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UTILIZATION OF LOCAL RESOURCES

UTILIZATION OF LOCAL RESOURCES
A Case Study of Goa

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FOREWORD

The present report was prepared mainly for use of the Government of Goa in preparing a development plan for that territory. Nevertheless, we are releasing it for a limited circulation hoping that it may prove of wider interest as an exercise in planning for regional development.

It is obvious that all planning should be based on as full a knowledge of local resources and circumstances as possible and that in a plan of regional development, special attention should be paid to the solution of local problems and the development of local resources. With this in view, the Institute undertook a quick survey of Goa to obtain some knowledge of resources and problems in various areas and in various sectors of its economy. A considerable part of the present report is devoted to a description of the results of the survey and to sketching various facets of economic conditions as revealed by it. An attempt has been made to identify problems and to discover potentialities. It is in relation to these that certain proposals regarding future development are put together. It is regretted that the part relevant especially to development of industries including mineral industries could not be completed chiefly due to the sad death of Shri N.M.Joshi, a member of the staff of the Institute who was specifically working on these aspects of the economy. It is hoped that even with this gap, the report will be found of interest.

The effort to collect data and available experience and put together a plan for regional development was done by the staff of the Agro-Economic Research Unit in the Institute in close consultation with several officials and non-officials in Goa. Among the latter, I should mention especially the Principal and staff of the Shrimati Parvatibai Chowgule College of Margao. Our thanks are due to all officials and non-officials on whose willing co-operation we were able to draw heavily in many ways. We trust that the present report will evoke sufficient interest for them to subject it to closer examination.

Gokhale Institute of
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Poona.4
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V.M.Dandekar

PREFACE

The quick survey of Goa, the findings of which are embodied in this report, was carried out between November 1964 and March 1965. It was carried out with the help of a locally recruited staff because of the existence of a separate and distinctive local language in the territory.

The report does not attempt any estimation or quantifications because of the absence of essential overall data pertaining to population, land, water resources etc., the territory not being cadastrally surveyed as yet. It is, therefore, a study of the patterns of utilisation of some of the principal resources of the territory.

We would like to mention here the loss of participation and guidance occasioned by the unfortunate demise of one of the senior members of the team during the conduct of the survey. Shri N.M.Joshi took active part in the planning and direction of the investigations and died in harness during one of our visits to the field. We wish to record our sense of indebtedness and affection for the late Shri N.M.Joshi.

We owe a special debt of gratitude to Principal Wagh of the Shrimati Parvatibai Chowgule College of Margao whose profound interest in the economic development of Goa made him invite us to Margao for setting up headquarters of the survey and lend us all types of assistance. In particular, he was helpful in securing for us local contacts with official and non-official leadership.

The Government of Goa, Daman and Diu was very cooperative in making available all official data required by us. We would specially mention Shri A.F.Couto, then Secretary to the Goa Planning Board and Development Commissioner, Shri B.K.Chowgule, then acting Chief Secretary to the Government, Shri Kale, Director of Fisheries and Shri Prabhakar Kamat, Director of Industries who found time for discussions and assistance. We are thankful to all of them.

The territory, being under an alien rule and as such insulated from the rest of India for long, has developed a culture, in many ways different from our own. A basic understanding of the culture and its problems was essential for identifying issues for the inquiry. In this we were fortunate in getting the benefit of the experience and the thinking of prominent social leaders like Shri Gopal Appa Kamat, Shri Madhav Bhir and others. We record with gratitude their help in this regard.

Also, we are greatly appreciative of the understanding of the people of Goa, who, as respondents bore with patience and fortitude our efforts at collecting data and information.

While the three members of the team acted as a single unit all through, it may be mentioned that Shri Pore was in charge of looking after communications, forests, animal husbandry and mining labour, Shri Muranjan studied the problems in utilisation of land and water resources and the cultivation of crops and Shri Padki, fishing and the general background.

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CHAPTER 1

SUMMARY OF CONCLUSIONS

This chapter brings together the results of our investigations in the Union Territory of Goa, and indicates certain directions in order that the development programme should be an integrated and coordinated one, and hence more effective. The Territory of Goa, with its 1400 sq. miles of area and 6 lakhs of population, though small as compared to some of the adjoining districts, presented a complex socio-economic picture. The reason for this complexity was mainly the geographical and the topographical nature of the territory, with level lands nearer the sea on the west and hilly lands in the east. The area possessed relatively rich land, mineral and marine resources, and these did not receive due attention from the former regime so far as their development was concerned. This fact complicated the already complex socio-economic picture. One could clearly distinguish between the areas of the territory known as 'old conquestas' and 'new conquestas'. The former area which included the talukas of Goa, Salcete, Marmugao, Ponda, Bardez, Bicholim and some part of Quepem were marked by a relatively well developed transport system, high wages and establishments of service industries, mainly as a result of the development of mining industry. As against this, the latter area which included the talukas of Satari, Sanguem, Canacona, Pernem and parts of Quepem were largely marked by lack of transport facilities, industrial development, and low wages. This broad picture indicated a certain approach for our investigation, the objective of which was, firstly, to obtain information about the availability of resources and their present utilization, and secondly, on the basis of this information, to indicate, as far as possible, certain directions of development.

✓ The approach to our investigation in Goa was based on the general principles involved in the planning of development for a local area. No doubt such planning has to be within the framework of the objectives laid down for national development, but at the local level these objectives required to be expressed in terms of the capacity of the area regarding its resources and potentialities. The assessment of the resources, their present use, and future potentialities, therefore, became important from the point of view of the development of the area. Even in a small area like Goa the resource position, and its use pattern differed from one part to another, and such a situation threw up different problems of development for different parts. The first important aspect of the planned development of the area was the manner in which its different parts were connected with each other, and how necessary facilities were provided so that each part could develop its potentialities fully, take its due place in the development of the area, and receive the benefits of such a development. It was quite likely that in certain parts, because of special resource endowment or other specific circumstances, development started relatively earlier, got a certain momentum, and affected other parts of the area. If the development under these circumstances was not properly channelled, then some parts of the area were likely to move forward at the cost of others. From this point of view also the problem of connecting different parts of an area with each other, or what we may call as the problem of having a suitable physico-geographic

pattern, assumed primary importance. Such a pattern would include suitable means of transport for approach to the local market centres from villages, and from local market centres to those covering larger areas. It would also include suitable facilities, like banks, cooperative societies, godowns, schools, dispensaries, post offices etc., for assisting individual producers in their production and exchange, and for providing social amenities. The second aspect of the planned development of a local area was the knowledge of the available resources and their utilization. Such a knowledge gave insight into the problems of local development and facilitated suitable solutions from the point of conservation and development of the resources. This led to the third important aspect, viz., provision of means (including suitable organizational pattern) to enable the individual producers, since most of our production is in the hands of individual producers, to conserve and develop their resources.

This general approach to local planning involved tentative regionalization of the territory at the beginning of the investigation, on the basis of the available data mainly the occupational classification of workers. As explained in Chapter 2, the Goa district could be divided into three distinct sub-areas, the coastal, the transitory, and the interior hilly area. The coastal area covering the talukas of Bardez, Goa, Marmugao and Salcete, was characterized by relatively low percentage of workers in total population as a result of substantial emigration, relatively high percentage of workers in secondary and tertiary occupations, extensive utilization of land resources as shown by the absence of waste lands, and well developed and adequate transport facilities. In the transitional area, covering the talukas of Pernem, Bicholim, Ponda and Quepem, the occupational pattern became less urban, emigration less pronounced, land use showed existence of wastelands, and transport facilities, though adequate so far as their length was concerned, were not well distributed being concentrated more in the mining areas, as a result of which many villages have remained relatively isolated. The interior hilly area which covered the talukas of Satari, Sanguem and Canecona was characterized by emphasis on primary occupations, underdeveloped forest areas which also included wastelands, and lack of adequate transport facilities. Though the main crop of the entire district was paddy, the coastal area had a comparatively higher proportion of cultivated area under double cropping. Whereas the coastal area produced vegetables, sweet-potatoes and chillies, in addition to paddy, the crop-pattern changed as one moved into the transitional and interior hilly areas, the former producing chillies, pulses and fruit, in addition to paddy, and the latter inferior millets with urid, kulith, and grams. Irrigation facilities, though inadequate in the entire district, were more so in the interior areas. Farm-yard manure was inadequate, there was no composting, and beach manure was costly. Fertilizers were used, more in coastal areas, but the response was varied. Breeding and dairying as a business were absent, and milk was in very much short supply. The entire area was characterized by inadequate institutional credit facilities. Important village industries were rice and flour mills and liquor distillation.

Physico-Geographic pattern:

With this general background of the district and the sub-areas, it is being brought together and elaborated the results of the survey. As mentioned above, the physico-geographic pattern was the foundation of any area development programme, which meant

that minimum facilities of transport and communications and provision of necessary minimum socio-economic aids were the important basic structures on which the development of an area is built up. The details of the physico-geographic structure in Goa district are discussed in Chapter 3. The following points emerge significantly out of the discussion:

(i) So far as the total length of roads was concerned, Goa district has 42.7 kms. of roads per 100 sq.kms., which was almost double the all-India average. In spite of this many areas in the talukas of Pernem, Satari, Sangnem, Canacona and Quepem, i.e., some of the transitional and some parts of the interior-hilly area, did not have easy access to main roads. This was the result of having geared the system of roads to the commercial exploitation of a particular resource, and of not having paid enough attention to the systematic development of all areas;

(ii) A large mileage of public and municipal roads was in a very bad shape of repairs, and required widening and upgrading;

(iii) The heavy traffic on the west coast Highway and the resultant congestion required the rivers Chapora, Mandovi and Zuari to be urgently bridged.

(iv) To establish an effective and minimum physico-geographic network, the following additional provisions would be necessary:

- (a) construction of godowns at a few additional market centres, (like Bicholim, Bali for instance)
- (b) establishment of cooperative sale-purchase organizations;
- (c) veterinary services at some additional centres, (like Sanquelim, Usgaon and Colem) including upgrading and consolidation of available services at some centres;
- (d) consolidation of existing health and medical facilities;
- (e) extension of technical education facilities at some suitable centres; and
- (f) supply of power to at least some of the important taluka places and other centres.

In the absence of such a basic structure, the schemes of conservation and development of resources in the territory were bound to get hampered, as was the case with marketing of fish in the interior areas, some of the forest and wasteland development schemes, and also some of the agricultural development schemes.

Land and Water resources:

So far as the land resources were concerned our investigations have brought out certain significant points regarding its present utilization and future development. The land-use data indicated that as far as the entire district was concerned, 36 per cent of the total agricultural area was under cultivation, 29 per cent under forests, 26 per cent was classified as cultivable waste, and the remaining was not available for cultivation. As indicated above, the coastal area had a high percentage of land under cultivation, while in the transitional and interior hilly areas the percentage of forests and cultivable waste went on increasing. In Ponda and Pernem the latter two categories accounted for 42 and 45 per cent respectively of the total geographical area, while in the interior talukas of Satari, Sanguem, and Canacona, these categories covered between 73 to 82 per cent of the total geographical area. So far as the broad problems

of the development of land resources are concerned they pertained mainly to cultivated land in the coastal area, and forests and cultivable wastelands in the other areas. Cultivated land and water resources are discussed together in details in chapters 4 to 10. These lands are mainly of three types, viz., Khazan, Ker and Marad and are cultivated for producing crops like paddy, Khushki (inferior millets), coconut, arecanut, cashew, vegetables and fruits etc. The conclusions arrived at from the data regarding their utilization and the problems of their development could be summarized as follows:

(i) Regarding Khazan lands the policy of repairing the embankments and recovering 2/3rd of the cost from cultivators in the form of long-term loans, followed by the government so far, indicated mainly curative measures. The data, however, showed increasing incidence of breakages, and hence, the necessity of preventive measures also.

(ii) These preventive measures would include, among others, broadening of bunds, use of newly developed impermeable materials, protection by willows, etc.

(iii) As a first step in the development of this resource it was necessary to carry out a survey to demarcate the farms which needed preventive measures and to indicate the specific type of the measures needed.

(iv) It was necessary to examine if the mining refuse could be economically used for broadening and making permanent improvements to the bunds, at more favourable sites.

(v) In due course such measures would require building up of suitable organizations of the cultivators themselves. These organizations could be expected not only to attend to the maintenance of the bunds but also to raise finance for the purpose through increasing the productivity of the individual cultivators as well as through raising an overhead income for a farm.

(vi) It should be possible for such organizations to raise overhead income for the farm by measures like producing ragi on the bunds or planting coconut trees on the bunds where they are broad and practising intensive fishing in a number of ways as done in other states and other countries.

(vii) The productivity of the individual fields could be increased by providing proper drainage, adopting graded bunding, reducing the salinity of the farms, planning the crops efficiently so as to tap and utilise the water potential fully and adopting new technology even in case of the existing crops.

(viii) It was possible to grow a number of crops including sugarcane and a variety of vegetables in addition to paddy in the Khazan farms through planning for a rational use of the land and water resource in a farm.

(ix) Among the new methods could be mentioned the 'Kaipad' method used on the Malabar coast, deep ploughing with tractor, introduction of new varieties, use of phosphetic fertilizers, etc.

(x) The formation of 'pan' (hard layer) in some of the Khazan farms could be broken up by using sub-soil plough or other suitable methods according to the nature of the pan.

(xi) So far as the Waingan cultivation was concerned, which was influenced mainly by the source of water, the survey revealed considerable variations in the irrigable and the irrigated areas in case of many farms. In some farms water was scarce, while in others it was surplus. There was also a great potential for tapping additional sources of water in some farms. This indicated considerable scope for rational utilization of water through organized efforts and efficient crop planning for the individual farms.

(xii) It was possible to introduce a number of other crops such as sugarcane, banana, maize, green manuring crops, a variety of vegetables etc., in these farms from the points of the rational use of land and water resources as well as restoring the soil fertility through proper rotations. So was there scope for increasing the intensity of cropping in some of the farms through growing three crops in a year according to the availability of water.

(xiii) The problem of non-utilization of Waingan farms in the Kharif season was severe in some villages. These farms could be utilized in the Kharif season by increasing the number of sluice gates and by growing certain flood resistant varieties which were readily available in the other states.

(xiv) Potential water supplies could be tapped by adopting new methods, like the use of filter points, in addition to those which are being presently adopted.

(xv) Productivity of the paddy crop could be increased by adopting conventional as also new methods practised or evolved in the other states and other countries. The new methods included even means to regulate the maturity of the crop, use of green manuring, control of acidity of the soils etc.

(xvi) Study of the present practices of paddy cultivation in Goa indicated a need for introduction of interculturing in the broadcast paddy fields through the use of suitable implements as done in some other states and other countries.

(xvii) In some areas it was necessary to introduce scientific methods for the control of snails.

(xviii) Marad lands could be utilized for a number of crops like jowar, maize, groundnut, tapioca, etc., in addition to paddy and ragi.

(xix) The main problems were, however, improvement of these lands by adding silt, protection of crops, systematic contour bunding and provision of field roads.

(xx) Possibilities of introducing supplementary irrigation to these lands by building bandharas on the tops of hills required to be thoroughly explored.

(xxi) Donger lands were mainly used for cashew cultivation. It was, however, necessary to encourage other crops such as pineapple, bamboo, mango, jackfruit, coconut etc., according to the soil formations at the different sites on a hill. This would require area planning for the individual hills and organized efforts to implement these plans.

(xxii) It was necessary to try out the cultivation of coffee in the interior to determine the comparative advantages of the alternative uses of the interior lands for cashew, coffee, forestry etc.

(xxiii) Regarding coconut cultivation the problems were the expansion of cultivation and raising the productivity per acre. There was a great scope for the expansion of coconut cultivation in Goa as against only a limited scope in the other parts of the country. The small size of the holding and excessive fragmentation were the two main factors hampering this scope.

(xxiv) The productivity was affected by the lack of irrigation, and the resultant problems in the use of proper manures and fertilizers and spacing. Fencing to protect the young trees against the stray cattle was the other problem hampering the initiative in the use of improved methods.

(xxv) Coconut as a monoculture had become an outmoded concept in the other tropical countries and it was also necessary to introduce intercropping in the coconut gardens in Goa. A number of crops were suitable for intercropping, which could not only increase the production of coconuts but also the total income from these gardens.

(xxvi) It was necessary to solve the problems of irrigation, fencing and intercropping through organized efforts over blocks

of coconut gardens.

(xxvii) There was much scope for introducing the high oil yielding oil palm cultivation, but this would need experimentation and piloting in the initial stage.

(xxviii) The problems of development of the arecanut cultivation could also be viewed from the points of expansion and of increasing per acre production. However, in view of the recommendations of the Working Group on the Fourth Five Year Plan, a cautious policy should be adopted regarding expansion. There was already scope for expanding arecanut cultivation in Goa, but it was necessary to give priorities for mixed crops such as pepper, nutmeg, cloves, cardamum, banana and pineapple at these new sites.

(xxix) It was possible to raise the production in the existing gardens through wider spacing, cultivation of more productive mixed crops, intensive use of fertilizer mixtures, and adequate supply of water throughout the year.

(xxx) There was a need for mechanization of some of the process in the different types of cultivation. It was necessary to introduce the walking type of tractors and the small tractors to promote the mechanization.

(xxxi) A substantial change in the cropping pattern to suit the nature of the land water relations at specific locations could, thus, be the major strategy for the development of agriculture in Goa. This would lead to a small displacement of the area under paddy but because of the other measures, there would be not only an increase in the total cropped area under this staple food crop but also a sizable increase in its production.

(xxxii) These changes in the cropping pattern and the techniques would ensure higher returns to the farmers and it should be possible to utilize a part of the increased returns for the maintenance and development of the resources themselves without much aid from the state in future. This would, however, necessitate organized and preplanned efforts over the individual blocks of lands under the different types of cultivation and one may have to proceed bit by bit and by steps after careful selection of the areas.

Forests and Wastelands:

Considering the importance of forests and wastelands development in the economy of Goa, especially in the talukas of Quepem, Sanguem, Canacona and Satari, the striking fact was that it received very little attention from the former regime. The neglect was reflected in the facts that Goa had no technical forest administration, that proper records of the area under different classes of forests were not available, that boundaries of forests were not demarcated, that reliable information of the volume, species and the quality of timber harvested in the past was not available, and that no working plans were prepared for long-term exploitation of the forests. The significant points revealed by the investigation were as follows:

(i) The Goa government organized its department of forest in the middle of 1963, and this department immediately took up a detailed survey of the forest area, so that information regarding boundaries, topography, soils and development potentialities could be gathered. But the process was a slow one because of the non-availability of previous records, and frequent disputes about the boundaries and the ownership of land. Considering the urgency of the work, it was, however, necessary to use modern techniques of surveying, instead of the old ground methods;

(ii) A permanent road system was essential in order to effect a continuous economic exploitation of the forests;

(iii) Several ambitious schemes were being taken up so as to make for the lost period, which included new plantations, research, publicity, farm forestry, development of pastures, and forest based industries. However, these schemes required detailed working out, and coordination with programmes of other departments like animal husbandry, agriculture, cooperation, industries etc.

(iv) Since the entire programme was expected to create many job opportunities, it would be necessary to consider it along with other programmes which create demand for labour.

Shifting cultivation (Kumri):

Certain privileges were allowed by the government to local population for the use of products from the forests, mainly C-class forests, which adjoined the populated areas. These privileges included unrestricted lopping, free and unregulated grazing, free use of firewood and of timber for agricultural implements and construction of huts and cattlesheds, removal of leaf manure, and the practice of shifting cultivation, or Kumri. This last privilege was the most ruinous of all, in that, it has completely denuded about 50,000 acres of forest area, by damaging the tree growth and ruining the top soil by repeated burning. The practice of Kumri was very old, and our investigations revealed the following points in this respect:

(i) Kumri was extensively practised in Satari, Sanguem, Canacona and Quepem talukas. The data indicated that not less than 43 per cent of the families (even 70 per cent in some interior villages) were engaged in Kumri, most of these being small cultivators and landless labourers;

(ii) The families engaged in this type of cultivation derived, on an average, 23 per cent of their total income from Kumri;

(iii) The problem was two-fold. On the one hand, it referred to the damage done to an important resource of the area, and on the other hand, since large number of families depended on this occupation for a part of their earnings (mainly in the form of grains which supplemented the need of the family for food), it referred to the provision of alternative opportunities to these families;

(iv) To solve these problems, the government, in the first place, stopped the practice of Kumri by a notification, and tried to rehabilitate these families by giving them C-class forest areas for cashew cultivation. But while implementing this programme, the government considered only the landless labourers which formed about 23 per cent of the total Kumri cultivators. This left out a large and an important segment of Kumri cultivators, viz., small cultivators, that is, those who cultivated less than 1.5 acres per family, which accounted for nearly 55 per cent of the total Kumri cultivators.

(v) The forest areas given to these families for cashew cultivation were, in many cases, away from their habitation, and in the absence of the availability of good paddy lands, these cultivators were not given paddy lands as stipulated. The situation, therefore, was doubly inadequate. It did not solve the problem of the landless Kumri cultivators, and it neglected the small cultivators who were affected by the government decision. As a result, the solution did not do much to ease the pressure of Kumri cultivators on forest lands;

(vi) Wastelands were also required to be considered, along with forest, as a problem in the entire development of resources. The initial difficulty here was, however, the

availability of reliable data, in respect of the extent, ownership, location and the quality of the government and private wastelands. The present survey by the government obtained information on boundaries, ownership, and location of the wastelands, but not the land use and the quality of the land covered.

(vii) The present approach to the utilization of wastelands consisted of locating the area and distributing it to the landless labourers and/or political sufferers. This was almost a piecemeal approach, not integrated with the general development programme of the particular areas, and the territory.

Livestock:

Another important resource in the territory was that of livestock. In this respect also the neglect by the former government was striking. There was no separate animal husbandry department, no schemes of developmental nature were undertaken, and no attention was paid to improve the breed, to supply better fodder and feed, to provide proper veterinary facilities, and to build up livestock based industries. The points thrown out by our investigation, regarding the present position of livestock and the problem of their development could be summarized as follows:

(i) Except in certain areas of Bicholim, Ponda, Salcate and Satari talukas, bullocks were used for the purpose of cultivation;

(ii) In coastal areas very small proportion of cultivators, less than 19 per cent, maintained working animals. This proportion increased in the eastern areas;

(iii) Pigs and poultry were observed to be concentrated in the coastal areas;

(iv) The animals were of non-descript type and were small in size. This was because feeding and breeding was not paid sufficient attention since the need for it was not felt as paddy cultivation required relatively less draught power, and milk and milk products had less demand because of specific food habits. The existing demand for milk and milk products was largely met by imports;

(v) The existing situation regarding the livestock pointed out that in the coastal areas, instead of introducing bullocks, it would be proper to introduce, experiment, and propagate mechanization suitable for paddy cultivation in small holdings. In the transitory and interior hilly areas new breed, preferably Dangi or Sindhi, could be introduced. Dairy development could also be taken up in these areas;

(vi) The Fourth Plan of the area envisaged huge animal husbandry development programme, which, however, required to be thought out in good deal of details, and coordinated with programmes of other departments like forest and agriculture;

(vii) The distribution of loans to individuals and societies for dairy, poultry, or piggery development required careful follow up. Our investigations revealed that in many cases the objectives were not achieved.

Fishery:

Another important resource in Goa was fish. Situated as it was on the west coast, with a coast line of 100 kms., about 250 kms. of inland waterways and numerous small tanks, the territory was rich in fishing resources. A special inquiry was conducted to study the present conditions of the exploitation of the resource. The results are presented in details in chapter 13. The conclusions of the inquiry could be summarized as follows. Regarding fishery there were two important aspects, viz. those relating to the production of fish, and those concerning their

disposal.

(i) About 4200 families with about 6000 active fishermen were engaged in fishing. The total annual catch was estimated to be about 15,000 tonnes. Of the total number of active fishing population, 42 per cent were engaged in beach seine fishing, 35 per cent in creek fishing, 15 per cent in gill net fishing, and 8 per cent in stakenet fishing. Adoption of a particular technique of fishing was influenced by the location of the community and the resources available to it;

(ii) Beach seine fishing was the largest activity and required an organization of 30-40 fishermen. It was a carefully worked out indigenous cooperative organization, and was ideally suited for being formalized into a cooperative fishing society, so that, in due course, it could obtain the advantages of mechanization;

(iii) Beach seine fishing could be combined with deep sea fishing by gill nets. Creek fishing by throw nets was not practicable because of the unbroken shore line of Salcete and Bardez. The combination of beach seine fishing with gill net fishing would require, in the initial stages, exploitation of the sea waters within the navigable distances, provision of necessary gear to the fishermen, and training of gill net fishing to the local fishermen;

(iv) Fishermen who pursued creek fishing belonged mainly to inland fishing villages, fishing in rivers and estuaries. Fishermen in Canacona also pursued this type of fishing because of the broken shore line. This type was largely pursued in combination with the other three types, but about 30 per cent of the total fishermen engaged in this type were solely dependent on it. These fishermen were unorganized and spread over a wider area. Though individual fishermen could always be assisted, the main problem was bringing them into some kind of organization, like for instance, boat organizations;

(v) So far as the fishermen who combined creek fishing with other types were concerned, the Fisheries Department was trying to organize them into cooperative societies and provide necessary assistance. Such type of organization and assistance was appropriate in Canacona taluka;

(vi) Gill net was usually carried on in combination with other types. It was a highly skilled technique, and fishermen also required the knowledge of navigation as it had to be done in deep waters about eight to ten miles away from the shore. The skill of these fishermen could be utilized, in the initial period, to train beach seine fishermen and to experiment with deep water fishing.

