good as they are, can be improved. It is always desirable to rotate legumes with cereals in order to quickly recuperate the lands. With the same object, the extension of groundnut, peas (watana) and tur on a much larger scale than at present is also indicated.

As climate and soils are congenial for the cultivation of variety of fruits, the acreage under orchards may profitably be extended wherever adequate water supplies are available. Such extension of orchards will increase the income of the agriculturists. With increasing irrigational facilities it should be the policy to produce on an ever-increasing scale raw materials for industries.

In order to make the agriculture more remunerative and stable, mixed farming with dairying or poultry-keeping should be followed.

**The Desh:**—The Desh belt, constituting more than half of the total area of the survey tract, comprises vast treeless undulating plains and lends itself mainly for agriculture. The soils are fertile and capable of producing good crops under seasonable rainfall. But the annual precipitation is very low, ill-distributed and precarious. It is normally received late in the monsoon. Under these circumstances, agriculture reduces itself to a gamble in rain. The belt is subjected to frequent failures of crops and as such has come to be known as famine tract. Furthermore, the showers, though few in number, are so sharp and of beating character that they destroy the physical structure of soil particles and wash away year after year the rich surface soil. The lands are thus continually getting deteriorated and impoverished. The problem of problems, therefore, is how to grow crops in this belt successfully. This can be done by two ways: firstly by providing irrigation facilities and secondly by conserving soil and rain water.

**A. Major Irrigation:**—A recourse will have to be had to major irrigation works as recommended by the Famine

Commission of 1880 and the Irrigation Commission of 1901. Some of these works have already been executed by Government but much remains as yet to be done. The storage of water in the reservoirs situated at higher levels in the Maval and transition belts being ample and unailing, large areas can be irrigated under seasonal and perennial crops in the existing famine districts in the east. Wherever heavier soils are met with proper drainage will have to be provided for simultaneously.

In the rainy season considerable volumes of water flow down the waste weirs of storage reservoirs and over pick-up weirs. Investigations should be carried out to see if this surplus water can be diverted through canals to fill-in additional auxiliary and tail-water tanks for post-monsoon use. There may be occasions during flood periods when there will be water in addition which should be let into low-lying fields for moistening them for rabi sowing.

Major irrigation systems will make it possible to grow two or three seasonal crops every year in rotation or perennial crops like sugar-cane, lucern and orchards. It will considerably increase the level of yields of all the crops with the help of manures and make it possible to follow diversified cropping. Raw materials like cotton, oilseeds, sugar-cane, tobacco etc. will be available for the development of industries. The yields of foodgrain crops (including cereals and pulses) grown after sugarcane will be unusually heavy, getting advantage of the residual effect of manuring. The irrigation farming will not only prevent recurrence of famine conditions in future but would stabilize agricultural economy at a higher level and provide employment to a large number of persons from the neighbouring tracts both in agriculture and processing industries. It will also promote the establishment of mixed farming with dairy industry, animal husbandry and poultry and bee-keeping. This will increase the supply of protective foods and cash receipts, thereby helping to raise standard of living.

The relief afforded by the construction of major irrigation works will not cover all the areas in the famine tract, as the terrain is not favourable for lateral extension of irrigation.

It is estimated the even if all the ghat-fed rivers are harnessed they will not be able to cover more than 20 percent of the famine area under major irrigation. Even then, the direct and indirect benefits derived from major irrigation will be more varied and valuable and of permanent nature than is indicated by the small percentage figure.

**B. Minor Irrigation :—**In the remaining 80 percent areas advantage should, however, be taken of all potential sites to construct small storage and percolation tanks for giving one or two waterings to save the crops. Another way would be to construct a series of bandharas, as in the Baglan tract, on rivers and major streams. Besides preventing scouring of the beds, this will conserve part of the flood water for drinking and lift-irrigation purposes and raise the sub-soil water level in the valley down below. As a result, the supply of water in the existing wells will increase and sustain as a result of which the sinking of new wells will be facilitated. It will further augment post-monsoon flows in the streams.

**Conservation of soil and rain water :—**The same area will have to be protected by conservation of rain water through universal contour bunding. The universal contour bunding will also result in preventing surface run-off of rain water and conserve surface soil. This must be followed by the adoption of dry farming methods in order to achieve the maximum benefit of the conserved moisture and soil for securing better crops.

The other necessary developments incidental to the above would include provision for communications and fuel forests. To get the maximum benefit of the diversified cropping and orchards, provision of quick transport facilities for marketing the produce will have to be made by the construction of roads, rails and other communications.

Advantage should be taken of the berms of canals and river banks for raising fuel forests to meet the demand for fuel of increasing population. This will enable us to augment the supply of farmyard manure for agriculture and yield revenue to government.

**Livestock Improvement:**—Taking the advantage of the proposed increase in grass resources in the forests, efforts can be made to improve the livestock of the valley. The total potential forest area ( about 38,000 acres ) in the first two belts from which grass will be available for stall feeding, supplemented by fodder and concentrates from agriculture, should be able to maintain in good condition a cattle population of the same order. What is needed is qualitative improvement of cattle. Taking the physical and climatic conditions in the first belt into account, the Dangi breed may prove to be a suitable breed for replacement of the present mixed breed. In the second and third belts the Khillar breed should be established. With the facilities of artificial insemination now available it should be possible to replace the present stock by pure breed in a period of say 10 years. This will serve a dual purpose of providing more milch and better draft cattle. It is presumed that with the improvement of cow breed and increase in fodder supply the present milk supply can easily be doubled and efficiency of the work cattle improved. The supply of milk from buffaloes can also be increased by proper selection of the breed and better feeding.

In this connection, development of the village poultry by improvement of the country birds by mating them with breeds like Leghorn and Rhode Island is indicated. This will result in yielding larger number of eggs of bigger size. The improvement of poultry will provide protective and nutritious food to the rural population. There is scope for increasing the number of poultry birds in view of the development of agriculture, especially of lucern and hybrid maize crops, in the tract.

The sheep rearing can only be followed in the drier tract of the third belt (Desh). At present improvement in the village flock is carried out by grading the local breed with some foreign strains. Some breeds are known for better wool and others for quality meat.

**Compost and Manure:**—With the idea of improving village sanitation and increasing the supply of manure, efforts should be made to conserve all the human waste from villages.

The cattle urine must specially be preserved along with the cattle dung. Large quantities of organic matter from the forest areas should also be converted into compost and used in irrigation farming. In this connection, production and utilization of green manure should also receive adequate attention.

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## CHAPTER VIII

### BENEFITS AND FINANCIAL IMPLICATIONS OF THE RECOMMENDATIONS

#### I. Due to Forest Developments.

The total benefits, direct and indirect, derived from the implementation of the recommendations made earlier cannot be assessed in terms of money value. The benefits accruing from the extension of protection forests in the Maval belt, for instance, cannot all be calculated in terms of money returns, though its importance from national point of view is incalculable. Protective forests play an important part 'in the conservation of soil fertility' and 'in the maintenance of the water regime of the land. The organic matter they yield improves the tilth and increases the water-holding capacity of the soil thereby reducing the run-off. The presence of vegetation acts as a physical check to the velocity of the run-off and reduces its soil carrying capacity.....They (forests) exert a beneficial influence on the climate of the region.' The forests also serve as important source of raw materials, such as, timber, bamboos, fuel, lac, gum, kath, honey, hirda etc, money value of which can be calculated.

The forests in the Deshi Maval or. transition belt are mainly productive. They provide timber and poles from teak, airo, dhavda etc. and yield regular revenue to Government. They are easy to regenerate and can be maintained at an optimum density by adopting a regular working plan in areas which receive more than 40 inches of rainfall. By raising the density of forest stand in the existing area and by extending the area of forests it is estimated that the yield in kind can be doubled.

The third or Desh belt is not congenial for the development of forests in general but with the extension of major irrigation canals fuel forests can be grown along their berms as stated earlier.

#### II. Due to Agricultural Development

(A) **Dry Land Agriculture** :—As stated above, about 50 percent increase in the yield will be obtained by universal



contour bunding followed by the adoption of dry farming methods. This increase would begin to accrue from about the fourth year after bunding in most cases. The area to be banded in the second and third belts would roughly be as follows :—

Net cropped area	...	...	1,05,800
( 28,640 plus 77,160 )			
Less : (1) Existing bagayat under minor irrigation ( 2209 plus 3166 )		5,375	
(2) Proposed increase in area under bagayat		5,375	
(3) Area likely to be irrigated under major irrigation assumed at 6% of the net cropped area in the sample villages		6,000	
(4) Approximate submerged area under Gangapur Budruk stor- age tank		12,000	
		<hr/>	
Total area to be deducted			28,750
			<hr/>
Net Area to be banded.	...		77,050
or say 77,000 acres.			
Present average yield from the dry area at one ton for 10 acres			7,700 tons
Anticipated 50% increase due to improvement from the 4th year on- wards year after year.			3,850 tons
For this, the Government will have to invest by way of departmental technical assistance at Rs. 20/- per acre			Rs. 15,40,000

But this amount will be met from the subsidy that will be received from the Government of India for soil conservation schemes. The State Government will also have to find a sum of about Rs. 46.42 lakhs to start with at the rate of Rs. 60 per acre for construction work but this is returnable by the

cultivator in 20 annual equated instalments bearing interest at  $4\frac{1}{2}$  percent. This means no loss or no gain to the State Government while the cultivator will have to pay about Rs. 5 per year per acre in addition to land revenue. But in years when rains fall short of minimum required or are ill-distributed the anticipated annual yield may not materialise in the famine tract, making it impossible for the cultivator to bear the additional burden.

It is needless to stress that land, especially in an agricultural country like India, must be treated as a national asset of primary importance and it is the imperative duty of Government as superior holder to provide for protecting it against erosion by bunding and to maintain the bunds in good repairs from year to year. The Government should, therefore, share an appreciable part of the expenditure on contour bunding and should not charge any interest on the capital outlay. Normally in years of scarcity and famine the Government has to incur expenditure on relief works and to forego land revenue by way of land revenue remissions. As contour bunding is expected to reduce the frequency of crop failures and consequent scarcities and famines, a part of capital expenditure on contour bunding should justifiably be set off against famine relief expenditure.