(vii) Stakenet fishermen who operated in the interior, formed a small percentage of total fishermen and were less mobile, as this type of fishing required more attention on the part of the fishermen. The Department was trying to entrust the right of exploiting the interspacings to local fishery cooperatives;

(viii) The introduction of mechanized fishing by the Department has bypassed the existing techniques, though it has achieved to a certain extent its objective of increasing fish production. Trawling, purse-seining, and fishing by gill nets were the types of fishing which could be done by mechanized boats, and when introduced on large scale it would displace some of the fishermen engaged in other techniques. Other problems of operation and organization would evolve out of the experiment:

(ix) The problem of repairs was also an important one, and breakages have resulted in wastage of working day. The Department was trying to provide repair services at different points along the coast;

(x) Though a training centre for training of fishermen was started at Panjim, it would be necessary to re-organize this programme with the introduction of mechanized

(xi) The introduction of new mechanized techniques would increase fish production, but it would also bring its own problems of marketing, preservation, and disposal;

(xii) The difficulties of marketing were mainly connected with transport. In the talukas of Pernem and Canacona the transport was badly organized. Similar was the case with the interior talukas. The Department's proposal of insulated van would not solve the entire problem, and it would be necessary to establish a fish marketing organization, such as a cooperative fish marketing society;

(xiii) The Fisheries Department, though a newly organized one, has tried to introduce schemes for the purpose of increasing production, and improving marketing conditions. A brief review of these schemes is attempted in the chapter.

Resources and development:

As indicated above the present utilization of the available resources, viz., land, water, livestock, forests, wastelands and fisheries showed that the potentialities were not being fully utilized. There were various reasons for this. In the first place, requisite information about the size of the available resources, and their present utilization, was not available, and secondly, the former regime, being interested mainly in maintaining the territory as a colony, showed complete disregard towards the development of the resources. Therefore, in order to bring the territory to a certain level of development, in as short a period as possible, the government was required to take up large development programmes. These were administered without taking into account the local conditions. In fact the district of Goa with undeveloped, underdeveloped, and maldeveloped resources presented almost a virgin field for new experiments. As a result of the operation of schemes elsewhere and studies made of them, considerable experience was available. On the basis of this experience some of the schemes could have been altered to suit the local conditions and experimented with in Goa, for instance, schemes like community development, distribution of premium bulls, poultry birds, loan and subsidy component of various schemes and their distribution, different organizational patterns, etc. It was also shown that the development programmes were not worked out into details regarding their integration and coordination, and in many cases the follow up was absent, as a result of which the schemes showed almost no progress. Some of the cases of loan distribution for dairy and poultry would fall into this category. Obviously, the conclusion which one could draw about the development programmes was that much remained to be done regarding adjusting the individual programmes to suit the local conditions, and integrating and coordinating them with the entire development programme of the district.

Mining activity and agriculture:

Regarding employment, the situation in the territory was of a nature that was available under near full employment conditions, with slight variations in different areas. Generally the labour which was engaged in agricultural and non-agricultural activities remained in these activities as long as the wage rates were comparable with that obtained in mining. By and large the wage rates varied between Rs. 2.25 to Rs. 3.50. Agriculture was available for about one to three months duration in the coastal areas, between two to four months in the interior area, and for about three months in the mountainous areas. The relative improvement in the employment relating to the agriculture was mainly due to the job opportunities offered

by the mining operations. Of the total working population in Goa in 1950 about 2.6 per cent were engaged in mining and quarrying. This percentage increased to 9.0 in 1960, with a corresponding fall in the workers engaged in agriculture. Mining operations were concentrated in the talukas of Bicholim, Quepem, Sanguem, and Ponda, and the demand for labour created by these operations exerted a considerable pull on the available labour in certain areas. It was, therefore, necessary to enquire into the problem of the effects of mining operations on agriculture. A special inquiry was conducted, and its results are presented in chapter 14. Briefly, the inquiry showed, (i) that more than 60 per cent of the cultivator families in the villages around the areas where mining activity was concentrated were engaged in mine labour either as main or subsidiary family occupation; (ii) that on an average two persons out of every family of five members worked on mines; (iii) that in spite of higher wages on mines, almost all the cultivator-mine labourers worked on their fields during the agricultural season; (iv) that the mining industry, with the development of its associated activities like trade, transport, communications, and engineering, affected the wage levels in the areas excluding the talukas of Pernem, Canacona, and parts of Satari, Sanguem, and Quepem which have remained undeveloped and neglected; and (v) that the rapid expansion of mining industry affected agriculture, in that, by offering higher wages it exerted considerable pull on agricultural labour in the surrounding areas, thereby causing a steep rise in the agricultural wages which probably made it difficult for cultivators to properly cultivate their fields.

It was reported that mining activity affected agriculture in other ways also. Firstly, cultivation was affected as a result of overburdens being directly dumped on cultivated lands; secondly, cultivated land was being abandoned because earth from overburdens which contained a small amount of iron ore, was carried to the low-lying fields during the rainy season, thereby reducing slowly the fertility of the land; and thirdly, cultivation was abandoned because of persistent shortage, and high wages, of agricultural labour. Our investigations revealed that though the cultivators did not abandon cultivation because of labour shortage, it may have affected the efficiency of agricultural operations, but the data were not conclusive on this point. Regarding the cultivated land being affected by the overburdens, the data showed that though the land affected in this way was not more than 2 to 3 per cent of the total cultivated area, the incidence may be heavy in particular areas. The action indicated was, therefore, initiative on the part of the authorities to estimate the damage caused in this way and to take necessary action in time.

In respect of the total development of the territory, the mining activity no doubt gave considerable impetus to secondary activities. Since the movement of the product of mining was towards the coast, all the secondary activities developed between the coast and the mining areas, particularly in the talukas of Goa, Salcete, Bardez, Ponda, Marmugao and Bicholim and parts of Satari, Sanguem, and Quepem. The rapid spurt in the mining and other activities in these talukas has effected sectoral as also regional development. Only mining and associated sectors developed in these talukas, other sectors lagged behind, and in the talukas of Pernem, Canacona and large parts of Satari and Sanguem, the area not affected by the mining activity, almost all the sectors lagged behind, thus presenting a picture of a lop-sided development, which would require preventive and curative developmental measures.

7.4
% to total

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to total

CHAPTER 2

GENERAL BACKGROUNDPhysical Features

The union territory of Goa was administratively divided into 11 concelhos or taluks as shown in the attached map. The total area was a little over 9 lakh acres. Ten percent of this land was not available for cultivation being under rivers and nallas, roads and streets, residential buildings, railway tracks and such other non-agricultural uses. 90 percent of the land was classified as 'available for cultivation'. It was divided into three categories namely land under cultivation, fallow land and land under forests.

The total population, according to the census undertaken by the former administration in 1960 was 5,89,997. 85 percent of the population was rural.

Topographically the territory was divided into two distinct types of terrains, the level lands nearer the sea on the west and hilly land in the east. The latter could be further subdivided into two regions, the transitional and the hilly interior. The former was characterised by smaller and flatter mounds and hills, habitable and cultivable valleys and a lighter type of vegetation. Towards the east it gave way to higher mountains and thicker jungles.

The taluks of Goa could be broadly classified into the above three natural divisions as under. The attempt to so classify them involves a certain overlap as administrative divisions are not necessarily coterminous with natural divisions. The overlap was particularly inevitable while classifying the taluks in the latter two categories.

Region I	:	<u>Coastal</u>	1. Bardez
			2. Goa
			3. Marmugoa
			4. Salcette

Region II	:	Interior-Transitional	1. Pernem
			2. Bicholim
			3. Ponda
			4. Quepem

Region III	:	<u>Interior-Hilly</u>	1. Satari
			2. Sanguem
			3. Canacona

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source The pattern of land utilisation broadly conformed to the The co. ussification. Table 2.1 gives percentage distribution Regarding fi relating to

Table 2.1 : Talukawise Land Utilisation (Percentages)

Type of Utilisa- tion	Coastal Region I				Interior-Transitional II			
	Bardez	Goa	Marrugoa	Salcette	Pernem	Bicholim	Ponda	Quepem
Paddy	31.7	49.7	23.4	44.2	15.8	13.2	12.2	14.4
Khusky	4.4	1.5	7.3	2.5	14.0	29.8	15.5	2.8
Coconut	11.8	11.4	28.8	19.9	4.8	5.8	7.3	4.0
Betalnut	-	0.2	-	-	-	1.2	3.8	0.1
Cashew	27.7	30.8	6.4	6.2	15.8	27.6	11.5	3.2
Sugarcane	-	-	1.5	-	-	-	-	-
Vegetables & Orchards	10.6	3.3	1.2	3.6	.6	2.7	1.2	3.1
Bamboo	0.1	1.1	-	-	-	0.2	1.5	-
Area cul- tivated	86.3	98.0	68.0	76.4	57.0	80.5	53.0	27.6
Fallow l. land	13.7	2.0	31.4	23.6	43.1	15.9	34.2	37.5
Forests	-	-	-	-	5.9	3.6	12.8	34.9
	100.00	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Area (Acres)	52592.5	32210.0	10890.0	57562.5	55620.0	49330.0	57110.0	83695.0
% to total	7.44	4.56	1.54	8.15	7.87	6.98	8.09	11.85

Continued...

Table 2.1 : Talukawise Land Utilisation (Percentages)

(Contd.)

Type of Utilisa- tion	Interior - Hilly III			Goa	
	Satari	Sanguem	Canacona	Acres	Percentage
Paddy	3.3	2.9	8.0	111747.5	13.7
Khusky	7.3	5.0	1.6	59452.5	7.3
Coconut	.8	3.0	1.6	46240.0	5.7
Betalnut	.7	0.1	0.2	4302.5	0.5
Cashew	10.2	3.3	1.6	81292.5	9.9
Sugarcane	-	0.1	-	175.0	-
Vegetables & Orchards	1.0	1.5	2.1	47862.5	2.2
Bamboo	-	-	-	1450.0	0.2
Area cul- tivated	23.3	14.9	15.1	322522.5	39.5
Fallow land	27.3	25.9	42.1	230917.5	28.3
Forests	49.4	59.2	42.8	263237.5	32.2
	100.0	100.0	100.0		100.0
Area (Acres)	122625.0	211277.5	83755.0	816677.5	
% to total	1.74	29.92	11.86	100.0	

of different types of land usages.* It may be seen that while there were no forests in the taluks comprising the coastal region, forests predominated in the interior hilly taluks of Satari, Sanguem and Canacona. Among the taluks in the transitional region, Pernem appeared to be more coastal while Quepem more closely resembled the taluks of the interior hilly region.

Table 2.2 gives percentage distribution of land under different crops. The table indicates some basic characteristics as regards cultivation in different taluks. It may be seen that paddy cultivation was predominant in the taluks of Goa, Salcette, Quepem and Canacona. The proportions under paddy may be seen to decline in Bardez, Marmugoa and Pernem. All these taluks were either coastal or nearer the coast. In the latter three taluks with the proportion of land under paddy ranging between 31 to 37 percent, the second important crop was cashew in Bardez and Pernem and coconut in Marmugoa.

Lands under paddy could be classified into three categories; Khajan, Ker and Marod. The Khajan lands were formed by the deposit of silt along the banks of the bigger and broader river-systems. They were rich lands and a good deal of human effort had to be invested in order to insulate them against salinity on floods by constructing embankments.

The next type, called Ker locally, were superior rice lands with alluvial soil and good drainage. Almost all such lands were situated in the coastal region. A second crop of paddy or vegetables like onions, chillies, sweet-potatoes etc. was taken in these lands wherever irrigation was possible. Seasonal storage tanks were created by impounding rain-water from late monsoons in fields at higher levels in order to take a second crop of paddy in Ker lands.

The 'Marod' lands were the rice lands at higher levels and were generally poor in productivity.

The 'Marod' lands were also put under 'Khushky' crops that is inferior millets. Area to the extent of 30 to 37 percent was under inferior millets in the case of three of the remaining four taluks namely Bicholim, Ponda and Sanguem. Satari had as much as 44 percent of land under cashew along with 31 percent under inferior millets. The adjoining taluk of Bicholim had also one third of its area under cashew.

The last column in the table gives the cropping pattern of the territory. Paddy, which was the staple of the residents, was the most important crop. Area-wise the next important crop was that of cashew. As regards its cultivation however, the Report of the Goa Land Reforms Commission observed that there were no regular plantations and the cashew trees were found on hillsides along with other minor forest growth or in open pastures and that inadequate attention was paid to the cultivation, irrigation or manuring of that crop.

The next important field crop was that of nachani, an
 * The data made available by the Land Survey Department of Goa pertain to the period prior to 1920 when some parts of some taluks were cadastrally surveyed. As such they are out of date. Since liberation, some of the Block Development Offices had tried to collect fresh data but they were unwilling to vouchsafe them in the absence of actual land survey. Their data were in the nature of eye-estimates.

Table 2.2 : Cropping pattern of cultivated land (Percentages)

Crops	Bardez	Goa	Marmagoa	Salcette	Pernem	Bicholim	Ponda	Quepem	Satari	Sanguem	Canacona	Goa
Paddy	36.70	50.72	234.12	57.86	30.97	16.39	23.02	52.17	14.10	19.45	52.98	34.65
Khusky	5.10	1.53	10.64	3.27	27.44	37.01	29.24	10.14	31.33	33.54	10.58	18.44
Coconut	13.65	11.63	41.98	26.05	9.41	7.20	13.77	14.49	3.43	20.13	10.58	14.33
Betalnut	0.01	0.20	-	-	0.04	1.49	7.17	.36	3.00	.67	1.32	1.33
Cashew	32.10	31.43	9.33	8.11	30.97	34.27	21.69	11.59	43.70	22.13	10.58	25.21
Sugarcane	-	.01	2.18	-	-	0.03	0.02	0.02	0.10	0.67	0.06	0.05
Vegetable & Orchards	12.28	3.36	1.75	4.71	1.17	3.34	2.26	11.23	4.29	3.35	13.90	5.54
Bamboo	0.16	1.12	-	-	-	0.27	2.83	-	0.05	0.06	-	0.45
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
(Acres)	45385.0	31563.8	7468.5	43975.5	28364.2	39708.6	30266.2	23097.8	85569.6	31478.3	12645.0	322522.5

inferior millet that was the staple of the poorer sections of the population. An important crop, both from the point of view of area and income was the coconut with 14 percent of the total cultivated area. The coconut was an important ingredient of daily food supplying the necessary requirements of fats. In the taluks of Bardez and Salcette, there were good coconut plantations which were regularly manured and irrigated. In the rest of the taluks however there were no conscientious efforts to ensure that the trees were properly attended to by way of manure, irrigation and watch.

The arecanut was another important tree-crop of Goa and was grown in the taluks of Ponda, Satari, Bicholim and Canacona. The plantations required heavy irrigation and were therefore found in valleys with perennial tanks or fresh-water springs.

The mango, pine-apple, jack-fruit and the banana were the other fruit crops grown in Goa. Pine-apple and the banana were grown as mixed plantations along with coconut and arecanut plants. A small proportion of the cultivated land was under bamboos also but there was no systematic plantation.

Land Ownership

As regards land ownership, available records show that 54 percent of the cultivable land was privately owned, 32 percent was owned by the government and 11 percent was owned by the local institutions called the *Commindades*. The remaining 3 percent was owned by Churches, temples etc. If the government lands, which are mostly forests are left out of the accounting, the proportions of cultivable land inclusive of lands under field cultivation and tree crops and cultivable waste, were 79 percent under private ownership, 16 percent owned by the *Commindades*, and 5 percent owned by religious and charitable bodies.

The indigenous institution of '*Comunidade*' was more predominant in the coastal region. There were in all 256 *Commindades* in the territory of Goa. In the three coastal taluks of Bardez, Goa and Salcette, the *Commindades* held over 50% of the area under paddy.

The *Comunidade* had started as a co-operative organisation centuries ago and had evolved into a sort of agricultural joint stock company with shares which were both transmissible and transferable. Originally the ownership was vested in the village body with an equal share to each adult male called the '*Jana*'. This right was personal and inalienable and took effect after it was registered and the '*Janoeiro*' claim was admitted. The right was extinguished with the death of the '*Janoeiro*'.

Under the '*Jana*' system the lands were cultivated collectively and the produce was distributed according to established customs and practices. A certain proportion of the gross produce was earmarked for village expenditure such as maintenance of temples, remunerations to village and temple servants etc. The government's share in the produce, which was a tax for protecting the village against aggression etc., was also kept aside. The rest of the produce (the '*net*' produce) was distributed among the participating households according to the number of adult males. The individual members had proprietary right in the produce only and not in the land. The land ownership was vested in the village community (the *Comunidade*) with a separate legal personality.

The 'share-holders' was a subsequent addition. Some of the Comunidades, on finding themselves short of essential finances needed for capital expenditures such as construction and maintenance of lands and embankments etc. had to borrow from individuals. A part of the annual produce had to be set aside by way of interest of these loans. The lenders were given 'Accoes' which were shares in the modern sense of the term. The holder of an 'Accoe' could collect a dividend. The shares were transferable unlike the 'Janoeiro' rights. The shares on transmission or transfer had to be so registered for claiming the dividend. Both the 'Janoeiros' and the shareholders could participate in the profits and losses of the Comunidade as also in its administration.

The lands held by the Comunidades were subject to the payment of a land tax as in the case of privately owned lands. All the lands owned by the Comunidades and a major portion of privately owned lands were cultivated by tenants on a share cropping basis. The Comunidades held 'auction' once in six years with a minimum reserve rent which was the average of the previous three years and amounted approximately to half of the gross produce. Intending cultivators could bid at the auctions. The auction system had however been discontinued during the last ten years and the tenancies of the existing lessees had been extended. As regards private lands, the tenants had to pay a rent of 50 percent or more of the gross yield in the case of the winter crop of paddy and between 20 to 30 percent of the monsoon crop.

The lands owned by the Government had been leased to individuals under two systems. Under the 'Concessao Provisoria' fifteen acres of land could be given out for a period of 10 years to any local villager who intended to bring the area under cultivation. The lessee could convert the provisional lease into an 'Aforamento'.

Under the 'Aforamento', the government leased out 50 acres of land on a long-term basis. For all practical purposes, the right in the land was permanent.

A large proportion of cultivable waste lands owned by the government, particularly in the taluks of Satari, Bicholim and Pernem was reported to be under the Aforamento lease. The actual proportion was not known. It was generally supposed that no efforts for bringing the lands under cultivation had been made. The difficulty in this regard was that of identification of the land and that of tracing the present holder.

Cultivated Holding

There were no adequate data regarding the size of cultivated holdings. The report of the Land Reforms Commission, on the basis of figures given by the Agricultural Mission from Portugal that visited Goa in 1955 notes that the majority of holdings varied between 10 gunthas to 5 acres. In the coastal region, large sized holdings were owned by Comunidades but the unit of cultivation was less than 1.75 acres on an average. Private lands were much fragmented.

Data given by the Agricultural Mission and quoted by the Land Reforms Commission indicated that between 80 to 88 percent of the cultivated holdings were below the 5 acre size. Of these about one third were below the 10 guntha size.

Water resources

No data were available as regards the irrigation resources also. The crops most benefitted were paddy, arecanut and vegetables. The principal resource was that of storage tanks, diversion bandharas, springs and wells. Paddy grown in the rabi season (called Vaingana locally) got its water supply mainly from seasonal storage tanks. The rain-water of the receding monsoons was impounded in the paddy fields at higher levels and was later utilised for irrigating the winter paddy crop. The Land Reforms Commissions estimated that there were about 400 storage tanks of this type, located mostly in Bardez and Salcette. In the taluks of Bicholim and Ponda, where the rivers had a post-monsoon flow, small kutchha diversion works were constructed to irrigate paddy fields and areca-plantations. In the valleys, water from natural perennial springs was used for irrigating the areca plantations. Well irrigation was mostly found in Pernem and Bardez.

The Survey

A short-durated survey of the territory was undertaken by the Institute between November 1964 and March 1965. The inquiry sought to collect information as regards the nature and availability of resources and the operational practices of economic vocations. A total of thirteen clusters were selected for the purpose. The selection was largely purposive and was done in consultation with the Block Development Officers of the taluks. The main considerations for selection were firstly, the availability of all types of crops in order to study the cultivation practices, and secondly, the possibility of obtaining fair response from the residents. A list of the selected clusters is given as appendix at the end of this chapter. Map No. 1 indicates their locations.

In the absence of recorded data, a total frame of households in the clusters had to be prepared with the help of an enumeration schedule. The schedule collected certain basic data such as the size of the households, earners and non-earners, main and subsidiary occupations, cultivated land, owned and leased in land, livestock holding and economic contact outside. A total of 8204 households were covered by the enumeration schedule. This formed about 7.4 percent of the rural households of Goa.

The total frame was used for drawing out a 10% random sample (stratified in the case of cultivation) for more intensive inquiry as regards agriculture labour and smallscale and village industries.

More detailed investigations were undertaken to study certain special aspects of the economy such as Khajan, Vaingana and Morod cultivation, cultivation of coconuts and arecanuts, fishing, mining labour, small industries and Kumeri (shifting) cultivation. In many cases the investigations extended beyond the selected villages.

More detailed analytical accounts of the special studies are presented elsewhere in this report as separate chapters. This chapter gives a general perspective of the economy based on the village schedules used for the purpose.

Local regions of the districts and their characteristics

For a closer understanding of the economy an attempt is made here to see if the territory could be divided into smaller and more homogenous regions. The only data available are the occupational classifications of the households of the selected clusters. Supplementary evidence such as average operational holding per working household, area per pair of bullocks and proportion of working force to total population are also presented. The data are presented in table 2.3. Columns 2 and 3 give the proportions of households engaged in primary and other occupation. The former category includes cultivation, agricultural labour, fishing and mining. All other occupations are included in the second category.

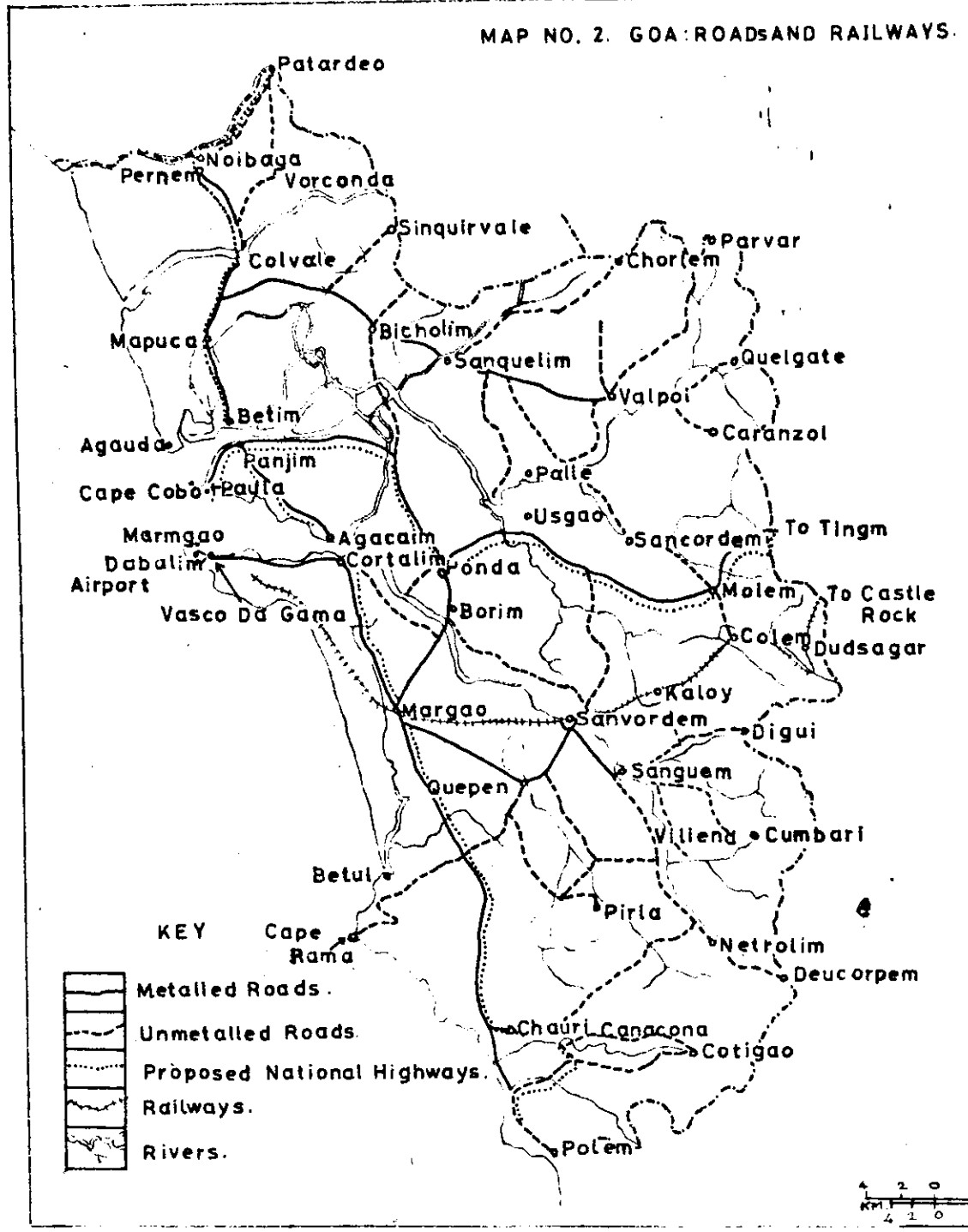
The clusters based on the above classification, can be seen to fall into the three distinct regions stated earlier. The first four villages with a proportion of 70% and below engaged in primary occupations belong to the coastal region. A relatively larger proportion was engaged in tertiary types of occupation and retired persons living on remittances. The next four villages can be placed in the transitional region, with the proportion of primary occupation between 70 and 85 percent. The proportion appears less in the case of Morjim and Verem, mainly because of the existence of coir-manufacture and masons at Morjim and that of country-craft operators at Verem. Coir-manufacture at Morjim was actually a primary type of occupation without much skill needed for the half finished rope lengths prepared in the village. The masons were cultivators during the paddy seasons in the village. They went out for construction work during the dry season. The remaining five villages with 85 percent and more engaged in primary occupations could be placed in the interior hilly-region.