#### (B) Bagayat Land Agriculture :

(1) **Minor Irrigation** :—As most of the land in the heavy rainfall belt is proposed to be brought under forest and as major portion of the basin land is likely to be submerged by the proposed Gangapur Budruk Tank, there will not be much scope for improvement by minor irrigation and, therefore, it is not taken into consideration.

The target suggested above for the development of minor irrigation in the second and third belts is to double the existing bagayat area. This would work out as follows:—

	Acres
Existing bagayat area ( Table No. 13 )	
( 2209 plus 3166 )	5,375
Proposed increase due to development	5,375
Total expected bagayat area	10,750

Estimated Additional Value of crops per year under  
Minor Irrigation

	Area (acres)	Average yield per acre (lbs)	Total yield ( lbs )	Rate in Rupees	Total Amount Rs.
Cereals and Pulses ( 686 plus 1587 )	2273	1000	2273000 or 1000 tons	Per ton 170/-	1,70,000
Potatoes, tubers, and vegetables ( 1160 plus 1000 )	2160	10000	21600000 or 9650 tons	70/-	6,75,500
Sugarcane ( 182 plus 397 )	579	9000	5211000 or 2300 tons	200/-	4,60,000
Orchards ( 181 plus 182 )	363	30000 Mosambi fruit	10890000 fruits	3/- per 100	3,26,700
Total.....	5375	...	...	...	16,32,200

The additional equal area to be brought under minor irrigation will be by converting the existing dry area which at present yields  $\frac{5375 \text{ acres}}{10 \text{ tons}} = 537.5$  tons valued at Rs. 91,350.

The net increase in income will be, therefore, Rs. 16,32,200 minus Rs. 91,350 = Rs. 15,40,850.

The above calculations are worked on the cropping pattern obtained in the existing bagayat areas of the two belts in the Ghod valley. The crop pattern may, however, vary from valley to valley in the Deccan plateau.

(2) Major Irrigation:—The area likely to be irrigated under the proposed Gangapur Budruk major irrigation project is assumed to be 6,000 acres in the sample villages. The break-up of this under different crops and the total yield and value therefrom would be as under :—

**Total Estimated Additional Value of Irrigated Crops per year under proposed Gangapur Bk. Tank**

Crops	Percentage assumed	Area	Average yield per acre unirrigated	Average yield per acre irrigated	Increase in yield per acre due to irrigation	Increase in production	Rate of produce Rs.	Value of additional production (in 000)
<b>18 months crops</b>								Rs.
Sugarcane	12½	750	...	4 ton gul	4 tons gul	3000 tons gul	200 per ton	600
Other perennial Orchards	6½	375	...	30000 fruit	30000 fruits	10250000 fruits	3 per 100 fruits	307
<b>8 Months crop</b>	23	1380	...	...	...	...	...	...
Cotton	...	650	...	360 lbs. (lint)	580 bales (lint)	580 bales (lint)	350 per bale	208
Groundnut	...	650	...	2000 lbs (pods)	580 tons	580 tons	250 { ton	130
Other crops	...	80	...	6 tons	480 tons	480 tons		150
<b>Seasonal Kharif and rabi</b>	53	3120	200 lbs	1000 lbs	800 lbs	1110 tons	170 per ton	189
<b>Seasonal hot Weather</b>	6½	375	...	12 tons	12 tons	4500 tons	40 per ton	180
<b>Total.....</b>	100	6000	...	...	...	...	...	1680

The total estimated annual value of the yields of crops under major irrigation project at Gangapur Budruk would be Rs. 16,80,000 as against Rs. 70,000 under the dry crops. Even the yield of dry crops that we have assumed is an average figure realisation of which is very uncertain in a given year.

By the conservation and development of the land and water resources in the valley the total production would be as follows :—

<i>Net cropped area = 1,16,000</i>			
	Existing	Potential	
	(yields given in tons.)		
(1) Area that will remain under dry crops (77,000 Acres.)	7,700	11,500	
(2) Area under existing and potential minor irrigation only 4546 acres under cereals and Pulses (10,750 Acres.)	1,455	2,000	
(3) Area under potential major irrigation of which 3120 acres would be under cereals. (6,000 Acres.)	600	1,393	
(4) Area to be submerged under Major irrigation work at Gangapur Bk. (12,000 Acres.)	1,200	...	
(5) Area to be afforested of which cropped annually is only 4,000 Acres. (10,250 Acres.)	990	590	
Total Acres:	<u>1,16,000</u>	<u>11,945</u>	<u>15,533</u>
Value at Rs. 170/- per ton in lakhs of rupees ...	20,30	26,41	

The total population of the sample villages is about 70,000 or 14,000 families. They will annually require total foodgrains

of 14,000 tons at the rate of one ton per family per year. Even according to this standard which does not include other articles in the diet like salt, oil, condiments, sugar, etc., the present production falls short by about 15 percent. After the adoption of various measures suggested above the production will come to about 15,533 tons or a little more than the above standard. This is so far as the cereals and pulses are concerned which are the basic essential articles of daily food. The increased production of cereals and pulses would augment the supplies of fodder and concentrates (including oilcake and cotton seed) which in turn will result in producing more milk and its products which will provide protective foods.