Map 1 attempts to divide the territory of Goa into the three regions mentioned above. Broad occupational classification provided by the 1960 census are used for this purpose. The main difficulty experienced in the attempt was that of identifying the localities. A recent map prepared by the Land Survey Department identifies a much larger number of localities than the 'villages' given in the census. The 'villages' recorded as such by the census were groups of localities, put together for administrative convenience only. It may be seen that, because of this difficulty of identification of localities as well as absence of data pertaining to occupations of these localities, large tracts had to be grouped in the interior transitional and interior hilly regions in Satari, Canacona, Sanguem and Quepem taluks.

It may be seen that towards the west, the territory is fairly equally divided into the coastal and the transitional regions. There are certain areas with more than 85 percent of the households employed in primary occupation also. The map could be much improved with the help of natural topographical divisions. The areas with hilly interior characteristics might be found to be areas with inferior soil and lack of irrigation as well as transport. The next category, the hilly interior (and the mining area also) can be identified with forests and cultivable waste lands towards the eastern side. The map emphasises, in the main, the need to classify the territory into homogenous regions, with similar economic problems, so that the planning effort could be carefully oriented to suit each region.

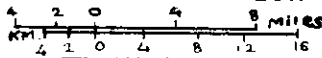
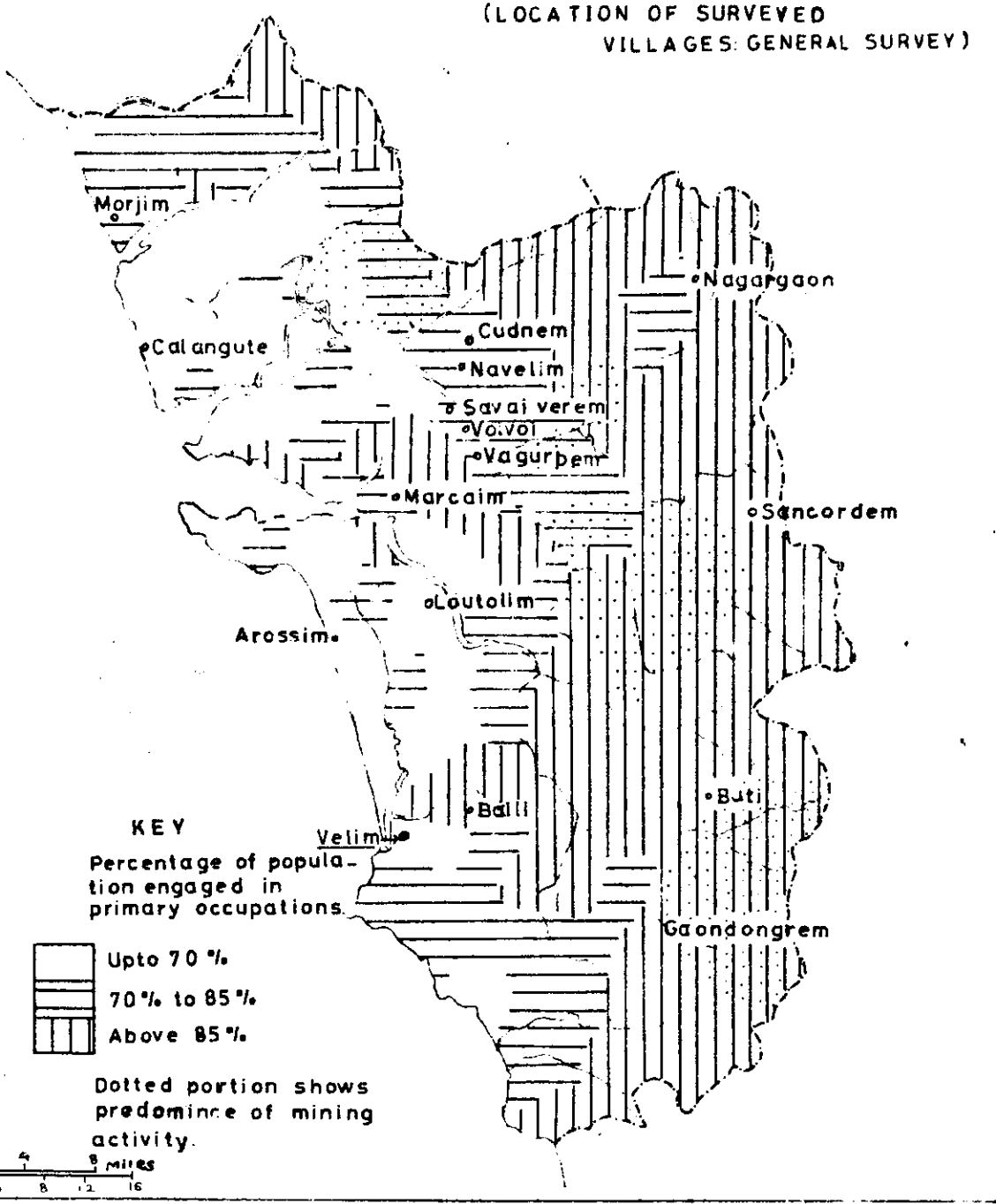
Table 2.4 gives the population figures of the selected

MAP NO. 2. GOA: ROADS AND RAILWAYS.



MAP NO. 1 GOA: BROAD OCCUPATIONAL GROUPS.

(LOCATION OF SURVEYED VILLAGES: GENERAL SURVEY)



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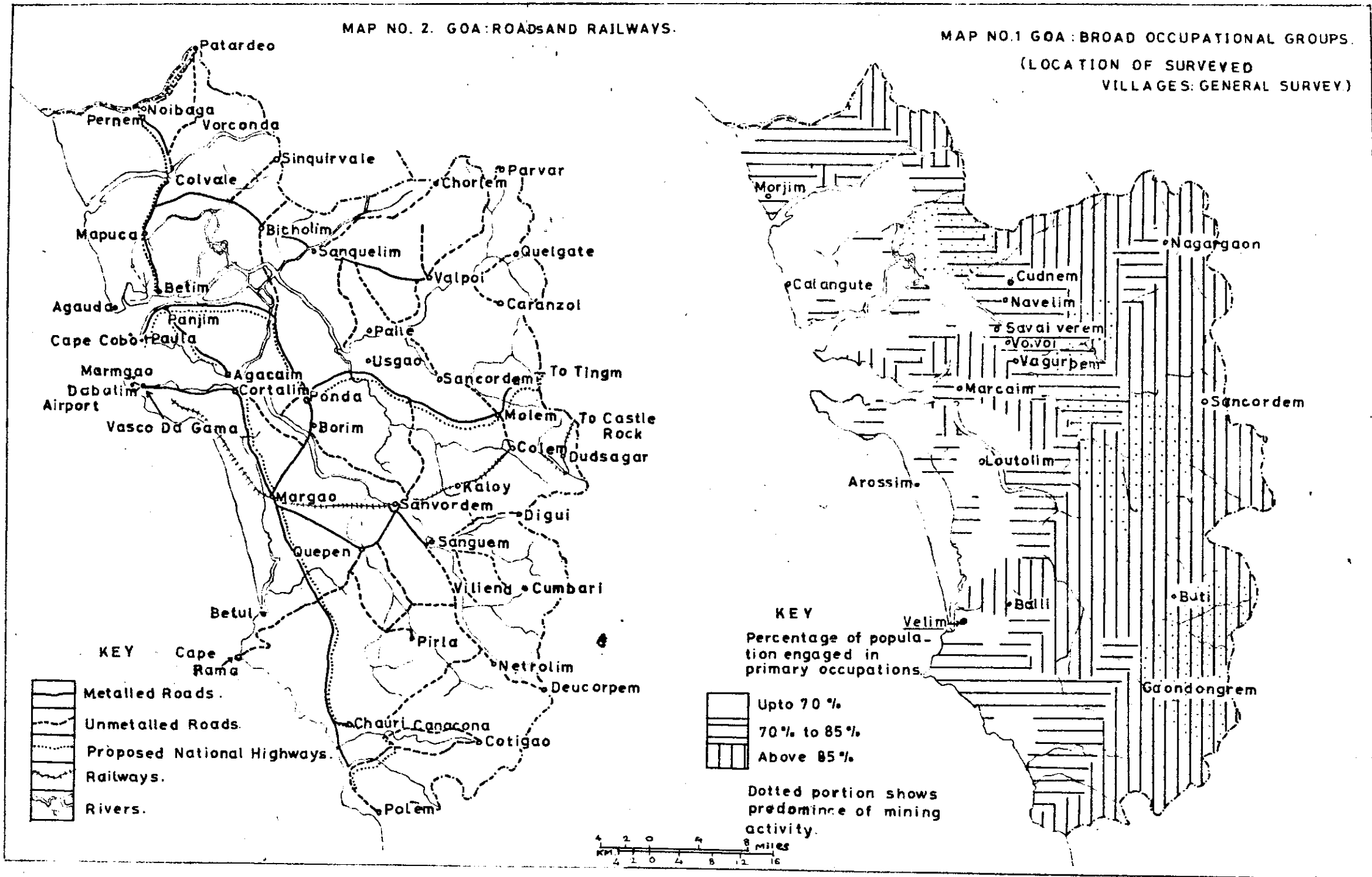


Table 2.3 : Economic characteristics of the selected villages

Clusters	Proportion engaged in primary production	Proportion engaged in other occupations	Area per household in Agriculture (cultivator & Agri. Labour) (Acres)	Area per pair of working bullocks (Acres)	Working force (percentages)
Arosim	46.8	53.2	3.34	16.08	17.9
Velim	60.6	39.4	1.92	68.25	30.2
Calangute	62.9	37.1	2.11	9.37	28.5
Loutolim	68.2	31.8	1.24	7.51	23.1
Morjim	59.9	40.1	1.34	2.87	47.9
Verem	64.8	35.2	0.75	2.50	32.7
Marcaim	83.4	16.6	0.74	4.40	30.0
Balli	84.2	15.8	1.36	1.76	32.6
Sancordem	84.8	15.2	1.22	2.34	44.8
Bhati	87.4	12.6	1.85	2.76	33.4
Kudnem	95.7	4.3	2.74	3.49	52.0
Gaondougrem	91.9	8.1	8.09	9.96	45.2
Nagargaon	92.3	7.7	1.21	4.02	43.4

clusters. The overall size of the family was 5.04 persons. Individual deviations from this average can be seen to conform to the classification of the cluster according to regions. The average size was below 5 in the case of the clusters in the coastal region. The family became larger, between 5.31 to 5.96 towards the east, in the transitional region. In the interior hilly tract, particularly in Gaodongrem in Canacona taluk, the size was the largest with an average of 7.58 persons per family. It may be seen that the size was smaller and more akin to that of the coastal region in the case of the two predominantly mining villages of Sancordem and Bhati.

The proportion of workers to total population also reveals similar characteristics. The proportions were below 30 percent in the coastal region, between 30 and 33 in the transitional region (with the exception of Morjim) and above 43 percent in the hilly interior and the mining region (with the exception of Bhati).

The particularly low proportion of workers in the coastal region was due to emigration from the villages to other places in Goa and mainly outside Goa and largely to Bombay. The practice of emigration was established since the thirties and appeared to have increased after the Second War. Since 1946, the rate was fairly even with occasional annual variations. While the region was more densely populated than the interior, the sex-ratio in terms of the number of males per 1000 females, increased towards the interior corroborating the existence of the practice of emigration. Three clusters namely Kudnem, Bhati and Gaodongrem did not report any emigration. Of the remaining ten, emigration reported by the clusters in the interior region was three per cent in the case of Balli, Verem and Nagargaon and one per cent in the case of Marcin and Sankordem.

Emigration was significant in the four villages in the coastal region namely Arosim, Vellim, Calangute and Loutolim and at Morjim which though placed in the transitional region was a coastal village. It was between 20 to 29 per cent in the four villages, which were predominantly Christian villages. At Morjim, a Hindu village in the main, 16 per cent of the households reported emigration. It may be noted that a majority of the reporting households were Christian. The four villages revealed that between 11 to 19 per cent of their households lived mainly on remittances and pensions. At Morjim the proportion of households in the unproductive category was 2.5 per cent only. Taken as a group, it is found that about 22 per cent of the households of the five villages reported emigration. Occupationwise the proportions reporting emigration were 71 per cent in the case of those in the unproductive category whose income was composed of either remittances or pensions, 29 per cent in the case of cultivating households, 9 per cent in the case of services, 8 per cent in agricultural labour households and between 4 to 6 per cent in the case of households engaged in trade and commerce, manufacturing and processing and construction. Only 2.3 per cent of the total fishing households in the five villages reported emigration.

As regards the place of emigration, it was found that about 55 per cent had emigrated to India (with 51 per cent to Bombay), about 20 per cent were within Goa but outside the native villages and the rest of the 25 per cent were outside India with about 20 per cent employed on steamers and ocean liners in the capacity of cooks and stewards.

Table 2.4 - Classification of population of selected clusters.

Clusters	Male Earners		Female Earners		Male Non-earners		Female Non-earners		Children		Total		No. of Families	Average size of family	Percent- age of workers
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
Arosim	368	14.8	78	3.1	182	7.3	733	29.4	1128	45.4	2489	100.0	552	4.51	17.9
Velim	766	16.4	490	11.8	663	15.9	971	23.3	1270	30.6	4160	100.0	1060	3.92	30.2
Calangute	1009	19.1	497	9.4	271	5.1	1272	24.1	2224	42.3	5273	100.0	1177	4.48	28.5
Loutolim	573	18.5	144	4.6	280	9.0	895	28.9	1205	39.0	3697	100.0	608	5.09	23.1
Morjim	1197	23.3	1260	24.6	151	2.9	497	9.7	2026	39.5	5131	100.0	967	5.31	47.9
Verem	1073	23.8	402	8.9	203	4.5	888	19.7	1933	43.1	4495	100.0	767	5.86	32.7
Marcaim	927	22.8	291	7.2	131	3.2	767	18.8	1952	48.0	4068	100.0	698	5.83	30.0
Balli	543	24.3	185	8.3	34	1.5	404	18.1	1065	47.8	2231	100.0	374	5.96	32.6
Sancordem	876	32.0	350	12.8	65	2.4	327	11.9	1122	40.9	2740	100.0	691	3.96	44.8
Bhati	289	24.9	99	8.5	5	0.4	189	16.3	578	49.9	1166	100.0	231	5.02	33.4
Kudnem	811	26.9	758	25.1	5	0.22	86	2.8	1359	45.0	3019	100.0	534	5.65	52.0
Gaondougrem	610	29.6	322	15.6	17	0.8	232	11.3	880	42.7	2061	100.0	272	7.58	45.2
Nagargaon	364	24.9	271	18.5	30	2.0	114	7.8	685	46.8	1464	100.0	273	5.36	43.4
	9406	22.7	5147	12.4	2037	4.9	7375	17.8	17427	42.2	41392*	100.0	8204	5.04	35.1

* 7.015 % of All Goan Population

* 8.234 % of All Goan Rural Population

A large proportion of emigrants were engaged in technical factory jobs (38 per cent), in clerical services (26 per cent), domestic services of buttlery and cooking (17 per cent) and self-employed mainly as traders and tailors (8 per cent). About 11 per cent were engaged in labour work. Of the total households reporting emigration, about 63 per cent reported receipt of regular remittances, the rest reporting irregular receipts of money from the emigrants.

Occupational Distribution: Survey and Census

Tables 2.5 and 2.6 give the occupational distribution of households. The former presents the sample data. The classification is according to the main occupations reported by the households, the occupation being defined as that contributing the largest proportion to the total household income. Table 2.6 gives the census data that gave the numbers of workers in each occupational category. The proportions of workers to total populations, further calculated for males and females separately are also given in the last three rows. The data pertain to the whole territory inclusive of urban centres. The sample data in Table 2.5 are rural.

According to the sample data, totalled to give the distribution for the rural sector of the territory as a whole, 71 per cent were dependent for their living on primary occupations. Of these 59 per cent were in agriculture, 8 per cent in mining and 4 per cent in fishing. These two occupations were however available in the mining region and the coastal region respectively. Proportions in the next category, that of secondary occupations that included village artisans, manufacturing and processing industries may be seen to generally decline from the coastal to the hilly interior region.

The third category, comprising of occupations of a tertiary nature, appears to be more important than the second in view of the rural characteristics of the sample data. The two principal reasons for this, it may be stated, were the presence of the mining industry and the scattered nature habitation of the households. The former provided employment in transport as well as living on remittances while the latter resulted in daily commutation for work to urban centres. The category as a whole amounted to about 21 per cent of the households. In the coastal region, larger proportions were engaged in services and living on remittances. In the clusters in the transitional regions relatively larger proportions were to be found in services, in government and private offices and transport. The category was relatively less important in the case of clusters in the hilly interior.

It is on account of the two reasons mentioned above namely mining industry and scattered type of habitation that the occupational distribution of the total as well as the rural households show a similar pattern in table 2.6. The proportions engaged in cultivation and agricultural labour show variations which may be due to the fact that many of the agricultural labour families have small cultivated holdings and could easily be placed in the other category. An important variation is seen in the proportions engaged in the seventh category namely that of transport, storage and communications. One of the reasons for this may be the location of transport companies only in the urban centres. The proportions engaged in the remaining categories seem to be largely similar.

Table 2.5 - Occupational Distribution of households in selected clusters (Percentages)

Occupational categories	Arosim	Velim	Calan- gute	Louto- lim	Morjim	Verem	Marcaim	Balli	Sancor- dem	Bhati	Kudnem	Gaondon- grem	Nagar- gaon	Goa
Cultivation	37.2	23.4	28.2	24.0	31.2	27.8	41.8	60.9	22.3	64.9	36.7	82.7	73.6	35.3
Agricultural Labour	7.8	36.9	19.6	43.1	20.6	33.9	33.7	23.0	24.5	-	-	9.2	12.7	23.8
Fishing	1.8	0.3	15.1	1.1	8.0	0.1	7.9	-	-	-	-	-	-	4.0
Mining	-	-	-	-	0.1	3.0	-	-	38.0	22.5	59.0	-	-	8.0
Manufacture & Processing	9.2	9.3	3.1	5.0	18.5	6.0	4.0	5.3	3.3	1.3	1.7	3.3	1.8	6.6
Construction	-	1.7	0.3	0.3	11.7	0.1	-	0.3	-	-	-	-	0.4	1.7
Trade & Commerce	3.4	6.1	4.7	2.3	1.6	4.8	1.3	1.9	1.7	1.3	1.9	.4	1.1	3.0
Transport	5.6	1.0	1.7	1.0	0.8	10.5	6.7	0.3	-	-	-	-	0.4	2.5
Services	14.5	10.1	12.0	9.5	4.8	8.5	4.6	6.9	9.5	3.5	-	3.7	1.8	7.8
Unproductive	19.4	10.9	15.0	13.0	2.5	4.3	-	0.8	0.1	0.9	0.7	-	1.5	6.7
N.R.	1.1	0.3	0.3	0.7	0.2	1.0	-	0.3	0.6	5.6	-	0.7	0.7	0.6
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

N.R. = non-reporting

Table 2.6 - Occupational Distribution of households (Census Data)

Occupation Categories	Bardez	Goa	Mormugoa	Salcette	Pernem	Bicholim
Cultivation	37.7	32.4	10.9	24.5	70.8	49.5
Agricultural Labour	17.3	16.0	17.1	27.6	9.3	7.9
Mining, Quarrying, Fishing, Hunting & Plantations, Orchards and allied activities	7.9	4.9	7.4	7.2	3.3	26.5
Manufacturing industries including those of households	10.7	8.3	11.4	11.9	5.1	5.4
Construction	2.1	2.6	2.1	1.3	4.1	0.6
Trade & Commerce	7.6	7.8	7.7	7.7	1.6	2.7
Transport, Storage & Communication	4.4	8.1	30.9	7.6	1.9	2.9
Other Services	12.3	19.9	12.5	12.2	3.9	4.5
Total	100.0	100.0	100.0	100.0	100.0	100.0
Proportion of workers to total population	34.8	37.5	44.7	36.4	47.2	47.1
For Males only	44.6	48.7	61.5	46.7	53.0	56.5
For Females only	26.9	26.6	24.0	27.7	41.9	37.6

Continued...

Table 2.6 - Occupational Distribution of households(Census Data)

(Contd.)

Occupation Categories	Ponda	Quepem	Satari	Sanguem	Canacona	Goa	Sample data (Rural)
Cultivation	56.8	57.7	73.0	37.7	60.2	42.6	38.0
Agricultural Labour	12.5	12.7	11.9	6.7	15.8	15.5	25.7
Mining, Quarrying, Fishing, Hunting & Plantations, Orchards and allied activities	11.3	14.9	8.1	45.8	8.6	12.3	12.9
Manufacturing industries including those of households	5.3	4.9	2.1	2.3	4.4	7.5	7.1
Construction	0.3	0.6	0.3	0.8	0.5	1.5	1.8
Trade & Commerce	3.0	2.2	1.0	1.3	3.8	5.0	3.3
Transport, Storage & Communication	4.6	2.8	1.1	2.4	1.3	6.3	2.7
Other Services	6.2	4.2	2.5	3.0	5.4	9.3	8.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Proportion of workers to total population	42.4	45.2	50.6	54.5	44.1	41.4	
For Males only	52.0	52.5	57.1	63.6	51.8	51.5	
For Females only	33.0	38.0	44.0	44.1	36.6	31.9	

The proportions engaged in the various activities, as given by the number of workers, male and female, in each type, show a clear division between the coastal and the interior regions. Particularly noteworthy is the fact that a larger proportion of females were actively engaged in the latter region as a whole. This was due to the necessity of larger variety of agricultural operations such as manuring, watering and watching in the transitional region and the availability of the work of loading mining ore in the mining areas.

It may be broadly stated that the occupational pattern tended to be nearer an urban area in the case of the coastal region, a semi-urban area in the transitional region and more rural, with larger proportions engaged in primary occupations in the hilly interior and the mining areas.

Crops

As regards crops, paddy was the principal crop and was grown wherever it was possible to grow. In the coastal region, it was almost the only crop and was of a superior quality owing to the availability of 'ker!' and 'Khajan' lands. Since the Khajans were developed along the river banks, they were obtainable in the transitional region also. Area-wise, a larger proportion of the paddy crop was under morod or inferior lands.

The proportion of double-cropped area was found to decrease from the coast towards the east. In the coastal region it varied from 15 to 20 per cent of the total cropped area, from 5 to 10 per cent in the transitional region and below 7.8 per cent in the hilly interior region.

In the coastal region, a little over half the double-cropped area was under paddy. The rest was under vegetables like onions, sweet-potatoes and chillies. In the transitional region the second crops were mainly chillies, pulses and fruits.

Stray efforts on experimental basis of growing groundnut were reported. The efforts were undertaken at the instance of the Block Development authorities. Likewise there had been some efforts and experimentations for introducing the Japanese method of rice cultivation. According to reports, the experience in the transitional tract was that the extra yield barely compensated for the costs and did not retain any extra margin for the grower. Japanese cultivation in a village in the hilly interior resulted in a loss as regards yield.

The main difficulty in this regard, as reported by some of the cultivators was the high cost of labour. In fact the relative scarcity of labour was found to be a common difficulty experienced by all types of employers of labour. The cultivators felt it more acutely. It was said that the availability of employment in the mining industry had brought about this scarcity.

As stated earlier the interior region was largely under the 'khushky' crops. Pulses like Udid, Kulith and gram were grown as mixed crops with inferior millets.

Soil erosion

According to the village schedules, there was relatively little erosion of soil. The territory received heavy rains ranging from 100 inches in the coastal region to 150 inches and more in the interior. The rain water found its way to the sea

through rivers, streams and nallas. The fields along the way had been properly bunded or embanked. A little erosion was reported by one of the villages in the transitional region owing to the overflowing of a stream in recent years.

Wastelands

There were no cultivable waste lands in the coastal villages. This was also the case in the villages in the hilly interior region. The waste lands in the latter were presumably mistaken for inferior forest lands. The villages in transitional region however reported some waste lands. These, according to local opinion, could be put under paddy, inferior millets, coconut, cashew or teak depending on the soil conditions. This work was however neglected owing to the ready availability of work in the mines.

Cultivation practices

The methods of cultivation were traditional. The paddy seed was sprouted before sowing by the broadcast method. Farm-yard manure was given before sowing. The second dose was usually administered after transplanting. The manure used was either beach manure or fertilizers. No particular effort was done to preserve the seed except in one village where ash was said to be used. In another village the seed was preserved in tightly-packed straw bundles.

Irrigation in the villages in the coastal region was usually done by means of seasonal storage tanks in the case of the second crop Vaingana (winter paddy) and by kutchha wells and ponds in the case of vegetables, sweet-potatoes, onions and chillies. There were little possibilities for new sources of water according to local opinion. In the village Morjim in Pernem taluka, kutchha ponds and wells were the sources of irrigation.

In the villages in the transitional region, the principal resources were the natural springs, storage tanks and diversion bandharas. Three of the villages in this region reported the possibility of increased water supply by bunding local streams, and another three villages could get more water if the local tanks were dredged and reconstructed. In one case, the supply could be increased if the salty tidal waters of the river could be stopped from getting into the fresh water stream by raising the embankment on the river.

In the interior region, the difficulties as regard water supply was the absence of storage facilities. The rain water drained away through the natural water course and the laterite soil. The cost of construction of storage tanks was thought to be heavy. In the hilly areas in the south, there was no second crop as all the streams were seasonal.

As regards manure, it was reported to be inadequate in all villages except those in the hilly interior. As paddy cultivation required relatively little animal labour except for ploughing, the cattle holding, especially in the coastal region was comparatively small. Pig manure was reported to have been used, especially by Christian farmers, at Morjim for rabi crops.

Usage of beach manure, though highly preferred, was on the decline owing to higher prices. It was also reported that it was not available in adequate quantities during the past two

years. None of the cultivators selected in the cultivators' sample reported inputs of beach manure during the previous season. As regards experience, it was specifically mentioned in two villages, one in the coastal and the other in the transitional region, that beach manure gave higher yields as compared to fertilizers.

All types of chemical fertilizers, ammonium sulphate, super phosphate and urea were used by all cultivators in the coastal region and between 30 to 50 per cent of cultivators in the interior regions. The usage had been tried out by the former administration. The Block Development administration made special efforts to popularise the use of fertilizers. The distribution was done through the co-operatives.

Response of cultivators as regards the usage of fertilizers was a little varied. In the majority of the cases the experience was reported to be good, the only difficulty being that they were not available in adequate quantities and at the proper time. One of the villages in the transitional region reported that the fertilizers made the land lose its natural productive capacity with the result that the next crop without the fertilizer was less than the average. In two other villages in the same region the response was that they were expensive and the increase in the yield did not compensate for the high cost of the fertilizers. Two villages however reported that yields had improved by about 25 per cent.

The practice of conserving available manure in compost pits or the usage of green manure specially grown for the purpose was largely absent. The Block Development authorities, it was reported, were making efforts to popularise them.

The usage of green manure was however not unknown. The practice was traditionally current in the interior to use the leaves of a wild bush called Sanval as manure mainly for the tree crops like coconuts and arecanuts. The bush grew wildly on hill slopes and its green leaves were buried under the areca plants every year. It was also used in a three year rotation for the coconuts. In the south, Sanval was also used for the chilli crop.

Two stray efforts, both in the villages in the transitional regions, were reported where san hemp and Dhencha were used during the current year. The experience as regards the cultivation of the manure-crops and their effects on the yield were not known.

As stated earlier, the labour situation in the territory was of a nature that is generally available under full-employment conditions. It was generally stated that the available supply of labour particularly in agriculture and other non-agricultural unskilled works, remained in the respective sections as long as the wage rate was not less than that was available in mining. Except for specific considerations that made it unable for the labourer to move from one place or industry to another, the general situation appeared to be as reported. By and large the wage rate was between Rs.2.75 to Rs. 3.00-3.25 whether in agriculture, non-agricultural work or mining.

Labour Employment

Table 2.7 presents the pattern of labour employment in the selected clusters. The proportions for the different regions

Table 2.7 - Pattern of labour employment(Sample data)

Clusters	Agriculture	Mining	Non-agriculture	Agriculture & Mining	Agriculture & Non-agriculture	Total
Arosim	-	-	-	-	6	6
Velim	38	1	4	-	11	54
Calangute	18	-	5	-	1	24
Loutolim	-	-	2	24	23	49
Total (Percentage)	56 42.1	1 0.3	11 8.3	24 18.0	41 30.8	133 100.0
Morjim	1	-	3	-	16	20
Verem	20	8	15	2	5	50
Marcaim	1	4	9	5	24	43
Balli	-	-	-	1	7	8
Total (Percentage)	22 18.2	12 9.9	27 22.3	8 6.6	52 43.0	121 100.0
Sancordem	4	25	2	9	-	40
Bhati	-	3	-	4	-	7
Kudnem	-	76	-	-	-	76
Total (Percentage)	4 3.3	104 84.5	2 1.6	13 10.6	-	123 100.0
Gaondougrem	3	-	-	-	-	3
Nagargaon	2	-	-	-	1	3
Total	5 83.3	-	-	-	1 16.7	6 100.0
Total (Percentage)	87 22.8	117 30.6	40 10.4	45 11.7	94 24.5	383 100.0
Total in Agri.	226	43.3				
Mining	162	31.0				
Non- agri.	134	25.7				
	522	100.0				

and the territory are also worked out. The proportions of the overall dependence of labour on agriculture was 43 per cent, on mining 31 per cent and about 26 per cent on non-agricultural work.

It may be seen that for the territory as a whole, about 23 per cent of the available labour was engaged in agricultural labour work, 31 per cent in mining and 10 per cent in non-agricultural labour work exclusively. Only two combinations were obtained, the proportions engaged in the agricultural and non-agricultural labour combination being particularly high in the transitional and the coastal regions. The other combination, namely that of agricultural labour and mining labour work engaged a relatively smaller proportion, it being the highest in the coastal region, where work of loading the ore on barges was available at river points. It became available after the monsoons were over, by which time agricultural season also came to an end.

As could be expected, about 85 per cent of the labourers were engaged in mining work in the mining areas. In the hilly interior, where mining labour work was not available, five out of the six labour households selected in the sample, were exclusively engaged in agricultural labour work.

Wage data in the village schedules showed certain variations between agricultural wage rates in different regions. The wage rate for males ranged from Rs.3 to Rs.5 per day in the coastal region, from Rs.3 to Rs.4 in the transitional region and from Rs.2.50 to Rs.3.50 in the hilly interior region. For females it ranged from Rs.1.50 to Rs.2 in the coastal region, from Rs.1.50 to Rs.3 in the transitional region and from Rs.2 to Rs.3 in the hilly interior. The reason for the rise towards the interior was on account of the availability of loading work which cut down local female agricultural labour.

In the selected village in the Canacona taluk in the south, the system of Mahmadari was reported. The labourer was retained, on a monthly basis, for a month at the commencement of the cultivation season and towards the end. He was paid mainly in kind and given three meals a day and perquisites. At current rates, the payment in paddy amounted to about Rs.50 per month.

The duration for which agricultural labour work was available also varied with regions. In the coastal area the duration was between 1 to 3 months; in the transitional region it was between 2 to 4 months and about three months in the hilly interior.

Livestock

Regarding livestock, it was found that except in the two villages in the hilly region, livestock or dairy farming as a business was absent. The livestock was of the local variety. Grazing facilities were relatively absent in the coastal region. Hill slopes provided grazing facilities in the interior. Draught and milch cattle were given groundnut cake and mixed bran. They were reported to be fed with urid and kulith in a village in the transitional region, while in another they were said to be given maize feed. The usual practice in some of the coastal and transitional villages was to feed (wild) hay that was available for sale.

Milk was reported to be generally in short supply. The

small quantity locally available was sold locally, the prices ranging from Re.1 to Rs.1.25 a litre in the coastal region, and from Re.0.75 to Re.1 a litre in the transitional region.

The co-operative dairy farming efforts undertaken by the Animal Husbandry Department were limited to collection of milk from member cultivators or milkmen with one or two heads of milch cattle, bottling the milk and selling it to urban consumers. About 700 litres of milk at Panjim collected by 3 dairy co-operatives in the taluk and about 300 litres at Margao collected from around were thus sold daily.

In two hilly villages selected for survey there were some families belonging to the caste of cowherds, namely, Dhangar and Gavali. These reported livestock farming as a business. The business was not however systematic and was limited to selling young stock at religious fairs. There was no purposive breeding for the purpose.

In the hilly village in Canacona, the practice of milking the animals was reported to be absent. A semi-tribal community that resided on the hill slopes reported ownership of fairly large holdings of cattle. The cattle grazed on the slopes and multiplied naturally. The families were said to keep no count of the cattle and penning the cattle at night time or feeding the cattle was not known.

Credit and marketing

Credit facilities were absent except in three villages where tagavi loans had been made available during the year by the Block Development authorities. In two other villages crop loans, partly in kind as seed, were reported to have been made available through the service co-operatives. It was, however, generally said that credit was not difficult to obtain, either from moneylenders or owners of the leased in land at a reasonably low interest rate. In this context it was also reported that the low rates were on account of the former administration which, as a Christian principle, forbade charging of high rates.

The produce that was reported to be usually sold was coconuts, chillies and onions. It was mainly sold to local dealers against an advance payment of 40 to 50 per cent of the price, fixed earlier. A part of the produce was also sold directly to local consumers on a retail basis.

Sales of paddy were reported to take place within the village, mainly to consumers, dealers or owners of the leased-in-land. Three of the villages in the transitional region reported no sale of produce at all. In the hilly village in Canacona the produce of chillies was reported to have been sold through the local co-operative society, that being a condition under which the society had made crop-loans available, partly in seed and partly in cash.

Village Industries

As regards village industries, the most common ones were the rice and flour mills and units of liquor distillation. Only two villages in the transitional region and all the villages in the hilly interior reported absence of rice and flour mills. The flour mills usually had mechanical oil expellers and hullers for milling oil and dehusking paddy respectively. Since the

practice of consuming par-boiled rice was common, the hullers were in regular use, where the individual consumer often took small quantities of par-boiled paddy for dehusking. Likewise he also took a quantity of home-made copra for pressing oil for domestic use.

Two of the coastal villages also reported the existence of bullock operated Ghanis. They were not reported elsewhere.

Distillation units for distilling liquor from coconut toddy or cashew juice were reported by all the selected villages. The units varied from 5 to 50. Since there was no prohibition, anybody could undertake distillation by procuring a licence for the purpose. Pheni, the local name for the final distilled products, was distilled out of coconut toddy in the coastal villages as well as villages in the interior. Distillage of cashew-juice was however restricted to villages in the transitional and the hilly interior where the fruit was available. It was however a seasonal industry. Extraction of coconut toddy and subsequent distillation went all round the year except for a couple of months during the monsoons when the coconut trees became slippery and as such untappable.

APPENDIX TO CHAPTER 2Centres selected for inquiry

S. No.	Name of the Centre (and villages)	Concelhi or Taluka	Total population (1960)
<u>COASTAL REGION</u>			
1.	Morjim	Pernem	4718
2.	Calangute	Bardez	5989
3.	Cansaulim	Marmugoa	1238
	Arossim	Marmugoa	1134
4.	Velim	Salcette	3955
<u>INTERIOR - TRANSITIONAL REGION</u>			
5.	Cudnem	Bicholim	1615
	Navelim	Bicholim	1379
6.	Volvoi	Ponda	1240
	Verem	Ponda	2486
	Vagurbem	Ponda	517
7.	Marcaim	Ponda	4224
8.	Lo Molim	Salcette	2797
9.	Bali	Quepem	1585
<u>INTERIOR-HILLY REGION</u>			
10.	Nagargao	Satari	1464
11.	Sancordem	Sanguem	3633
12.	Bati	Sanguem	2081
13.	Gadongrem	Canacona	3361

CHAPTER 3

TRANSPORT, COMMUNICATIONS, AND SOCIO-ECONOMICAIDS AND ASSISTANCE

Economic development and social well-being are the two basic objectives of any development plan. Achievement of these objectives with reference to a region, presumes simultaneous development of all the local areas as also of all the sectors, with more or less equal speed, depending upon the existing conditions. This means that all the local areas get the opportunity of taking active part in the development of a region, and obtain the benefits of economic growth. This can happen only when all the areas are provided with sufficient means of transport and communications with important growth centres. A well laid out system of roads, railways and waterways, therefore, assumes primary importance from this point of view. Other economic and social aids and amenities like arrangements of sale and purchase, banking services, production centres, provision of educational, health and sanitary facilities can be provided as and when necessary, taking into account the local conditions. A systematic development of the means of transport and communications and the provision of necessary socio-economic aids are the important basic structures on which the development plan of an area is built up. It is with this consideration that transport and communication facilities and other socio-economic services, in respect of the Goa territory, are discussed together in this note.

The system of transport in Goa is geared mainly to the requirements of commerce, particularly with reference to joining the port of Marmagao to the commercially important areas. From this point of view the district of Goa can be said to be sufficiently provided with a network of roads, railways and waterways. This network, however, requires examination from the point of the approach stated above. Since the railways and the waterways provide means of transport to a limited area, it is the system of roads which assumes importance in this connection.

Roads:

The total length of roads in the Goa district is 1487 kms. This includes roads maintained by the Public Works Department and also by the municipalities and the local boards. The former are known as 'public roads', while the latter are called 'municipal roads'. The district has 41.2 kms. of roads per 100 square kilometers of area, about 4 kms. less than the target visualized in the 1961-81 road plan. The Public Works Department maintains 'national' roads which are categorized as first and second class, according to width and other prescribed standards. The roads connecting important towns are first class roads, while those connecting taluka places and important villages are second class roads. More than 70 percent of the length of the first class public roads are black topped, while the remaining first and second class roads are mostly of laterite macadam. The first and second class municipal roads are within the limits of municipalities, the rest being roads linking villages to the main roads. The detailed figures about the public and municipal roads in Goa are given in table 3.1. The details of the first and the second class roads are given in tables 3.2 and 3.3.

The proposed West Coast Highway enters Goa at Naibag in the north and runs up to Canacona in the south, thus linking the Ratnagiri district of Maharashtra to the Karwar district of Mysore. It passes through Pernem-Colvale, Mapuca, Betim, Panjim, Agacaim-Cortalim, and Margao, encountering three river crossings in between at Colvale, Betim and Agacaim, where the traffic is carried over in ferries. There is considerable congestion of traffic and long hold-ups, especially at Betim and Agacaim, and the rivers Chapora, Mandovi and Zuari require, therefore, to be urgently bridged. For a direct link with Savantwadi a bridge is also required at Naibag on the Terecol river. The only highway running west to east is the Panjim-Belgaum road via Ponda, Tisk and Tinemghat. Feeder roads connect these highways to important towns and villages. Some of these roads are heavily used for transporting mineral ore, either to the railway stations or to the river heads for further dispatch to harbours. This constant and heavy traffic of mine ore has totally damaged the road surfaces at many places, and has completely wiped off the original metal. A large mileage of public and municipal roads are in a very bad state of repairs, and require widening and upgrading. The cases in-point are the Usgao-Molem section of the Panjim-Tinemghat road, majority of the road connections in Pernem, Margao-Canacona road, the Sanvordem-Sanguem section, and the Siroda-Sanvordem section. However, during the Third and the Fourth Plan periods the Government proposes to complete most of the repairs and upgrading of national roads and those in mining areas.

Growth centres :

It has already been stated that so far as the standard criteria like the length of roads for a specific area or for a specific number of people are concerned, Goa has a good network of roads. With the present road length no village in Goa should be more than 2-3 kms. away from the main road. Actually, however, there are areas, particularly in Pernem, Satari, Sanguem, Canacona, and part of Quepem, which do not have easy access to the main roads. This is especially true in respect of wadis which are in many cases, more than 5 kms. away from the main village. This situation is the result of having geared the system of roads to the commercial exploitation of a particular resource, and of not having paid enough attention to the systematic development of all local areas. As stated at the beginning an essential precondition for such a development, is provision of sufficient means of transport and communications with the important growth centres. At present, though we have no quantitative data about the market inflows, outflows and congregations, the following seem to be the established centres

Market Centres in Goa district

Taluka or Development block	Market Centres		
	Taluka Sq.	Other deve- loped centres	rapidly deve- loping centres
Pernem	Pernem	-	-
Bardez	Mapuca	-	-
Bicholim	Bicholim	Sanquelim	Usgao
Satari	Valpoi	-	-
Ponda	Ponda	-	-
Goa	Panjim	-	-
Salcete	Margao	-	Concolim
Marmagoa	Wasco	-	-
Quepem	Quepon	Curchorem	Bali
Sanguem	Sanguem	-	Colem
Canacona	Chaudi (Canacona)	-	-

in different talukas or development blocks. These centres are either already developed or are in the process of rapid development. It can be seen that apart from some of the taluka places which have developed mainly because of administrative reasons, the development of additional centres is due to the establishment and rapid development of mining industry. These centres have developed or are developing in the area where mining industry is operating, e.g., in the talukas of Bicholim, Salcete, and parts of Quepem and Sanguem. Large areas of Pernem, Satari, Sanguem, and Canacona have to depend upon mostly on taluka places which are not easily accessible to them.

Municipal roads :

The available information about the municipal roads, which are the means of transport joining villages to the main roads, shows that these form more than 56 per cent of the total road length. Detailed information about these roads is not available but the following statement is particularly informative in this

Length of municipal roads in different talukas in Goa district

Taluka	Area (sq. kms.)	Length of M.Rs. (kms.)	Length of M.Rs. per 100 sq. kms. (kms.)
Salcete	107	200	187.9
Bardez	102	155	152.0
Pernem	93	75	80.6
Penda	97	81	83.5
Marmugoa	30	23	76.7
Goa	64	45	70.3
Bicholim	91	60	65.9
Quepem	134	44	32.8
Canacona	134	40	29.9
Satari	198	50	25.2
Sanguem	343	67	16.6

respect. It shows that so far as the length of the municipal roads is concerned, the first seven talukas in the list are well provided with. Pernem taluka has a good mileage of municipal roads, which means that majority of the villages have easy access to the main roads. If we consider this together with the fact that the area of the taluka is only 93 square kilometers, then the present market centre, i.e., Pernem, seems to be quite sufficient for the entire taluka. The talukas of Quepem, Canacona, Satari and Sanguem have relatively inadequate network of municipal roads. In Quepem, Satari and Sanguem the municipal roads are concentrated in the areas where mining industry has developed. This has left large areas of these talukas unconnected and, therefore, relatively underdeveloped. In addition to the provision of adequate transport and communication facilities, it would be advisable to develop two-three additional suitable market centres in these areas. As indicated above, detailed data are not available with us in order to offer concrete suggestions in this respect.

Other facilities :

It has already been stated that the development of mining industry has largely contributed to the growth of the majority

of the centres, and that no steps were taken to see that other sectors of the economy, and other regions of the territory, develop simultaneously. Conscious efforts were not made to provide socio-economic aids and assistance in order to assure the effective execution of development schemes. For, unless proper arrangements are made to reach the various services to the persons concerned, e.g., seeds, fertilizers, credit, etc. to the cultivators, development programmes cannot be successfully implemented. From this point of view, the different centres were deficient in some respect. Information regarding the availability of various socio-economic facilities at these centres is given in table 3.5. The communication net work and the market centres are shown in Maps 2,3 and 4.

So far as the facilities of credit and marketing are concerned, it can be seen from the table that service societies are organized at all the centres, that the Goa State Cooperative Bank is functioning at Panjim, with a branch at Margao (and six additional branches are being started at six talukas headquarters), that a separate wing for long-term credit is also functioning in the State Cooperative Bank, and that at 10 out of 17 places godown facilities are made available. The Cooperative Department started functioning during 1963-64 and the cooperative structure is yet to be built up effectively. However, with the provision of a few more godowns, a basic structure will have been established for the purpose of distributing essential requisites like seeds, fertilizers, implements, etc., to the cultivators. Sale and purchase societies have not yet been organized, excepting one Cooperative Marketing Society for Arecanut. Veterinary aid is available at 11 out of the 17 places. At four of these centres, viz., Bicholim, Panjim, Margao, and Wasco, fullfledged veterinary dispensaries have been established, while at the remaining centres only veterinary aid is provided through veterinary extension officers. A few veterinary aid is provided through veterinary extension officers. A few veterinary aid boxes have been distributed to the gramsevaks for use in their areas. Medical and health facilities are available at almost all centres. These consisted of either the primary health centre, cottage hospitals, allopathic dispensaries, or maternity hospitals, In addition to this 26 rural dispensaries began functioning by the end of 1964-65. Five family planning centres were working at Mapuca, Ponda, Panjim, Margao and Wasco. It seems that so far as medical and health facilities are concerned, instead of expansion, consolidation by completing the requirements of staff and medicine, is necessary. All the centres are provided with primary and secondary schools, while facilities for higher education in arts and science are available

Table 3.1 : Showing the length of public and municipal roads in Goa.

Dis- trict	Area (sq. kms.)	Popu- lation (1961) (Lakhs)	Length of roads (Kms.)								Length of black topped roads Kms.	Black topp- ed as cen- tage to total length Kms.	Length of la- terite maca- dem roads Kms.	Per cen- tage of maca- dem roads to total length Kms.	Road leng- th per 100 sq. kms. Kms.	Road length per 10,000 popu- lation Kms.	
			Total length	Public roads		Municipal roads											
				First class	Second class	Total	First class	Second class	Third class	Un- classi- fied	To- tal						
Goa	3,646	6.29	1,487	331	316	647	86	87	537	130	840	317	21.3	1,170	78.7	42.2	23.6

Table 3.2 : Details of first class roads in Goa district.

S. No.	Description of the road.	Length in Kms.			Remarks
		Black topped	Laterite macadem	Total	
1.	Panjim to Naibag via Betim, Mapuca, and Pernem.	18.71	12.10	30.81	Connecting the coastal road to Vengurla. Bridges are required at Betim and Colvale on Mandovi and Chapora.
2.	Mapuca to Parvar (northeast Border) via Cuncholim, Moulinguem, Bicholim, Sanquielim and Valpoi	39.86	10.25	50.11	Connecting the road to Belgaum.
3.	Panjim to Tineghat via Ponda and Molem	49.00	21.00	70.00	Main highway to Belgaum.
4.	Panjim to Polem via Agacaim, Cortalim-Margao-Cuncholim-Canacona.	49.60	44.25	93.85	Connecting Sada-shingad in North Canara to Panjim. Bridges required on Zuari.
5.	Panjim to Dona Pavla.	6.83	-	6.83	Leading to the river front on Zuari.
6.	Margao to Digui on eastern border via Quepem, Curchorem, Sanguem	29.50	7.57	37.07	Connecting road to Dandeli.
7.	Sanguem to Devcarpem via Netrolim.	10.00	10.54	20.54	Joins Kalinadi in North Canara, and Yellapur on the Hubli road.
8.	Cortalim to Margao via Vasco	16.47	-	16.47	
	Total	225.18	105.71	330.89	

Source: P.W.D. Goa.

in four colleges, two at Panjim and one each at Margao and Mapuca. Facilities for technical education are provided at Mapuca, Panjim and Margao. These require extension to some of the other suitable centres. Post and telegraph facilities are available at almost all the centres. Power was being supplied to Goa from Maharashtra and Mysore and the work of laying down H.T. and L.T. lines was in progress. So far, electricity was available at Pernem, Mapuca, Bicholim, Sanquelim, Ponda, Panjim, Margao, Wasco, and Gurchorem.

Railways:

Only one meter gauge railway line serves the territory. It runs between Castle Rock to Marmugao harbour, a distance of about 79 kms., and is linked up with the Poona-Bangalore section of the Southern Railway at Londha. The line was known as the Western India Portuguese Railway, and was operated by the Southern Railway under an agreement with the Portuguese Government. During the period of blockade, however, when the Southern Railway stopped working the line, Marmugao Port Authorities were operating it. After liberation the line was again handed over to the Southern Railway and is, at present, integrated with the S.R., except for the fact that integration of the freight and passenger fares with the all India system is not complete. Owing to the rush of passenger and goods traffic, the line is already feeling the strain, and requires immediate improvements by strengthening the bridges and by overhauling the track. There is an acute shortage of wagon supply which causes delay in the clearance of traffic. The rapid industrialization of the territory would cause additional strain, and in due course the line would require broadening.