Coming to the financial implications of the major and minor irrigation proposals it may be reiterated that it is the primary responsibility of the Government to give protection to the chronic famine tract and it should not, therefore, insist upon getting an economic percentage return on capital outlay involved. An appreciable part of the outlay may have to be set off against heavy expenditure on relief measures during recurring famines<sup>1</sup> and indirect benefits of increased irrigation will also have to be taken into consideration while assessing the benefits of such schemes.<sup>2</sup> The proportionate capital outlay involved in the construction of major and minor irrigation schemes in the sample villages of the Ghod valley is roughly estimated to be about Rs. 70 lakhs for 11,000 and odd acres at Rs. 600 per acre on an average, resulting in an additional gross yield of Rs. 32.20 lakhs for the irrigated area. This will increase the area under irrigation from about 4 percent at present to about 14 percent which will, in addition to direct and indirect monetary returns, provide full-time gainful employment to a large number of people all the year round.

**III. Industries :—**The developments in forest and irrigation suggested above envisage production of economic plantations and cash crops like sugarcane, groundnut, cotton, tobacco, fruits

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1. A tentative formulæ for calculating permissible set-off against famine relief is given in Appendix IV.

2. Vide 'Economic Effects of Irrigation' by Prof. D. R. Gadgil, Gokhale Institute of Politics and Economics; Publication No. 17.

etc., which will earn about Rs. 30,000 per year in round figure over an area of about 300 sq. miles or say Rs. 10,000 per sq. mile. The non-food crops, besides increasing the cash income of the agriculturists, will provide raw materials for several industries, such as:—

(1) Sugar and gul manufacture :

- (a) Manufacture of confectionary,
- (b) manufacture of mythilated spirit or power alcohol,
- (c) manufacture of card-board from sugarcane bagass, groundnut husk or rice straw,

(2) Oil mills.

(3) Manufacture of hydrogenated oil or Vanaspati

(4) Cotton spinning and weaving as a cottage industry with electric power.

(5) Bidi and cigarette manufacture.

(6) Fruit preservation and canning.

(7) Saw mills.

(8) Manufacture of tannin from hirda fruit.

(9) Manufacture of Kamala dye.

(10) Manufacture of Pisa oil.

(11) Industries involving processing of minor forest produce like agave, khair wood ( for kath ), lac, etc.

**IV. Employment:—**The dry land agriculture can employ the labour for only 3-5 months in a year, whereas irrigated farming can provide employment to the local hands throughout the year and provide work to an additional equal number or more.

The development schemes of contour bunding and of minor and major irrigation will engage enforced idle labour of the tract under survey for the duration of their execution. The exploitation of the developments, when completed, will provide work to many of these people released from the development schemes, while the remaining will be absorbed in the industries that may be started. Besides the people in

the tract itself, the people in the adjoining dry area would be able to find employment in the industries.

**V. Period Required for Development :—**It may take long to carry out the developmental works like afforestation, universal contour bunding, minor irrigation and major irrigation. The state Government with the help of Government of India will have to evolve a suitable machinery to carry out this programme in the light of experience gained so far in the execution of developmental schemes. The capital outlay for all these schemes in the sample tract will need 1.5 crores of rupees. As area of the sample villages constitutes about 42 per cent of the entire Ghod river valley (4.5 lakhs of acres) upto the end of the tenth zone, a few miles to the south-east of Shirur, the capital outlay for the development of the entire valley will be about 3.5 crores of rupees. This works out at 0.8 crores of rupees per lakh of acres. The total area of the Bombay Maharashtra would roughly be 300 lakhs acres and at the above rate the cost of development would be about Rs. 250 crores. This figure does not, however, include expenditure that will have to be incurred on items like afforestation, hydel electric works, industries, construction of transport facilities and other essential development activities but provides only for universal contour bunding and irrigation which are the basic needs of development.

This outlay will have to be suitably spread over a period of 15-20 years as required. Benefits of these schemes will begin to accrue gradually after a lapse of some period, for instance, from the fourth year in the case of bunding.

**Conclusion :—**An attempt has been made in the preceding pages to analyse and evaluate the data, collected through the sample survey, regarding the existing land and water uses in the Ghod river valley from its origin at Ahupe on the crest of the Sahyadries to its confluence with the Bhima river at Sangavi in the Shrigonda taluka. On the basis of these data and personal observations of the tract by our survey party we have tried to prepare a comprehensive and integrated plan of development for the tract by providing for the exploitation of the existing land and water resources to their optimum



capacity. The claims of forestry, agriculture and industry have been considered from a scientific and rational point of view and attempts have been made to balance them. Ways and means have been suggested for developing forestry, agriculture, irrigation and power. Special emphasis is laid on the development of agriculture so as to make it more productive, stable and diversified. Diversified agriculture would facilitate the production of a variety of raw materials which would bring about structural, instead of linear, economic and industrial expansion. The problems of under-employment and unemployment would automatically get solved successfully by the adoption of the integrated programme of development suggested in this report.