Inland waterways:

Goa is fortunate in having a good network of inland waterways in its western part. A large number of craft ply on these waterways and carry passengers and freight, including the iron ore. Of the seven rivers two are navigable for a distance of more than 60 kms., while the remaining are navigable for short distances of 3 to 35 kms. The total navigable distance is about 270 kms. of which about 169 kms. is accounted for by the two longer rivers. The information regarding the navigable rivers is given below:

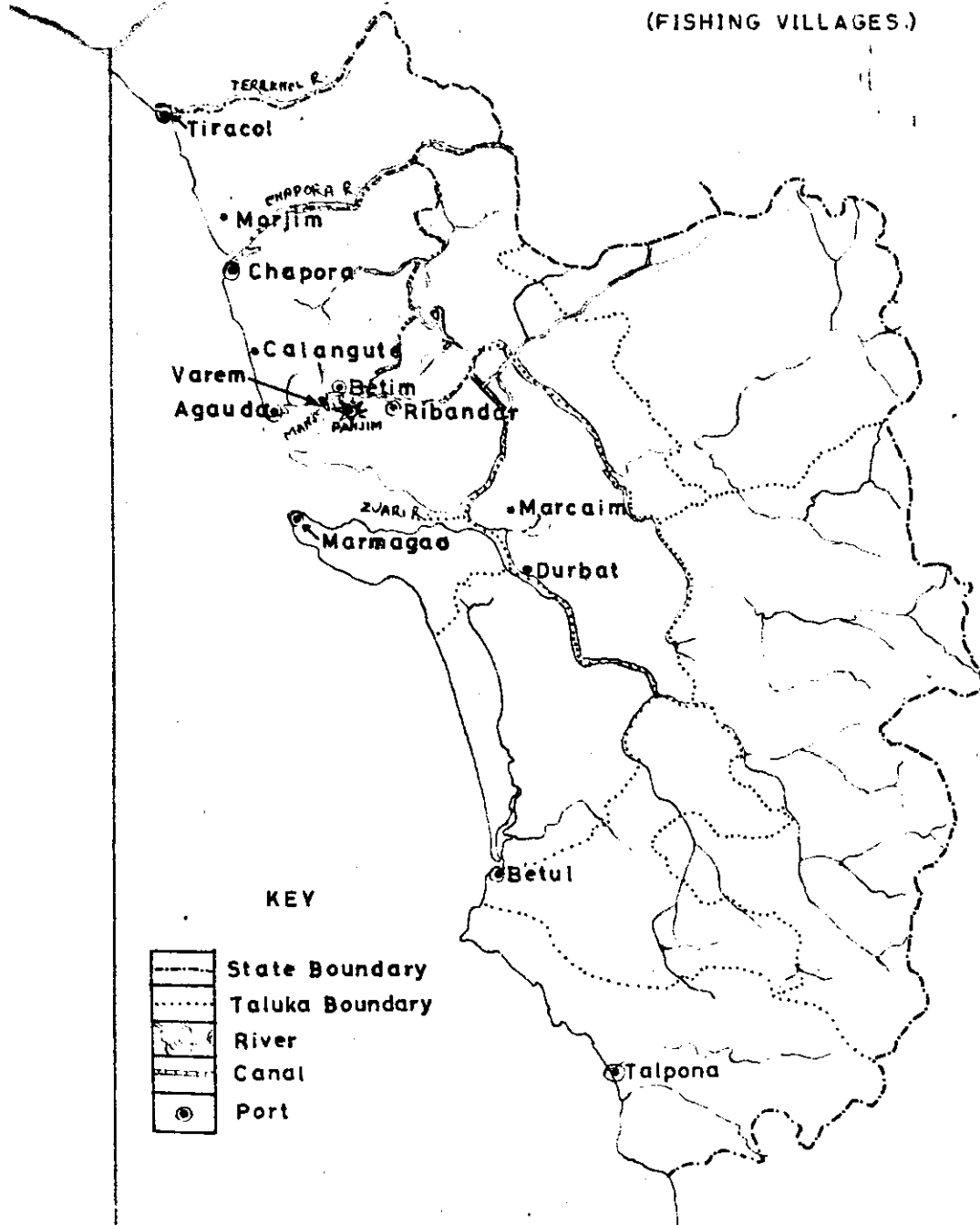
(i) (1) The Terekhol river on the northern boundary of the Goa district is 48 kms. long and is navigable for 32 kms. Crafts of 20 ton capacity can go upto Sanvorzuna at any time, while at high tide crafts of 4 ton capacity can go upto Badem.

(ii) The Chapora river on the northern border of Bardez and Bicholim is 64 kms. long and is navigable for 32 kms. Crafts of 20 ton capacity can go upto Sirgalom and smaller crafts upto Salem.

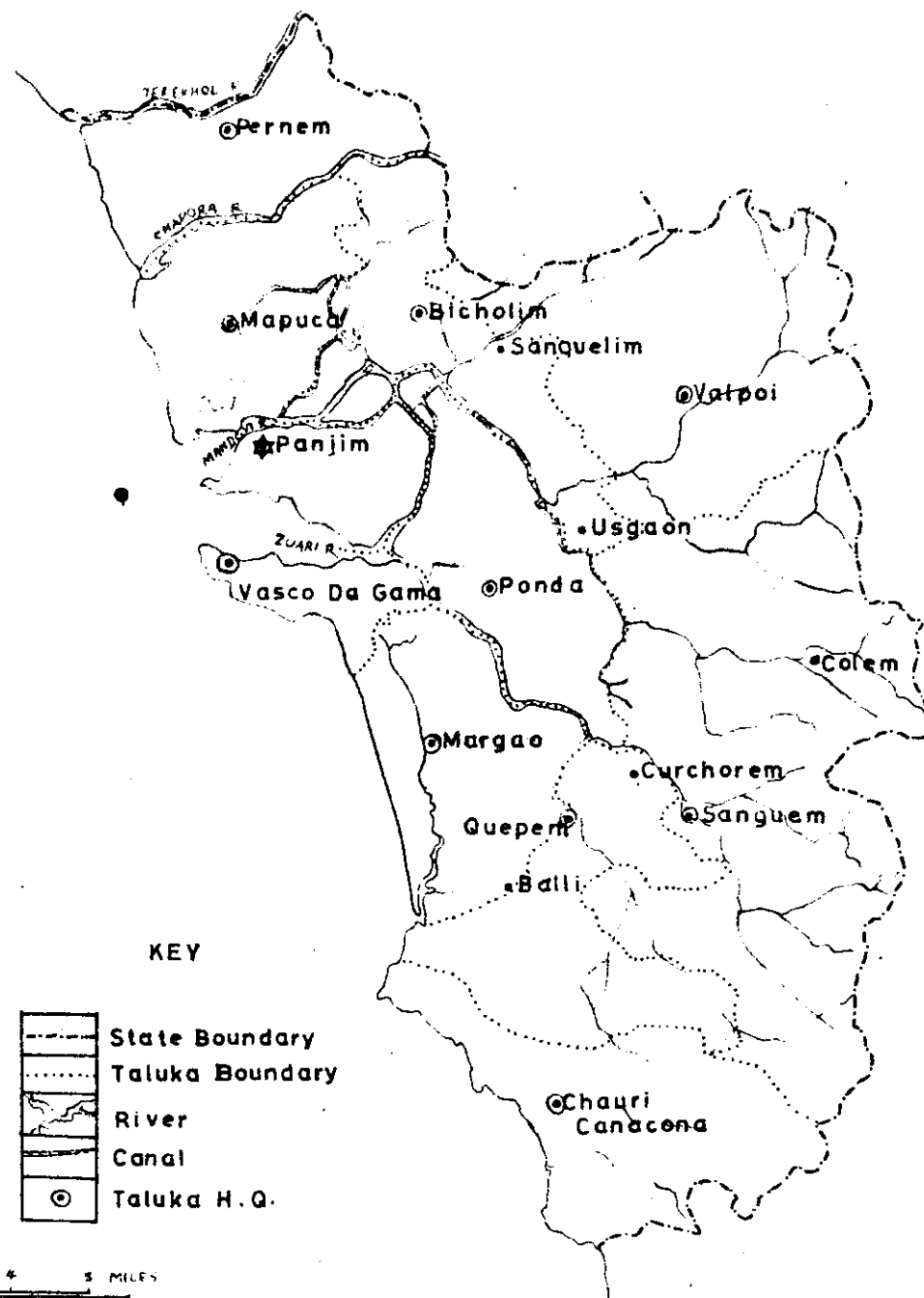
(iii) Mandovi river is one of the most important one in the territory. It rises in the Parver ghat in Satari taluka and flows through Bicholim and the northern part of Ponda. It empties into the bay of Aguada after passing Panjim. With its five tributories, viz., Madi, Candepar, Sanquelim, Bicholim and Mapussa, and a branch canal, viz., the Combarjua Canal, it is navigable for 105 kms. Barges of 300 ton capacity can go upto Usgao even at low tide.

(iv) The Zuari river, equally important like the Mandovi, rises in the Digui ghat, runs northwards through Ponda, and empties into the bay of Marmugao. The length of the river is 145 kms. and is navigable for 64 kms. Barges of 300 ton capacity can go upto Sanvordem, near the railway bridge, and crafts of 30 tons can go upto Sanquem at high tide.

MAP NO. 3 - GOA: WATERWAYS AND PORTS
(FISHING VILLAGES.)



MAP NO. 4 - GOA: MARKET CENTRES.



0 2 4 5 MILES
0 2 4 5 12 16 K.M.

(v) The Sal river near Margao is 49 kms. long, but navigable for 18 kms. for small crafts only.

(vi) The Talpona river runs through Canacona taluka and falls into the sea near Talpona fort. It is 32 kms. long and is navigable for 8 kms. only upto Mocad, for small crafts.

(vii) The Galgibaga river in Canacona taluka is a small river and navigable for small crafts only for 5 kms. upto Botabanda.

Ports

There are six ports on the western coast of Goa, viz., Chapora(Bardez), Panjim(Goa), Marmugao harbour (Marmugao), Betul(Quepem), and Talpona(Canacona). Of these Marmugao is one of the best equipped ports between Bombay and Cochin. Others are minor ports which handle about 9 per cent of the total maritime traffic. The Marmugao harbour is divided into two anchorages, Aguada and Marmugao, by Cape Cabo. Both are capable of accommodating large ships from September to May. The present handling capacity of the Marmugao port is about 6 million tons and can be increased to 10 million tons with improvements like deeper dredging, reclamation, provision of additional mechanical birth, additional protection facilities, provision of additional barges, and improvements in road and railway links with the hinterland.

Summary

To summarize, the approach we have adopted for the provision and development of the means of transport and communication and other socio-economic aids is different from the one adopted in the Third and the Fourth Plan of the district. Our basic contention is that without a minimum physico-geographical framework of social and economic overheads, it is not possible to carry economic growth and social advancement to the relatively backward areas in a region. In the absence of these overheads particular parts of a region are likely to move forward, economically and socially, thereby increasing the regional disparities, and aggravating the problems created by the existence of a dual economy. This is what has happened in Goa with the rapid development of the mining industry in the central parts of the territory. The economic development which has accompanied the growth of mining industry has neither influenced the growth of other primary sectors of production in the area, nor was it carried over to other relatively backward regions so that these could actively participate in the process of development. The first requirement of systematic development planning is, therefore, that of opening up these regions to the influence of already developed and developing areas by providing adequate means of transport and communications and social services. We have, therefore, listed about 17, what we may call 'mandi centres' or 'growth centres', and have suggested purposeful development of additional two or three centres, especially to cover those parts of Satari, Sanguem, Quepem and Canacona talukas which have so far remained undeveloped. We have also indicated the present availability of the means of transport in relation to these growth centres, as also the availability of other necessary services. With reference to roads we think that nothing more than repairs and upgrading will be necessary, excepting the provision of approaches to some of the wadis. While with reference to other aids like basic structure for the distribution of agricultural aids and assistance and veterinary services, it is necessary to extend these to the centres where they are not available and consolidate and intensify at the centres where they are made available during the last two years. The present approach to development planning in Goa is that of concentrating

a large programme in as short a time and on as wide an area as possible. This approach has resulted in adopting several 'crash programme' in all the sectors of development without integrating them with reference to time, location and action, as between different sectors and different areas. In the absence of such an integration the development programme is not likely to achieve the desired results.

Table 3.3 : Details of second class roads
in Goa district

S. No.	Description of the road	Length in Kilometers			Remarks
		Black topped	Laterite macadam	Total	
1.	Betim to Aguada- via Verem	2.19	-	2.19	will lead to Nerule
2.	Mapuca to Reis Magos-via Verem	12.12	-	12.12	
3.	Durgalim-Nagzar- Mope-Patardem	-	3.00	3.00	
4.	Assanora to Sinqer- vale	-	9.25	9.25	
5.	Bicholim to Mau- ling Nem	-	2.50	2.50	
6.	Bicholim to Banas- tarim via Sar & Tonca	3.52	9.46	12.98	
7.	Sanquelim to Chorlem	0.55	8.45	9.00	
8.	Onda to Piliem via Pale, Surla & Usgao	19.70	0.15	19.85	
9.	Onda to Birondem	-	9.99	9.99	
10.	Valpoi to Tanem	-	9.50	9.50	
11.	Valpoi to Colem via Birondem & Sancordem	10.00	10.53	20.53	
12.	Valpoi to Quelgate via Veluz & Padra- demel	-	6.28	6.28	
13.	Cortalim to Ambora via Loutoulim	-	7.54	7.54	
14.	Ponda to Margao via Bori	21.02	-	21.02	
15.	Bari to Sanvordem, via Seroda & Pandravadi	-	16.63	16.63	
16.	Darbandorda to Sanvordem via Quir- laparle	10.07	7.77	17.84	
17.	Dancond to Dabal	-	2.54	2.54	
18.	Colem to Sigao	-	1.85	1.85	
19.	Canacona to Netrolim via Ordofond, Gaodon- gram	-	23.57	23.57	
20.	Partagal to Cotigao	-	27.35	27.35	
21.	Daunapaula to Cabo	1.89	-	1.89	
22.	Quepem to Cabo - via Fatorpa, Cananqui- nim	-	12.77	12.77	
23.	Quepem to Curdi	2.50	13.90	16.40	
24.	Quepem to Pirla, via Ambavalim	-	16.50	16.50	
25.	Rivona to Cupa	-	0.20	0.20	
26.	Maulinguem to Colem	-	6.00	6.00	
27.	Sanguem to Cumbarim	8.08	1.92	10.00	
28.	Damal to Maida	-	10.00	10.00	
29.	Curpem to Portem	-	1.47	1.47	
30.	Darbandrda to Sancordem	-	5.4	5.4	
	Total	91.65	224.54	316.19	

Source: P.W.D. Goa

Table 3.4 : Showing market centres and the availability of different services at each centre

Market Centre (Taluka or Development Block)	Popula- tion	Bazar place	Coop. Bank	Land Dev. Bank	Sale- purchase society	Godown	Service Society	Veterinary aid centre @	Vet. dispen- sary	A.I. centre
Pernem(Pernem)	1,994	Yes	-	-	-	*	Yes	Yes	-	-
Mapuca(Bardez)	8,198	"	-	-	-	*	"	"	-	-
Bicholim(Bicholim)	3,969	"	-	-	-	-	"	-	Yes	-
Sanquelim(Bicholim)	2,684	"	-	-	-	*	"	-	-	-
Usgao (Bicholim)	3,483	"	-	-	-	-	*	-	-	-
Valpoi(Satari)	8,542	"	-	-	-	*	"	Yes	-	-
Ponda(Ponda)	3,279	"	-	-	-	Yes+	"	"	-	-
Panjim(Goa)	19,464 ⁽¹⁾	"	Yes	£	&	+	"	-	Yes	-
Margao(Salcatte)	14,363	"	"	-	-	Yes+	"	-	"	-
Concolim(Salcatte)	11,694	"	-	-	-	-	"	-	-	-
Vasco(Marmugao)	6,483	"	-	-	-	-	"	-	Yes	-
Quepem(Quepem)	1,142	"	-	-	-	*	"	Yes	-	-
Curchorem(Quepem)	4,492	"	-	-	-	-	"	-	-	-
Bali(Quepem)	1,585	"	-	-	-	-	"	-	-	-
Sanguem (Sanguem)	2,440	"	-	-	-	*	"	Yes	-	-
Colem(Sanguem)	3,669	"	-	-	-	-	"	-	-	-
Canacona(Canacona)	4,104	"	-	-	-	*	"	Yes	-	-

(1) Only Panjim and not the Goa town.

£ .A separate land development wing is organized in Goa State Coop. Bank, Panjim.

& Coop. Marketing Society for arecanut has started working.

* Proposed to be built during 1965-66.

+ Storage facilities of the Civil Supply Dept. are available.

Not a full-fledged aid centre but service by extension officer.

(Continued)

Table 3.4 : Showing market centres and the availability of different services at each centre(continued)
(contd.)

Market Centre (Taluka or Development Block)	P.H. centre	Allo/Ayur. dispensary	Materni- ty hospi- tal	Family planning centre	P&T office	Elec- tri- city	Primary and Se- condary School	College	Techni- cal School/ College	Admini- stra- tion
Pernem(Pernem)	Yes %	-	Yes	-	P&T	Yes	Pri.&Sec.	-	-	Tal.& Bl.Hq.
Mapuca(Bardez)	-	-	"	Yes	"	"	"	Yes	Tech.Sch.	"
Bicholim(Bicholim)	Yes %	-	"	-	"	"	"	-	-	"
Sanquelim(Bicholim)	"	Yes	-	-	"	"	"	-	-	-
Usgao(Bicholim)	-	-	-	-	"	-	"	-	-	-
Valpoi(Satari)	Yes %	-	Yes	-	"	-	"	-	-	Tal.& Bl.Hq.
Ponda(Ponda)	"	-	"	Yes	"	Yes	"	-	-	"
Panjim(Goa)	(1)	-	-	"	"	"	"	Yes	Med., Pha.Poly.	State Hq.
Margao(Salcatte)	(1)	-	-	"	"	"	"	"	Tech. Sch.	Tal.& Bl.Hq.
Concolim(Salcatte)	-	-	-	-	"	-	"	-	-	-
Vasco(Marmugao)	-	Yes	-	Yes	"	Yes	"	-	-	-
Quepem(Quepem)	-	-	Yes	-	"	-	"	-	-	Tal.& Bl.Hq.
Curchoem(Quepem)	%	-	"	-	"	-	"	-	-	-
Bali(Quepem)	-	Yes	-	-	"	-	"	-	-	-
Sanguem(Sanguem)	-	-	Yes	-	"	-	"	-	-	Tal.& Bl.Hq.
Colem(Sanguem)	-	-	-	-	"	-	"	-	-	-
Canacona(Canacona)	Yes %	-	Yes	-	"	-	"	-	-	Tal.& Bl.Hq.

% Cottage hospitals (1) Medical facilities are available.

CHAPTER 4

GENERAL FEATURES OF THE LAND AND WATER RESOURCES AND THEIR UTILIZATION

Soils¹

The soils in Goa are mainly lateritic or ferralitic and are formed out of clay schist, granite and basalt. For a larger part clay schist is the main parental material. Soils formed out of shales are also seen at places. It is mainly in certain parts of Satari taluka that the soils have a basalt origin as in the case of other soils in the Deccan tract. The granitic soils cover a very small part of the area and are found mainly in the southern part of Goa.

The soils formed out of clay schist are quite fertile and deep. The clay schist below these soils consists of an impermeable pan of clay lying above the parental igneous rock which is the granite. A part of the rain water is held above the layer of clay schist and is available through the wells and the seasonal springs. Very large quantities of water are, however, held above the layer of granite which may at times be found at a depth of 300 to 400 feet. Where the granite is very near the surface it gives rise to permanent springs which are quite common throughout the area. It is, however, not known whether the layer of water above the granite exists anywhere with a pressure of the artesian type.

Types of soil

The soils in Goa may be first classified according to the terrene as the soils lying on the hilly tract and the soils on the plains and then according to their nature. The soils of the hilly tract fall into two categories as the ferralitic soils of the schist origin and the ferralitic soils of the granite origin. The soils on the plains can be grouped into three types as the alluvial, sandy and the hydromorphic soils. The alluvial soils again are found in three types such as the alluvial soils of ferralitic origin, alluvial soils of nonferralitic origin and saline alluvial soils. These seven types of soil cover most of the area in Goa in varying proportions. An attempt was made by the Agricultural Department in Goa to analyse certain representative samples for these different types of soil. The results of the mechanical and the chemical analysis of these types of soil are given in Table 4.1. A very rough indication about the extent of each type of soil as may be obtained through mere observation and guesswork is also given in the same table to get some idea about the preponderance of each soil type in the territory.

Before proceeding to interpret the results of these analyses, a mention may also be made of the attempts made by the Department of Agriculture of the then Bombay Province to analyse the soils in Goa sometime by 1925. The results obtained by the Department were published in Bulletin No.160 of 1929 of the Department entitled as "Soils of the Bombay Presidency".

1. The comments on soils are based on the discussions with the officials of the Department of Agriculture, Goa and the data provided by the Department.

Table 4.1 : Table showing the composition of typical soils in Goa

Type of Soil (1)	Extent of the soil as approximate per cent of the area under the soil to the total area (per cent) (2)	Locality of typical profile (3)	Whether first or second year (4)	Coarse sand (per cent) (5)	Fine sand (per cent) (6)	Silt (per cent) (7)	Clay (per cent) (8)	Organic matter (per cent) (9)
I) Soils of the hilly tract:								
1) Ferralitic soil of schist origin	75-78	Boma	First	11.39	16.61	32.35	39.65	3.20
			Second	12.50	12.00	22.55	52.95	0.79
2) Ferralitic soil of granite origin	2-3	Canacona	First	24.45	36.40	16.95	22.20	3.28
			Second	20.90	30.25	14.00	34.85	1.14
II) Soils in the plains:								
1) Alluvial soils:								
a) Ferralitic soils								
a) Ferralitic soils	2-4	Maem	First	7.25	31.17	40.40	20.18	4.24
			Second	7.98	18.62	36.65	36.75	2.84
b) Nonferralitic soils	negligible	Macasana	First	22.90	57.22	12.70	7.18	1.02
			Second	7.35	72.81	13.72	6.12	0.66
c) Saline soils	5-6	Morcmbim	First	24.95	25.95	17.90	31.20	1.46
			Second	43.35	46.96	2.36	7.33	1.96
		Neura	First	0.39	62.10	30.35	7.16	0.41
			Second	0.96	2.88	33.30	63.46	2.01
2) Sandy soils	6-7	Taleigao	First	36.65	57.66	1.51	4.18	0.38
			Second	47.55	49.51	2.10	0.84	0.08
3) Hydromorphic soils								
	4-5	Saligao	First	41.65	51.85	3.37	3.13	0.55
			Second	41.75	44.02	4.76	9.47	0.29
		Mapuca	First	20.00	59.24	9.30	11.46	0.59
			Second	12.52	45.70	20.80	20.98	0.70 (continued)

Table 4.1 (continued)

Type of Soil	Locality of typical profile	Whether first or second	Moisture (per cent)	Permeability (cms/hr)	pH	Available potash	Available phosphorous	Carbonates	Chloride
(1)	(3)	(4)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
						----- (mgms/100gms) -----			
I) Soils of the hilly tract:									
1) Ferralitic soil of schist origin	Boma	First	5.33	1.71	5.4	45.00	3.30	nil	nil
		Second	4.50	2.24	5.4	25.00	7.40	nil	nil
2) Ferralitic soil of granite origin	Canacona	First	2.18	2.70	4.4	58.00	Traces	nil	nil
		Second	2.05	5.04	4.6	53.00	0.60	nil	nil
II) Soils in the plains:									
1) Alluvial soils:									
a) Ferralitic soils									
	Maem	First	4.54	2.01	4.9	83.00	2.70	nil	0.08
		Second	5.45	5.37	4.5	33.00	2.10	nil	Traces
b) Non-ferralitic soils									
	Macasana	First	1.65	3.92	6.3	30.00	1.90	nil	Traces
		Second	1.89	3.60	7.2	31.00	7.20	nil	Traces
c) Saline soils									
	Morombim	First	33.00	0.25	4.9	125.00	Traces	nil	nil
		Second	0.80	9.72	6.9	88.00	1.03	nil	nil
	Neura	First	10.35	0.03	4.5	250.00	1.03	0.23	1.60
		Second	12.10	0.03	3.9	169.00	Traces	1.73	1.73
2) Sandy soils	Taleigao	First	0.29	53.20	6.6	Traces	5.60	nil	Traces
		Second	0.15	85.00	7.3	23.00	4.60	nil	Traces
3) Hydromorphic soils	Saligao	First	0.29	21.50	4.4	Traces	Traces	nil	nil
		Second	0.63	27.08	4.9	Traces	Traces	nil	nil
	Mapuca	First	1.34	0.95	4.6	31.00	1.90	nil	nil
		Second	2.70	1.04	7.0	14.70	6.20	nil	nil

(Source: Department of Agriculture, Goa.)