The above integrated pattern of development plan could be repeated *mutatis mutandis* in other valleys of Maharashtra. This, in the opinion of the Sub-Committee, would effectively prevent or mitigate the evil effects of recurring scarcities and famines which result in migration of a large population to industrial places, the loss of a large proportion of cattle, the loss of land by mortgage and distress sale, increased and perpetual indebtedness and the general disruption of the almost entire agricultural economy in the tract.

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## **SUMMARY OF FINDINGS AND RECOMMENDATIONS**

The Technical Sub-Committee of experts was entrusted by the Maharashtra Central Famine Relief Committee with the task of suggesting ways and means for the maximum utilisation of land and water resources on the basis of a general survey of a typical river valley in the Bombay Maharashtra with a view to preventing or minimising the recurrence of scarcities and famines and thereby to bring about all-round development of the region.

As the region to the east of the Sahyadri range is subdivided into a series of nearly parallel river valleys running west to east with almost similar characteristics, the Sub-Committee selected the Ghod river valley in the Poona district as a representative valley of the Bombay Deccan and carried out a reconnoitring survey of a few selected villages of representative character.

The survey covered 41 sample villages with 305.3 square miles, inhabited by about 70,000 people.

The Sub-Committee divided the Ghod valley into three belts according to differential physical and climatological conditions obtaining in each belt. The first belt, called Maval, comprises the highly hilly tract bordering on the Sahyadrian range and receives an assured rainfall of between 180" and 70". The second belt, popularly known as transition tract and called here as Deshi Maval, is less hilly with broader valleys and receives moderate rainfall. The third belt called Desh, consists of wide and undulating plain with low and erratic rainfall of less than 30 inches. The Desh covers more than half the total area and is subject to frequent visitation of scarcities and famines.

As a result of the survey and study of records the Sub-Committee recommends that the first belt (Maval) is predominantly suited for planned intensive development of forests, and construction of reservoirs for major irrigation projects and for hydro-electric projects. The Sub-Committee has advocated the prohibition of shifting cultivation on mountain

slopes and has urged the adoption of intensive afforestation there. According to the Sub-Committee such afforestation would check denudation in mountainous region, conserve rain water, minimise silting of reservoirs for irrigation and hydro-electric power projects, induce under-ground currents and lead to longer flows in nallahs and rivers. Hydro-electric tanks could also be constructed in the Maval, taking advantage of the elevation of the Ghats. Though there was no suitable site for such tank in the Ghod valley, the Sub-Committee feels that a hydrographic survey of similar other valleys in Maharashtra would reveal several sites for the purpose.

The transition tract ( Deshi Maval ) is on the other hand best suited for diversified agriculture. The schemes suggested by the Sub-Committee for the development of this belt include, besides afforestation in hilly terrain, a programme of contour bunding, construction of master drains at the foot of hills and a series of bandharas on most of the rivers, nallahs and streams and adoption of irrigation thereon, wherever possible, on lines of ' Baglan System.'

The Sub-Committee has suggested that while carrying out a programme of afforestation in both Maval and Deshi Maval belts, preference should be given to trees of economic value, such as, hirda, shendri, pisa, khair, cashewnut, mango, bamboo tapioca and medicinal herbs which would provide, in course of time, additional source of income to the people in the area and raw materials for industries.

After suggesting an alternative site at Gangapur Budruk in place of at Sakora, as suggested by Beale, for constructing a storage tank on the Ghod river for reasons given, the Sub-Committee has desired that its suitability or otherwise might be further explored.

The Sub-Committee has suggested provision of major irrigation facilities for combatting scarcities and famines in the Desh belt. But the relief afforded by such irrigation would not cover all areas in the famine tract as the terrain is not favourable for the lateral extension of irrigation. Major irrigation, it is estimated, would not be able to cover more than 20 percent of the area of the tract. Even then the direct

and indirect benefits derived from major irrigation would be far more varied, valuable and of permanent nature, providing employment all the year round, than this small percentage indicates.

The Sub-Committee further recommends for areas that cannot be brought under irrigation universal contour bunding for conservation of soil and rain water, to be followed by the adoption of dry farming methods. Percolation tanks in the upper reaches of natural drainage lines would also help to some extent, the Sub-Committee has said.

The Sub-Committee has suggested the possibility of starting on cooperative lines some industries for processing the raw materials available in the tract, such as, production of sugar, gur, methylated spirit and power alcohol, manufacture of cardboard, cotton spinning and weaving mills, the extraction of tannin, pisa and Kamala oils and the establishment of saw mills.

According to the Sub-Committee, the capital outlay required for the development of the valley, excluding the industrial section, will be about 3.5 crores of rupees. At the rate Rs. 0.8 crores per lakh of acres, the cost of development for about 300 lakh acres of Bombay Maharashtra would amount to Rs. 250 crores. This amount will be required for universal contour bunding and irrigation alone which are the basic needs of development and shall not include the cost of afforestation, hydel electric works, industries and other essential development activities.

This outlay should suitably be spread over a period of 15-20 years as required. The development scheme should be entrusted for execution to a suitable executive machinery specially set up for the purpose.

The Sub-Committee has recommended, in short, an integrated regional plan for balanced development of forests, agriculture, irrigation, power and industry. A special emphasis is laid on the development of agriculture so as to make it more productive, stable and diversified. For, according to the Sub-Committee, such kind of agricultural development would

not only increase food production but would also facilitate the production of a variety of raw materials with the help of which industries could also be established in the region, providing increased employment to the people for longer periods. This pilot plan for a representative river valley, according to the Sub-Committee, could be applied *mutatis mutandis* to similar river valleys in the Bombay Deccan and, in its opinion, it is the only and best means of preventing or minimising rigours of recurring scarcities and famines in the region as a whole.

## APPENDIX I

### The Konkan

The Konkan is bounded on the north by the Damanganga river and the Kali Nadi in the south. To the west is the sea-board—the Arabian Sea. The western flank of the Sahyadris forms its eastern boundary. The eastern hill-slopes fall precipitously from an elevation of 2000 ft. to 600 ft. within the width of first 5 to 10 miles from the Ghats and further west in Ratnagiri district the average elevation above sea-level is 300 ft. to 500 ft. while in Kolaba and Thana districts it is much lower. Orientation to the Arabian Sea, the projecting hill features of the Sahyadrian range, the restricted alluvial area, preponderance of laterite in the southern half of the Konkan belt and a fairly dense population partly depending on local resources and partly on emigration are the main features of the Konkan.

According to physical, topographical and climatic conditions Konkan divides itself into five belts or regions. These are (1) the steep western flank of the Sahyadries, (2) the north Konkan, (3) the south Konkan with laterite cover and mineral resources like iron and manganese, (4) the coastal plain developed into garden cultivation of cocoanuts, betel-nuts, plantain, betel-vines, pepper, nutmeg and other spices, cashewnuts and mangoes, kokam and bread-fruit etc. and (5) the large marshy 'Khar' lands along both the banks of tidal rivers meeting the Arabian Sea which have been developed into well protected salt-rice fields and salt-pans to manufacture common salt. The estuaries have great trading centres for exporting timber and other forest produce. Each of these regions, having its own peculiar and common problems, needs be developed on different lines. But some of the important problems affecting the Konkan are broadly indicated below along with their possible solutions.

1. Very steep slopes of the Sahyadrian range and its cross spurs, laid bare by man's continuous vandalism, accelerate heavy denudations during the downpours of rain. The

loose soil at such sites is washed away upto hard rock below, thereby retarding the regeneration of the forest.

2. Forests in the Kolaba and Thana districts are comparatively better off due to flatter ground and gentler slopes and due to proper protective arrangements by the Government. But the tracts in the Ratnagiri district are found to be bare due to indiscriminate cutting down of trees without any attempt whatsoever at replacing. No check appears to have been exercised there by the Government in stopping the depletion of the forests.

3. Heavy floods of hill-streams constitute a periodical menace to villages and cultivated areas.

The solution of these problems lies in developing the steep slopes of the Sahyadri by a planned programme of afforestation, trenching and terracing and training of small and large streams and rivers. Felling of trees and branches of forest growth on hill slopes at least in the first 10 miles from the crest should be strictly prohibited by law and private rights to such practices should be abolished. Cultivation of steep hill slopes should be immediately stopped, including grazing.

Planting of economic trees like aloe, bamboos, hirda, mangoes etc, on the slopes of hills should be resorted to. This will yield raw forest materials in abundance for commercial exploitation as the climate, soil and rainfall are favourable for such development.

When hill slopes are protected by new forests the menace of catastrophic floods will decrease.

4. Cultivated land in the Kolaba and Thana districts is good. But the land in Ratnagiri is poor, the soil is shallow and devoid of organic matter. At present there are no irrigation facilities in the Konkan. Crops are scanty and insufficient for the yearly maintenance of the population. People are, therefore, forced to migrate to industrial places like Bombay for their livelihood.

The land development programme (including afforestation) envisaged above together with small hill tanks and building up of pools in the beds of streams will generally increase the

water supply for use in the post-monsoon months. Irrigation facilities can be made available by canalising the tail-waters of existing and future hydel schemes and partly by pumping water from the running streams by cheap electric power likely to be available from the Koyana Hydel works and also from wells, for seasonal cash crops the manuring of which will improve the soil structure gradually. Increased water resources might facilitate extension of plantations of graft mango and cashewnut, betel-leaves and vegetables, giving good money returns to the farmer. Khar land development schemes, already under way, should be drawn up and extended. This will increase cultivable areas in the Konkan which are none too large at present.