The samples for these analyses were, however, drawn only under a few principal heads as the soils of the hilly tract and the soils in the plain and the varkas, coconut and rice soils. The sampling did not take into account either the parental material of the soils or the nature of soil deposition. The results from these analyses are given in Tables 4.2 and 4.3 to supplement the results from Table 4.1.

I. Soils of the hilly tract

It is estimated that these soils cover about 80 per cent of the Goan territory. They are ferralitic and for the major part are formed out of clay schist. The soils of granitic origin may be found hardly over 2 to 3 per cent of the area. The results of the mechanical and chemical analysis of these two types of highlylyng soils give the following indications about their characteristics.

The soils of schist origin contain about 40 per cent of clay and belong to the type of silt clays whereas the soils of granitic origin contain 60 per cent of coarse and fine sand and 22 per cent of clay and are, therefore, slit loam in nature. Both soils contain quite a high amount of organic matter. The contents of organic matter may, however, vary depending upon the growth of vegetation on these soils. The permeability of both soils differs to some extent. The soils of granitic origin are more permeable because of their loamy nature. Especially the second layer of the soils of granitic origin exhibits quite high permeability. The lower permeability of the soils of schist origin as indicated by these samples gives on the contrary an indication that even though these soils are lying at higher altitudes, they can conserve moisture very well if they are terraced and proper water conservation measures are adopted. Perhaps an analysis of the soils at a few more places for this specific purpose may throw greater light on this problem.

Both types of soil are acidic as indicated by their pH. The soils of granitic origin are somewhat more acidic than the soils of schist origin. Calcium carbonate is absent in both the types as indicated by the contents of the carbonates and this fact seems to have been responsible for the higher acidity in both types. Both soils contain a high amount of available potash but a very low amount of available phosphorous which exists almost in traces in the granitic soil. Chlorides are absent in both types.

The results from the analysis of the soils from the hilly tracts and the varkas soil (Tables 4.2 and 4.3) which correspond to the above two types may now be noted to supplement the indications from Table 4.1. The mechanical analysis of the soils of the hilly tract was not attempted. The mechanical analysis of the Varkas soil (Table 4.3), however, suggests that it contains much more of fine sand and resembles more the soils of granitic origin than the soils of schist origin in this respect. The organic matter and the loss on ignition in both soils compare well with the contents of organic matter as noted in the earlier table. The soils of the hilly tract contain a good amount of potash but the samples of the Varkas soil depict a great variation in this respect. So also the former soils contain a good amount of phosphorous but the latter seems to be very poor in it. The same observation holds good in respect of nitrogen also. Though carbonates were found to be absent from the results in Table 4.1, these tables show that the percentage of lime varies greatly in the different samples. On the whole, however, most of the samples are

Table 4.2 : Composition of the soils from the hilly and the plane tracts in Goa

Type of soil	Organic matter per cent		Loss on ignition per cent		Lime per cent		Potash per cent		Phosphoric Acid per cent		Nitrogen per cent	
	Mini- mum	Maxi- mum	Mini- mum	Maxi- mum	Mini- mum	Maxi- mum	Mini- mum	Maxi- mum	Mini- mum	Maxi- mum	Mini- mum	Maxi- mum
I) Soils from hilly tract:												
a) Soil	2.61	5.08	Not determined		0.60	1.40	0.50	0.85	0.32	0.45	0.14	0.16
b) Sub soil	2.87	3.85	Not determined		0.60	1.00	0.54	0.82	0.21	0.71	0.12	0.22
II) Soils from plane tract:												
a) Soil	Not determined		9.48	13.40	0.01	6.80*	0.34	0.85	0.20	0.61	0.16	0.26
b) Sub soil	Not determined		9.68	11.06	0.01	3.60	0.35	0.97	0.11	0.62	0.12	0.19

* It is only in two of the seven samples that the percentage of lime was above 6 whereas in the remaining five samples the percentage was below 1, in four of them it being even 0.2 and below.

(Source :- Soils of the Bombay Presidency, Bulletin No.160 of 1929, by Rao Bahadur D.L.Sahasrabuddhe, Department of Agriculture, Bombay, p.66-67)

Table 4.3 : Table showing the composition of the varkas, coconut and paddy soils in Goa

Type of Soil	1		2		3		4		5	
	Finest and fine silt		Medium and coarse silt		Fine sand		Coarse sand		Moisture	
	per cent		per cent		per cent		per cent		per cent	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
I. Varkas soil*	11.46	27.69	19.74	30.73	40.17	65.07	7.77	11.76	0.88	4.06
II. Coconut soil	- - - - - not determined - - - - -								0.12	3.24
III. Paddy soils:										
1) Coarser paddy soil	3.55	6.50	5.19	16.18	67.36	75.94	2.08	20.55	0.30	2.24
2) Finer paddy soil	15.49	45.14	23.97	46.13	14.64	48.42	6.50	17.73	2.00	3.46

(continued)

Table 4.3 (continued)

Type of soil	Loss on ignition per cent		L i m e per cent		P o t a s h per cent		Phosphoric acid per cent		Nitrogen per cent	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
I Varkas soil*	2.96	9.80	0.09	0.39	0.02	0.52	0.02	0.27	0.03	0.09
II Coconut soil	0.68	3.80	0.17	0.30	0.02	0.08	0.02	0.06	0.02	0.09
III Paddy Soils:										
1)Coarser paddy soil	0.12	2.05	0.10	0.33	0.03	0.07	0.02	0.04	0.03	0.04
2)Finer paddy soil	6.07	8.40	0.22	0.35	0.18	0.52	0.11	0.37	0.09	0.11

* The samples of 'Varkas' soil consisted of 10.0 to 48.0 per cent of stones.

(Source :Soils of the Bombay Presidency, Bulletin No.160 of 1929, by Rao Bahadur D.L.Sahasrabuddhe,
Department of Agriculture, Bombay, pp.67-68)

deficient in lime.

II. The soils in the plains

These soils are estimated to cover about 20 per cent of the area and are found scattered everywhere in the valleys, along the rivers and creeks and on the coast. They consist either of the alluvial deposits, deposits of sand or deposits of a hydromorphic nature. The alluvial deposits cover about 7-10 per cent of the area whereas the sandy and the hydromorphic soils cover about 6-7 per cent and 4 - 7 per cent of the area respectively. The alluvial deposits are either ferralitic, nonferralitic or of a saline nature.

Ferralitic and Nonferralitic alluvial deposits

The ferralitic alluvial deposits are found practically at the bottom of the valleys and along the rivers whereas the nonferralitic deposits are restricted mainly at certain places on the rivers. It is estimated that the ferralitic soils occupy about 2 to 4 per cent of the area whereas the area under the nonferralitic soils is extremely small. The ferralitic alluvial soils were formed as a result of the denudation and disposition of the uplands whereas the nonferralitic deposits were the results of the deposition of the material washed through the rivers. This accounts for differences in the characteristics of these soils as may be observed from Table 4.1. The ferralitic alluvial soils contain a large part of silt whereas the nonferralitic soils contain a large part of fine sand. The former soil also contains more clay than the latter. Because of the abundance of fine matter the ferralitic soils are much less permeable and more retentative of moisture when compared to the nonferralitic ones. The content of organic matter is also higher in the ferralitic soils than in the nonferralitic ones. Because of their formation through deposition from the rivers, the nonferralitic soils have a normal pH value whereas the ferralitic soils are acidic like most other types of soil in Goa. The ferralitic soils contain a high amount of available potash but the nonferralitic soils are normal in this respect. Except for the second layer of the nonferralitic soils, both are deficient in phosphorous. Carbonates are absent in both whereas chlorides are present only in the ferralitic soils though in a negligible amount.

Saline alluvial soils

These soils are found mostly along the creeks and rivers upto the points inundated by the backwaters. They occupy about 5 to 6 per cent of the area. They, however, vary greatly according to the nature of the deposition and the inundation by salt water. The soil samples at Morombim indicate that these soils are clayey whereas the samples at Neura indicate that they are sandy loams. There are, however, considerable differences in the first and the second layers of these soils. The second layer of the soils at Morombim contains a large amount of sand even though the first layer is distinctly clayey. The second layer of the soils at Neura on the contrary is made largely of clay and silt though the first layer is distinctly loamy and contains a large amount of sand. Because of these differences in the two layers, the soils at Morombim are more permeable than the soils at Neura even though the former are clayey and the latter, nearly sandy. The Neura soils are practically illdrained inspite of this sandy nature. The soils at Morombim contain adequate organic matter whereas the soils at Neura are deficient in it. Both soils are acidic.

The second layer of the Neura soils is more acidic than the first layer. The second layer of the Morombim soils is on the contrary distinctly alkaline in spite of the acidic nature of the first layer. Both soils contain a very high amount of available potash but are deficient in phosphoric acid. The Neura soils contain carbonates and chlorides in small amounts.

Sandy soils

These soils are found mainly along the coast and the deltas formed by the creeks and rivers. They occupy about 6 to 7 per cent of the area. They contain about 95 per cent coarse and fine sand and a very negligible amount of clay. They are highly permeable and deficient in organic matter. Unlike the other soils they have a neutral pH value with the second layer having a distinctly alkaline nature. Quite contrary to the other soils, they do not contain any potash but have a normal amount of phosphoric acid. Carbonates are absent in these soils whereas chlorides are present in traces.

Hydromorphic soils

These soils are the lowlying lateritic soils with the ground waters coming to the surface especially during the rainy season. They are found mainly along the rivers and streams and more especially where two or more water courses join together. They resemble the sandy soils in many respects as would be observed from their characteristics noted in Table 4.1.

Out of the two samples of these soils at two places, viz., Saligao and Mapuca, the soils at Saligao are more sandy than the soils at Mapuca. The soils at Mapuca contain a relatively large amount of silt and clay and are, therefore, less permeable whereas the soils at Saligao are very highly permeable. Both are deficient in organic matter. Unlike the sandy soils these soils are acidic like the other soils in Goa. The second layer of the soil at Mapuca is, however, distinctly alkaline like the sandy soils. The soils at Saligao are totally deficient in available potash and available phosphorous whereas the soils at Mapuca which contain a large amount of clay have retained adequate quantities of potash. The first layer of the latter soil is deficient in phosphorous whereas the contents of phosphorous in the second layer are quite normal. Carbonates and chlorides are absent in both soils.

Soils of the plane tracts (in general)

The data available through the analysis of the soils on the plane tracts in general conducted by the Agricultural Department of the then Bombay Province (Table 4.2) may now be noted in the context of the analyses of the soils of the above types. The mechanical analysis of these soils was not attempted. Indications are, however, available only about their chemical composition. The percent of loss on ignition indicates that the soils contain quite adequate amounts of organic matter. They also contain adequate amounts of potash and nitrogen and varying amounts of phosphoric acid and lime. These inferences however, differ from the earlier inferences in certain respects. The sandy and the hydromorphic soils and the soils of nonferalitic origin for example were found to be deficient in organic matter. So also the sandy soils and the hydromorphic soils at Mapuca were found to be deficient in potash. The indications about phosphoric acid tally with the earlier results except for the hydromorphic soils at Saligaon. It is likely that the sandy and the hydromorphic soils might not have been included while sampling for the soils of the plane tracts. One important

inference from this analysis is that the soils of the plane tracts contain very varying amounts of lime. Even though the earlier data had indicated almost a total absence of lime in the different types of soil on the plane tracts, the present data indicates that there may be patches of soils wherein the contents of lime may be quite high.

Cocconut Soils

As cocconuts are grown in Goa mainly on the plane tracts along the rivers, on the shore or in the valleys, the result of the analysis of the cocconut soils (Table 4.3) may be considered in the context of the results for the soils of the plane tract. In this case also only the results for the chemical analysis are available. The loss on ignition indicates that these soils are deficient in organic matter like the sandy and the hydromorphic soils noted earlier. They are also deficient in potash, phosphoric acid and lime like the same soils. It is likely that the samples for the cocconut soils may have taken into account only the coastal soils and not the soils in the interior. These soils are poor to moderately rich in nitrogen.

Paddy soils

The paddy soils were divided into two categories viz., the coarser soils and the finer soils (Table 4.3) for the purpose of analysis. The mechanical analysis of the former soils naturally indicates that they are sandy whereas the latter contain a good amount of silt and clay. The loss on ignition indicates that the coarser soils are deficient in organic matter like the sandy and the hydromorphic soils whereas the finer soils resemble the alluvial soils. The contents of potash, phosphoric acid and lime also indicate resemblances of these soils to the same types. The coarser type of soil is poor in nitrogen whereas the finer type is quite rich in it.

The above results from the analysis of the different types of soil, as available through different sources, give certain broad indications about the nature and properties of soils in Goa. For a larger part the soils seem to be composed of more of fine matter as silt and clay as indicated by the analysis of the ferralitic soils of the schist origin in the hilly tracts and the saline alluvial soils in the plane tracts. The remaining types of soil covering about 20 per cent of the area are composed more of coarser matter as fine and coarse sand. These characteristics have naturally an effect on the property of these soils to conserve and drain out water. Quite a large proportion of the area under paddy, cocconut, sugarcane and vegetables has latter types of soil which although well drained, create problems of water conservation. One of the former types of soil viz., the soil of schist origin having a lower permeability and covering three-fourth of the area is, on the contrary either remaining uncultivated or under forest and natural vegetation or being sparsely used for agriculture. It is, however, difficult to draw a very firm inference about the permeability of this type of soil as the analysis of a number of samples of Varkas soil indicate that they contain 40 to 65 per cent of fine sand. Besides, the samples for this soil type are limited only to one place when compared to its expanse over three-fourth of the Goan territory. The saline alluvial soils have the lowest permeability among the different soil types and it gives an indication that the soils are practically ill drained.

The contents of organic matter in the different soil types show that except for the sandy and the hydromorphic soils and parts of the saline alluvial soil which together occupy about 12 per cent of the area, there is enough of organic matter in the remaining soils. Especially the hilly and the ferralitic alluvial soils are quite rich in organic matter as indicated through both sources.

Acidity seems to be a major problem of the Goan soils. Only the sandy and the nonferralitic soils of alluvial origin together occupying about 8 per cent of the area, have a normal pH value whereas over more than 90 per cent of the area, the soils are distinctly acidic. Absence of carbonates seems to be one of the reasons for the higher acidity of these soils. The contents of lime, however, vary widely and it is likely that there may be certain pockets of soils wherein lime may exist in plenty.

From the nutritional point of view, the analyses reveal that the soils are deficient in phosphorous but contain adequate quantities of potash. Only the sandy soils contain a good amount of phosphorous. The sandy and the hydromorphic soils are, on the contrary, deficient in potash, which may be due to their high draining capacity. The contents of nitrogen show great variation from one soil to the other. The hilly soils are quite rich in nitrogen whereas the Varakas soils are poor to moderately rich in this respect. This may be due to the continuous use of the Varkas soils for cropping though they are practically hilly in nature. The coconut soils and the coarser type of paddy soils resembling the sandy and the hydromorphic soils in other respects, are deficient in nitrogen whereas the finer type of paddy soils resembling the alluvial soils, are quite rich in this respect.

The marked differences in the first and the second layers is a characteristic of certain soils as the saline alluvial and the hydromorphic soils. The great variation in the contents of sand and clay and as a consequence in their permeability and acidity, give an indication that absence of deep tillage may be one of the factors for such drastic variation between their first and second layers. On the whole a very significant point which emerges from the results of the soil analyses from the two sources is that unlike the other areas in the country the soils in Goa vary greatly in their composition from place to place even though Goa is a fairly small territory.

Extent of irrigation

Records are not maintained for the areas which receive irrigation in Goa. From the official records for the land use pattern and the crops irrigated normally, it can be, however, inferred that the area receiving irrigation in Goa may be of an extent of about 8000 hectares. This area bears a proportion of 6.15 per cent to the net cultivated area. Similar proportions work out to 3.6, 17.2 and 24.9 per cent in the adjoining Ratnagiri, North and South Kanara districts respectively. It may be mentioned here that it is mainly the Southern part of Ratnagiri which enjoys the bounties of nature in respect of irrigation, as the natural springs and tanks. The entire territory of Goa with its innumerable springs, ponds and tanks, however, bears a resemblance more to the North and the South Kanara districts than to the Ratnagiri district in these respects. These resemblances, however, raise a doubt as to whether these bounties of nature are being fully utilised in Goa.

The areas under irrigation in the different talukas of Goa as estimated from the land utilization statistics are given in Table 4.4.

Table 4.4 : Irrigated area in Goa

Taluka	Net cropped area (in hectares)	Net irrigated area	
		In hectares	As per cent to net cropped area(per cent)
1. Bardez	18,168	805	4.42
2. Goa	12,622	550	4.35
3. Marmugao	2,987	557	18.61
4. Salcete	17,604	983	5.58
5. Pernem	11,350	201	1.77
6. Bicholim	15,869	1002	6.31
7. Ponda	12,107	1981	16.37
8. Quepem	9,240	276	2.98
9. Cancona	5,055	282	5.57
10. Satari	11,431	587	5.13
11. Sanguem	12,574	714	5.67
Total	129,009	7938	6.15

Source: Compiled from - Structure of the Agricultural Area in Goa, Dr. Jose C. Almeida - Appendix Table Nos.1 and 3.

The table would indicate that quite a sizeable proportion of the cultivated area is under irrigation mainly in Marmugao and Ponda talukas in the Central Western part of the territory. The proportions in these two talukas work out to 18 and 16 percents respectively whereas they are quite small in the remaining talukas. The taluka adjoining Ratnagiri district, viz., Pernem has the least proportion viz., 1.7 per cent whereas the taluka of Quepem stands the last but one in this respect. In all the remaining talukas the proportions vary between 4½ and 6 per cents.

Irrigated crops

The irrigated areas under the different crops are given in Table 4.5. Paddy is the main crop which accounts for 76 per cent of the irrigated area. About 21 per cent of the area is under arecanut and the other mixed fruit crops such as banana, pomelo, limes etc which are grown along with arecanut. Out of the remaining 2 per cent area, one per cent is under sugarcane and the other under vegetables and flower gardens.

Table 4.5 : Irrigated areas under the different crops in Goa

Taluka	Paddy		Arecanut (hec- tares)	Sugar- cane (hec- tares)	Flower gardens and vege- tables (hec- tares)	Total irri- gated (hec- tares)
	Area (hec- tares)	Per cent to gross area under Paddy				
Bardez	801	10.7	2	1	1	805
Goa	491	7.1	21	1	37	550
Marmugao	484	32.2	63	-	10	557
Salcete	978	8.7	-	-	5	983
Pernem	197	5.3	4	-	-	201
Bicholim	770	23.6	227	4	1	1002
Ponda	1093	28.4	875	2	11	1981
Quepem	252	4.9	23	1	-	276
Canacona	210	7.6	70	2	-	282
Satari	239	13.5	327	11	10	587
Sanguem	555	13.3	109	47	3	714
Total	6070	12.1	1721	69	78	7938
Percent to the total irrigated area	76.4		21.7	0.9	1.0	100.0

Source: Structure of the Agricultural Area in Goa, Dr. Jose C. Almeida - Appendix Table Nos.1 and 3

Except for paddy, all the other crops mentioned above essentially require irrigation for their cultivation. Their talukawise distribution, therefore, does not differ from the one discussed in an earlier chapter. Paddy, is however, irrigated only when it is grown as a rabi crop. The proportions of gross area under irrigated paddy to the gross areas under total paddy in the different talukas are therefore, given in the same table to note the extent of irrigation for this crop in the different areas. The table would reveal that only 12 per cent of the gross cropped area under paddy in Goa receives irrigation. In the adjoining Ratnagiri, North and South Kanara districts, the proportions work out to 3½, 19¼ and 20 per cents respectively. The talukawise distribution of irrigated paddy would indicate that the crop is irrigated on a large scale in Marmugao, Ponda and Bicholim talukas only. The proportions of areas under irrigated paddy to the areas under total paddy in these talukas vary between 23 and 32 per cents. Bicholim, though ranked somewhere in the middle in respect of the total area under irrigation, falls in the groups of talukas here, having a sizeable proportion under irrigated paddy. Next to these rank the talukas of Satari and Sanguem

having a proportion of 13 per cent irrigated paddy whereas in all the remaining areas consisting of talukas on the coast or near the coast, this proportion varies between 4 and 10 per cent only.

Apart from the crops mentioned above, the field observations indicated that some of the other crops were also being grown by irrigation though on a very small scale and with varying practices. The Moira variety of banana which was grown as an unmixed field crop in a group of few villages in Bardez taluka was grown with the help of irrigation. A very insignificant part of the area under sugarcane was on the contrary grown without any irrigation in Bicholim taluka. Coconut was irrigated by channels through the rivulets and the streams where the trees were being grown closer to such available sources of water. This could, however, irrigate only a very narrow strip of low lying lands adjoining these sources of water. Barring such rare cases the entire coconut crop in Goa was grown without the use of irrigation. In all coconut plantations and mango orchards however, it was the practice to irrigate the young trees for a few months in a year for the first three years after planting. Water from the drinking water wells nearby these plantations was generally used for the purpose. So also a few grown up trees were watered occasionally especially when the plants were grown on the heaps of sands along the coast.

Sources of irrigation

Tanks, ponds, springs, diversion bandharas, wells and canals form the sources of irrigation in Goa. No records are, however, available either for the types of sources existing in the different villages or the areas irrigated through these different sources. In the absence of such data an attempt is made here merely to describe the sources with the help of the field observations and give an idea about the distribution of these sources as revealed by the study of the thirteen clusters selected for the general survey.

The tanks used for irrigation in Goa are of two types. One is the perennial tank or a natural tank and the other is the seasonal or the storage tank. The natural tanks, however, seem to be very few in number. Irrigation is practised largely with the help of storage tanks which are constructed in the parts of the paddy farms simply by closing the waste-weirs which drain out the excess water from that part of the farm during the monsoon. A crop of kharif paddy is taken in this part of the farm and the waste weir is closed early in September after the kharif crop is harvested. A time schedule for harvesting the crop under tank-bed is drawn by the Agricultural Officers to ensure that these tanks get filled in time. The late monsoon showers are stored in such a tank to irrigate the remaining part of the farm. Usually, every tank of this type has also a spring as a source of recuperating water. Apart from the late rain showers, the spring also helps in increasing the storage of water in the tank. At places a chain of tanks is constructed along a spring and water is laid down from one tank to the other. It is important to note that the ownership of the land in a tank and the part of the farm which is irrigated by this tank always vested with a single owner which may be either a comunidade, temple, church or a group of families having the rights to the shares in the income of the whole farm but not to any demarcated parts therein. It is, therefore, needless to emphasize that this practice of irrigation has been possible in Goa mainly because of the institutional or the co-operative ownership.

The ponds used for irrigation in Goa are in a way perennial tanks of a much small dimension resembling many a times the big wells in the other parts of the country. Though irrigation is possible entirely by the flow method in case of the tanks, water from the ponds has to be lifted up for irrigation especially at the end of the season.

The springs usually serve the purpose of storing water in the seasonal tanks or irrigate the arecanut gardens when they are lying high. The seasonality of the flow from a spring also determines the purpose for which it can be used. Arecanut requires perennial irrigation and hence springs with a seasonal flow are not used for arecanut even though they may be lying high.

The diversion bandharas are also very common especially in the hilly parts in Goa. Most of these bandharas are the Kachcha bandharas constructed across the streams and the rivulets which flow at least till the end of April. Streams with a seasonal flow lasting till December or so are usually led into storage tanks whereas streams with a perennial flow or with a flow lasting till the harvesting season are used for bandhara irrigation. Depending upon the topography of the area, bandharas put across big streams or rivulets irrigate even a chain of farms.

Wells are usually sunk for irrigation where water is not readily available by the flow system. They are located at places where the water table is very near the surface of the soil or along the streams and rivulets which go dry early. Most of these wells have to be deepened every year as they get silted heavily during the monsoon. The wells in Goa have generally very small dimensions and a limited storage capacity. A well can, therefore, irrigate hardly half an acre of paddy. A chain of wells is, therefore, sunk when irrigated paddy is to be grown on a big farm.

There are two canals in Goa, known as the Candepar and the Paroda canals. The Candepar canal was constructed in the forties and was designed to irrigate 465 hectares in the Sanguem taluka. It could, however, irrigate 50 hectares only and was, therefore, renovated to irrigate 200 hectares. At present, it irrigates about 65 hectares under sugarcane, 60 hectares under paddy, 10 hectares under coconut and 6 hectares under fodder crops. The Paroda canal which runs through Quepem and Salcete talukas was built in the early fifties with an objective to irrigate about 600 hectares. At present, it irrigates about 400 hectares under paddy, 15 hectares under vegetables and 2 hectares under sugarcane.