5. Means of communications, especially in the hilly portions, are meagre and badly maintained. Great inconvenience is experienced in the monsoon months when rainfall is almost continuous and flooded nullas and rivers cause serious impediments to wheeled and even to foot traffic.

6. As the sea is within 30-50 miles from the crest of the Sahyadries, the creeks ( which were once serving as cheap and efficient means of communications to Bombay and other important parts by country crafts ) are fast silting up by colossal quantities of debris washed down from the hills and are becoming difficult for negotiating.

Communications must be improved by expediting the construction of the proposed Konkan Railway and a concreted highway right up to Goa and also by making all-weather-concreted feeder roads from all important towns and villages to the nearest railway stations.

Following the land development schemes, the dredging and desilting of creeks should be taken up, preferably upto the rail line, so as to function again as alternative means of communication by the sea route. The improvement of major and minor ports in the Konkan which is already under consideration of Government will also help in this direction.

7. At present there are no industries worth the name in the Konkan, though its potentialities are great.



With adequate communication facilities coupled with the supply of cheap electric power from the Koyana works, some small and large industries, like manufacture of iron, aluminium and manganese from rich ores and construction of country crafts can be developed, utilizing most of the raw materials produced or available locally. This industrial development will, in course of time, provide employment to a large number of people who are now required to migrate to Bombay and other places.

Fishing industry, both inland and sea, can be extended on the main sea-board by following modern and scientific methods of fishing.

8. In spite of abundant rainfall, there is scarcity of drinking water in the eastern parts of the Konkan. A few wells in deep nalla beds and springs emerging from the toes of hills which thin down to mere streaks in the hottest part of the summer, are the main source of water supply in the hilly tracts just below the Ghats. In villages near the creek and sea-shore, water has to be stored in small village tanks for use of men and cattle during summer. This unprotected water supply results in a heavy incidence of guinea worm (नारु) among the people there, resulting in ill-health and enforced idleness. This disease plays havoc in summer months in some interior villages also.

Proper schemes should be drawn up for tapping water supply from hill streams and storages; though proportionately more costly, they are necessary for providing good potable water to men and cattle of all villages and towns in the Konkan region wherever its want is acutely felt. All the step-wells in Kharpat villages must be converted into draw wells and all drinking water sources must be protected from the contamination of men and cattle.

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## . APPENDIX II

### Baglan system of Bandhara Irrigation

(The following Note is prepared by extracting relevant portions from Beales' Report (Part I) and from the Report of M. Visvesvaraya Committee of 1938.)

The North Deccan districts differ from the other parts of the Presidency by their extensive system of bandharas or masonry weirs with channels taking off on one or both banks. The flow in the rivers and channels is principally during the monsoon and rabi seasons, but a small hot season supply is sometimes obtained. This is an ancient form of irrigation and is now being carefully fostered by the British Government. The system of cultivation under bandharas has reached perfection in what is called the "*Baglan*" - a tract including the Burai, the west Panjhra valley, the Mosum and the whole Girna valley west of Malegaon.

In this part the *thal* or area commanded by a bandhara and its channel, is usually divided into four nearly equal parts, or *phads*, the whole of which is annually brought under irrigation. Each *phad* is subdivided into an equal number of shares or fields according to the number of owners. In any one year, the whole of one *phad* is devoted to rice, another to sugarcane, the third to wheat, gram peas etc., and the fourth to bajri or kharif jowar, etc. All cultivators in a given *phad* are bound to grow the same crop so as to equate their water requirements. Further, they are not allowed to change the rotation of crop pattern fixed by the villagers in advance. In the next year the same crops are grown but on different *phads*, viz., in the following order (1) sugarcane, (2) wheat, (3) bajri, (4) rice and in the next two years the crops move round in the same rotation until in the fifth year they regain their original position. This rotation continues without interruption, the only periods of fallow being the interval between the crops. Manure is put on before the rice crop, and again, by those who can afford, for the sugarcane. This system is termed quadrennial rotation. In triennial rotation the bajri is

omitted; in quinquennial rotation two sorts of rice are grown, superior Kamod and ordinary.

Under *pacca bandharas*, which are not controlled exclusively by the irrigation department, a consolidated land and water assessment was fixed on the area irrigated under the *bandharas* at the time of the survey. The repairs to the *bandharas* are done by the Government from the revenue of the consolidated assessment.

This system of distribution of irrigation water was advocated by some witnesses for adoption before the Bombay Irrigation Inquiry Committee, 1938. Speaking of the *phad* system in a Technical Paper ( No. 16, issued in 1929 ) Mr. C. C. Inglis, I. S. E., Superintending Engineer, Irrigation Development and Research Circle, Poona, has explained why its introduction on major irrigation canals is not practicable. He writes :—

“.....It was not proposed to divide the blocks into *phads* because it was realised that such a drastic distribution of holdings would be impossible ; but it was anticipated that exchanges of land could be arranged between those with land outside the selected blocks who wanted to grow cane in the blocks and those with lands inside the blocks who did not want to grow cane.

“ The cane areas were not concentrated into large blocks and practically the only alteration that took place was that cane areas were standardised by demarcation, but they remained scattered widely over large areas wherever there was a demand for them.

“ The advantages which occurred from the introduction of blocks were, however, very great ; because when the areas were standardised it was possible for the canal staff to distribute water much more economically ; and the cultivators, having an assurance of water for a period of years, found it worth while to carry out improvements to their land.”

The technical difficulties mentioned above do not seem to be insurmountable and serious attempts should be made to find out how this Baglan system of irrigation can be introduced all over the major irrigation works. The system has great

advantages from the administrative and financial point of view. Its introduction will, in addition, simplify irrigation rules and give relief to irrigators. Besides, this system will appreciably reduce overhead administrative expenditure and thereby increase the returns on the capital outlay. The Sub-Committee would, however, suggest that this system should be tried as an experiment on all new schemes, especially in the famine tract, where introduction of co-operative and collective farming should be the policy of Government. It may be worthwhile to try it in some favourable areas irrigable under the new Ghod canals.

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## APPENDIX III

### A Note on the Irrigational Potentialities of the Bombay Deccan

Mr. H. F. Beale's Report on the Surveys for protective Irrigation Works in the Deccan (1909) gives in Table I on pages 2 and 3 a comprehensive list of projects with the corresponding sites of storage tanks in cases where they were surveyed and other useful details of 32 possible protection works in seven valleys from north to south viz. Tapti, Godavari, Bhima, Krishna, Ghataprabha, Malaprabha and the Tungabhadra. There were in addition some existing irrigation works in working condition. Out of the 32 works, Nasik Canal at Gangapur, Pravara Project with storage at Bhandardara, Godavari Canal with storage at Darna Dam, Koyna Project with storage at Helwak and Gokak Canal, are either already constructed or are in different stages of construction. Survey and preparation of projects are in progress or ready for some other works like the Tapti Project with storage at Hatnur in East Khandesh, Girna Project with storage at Panjhan, Mula Project with storages at Chas and Mandvi, Kukdi (now changed to) Ghod Project with storage near Annapur, Mutha Canal extension from a new higher dam at Khadakwasla, Nira canals on right and left from Vir storage, Daddi storage project for Gokak and Ghatprabha Right Bank Canal. The remaining projects are yet to be taken up for survey and further investigation, like the Tapti Project with storage at Sustti, Kadva Project with storage at Palkhed, Aundh Project with Storage at Mukne etc.

On page 65 of the Report, Mr. Beale states that he was directed to make a hydrographical and hydrological survey of a certain portion of the Bombay Presidency in which an unfailing supply of water could be relied upon and where also this water could be used for the irrigation of lands liable to a very fluctuating rainfall and to occasional droughts. His surveys and investigations were therefore mainly restricted to Ghat-fed rivers and to sites of storages or weirs suitable for leading the unfailing water to famine districts in the eastern

Desh tract. His sites for storages are, therefore, mainly found to be situated in Deshi Maval or Transition tracts so as to reduce the cost of unfruitful length of canal in the upper hilly region.

For the overall advancement of the region, however, all suitable sites of storages, small or large, in the first belt of hilly tract will have to be investigated and taken advantage of for storing as much of the rain water as possible for various uses and a fresh detailed survey of all such sites is, therefore, indicated.

## APPENDIX IV

### Formula of Permissible Cost of Protection Irrigation Works

One of the members of the Sub-Committee has suggested the following tentative formula for calculating the permissible cost per acre irrigated under protective irrigation works proposed to be financed as protection against famine.

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Suppose there is a district or tract subject to periodical famine.

Let its population be  $x$ .

Then the area that should be irrigated for purposes of famine relief may be about  $0.5x$  to  $0.3x$  according to the judgment of the officers concerned.

Suppose we take it as  $0.4x$ .

Suppose area already irrigated is  $y$ .

Further area which needs irrigation is then  $(0.4x - y)$  acres.

Suppose the annual average cost of famine relief for the last 25 years, including direct relief, remissions of revenue and all incidental measures and expenses is "F".

Suppose the net revenue due to irrigation is  $r$  and the rate of interest is  $i$  (say  $3\frac{1}{2}$  per cent for such works. ).

The formulæ for calculating permissible cost per acre would be :

$$\frac{100}{i} \left[ P \frac{F}{0.4x - y} \div r \right]$$

The factor  $P$  allows for :—

- (a) the increased produce of the State and insurance against famine.
- (b) the increased incomes and welfare of the people.
- (c) increase income of the State by way of increase in income-tax, railway freight, several taxes incidental on increased produce.

(d) value of crop saved in famine year and bad years.—

In Uttar Pradesh State this factor, it is understood, is usually taken as 3.

This would mean, speaking very roughly, that if conditions are favourable, the cost of top-priority protective irrigation works for relief of recurring famine may be as high as double the cost of a real productive irrigation work ; which cost is usually represented by the capitalised value of the net revenue obtained from it.

Irrigation works (a) saves crops in famine years ; (b) ensure good crops in bad years ; (c) increase the out-turn of crops in ordinary years ; and (d) benefit the crops even in best years as stated by an eminent Engineer.

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