Field observations indicated that the various sources of irrigation described above were spread over the entire territory though on a varying scale in the different zones. Tanks were common in the Bardez, Goa, Ponda, Marmugao, Salcete, Quepem, and Canacona talukas whereas bandharas were common in the hilly areas in Ponda, Bicholim, Satari, Sanguem and Quepem talukas. Wells could be seen in large numbers in all the coastal talukas. In some of the villages in these talukas, well formed the only source of irrigation. Wells were, however, being used for irrigation even in the hilly talukas. In the hilly areas well irrigation was practised mainly in the valley portions and the wells were sunk by the sides of some sources of water as the streams and rivers. The sources of irrigation in the thirteen clusters of villages selected for the survey have been noted in Table 4.6.

Table 4.6 : Sources of irrigation in the thirteen clusters of villages surveyed

Taluka	Village-cluster	Sources of irrigation
Bardez	Calangute	Tank, well, bandhara
Marmugao	Arossim and Quelossim	Tank, well
Salcete	Loutolim	Tank, well, bandhara, spring
	Velim	Tank, well
Pernem	Morjim	Well
Bicholim	Navelim and Cudnem	Tank, well, bandhara
Ponda	Marcaim	Tank, well, spring
	Savai Verem, Vagurbem and Volvoi	Tank, well, spring
Quepem	Balli	Tank, well, spring
Canacona	Gaondongrem	Bandhara
Satari	Nagargaon	Not available
Sanguem	Sancordem	Tank, bandhara, spring
	Batim	Not available

The table would reveal that tanks and wells were being used for irrigation practically in all the surveyed villages whereas bandharas and springs were used in the villages in the hilly areas mainly. Except the village Morjim where well was the only source and the village Gaondongrem where there was one bandhara in all the other villages a multiplicity of sources was available for irrigation.

Types of cultivation in relation to the land and water resources

In relation to the use of the land and water resources, crop cultivation in Goa can be classified into the following major types:

1. Khazan cultivation

The lands reclaimed from the inundation of the tidal waters through the rivers and creeks by constructing embankments are known as the Khazan lands in Goa. These lands are made of the saline alluvial soils as noted in the earlier sections. Though they do not generally receive any irrigation, they are being irrigated at places where the source of water is nearby. In the latter case, they are used for growing two crops instead of one. Paddy is the only crop which is being grown on the Khazan lands. It is estimated officially that Khazan lands cover an area of about 17,500 hectares or nearly 39 per cent of the paddy area in Goa. These lands are supposed to be the most productive lands.

2. Cultivation of the Ker lands and Waingan cultivation

The lands formed by the deposition of alluvial matter in the valleys or adjoining the courses of water are known as the ker lands. The alluvium may be of the ferralitic nature or the non-ferralitic one, depending upon the location. The soils may have also a hydromorphic nature according to the location, as noted earlier. These lands are utilized mainly for paddy cultivation. Officially, it is estimated that they cover an area of about 15,000 hectares or nearly 33 per cent of the paddy lands in the territory. Being located mainly in the lower areas, quite a large proportion of these lands receive irrigation. Where the irrigation facilities are available, two crops of paddy are grown and the cultivation of paddy in the rabi season is called as the Waingan cultivation. Though the Waingan cultivation is restricted mainly to these ker lands, it is also being practised on a small scale even on the Khazan lands and the sandy soils according to the availability of the water resource. The sugarcane cultivation is however mainly limited to the ker lands. Where there are no facilities for irrigation, the lands are used for growing only one crop of kharif paddy. In that case, it is known as the Sard cultivation and the farm is called as the Sard farm. The Sard farms are also used for growing a second crop of pulses and vegetables where the soils are very retentive of moisture or where the water table is high enough to provide occasional irrigations by sinking temporary wells.

3. Marad and Dongar cultivation

The high lying lands are called as the Marad lands if they lie on a plain either on the top or near the foot of the hills whereas they are termed as the Dongar lands when they lie on the slopes. These lands consist of ferralitic soils having a schist or a granitic origin. They, however, vary a great deal in their fertility depending upon the location and the growth of vegetation. A variety of crops such as paddy, ragi, pulses, coconut, mango, jackfruit etc. are grown on the marad lands, whereas the dongar lands are generally used for cashew, pineapple, and bamboo. It is estimated that about 12,000 hectares or 28 per cent of the paddy lands comprise of these marad lands. These lands generally do not receive any irrigation. It is only when the land lies at the foot of the hills that fruit trees such as mango, coconut and jackfruit grown on it are watered during the earlier stage of their growth by lifting water through the drinking water wells.

4. Coconut cultivation

Lands on which coconut is grown, do not belong to any specific category. It is grown on all types of soil, except the hydromorphic soil. It is grown on the saline soil if the degree of salinity is small. It is grown on the bunds of the Waingan and the Sard farms and on the ker type of lands when they are not used for paddy. It is, however, grown on the Marad lands only when the lands are near the foot of the hills. The coastal sandy soils are, highly suited to the cultivation of this crop and hence it is largely grown on the coastal plains. It is because of its suitability to a variety of soils that coconut is grown over a wide area in the Goan territory.

5. Areca nut cultivation

Areca nut cultivation is restricted mainly to the hill slopes or Dongar type of land, where the soil is deep and where there is a perennial spring. Because of these severe limitations, the

cultivation of this crop is restricted to a few hectares in localized areas only.

6. Kumri cultivation

This is the shifting type of cultivation practised on the barren or inferior forest lands on the slopes in the mountainous areas in the interior. The soils used for this cultivation are generally very inferior though they belong to the ferralitic type. It is because of the inferiority of the soils and their shallow nature that the vegetative growth on these lands has to be burnt to add ash to the soil to grow even the inferior millets for one or two years. After cultivating one patch, the tiller shifts to another and the old patches are taken up for cultivation again after a fallowing period of 5 to 9 years.

The different uses of the land and water resources noted above have been dealt with in Chapter Nos. 5 to 10 in detail especially with a view to identify the problems pertaining to their development. It is necessary to mention here that the terms 'Khazan, Waingan and Marad' have been retained throughout these discussions to denote the specific types of land resource even though it should be possible to use the nearer English equivalents for them. The 'Khazan' land, for example, can be denoted by the term coastal saline land whereas the 'Waingan' land and the 'Marad' land can be termed as the 'irrigated alluvial' land and the 'high lying' land respectively. These terms have been, however, retained for two reasons. Firstly, these terms are very commonly used in the Reports and the other Writings of the various Departments in Goa. Secondly the discussions in this Report have involved the local names of the farms and it would have been improper to translate these local names very often merely to suit the presentation of a report in a particular language. It is also necessary to mention here that the term 'farm' is again used throughout these discussions to denote the local term 'Xet' meaning a homogenous patch of a particular land resource identified through a local name prefixed to the term. This is somewhat different from the conventional use of the term in economic literature to denote a land holding. A farm in these discussions, therefore, comprises of a number of homogeneous fields or plots which may be cultivated by one or more households. A cultivated holding constitutes all these parts of land or the fields which are cultivated by a single household even though they may be scattered in more than one farms.

KHAZAN LAND RESOURCE AND ITS UTILIZATION

Locations

Khazan lands stretch all along the rivers upto the points of high tidal inundations in the entire coastal and the transitional tracts of Goa. They can, therefore, be seen practically in every taluka except Satari, Sanguem and Quepem talukas lying away from the coast. The rivers and the villages on their banks upto which Khazan cultivation has spread from the coast, are noted in the table below.

Table 5.1 Rivers and the villages on their banks upto which the Khazan cultivation has spread from the coast

<u>Name of the river</u>	<u>Villages</u>
Terekhol	Kargaon
Shapora	Makhjan, Dhargal, Kolwal
Mandovi	Betki, Khandola, Asnora and all along the Cumbharjua creek.
Juari	Panchvadi, Shelvan
Sal	Devsu, Shishinim
Talpan	Sadolshem

A major portion of the Khazan lands is, however, reclaimed from the beds of the Juari and the Mandovi rivers and their tributories. Besides the six rivers mentioned in the table, the Khazan farms can be seen on a small scale even along the rivulets and the small creeks which flow over a small distance from the coast in all the coastal talukas.

Important features of a Khazan farm

A Khazan farm consists of a narrow or^a wide strip of land in the bed of a river or a creek, protected from the inundation of the tidal waters by the construction of an embankment or a bund. A bund, therefore, forms an integral part of a Khazan farm since the existence of a farm, depends entirely upon the existence of the bund itself. A bund which protects the farm from the inrush of the direct currents in the river, is called as the main bund whereas the one which lies away from the friction of the direct currents, is called as the intermediary bund. At times a main bund protects two farms in succession and in that case the bund protecting the farm lying away from the current, is called as the secondary bund.

Sluice gates are fixed in these bunds to control the inflow and outflow of water through the farm. A sluice gate consists of one or more collapsible doors which get closed when there is a rise in the level of water outside the farm and open when there is a rise inside. They, thus, inhibit the flow of water into the farm at the time of high tides whereas allow the drained out water to flow into the river when there is a low tide.

The third important feature of a Khazan farm is the drain which carries water through a farm or through an entire catchment and discharges it into the river through the sluice gates. There can be a number of drains in a farm but the main drain usually lies parallel to the main bund and the other drains discharge the water into the main drain.

The dimensions of the bunds, sluice gates and the drains vary from one farm to the other according to the size of a farm and the depth of a farm below the tidal level. Usually, a bund has a height of 2 to 2.5 meters above the field level and a width of about 2 meters at the top. The inner side is given a slope of 1:2. The outer side is always built of stones and each layer of stones protrudes 2" to the outer side in relation to the layer just above it. A sluice gate is fixed at a level at which the sil level goes 50 cms. below the level of the farm. The main drain is always kept 5 to 10 meters away from the main bund. The main as well as the subsidiary drains vary largely in their width but they are made enough deep to drain out the water quickly. Usually a depth of 30 cms. is provided for this purpose. Experiments in Maharashtra have shown that the distance between two subsidiary drains in a Khazan farm should be roughly 200 meters. If this distance is increased, the water does not get drained quickly whereas if the distance is narrowed the crop suffers if there is a shortage of rain at the end of the season.

Since the existence of a Khazan farm depends entirely upon the bund, sluice gate and the drains, their maintenance forms an important feature of the Khazan land utilization. The bunds have to be trenched and plastered once in three years. The drains also need cleaning every year or at least in alternate years to remove the silt and maintain their depth. The sluice gates need repairs whenever there is any defect and the doors need to be replaced when the edges get worn out.

Because of the dependence of a Khazan farm upon its own independent bund, the gate in the bund and the drains carrying water to the gate, each Khazan farm develops certain characteristics of its own. Each farm therefore, differs from the others in certain respects and each carries a local name. The individual plots in a Khazan farm may, however, be cultivated by one or a number of farmers depending upon its size and ownership.

Selection of the Khazan farms for the survey

As the Khazan farms were concentrated mainly on the banks of the Juari and the Mandovi rivers, the selection of villages for a study of Khazan cultivation was restricted to these two rivers only. The Juari river flowed for quite a long distance in the territory when compared to the Mandovi river. Two representative villages were, therefore, selected from the villages on the banks of the Juari river whereas only one was selected from those on the banks of the Mandovi river. While selecting these villages care was taken again, to select one village from near and one from away the mouth of the Juari river. So also a village on an island in the Mandovi river was selected to represent the many islands in this river. Accordingly, the villages namely, Marcaim and Borim were selected from the villages on the earlier river whereas Cumbharjua island was selected from among the islands in the latter river. The village Marcaim was near the mouth of the Juari river and the village Borim was away from it. There were 7 and 8 Khazan farms at Marcaim and Borim respectively whereas the number of

farms at Cumbharjua was 12. These farms were identified through the local names they carried. At places, parts of a big farm also carried some local names. For the purpose of the survey, however, a farm was treated as a whole and identified through the broad name it carried. All Khazan farms located in the selected villages were surveyed for the purpose of this study.

The farms were surveyed partly by the case study method and partly through a schedule designed for a farm as a whole. The schedule was filled by interrogating a group of farmers cultivating in the farm. Schedules were also filled for a few of the cultivators in each farm to note the cultivation practices adopted by the individual cultivators in that particular farm. Generally, two cultivators in a farm were contacted for this purpose by selecting one cultivator tilling the land near the bund and the other away from it. In case of very small farms, however, the selection of cultivators was restricted to one cultivator per farm only. So also it was not possible to contact any cultivator when a farm was lying uncultivated because of breakage in the bund or when the cultivators had migrated out for seasonal employment elsewhere. This reduced the number of cultivators available for the enquiry and we could contact only 7, 12 and 11 cultivators in the villages Marcaim, Borim and Cumbharjua respectively.

Ownership Pattern and the general features of the selected farms

Out of the 7 farms at Marcaim, 3 farms belonged to the Comunidade; 3 farms were owned jointly by certain families in the village whereas a part of one farm was owned by the Comunidade and the other by a group of families. The Bar Khazan, Amre Khazan and the Neavel katar were owned by the Comunidade; the Parampay katar, Adan Khazan and the Save banar were owned jointly by different families whereas the Karanzal Khazan was owned by both. All these farms had their independent main bunds. The part owned jointly by the families in the Karanzal Khazan had, however, only a secondary bund and the main bund belonged to the Comunidade.

The farms at Borim were owned mainly by certain families. The Kharwade Khazan, Adulse Khazan, Tamshire Khazan, Bet Katar and the Bor Khazan were owned exclusively by the families whereas the Tishe Khazan, Viset Juvav Khazan and the Devate Katar were owned partly by the families and partly by the institutions. A part of the Tishe Khazan was owned by the Comunidade whereas parts of the Viset Juvav and the Devate katar were owned by the Shantadurga and a local temple respectively.

Three of these eight farms namely, the Kharwade Khazan, Adulse Khazan and the Devate katar had only secondary bunds without any sluice gates. The Kharwade Khazan was protected by the main bund of the Bor Khazan whereas the Adulse Khazan and the Devate katar were protected by the bunds of the Viset Juvav Khazan.

Eleven of the twelve farms at Cumbharjua were owned by different families. These farms were namely, the Wagle katar, Wadso Khazan, Kundaikar katar, Himate Khazan, Teer Khazan, Durga Pai Khazan, Kotak Khazan, Dhume katulli, Bor Khazan, Lavande katulli and another farm also known as the Wagle katar near the Wagle bhat. It is only the farm known as Chunya katar that was owned exclusively by the Mangesh temple. All the twelve farms had their independent main bunds. In spite of these independent bunds, however, the breakages of bunds in some of these farms depended upon the breakages of bunds in the others. The Wadso

Khazan and the Wagle katar depended upon each other in this respect. The bund of the Himate Khazan was also very weak and it, therefore, determined the flooding of water in the Kundaikar katar. The breakage of the bund in the Wagle katar near the Wagle bhat also depended upon the breakage of the bund in the Kotak Khazan.

Each of these Khazan farms in the selected villages was reclaimed from the rivers quite in the long past as far as the old persons in these villages remembered. There was, therefore, no growth of Khazan area in these villages at least since the beginning of the twentieth century.

In case of the farms owned by both the families and the institutions like the Comunidades and the temples, there were clear demarcations of boundaries between the parts owned by them. The boundaries were demarcated by bunds which served the purpose of a secondary or a tertiary bund. The parts owned by a single family in the above type of farm or even in a farm owned entirely by the families, were, however, not demarcated. The land owning families in such farms held rights only to certain portions in the income from the farm and not to any demarcated areas.

Size of the farms

There were certain difficulties in determining the size of the different farms very precisely in hectares for the absence of land records. The villagers themselves reckoned the size of a farm in terms of the seeds required for sowing. The knowledge of the villagers was, therefore, made use of in determining the size of the different farms. Under normal conditions, 20 cudavs of paddy seeds were required for sowing one hectare of a Khazan farm. The size of the farms was estimated on the basis of this requirement of seeds. The farms in the selected villages have been classified according to the size groups in the table below.

Table 5.2 Size of the farms in the selected villages

Size of the farm (hectares)	Number of farms			Total
	Marcaim	Borim	Cumbharjua	
1-5	-	3	7	11
6-10	2	3	1	5
11-25	1	1	2	4
26-50	-	-	2	2
51-100	3	1	-	4
Above 100	1	-	-	1
Total	7	8	12	27

The size of the farms in the selected villages varied from 1 hectare to 150 hectares or even more. A majority of the farms in the villages Borim and Cumbharjua were, however, below 10 hectares in size whereas those in Marcaim were above 50 hectares. Only one of the farms at Borim viz. the Bor Khazan exceeded 50 hectares. The Bar Khazan at Marcaim was the biggest of all and it exceeded even 150 hectares.

Owner and tenant cultivation

Except for the Adan Khazan in Marcaim and the Viset Juvav Khazan in Borim all the other farms were leased out to the tenants for cultivation. The Adan Khazan was cultivated jointly

by the five families which owned it whereas the part of the Viset Juvav Khazan owned by the Shantadurga temple was cultivated by the owner of the other part along with the part owned by him. The other farms in the selected villages have been classified according to the number of tenants cultivating in them in the following table:

Table 5.3 : Classification of the farms in the selected villages according to the number of tenants

Number of tenants per farm	Number of farms			Total
	Marcaim	Borim	Cumbharjua	
1-5	1	-	4	5
6-10	-	-	2	2
11-25	1	2	3	6
26-50	2	3	2	7
51-100	1	-	1	2
Above 100	1	2	-	3
Total	6	7	12	25

The above table would reveal that in a majority of the farms in Marcaim and Borim the number of tenants exceeded 10 whereas in Cumbharjua the number of farms having less than 10 tenants was equal to the number having more than 10 tenants. In a majority of the farms the number of tenants varied between 11 and 50 whereas there were five farms in these villages, wherein the number exceeded 50. There were, however, three farms in Cumbharjua which were cultivated by a single or two tenants only.

Collective cultivation in Khazan farms

It was said that there were a number of Khazan farms in Goa, which were cultivated collectively by tenants in groups. During the survey we could notice such a practice in only two farms at Cumbharjua, namely the Kotak and the Durga Pai farms. Both these farms were cultivated collectively by a single group of twenty tenants. Both farms were quite small in size, the Kotak farm covering 8 hectares and the Durga Pai covering 5 hectares only. Each of these farms was owned by a single family. It was for the convenience of supervision and collection of rent that these families preferred to lease out the farms to a group of tenants than to the individuals. The existence of such a group willing to cultivate the farms collectively under the guidance of a leader was also responsible for the collective cultivation. The leader possessed an ancestral heritage in organizing such groups as the uncle of the present leader was also leading such groups in the past.

The present group consisted mainly of a kinship group with the exception of two members who happened to be friends of the leader. The Kotak Khazan was leased in by this group since the last 12 years whereas the Durga Pai Khazan was leased in since the last five years. Each family in the group provided always an equal number of workers. The member-families were, however, free to provide either workers from the family or hired labourers. The cash expenditures incurred over the cultivation were shared equally by each family. The produce was also distributed equally among these families after paying the rent in kind and

providing for the requirements of seeds for the following season.

Combinations of the different types of paddy cultivation by those engaged in Khazan cultivation

The farmers available for this enquiry have been classified according to the types of paddy cultivation in which they were engaged in the following table.

Table 5.4 : Classification of the farmers according to the different types of paddy cultivation

Village	Number of farmers engaged in				Total number of farmers
	Khazan cultivation only	Khazan and Waingan cultivation	Khazan & marad cultivation	Khazan, Waingan & marad cultivation	
Marcaim	4	3	-	-	7
Borim	8	1	2	1	12
Cumbharjua	8	-	1	2	11
Total	20	4	3	3	30

Two third of the farmers who were available for this enquiry were engaged purely in the cultivation in the Khazan farms. About one fourth of the farmers had combined either Waingan or marad cultivation with Khazan cultivation whereas one tenth of them were engaged in the cultivation of all the three types of land. No specific variations were observable in the different villages in this respect as all these resources were available in each village.

Size of the cultivated holdings in the Khazan farms

The average size of the holdings, these cultivators held in respect of the three types of paddy cultivation are noted in the table below.

Table 5.5 : Average size of the holdings in respect of the Khazan, Waingan and the Marad cultivations

(Figures in hectares)

Village	Average size of the holdings in respect of			Average size of the total holding
	Khazan cultivation	Waingan cultivation	Marad cultivation	
Marcaim	0.91	0.56	-	1.15
Borim	0.70	0.14	0.31	0.80
Cumbharjua	1.34	0.70	0.30	1.55

The average size of the total holding varied from 0.80 to 1.55 hectares in these villages whereas the size of the holdings in the Khazan farms varied from 0.70 to 1.34 hectares. The size of the holdings was the largest at Cumbharjua which was an island and the least at Borim which had a number of Waingan farms. The size of the Waingan and the Marad holdings was fairly small when compared to the size of the Khazan holdings. This may be due to either greater attachment of the farmers cultivating in the Khazan farms to the Khazan cultivation itself than to the other types or the availability of the Khazan lands relatively in plenty in the villages on the creeks and rivers than in the other villages.

Fragmentation of the holdings in the Khazan farms

Many of these cultivators held plots in more than one Khazan farm. The number of cultivators cultivating in the different numbers of Khazan farms are noted in the table below.

Table 5.6 : Number of cultivators cultivating in the different numbers of Khazan farms

Village	Total number of cultivators	Number of cultivators cultivating in			
		One Khazan farm	Two Khazan farms	Three Khazan farms	Four Khazan farms
Marcaim	7	6	-	-	1
Borim	12	2	8	2	-
Cumbharjua	11	8	3	-	-
Total	30	16	11	2	1

namely,
Most of the cultivators in the villages Marcaim and Cumbharjua held lands only in one Khazan farm. At Borim, however, 2/3rd of the cultivators held land in two Khazan farms. The number of farmers cultivating in more than two farms was small. Yet it was 10 per cent of the total number of cultivators available for this enquiry.

Farms lying uncultivated

Only three of the 27 farms were lying uncultivated at the time of the enquiry. The Parampay katar at Marcaim had remained uncultivated since the last two years because of a dispute between the owners and the tenants. This had deprived about 30 tenants of the land they held in this farm. The Wadso Khazan and the Wagle katar at Cumbharjua had remained uncultivated since the last four and two years respectively because of a breakage in their bunds. A breach in the bund of the Wadso Khazan had also caused a breach in the bund of the Wagle katar after a period of about two years. These breakages deprived about 70 and 10 farmers of the lands they held in these two farms respectively. The Government had started repairing the bund of the Wadso Khazan in the year of this enquiry.

Partially uncultivated farms

Only two of the farms viz. the Adan Khazan at Marcaim and the Tishe Khazan at Borim consisted of parts which were not used for cultivation. The part in the Tishe Khazan was lying uncultivated since the last 15 years whereas that in the Adan Khazan was unused since the last 30 years. Cultivation in these parts in both farms was reported to have been given up because of bad drainage. Willows (marine trees) had even grown up in the part remaining uncultivated in the Tishe Khazan. The uncultivated part in the Adan Khazan was capable of producing about 40 khandis of paddy or about 28 per cent of the total quantity of paddy that could be produced in the entire farm. Similarly the uncultivated part in the Tishe Khazan would have produced 60 khandis or 35 per cent of the produce in the whole farm.

Utilization of the farms in the different seasons

A kharif crop of paddy was being grown in all the farms except in those lying uncultivated because of the breakages and the disputes. Eight of these 24 farms were also being used for growing a second crop of paddy in the rabi season whereas onions and chillies were being grown in three more farms in the same season. There was only one farm at Marcaim, viz. the Karanzal Khazan which produced two crops of paddy over the entire farm with the help of bandhara irrigation. There were as many as five farms at Borim, viz. the Kharwade Khazan, Adulse Khazan, Bet katar, Bor Khazan and the Devte katar, which produced two crops. Except the Bet and the Devte katar farms, the other farms produced two crops over their entire areas with the help of tank or bandhara irrigation. In the Bet and the Devte katar farms, however, only half of their areas were used for Waingan paddy because of the preference for flow irrigation. The teer Khazan and the Dhume katulli were the only two farms in Cumbharjua, growing the Waingan paddy. Irrigated paddy could be grown only in parts of these farms because of the scarcity of water. Certain parts in the Chunya katar, Lavande katulli and the Wagle katar (near the Wagle bhat) in the same village were being used for growing onions and chillies in the rabi season. These crops were, however, being grown on a small scale for home consumption in the Khazan and the Sard farms in most of the villages in Goa. Their cultivation was, however, being practised on a large scale in the above three farms, which may be due to the limited land resource available for this purpose in the village which was merely an island.

Frequency of breakages in the bunds

A study was made of the breakages in the bunds of these farms by enquiring about the breakages during the last 15 years and about the last breakage if there was no breakage during this period. The enquiry revealed quite differing conditions in the different villages in this respect.

There were on the whole only a few breakages in the village Marcaim near the mouth of the Juarai river. The last breakages in the bunds of the Bar and the Amre Khazans in this village dated back to the year 1910. There were breakages to the bunds in the Save banar and the Adan Khazan in the years 1945 and 1948 only respectively. It is only in the Parampay katar that the bund had suffered from breakages twice, once in 1955 and again in 1964.

There was no problem of the breakages in the bunds in

three of the farms at Borim, which were protected only by the secondary bunds. The bund of the Viset Juvav Khazan, an owner cultivated farm, was so strong that it had not given way at least in the last fifty years. The bunds of the remaining four farms were, however, subject to the breakages frequently. The Tamshire Khazan was submerged in the years 1960, 1963 and 1964. The bund of the Tishe Khazan had given way in the years 1955, 1959 and 1962. The Bor Khazan and the Bet katar were under water in the years 1959 and 1960 respectively. All the four farms were subject to small breakages practically every year but the breakages were being plugged instantaneously. The frequency of breakages was on the whole more at Borim which had a narrow water course than at Marcaim having a broad water course.

Except the bund of the Wagle katar near the Wagle bhat, the bunds in all the other farms in Cumbharjua had given way in the near past. The Wagle katar was cultivated by a single tenant and both the owning family as well as the cultivating family were very careful about the maintenance of the bund. It was, therefore, only in the year 1935 that this farm was submerged because of a severe breakage in the bund of the adjoining Kotak Khazan.

There were frequent breakages in the other farms during the last 15 years. The Wadso Khazan, Kundaikar katar and the Lavande katulli were submerged in the years 1955, 1957 and 1958 respectively. The Teer Khazan was under water twice, once in the year 1950 and again in 1958. The Dhume Katulli, the Bor, Kotak, Himate and the Durga pai Khazans were all submerged in the year 1962 which was the worst year in the history of breakages of the bunds in this village. The Durga pai and the Kotak Khazans were again submerged together in the year 1959. The Durga pai was under water even in the year 1954. The year 1964 was again a bad year for the village as the Wagle katar, Himate Khazan and the Chunya katar were submerged in the same year. The bund of the Chunya katar had also given way previously in the year 1960. If these breakages since 1950 were to be reviewed one would find that five of the twelve farms were under water twice; one was under water thrice; one was never submerged whereas the remaining 5 farms had submerged only once during this period.

The farmers in Cumbharjua and Borim attributed the frequent breakages after 1954 to the barge movements in the narrow water courses in these villages, which started roughly by the same time. The speed with which these barges moved created very forceful waves which burst heavily against the bunds. There were restrictions on the speed at which the barges were permitted to move. It was, however, being said that these restrictions were observed only near the ports. There being no inspectible speed charts in these barges (as in the railway locomotives for example), it was not possible to check the speed with which these barges moved.

If one is to generalize the breakages in these different farms during the last 15 years, one would find that there were 6 breakages in the 7 farms at Marcaim, 8 in the 8 farms at Borim and 18 in the 12 farms at Cumbharjua. The Cumbharjua island was, therefore, subject to a greater number of breakages than the other villages.

Months of breakages

The breakages in the bunds usually occurred during some specific periods in a year corresponding to the extra high tides.

The total number of breakages reported in case of the surveyed farms have been classified according to the periods of breakage in the following table. The breakages occurring in the year 1910 in case of the two farms at Marcaim have also been included in this table.

Table 5.7 : Classification of the breakages according to their occurrence in the different periods in a year

Village	Number of breakages in the periods				Total No. of breakages
	June-July-August	Sept.-Oct.	December-January	April-May	
Marcaim	-	-	8	-	8
Borim	2	4	2	-	8
Cumbharjua	11	-	5	2	18
Total	13	4	15	2	34

The table would indicate that all the breakages at Marcaim had occurred in the period December-January whereas a majority of the breakages at Cumbharjua had occurred in the period June-August. The breakages in the latter period, however, occurred usually mainly by the end of June or beginning of July. Half the breakages at Borim had occurred in September-October when there were no breakages in the other villages and the others in June-August and December-January. There were rarely any breakages in April-May, though two breakages at Cumbharjua had occurred in this period. No breakage was reported in any other months excluded from this table.

If the breakages in the different villages are added up one finds that there were nearly equal number of breakages in the periods June to August and December-January. The breakages in the period September-October were on the contrary, rare though they had occurred in the village Borim. If the breakages in the village Marcaim which was near the mouth of the river and which had a broad water course, are excluded, one would find that a majority of the breakages in the villages Borim and Cumbharjua which were away from the mouth had occurred during the period of the monsoon. The high tides combined with the floods or the high water levels in the monsoon might have led to a larger number of breakages in the latter villages. Because of the broad water course, the village Marcaim was free from the ravages of floods. Being very near the mouth of the river, it was, however, highly subject to the first blows of the extra high tide in December-January which was known as the 'Natalachi Jorgat'. All the breakages in this village had, therefore, coincided with this extra high tide of December-January.

The system of watching the bunds

In the small farms cultivated by a few farmers the farmers themselves watched the bunds turn by turn mutually. In the big farms, however, watchmen known as 'Bhos' were usually appointed by the owners for the purpose. These watchmen were generally provided with a plot of land for cultivation in the farm free

of rent. Rarely were they paid in cash for their duties. As soon as a watchman noticed a crevis in a bund, his duty was to inform the tenants cultivating in the farm. Once such a breakage was reported, all tenants used to rush to the point of breakage to repair it if possible. In case of major breakages, however, it was impossible to repair them immediately and it needed the help of both the owners and the tenants to reconstruct the damaged part.

Time lag between the breakages and their repairs:

Generally, the breakages were repaired within a week if they occurred in the period from April to September when either the presowing operations had to be done or the crops were standing in the field. The same practice was followed in the farms growing two crops if the breakage occurred in December-January. The breakages occurring in December-January in the other farms in this enquiry were repaired after one to even three months depending upon the length of the washed off bund. It was only in two of the three farms lying unused, that repairs to the breakages were neglected by the owners.

Expenses incurred over the repairs

An enquiry about the approximate expenses incurred over repairing these breakages was made with the tenants themselves as the owners of many of these farms were staying outside the villages. It was expected that such an enquiry even with the tenants would give a fair idea about the expenditures as either the tenants themselves were asked to repair the breakages on daily wages or the repairs were done on a contract basis. The number of breakages have been classified according to the approximate expenditures over repairs in Table 5.8.

A majority of the breakages in the villages Marcaim and Borim for which data are available, were repaired at a cost of Rs.500 or below. At Cumbharjua however, the costs were much high in case of many breakages. Twenty-five of the 28 breakages for which data are available, however, required Rs.2000 or less for their repairs whereas in only three cases the expenses exceeded this amount. It took also more than two months to repair these latter breakages.

Vulnerable points on the bunds

The bunds were generally susceptible to the tidal pressures at any point. The parts which remained untrenched for a long period were, however, always more susceptible than the others. There were, in addition certain points on a few bunds which were always susceptible to breakages because of certain natural conditions existing at these points. A part of the bund of the Himate Khazan at Cumbharjua passed over the ground consisting of pebbles. This part was, therefore, susceptible to breakage readily than the others. So also water was very deep near the bund of the Dhume katulli in the same village. The bund was, therefore, always giving way at this specific point. The bund of the Bor Khazan at Borim again used to give way in a part passing over rocky surface. Broadening of the bunds in such parts was, however, a remedy to counteract this vulnerability. There were no specific vulnerable points on the bunds of the other farms.

Protection of the bunds by willows

The willows growing on the outskirts of the bunds gave

Table No. 5.8 : Classification of the breakages according to the approximate expenses over their repairs.

Village	Number of breakages requiring					Number of breakages for which data are not available	Unrepaired breakages	Total number of breakages
	Rs. 500 & below	Rs. 501-1000	Rs. 1001-2000	Rs. 2001-5000	Above Rs. 5000			
Marcaim	4	-	1	1	-	2*	-	8
Borim	4	-	1	-	1	2	-	8
Cumbharjua	7	5	3	-	1	-	2	18
Total	15	5	5	1	2	4	2	34

* These two breakages had occurred in the year 1910.

protection to the bunds to some extent. They minimized the force of the waves dashing against the bunds. The effect of these willows in minimizing the action of the waves on the bunds could be clearly seen when a barge passed through a water course. A wave always shattered against the willows and reached the bund only after disintegration.

A variety of willows had grown naturally near the bunds. No attempts were reported to be made to plant the willows purposely except in the case of the Bor Khazan at Borim. The willows which were found to be common in Goa were locally known as 'Cheep, Viphal and Hurra'. Among these different types of tree, Viphal was said to be giving the greatest protection to the bunds. 'Cheep', in fact helped more in minimizing the force of the waves because of its banyan like aerial roots but in case if a tree of this type was to get uprooted by a high tide or a cyclone, it generally toppled with a considerable portion of the bund.

All these types of tree give out seedlings in June and July, which float near the banks of the rivers. A few of them get anchorage near the bunds whereas the others get washed off to the sea or decay.

There was not even a single main bund without the shelter of willows. Considerable portions of the bunds in certain farms, were, however, without any willows as no efforts were made by the farmers to plant willows on their own account. The willows required some silt deposition near the bunds for rooting and proper growth. It was, not therefore, possible to get a natural growth of willows where a river bed near a bund consisted of shallow soil or was rocky. The use of stakes for tying up the seedlings was, however, a remedy if the farmers were to plant the willows at places having shallow soils. For planting willows on rocky beds, it was necessary to construct groynes for the deposition of silt and then plant the willows with the help of stakes after the silt has accumulated in fair quantities. Once the willows were rooted firmly, they themselves helped further deposition of silt by the obstruction they provided to the water currents.

An estimate was made of the number of plants that would be required for planting in the portions remaining uncovered, at present. The enquiry revealed that there was no need for planting any willows in 6 farms at Borim and 7 farms at Cumbharjua, as some of these farms had only the secondary bunds whereas the number of plants was adequate in the others. The number of plants required in the remaining farms varied from 30 to as many as 500 per farm, depending upon the length of the unoccupied portions.

Maintenance of the bunds

The bunds required repairs for their maintenance every year. These repairs consisted of trenching and plastering the bunds once in three years. The process of trenching consisted of digging a V-shaped trench in the bund, having a breadth of 80 cms. at the top and 40 cms. at the bottom and a depth of 40 cms. below the field level. The trenches were being filled with plastic clay from the bed of the river. As the clay/its plasticity after three years, a practice had developed to trench the bunds once three years. The process of plastering consisted of plastering all the surface of the bund with clay and straw and this was generally done after trenching was over.

Repairs for the maintenance of the bunds were being undertaken every year in all the farms covered by this survey. The nature of repairs, however, varied from one farm to the other. Though it was necessary to trench a bund once in three years, the practice was not followed regularly in all the farms. The bund of the Chunya katar at Kumbharjua, for example, was not trenched since the last 20 years. The bunds of the Durga pai and the Kotak Khazans were not trenched since the last 6 and 5 years respectively. Trenching had been undertaken in all the remaining farms at least once during the last three years. Certain portions of the bunds even in these farms were, however, not trenched for more than four years. Trenching was being very regularly followed in the two farms viz. the Adan Khazan and the Viset Juvav Khazan, cultivated by the owners. So also the practice was properly observed in the farms namely Lavande katulli, Wagle Katar (near the Wagle bhat) and Himate Khazan, which were cultivated by one or two farmers. The other farms were quite big, had long bunds and hence a practice was adopted in these farms to trench generally only those parts of the bunds which had become weaker.

The costs over trenching were always incurred by the owners. The tenants offered their labour for the purpose either on contract basis or on daily wages. At times, a contract was taken even by outside labourers. As the owners of most of these farms were staying outside the villages, it was not possible to enquire about the annual costs incurred over trenching. The cost of trenching, however, came to nearly Rs.30 per meter where the bunds were trenched through the Government.

The labour required for plastering was supplied free by the tenants cultivating in those farms. The owners had, therefore, not to incur any costs over this process. It had become a commitment on the part of the tenants to plaster the bunds regularly. The tenants also took part in discharging their duties promptly as the product from their tilling the land in the farm depended entirely upon the strength of the bund. All the weaker sections in a bund were being plastered regularly, even if the owner did not agree to trench such portions. Plastering was done collectively by the tenants by supplying an equal number of labourers from each family. Plastering was done in the owner cultivated farms on a contract basis. The cost came to Rs.3 per meter in the cases of the two owner cultivated farms in the selected villages.

A modern method of making the bund impermeable was being experimented by the Government in the village Bhom on the Mandovi river. Instead of adopting the process of trenching, a sheet of polythene paper had been used to check the permeability of water. Since this experiment was started during the year of our survey, it was not possible to know the results.

Polythene is, however, a costly material. The National Buildings Organization of the Government of India has evolved a bitumen product for making a cheap nonerodable and impermeable plaster. The material can either be prepared from bitumen on the farm itself or it is even readily available in the market, as a product known as Janata emulsion.¹ This emulsion has to be mixed with sand or soil. When a surface is plastered with this mixture, it becomes impermeable to water. This material had not been tried in Goa.

¹ Manufactured by the Shalimar Tar Products (1935) Ltd.,
16, Bank Street, Bombay.1

Labour employment through the maintenance

It was not possible to estimate the employment generated through the maintenance repairs in the different farms for the same reason of most of the owners being staying outside these villages. Some idea can, however, be obtained about a rough estimate of employment available through an average sized farm, by resorting to some calculations.

The requirements of labour for the maintenance repairs varied with the height of the bunds. Trenching generally required 4 labour units per metre when a bund had a 2 meter height whereas 6 labour units were required for a 2.5 meter bund. Plastering required nearly one labour unit per meter.

The lengths of the bunds usually varied from 100 to 1000 meters or even more. The lengths of the bunds in the surveyed villages were again not available but on a rough estimate one can take 400 meters as the length of a bund in an average farm in Goa. This indicates that if a 400 meter bund was to be maintained regularly, it would provide 2000 to 2800 labour units of employment once in three years or roughly on employment to 22 to 30 labourers for a month every year.

Need for repairs

Because of the negligence of the owners in the near past, bunds in certain farms needed some major repairs. There was no need for any repairs to the bunds in case of the farms having the secondary bunds. So also the bunds in the Dhume and the Lavande Katulli at Cumbharjua, Viset Juvav Khazan at Borim and the Adan and the Karanzal Khazans at Marcaim needed no repairs. The bunds in all the remaining 19 farms including the two farms which were submerged, needed different types of repairs. Repairs to the outer stone work were neglected in most of these farms. It was, therefore, necessary to demolish the weaker parts in those bunds and reconstruct those with the old stones. Repairs of this type, formed the major need in 11 of these 19 farms. These repairs, however, involved very heavy expenditures which in the opinion of the farmers cultivating in these farms varied from Rs.5000 to Rs.25000 per farm. Trenching was needed in case of 5 of the remaining 8 farms. This needed an expenditure of Rs.1000 to Rs.15000 per farm depending upon the lengths of the untrenched portions. In the remaining three farms viz. the Himate and the Durga pai Khazans and the Chunya katar at Cumbharjua it was necessary to broaden the bunds and raise their heights besides trenching and repairs to the outer stone work.

The strength of a bund largely depended upon its breadth. A few of the farms in some of the villages other than those surveyed, had very broad bunds which had not given way since their construction. There was also no necessity of trenching these bunds because of their breadth. Increasing the breadth of the bunds could, therefore, be said to be almost a universal problem in Goa. There were, however, certain limitations on increasing the breadth, due to the costs involved and the availability of stones nearby. No one had tried the use of the mine refuse for the purpose, which had practically no value at the mining sites. Water transport was, again, a favourable factor from the point of reducing the costs if this refuse was to be transported from the mining sites to the Khazan farms. The economic use of the mining refuse for this purpose was, however, a matter of distances between the mining sites and the Khazan farms.

Sluice gates

All farms except two of the three farms at Borim having the secondary bunds, had sluice gates. The renewal of the sluice gates had been neglected, in most of the farms. In as many as 18 of these 25 farms, the gates were renewed in such a remote past that it was not possible for the farmers to recollect the years of renewal. It was possible to note the years of renewal in the remaining farms. In the Viset Juvav farm at Borim, the gate was renewed about 20 years back. The same was the position with the gate in the Wagle katar at Cumbharjua which was practically renewed at the same time. In one more farm namely the Kundaikar katar in the same village, the gate was renewed only a year prior to the survey. At Marcaim, however, a majority of the gates i.e. 4 out of 7, were replaced during the last five years.

The number of gates was generally adequate except in the case of five of these 25 farms. There was need for one more gate in the Adan Khazan at Marcaim, Kundaikar katar at Cumbharjua and the Bet and the Devate katars at Borim. A need was felt for adding two more gates in the Tamshire Khazan at Borim.

The doors were also not functioning well in most of the farms having the old sluice gates. There was generally a considerable leakage of water through the doors in many of the farms. This came in the way of earlier drying of the farms and reducing the salinity of the soil especially in the parts near the bunds. The farmers were, therefore, compelled to grow two different varieties of paddy in the parts near and away from the bund. This aspect of the Khazan cultivation will, however, be dealt with in a later chapter. The doors were reported to be defective in as many as 6 of the farms at Cumbharjua, 3 at Borim, and 2 at Marcaim. The costs required for repairing the sluice gates and doors were reported to be varying from Rs.100 to Rs.5,000 per farm depending upon the nature of repairs required.

Drains

The number of drains in a farm varied from 1 to 8 per farm. These drains were mainly in the form of the natural water courses formed in these farms through generations. No attempts were made to dig out systematic drains at certain distances except in the Adan Khazan at Marcaim. The owners of this owner cultivated farm had very lately constructed new drains in their farm to increase its productivity. The farms have been classified according to the number of drains in the following table:

Table 5.2 : Classification of the farms according to the number of drains

Village	Number of farms with				Total No. of farms
	1 drain	2 drains	3 to 5 drains	More than 5 drains	
Marcaim	3	1	3	-	7
Borim	5	2	1	-	8
Cumbharjua	9	1	1	1	12
Total	17	4	5	1	27

A majority of the farms in the selected villages had a single drain. It is only at Marcaim that four of the seven farms had more than one drains. The number of drains depended largely upon the size of the farm and whether the farm had a main or a secondary bund. Some of the big farms had yet only a single drain. The Tamshire Khazan at Borim which was a very big farm had only one drain. So also the Bor Khazan had only two drains. The Chunya katar and the Wadso Khazan at Cumbharjua which were also large in size had on the contrary 8 and 3 drains respectively. So also two drains were provided in the Adan Khazan even though the farm was quite small.

Despite these variations, the number of drains was considered to be adequate by the cultivators tilling in most of these farms. It is only in the Adan Khazan cultivated by its progressive owners that they wanted to have one more drain to bring the uncultivated part of the farm under cultivation. The farmers in the other farms held an opinion that instead of bringing any additional land under the drains, the problems of drainage would be solved if the present drains were to be deepened.

The practice of taking out the mud from the drains was followed practically in every farm except the Tamshire and the Bor Khazans at Borim and the Kundaikar katar at Cumbharjua. The drains in the Bor Khazan and the Kundaikar katar were said to be not cleaned since the last 15 years whereas only parts of the drain in the Tamshire Khazan were being cleaned at times. In the remaining farms also the practice was to take out only a little mud from the drains as would be enough to repair the bunds of the individual plots. No attempts were reported to have been made to deepen the drains systematically in any of these farms. It was necessary to deepen the drains in 18 out of the 27 farms. Removing the mud from the drains and spreading it on the farm had a significance not only from the point of improving the drainage but also from the point of raising the level of these lands gradually which cannot be expected to remain under the tidal level for ever.

Fishing in the Khazan farms

Most of the drains contained water for a long period in a year or even throughout the year in some cases. The drains, therefore, served as a place of breeding and growth of the fish. The fish also entered the farms when the gates remained open during the low tides. Fishing had, therefore, become an important source of income from the Khazan farms.

The amount of fish, however, depended upon the number of drains and the area covered by them. The drains were usually auctioned for catching the fish. In the small sized farms, however, it was not possible to get the fish in large quantities. The tenants cultivating in these farms were, therefore, given the rights to catch the fish for their home consumption. Fish was being caught in the large-sized farms throughout the year whereas the tenants used to catch the fish in the small sized farms only once after the harvest of paddy. The different farms have been classified according to the amounts for which the farms were auctioned in table 5.10

Fish was caught by the tenants themselves in 14 of the 27 farms. The remaining farms were auctioned for fishing. In 8 of these farms, the amounts of the auction came to Rs.1000 or below whereas five farms realized an appreciable amount of income through fishing.

Table 5.10 : Classification of the farms according to the amounts for which the farms were auctioned for fishing

Village	Number of farms auctioned for				Number of farms in which the fish was taken by the tenants	Total No. of farms
	Rs. 500 and below	Rs. 501-1000	Rs. 1001-2000	Rs. 2001-5000		
Marcaim	1	1	1	1	3	7
Borim	1	1	-	1	5	8
Cumbharjua	3	1	1	1	6	12
Total	5	3	2	3	14	27

It was being discussed in Goa that it might pay more to rear the fish in the Khazan farms than to grow paddy crop. The value of the fish realized in two of the farms which were submerged due to the breakages in their bunds, however, indicated that the value of the fish realized through them was only fractional when compared to the value of paddy they produced. The Wadso Khazan was auctioned for Rs. 3000 only whereas it produced about 1200 khandis of paddy valued at Rs. 36,000. So also the Wagle katar was auctioned for Rs. 500 but it produced paddy worth Rs. 4500. These illustrations howsoever limited they may be, indicated that it was uneconomic to convert the Khazan farms growing a regular crop of paddy into the tanks for fishing. There was also a belief that the low yielding farms suffering from pan formation, may give better returns if they were converted into the tanks for fishing. There were, however, other remedies to increase the productivity of such farms as would be noted later.

There were, however, possibilities of submerging the farms temporarily after the harvest of paddy for fish culture at places where the water remained sweet till December. Such a practice of flood following was already being followed in certain countries as the British Guiana for example.¹ This helped in the deposition of silt and raising the level of the farm, added to the income from fishing as well as controlled the growth of weeds. Nowhere was such a practice being followed in Goa. The practice, however, needed a careful check over the salinity of water at the time of flooding and a perfect knowledge about the type and movement of fish during the various tides.

There were again certain varieties of paddy grown in Bengal and Assam which matured well even in standing water. These varieties were being harvested even with the help of boats. It may be possible to rear the fish in the Khazan farms practically throughout the year if these varieties were to suit the Gaon conditions and give a normal yield of paddy.

The Portuguese Laws had imposed certain restrictions on the fishing of paddy in the Khazan farms. If water was to be taken in a farm for rearing the fish, it was obligatory on the part of

¹ The Sugarcane - A.C. Barnes, p. 116.

the owner to pay to the Government half the value of the fish realized because the river water and the fish entering the farm through it, was considered to belong to the Government. Another law as we were told prohibited the use of nets below a certain size of the mesh. This came in the way of catching the small fish. The types of fish available in the drains were the pawns and the mullets and not all the fish could grow big in size. The small fish had to be left out of the catch and it decayed in the farm after the drains dried. The zoology of the fish and the details of the fish fauna in Goa being, however, not known, it was not possible for the Fisheries Department to give a due consideration to this.

The control of snails

The snails bred in the tanks and ponds used for irrigation and they entered the farms growing the Waingan crop through the irrigation water. The presence of snails in a farm affected the germination of seeds because of certain secretions emitted by them. The snails, however, could not survive when they came in contact with salt water. Salt water was, therefore, being made use of to control the snails in certain villages in Goa. This was achieved by admitting salt water in the snail infested farms once in 12 to 15 years. In most of the cases admission of water into the Waingan farms was possible only by admitting water through the Khazan farms. The adoption of this practice, however, largely depended upon the extent of nuisance and the traditions developed in the different villages. There was no need for following the practice in the Cumbharjua island as the farms were irrigated by water through the temporary wells, which dried up in summer. The snails were being picked up manually at Borim and none of the farms except the Adulse Khazan was flooded with salt water in the past for the purpose. The breakages in the bunds had also served the purpose of killing the snails in many of these farms. The practice was, however, largely followed in the village Marcaim where there was a great nuisance from these snails. Salt water was purposely admitted in the Bar, Amre, Adan and the Karanzal Khazans once in the last 11 to 15 years. There was an urgent need in the opinion of the farmers to admit water in the Bar and the Amre Khazans as quite a long period had elapsed after the salt water was admitted into these farms. Modern methods of snail control were, however, not known to these farmers.

Formation of the pan

We were told that the productivity in some of the Khazan farms was dropping down due to the formation of a pan. For want of any technical investigation, however, it was not possible to detect what types of pan existed in the Khazan farms. The pan formation was locally known as 'Marig'. This was reported in only two of the surveyed farms viz. the Teer Khazan and the Kundaikar katar at Cumbharjua. Whatever may be the type of pan, remedies were available for removing all types of pan.

WAINGAN LAND RESOURCE AND ITS UTILISATION

The waingan resource is spread over the entire territory as noted in an earlier chapter. Because of the varying availability of the sources of irrigation, however, there is a considerable variation in the availability of this resource in the different zones and even in the villages within a single zone.

Important features of a Waingan farm

As in the case of the Khazan farms, the Waingan farms in Goa have also limitations of boundaries and distinct characteristics of their own. A Waingan farm depends entirely upon its source of irrigation as a Khazan farm depends upon its bund. The area of a Waingan farm, therefore, largely depends upon the nature of the source of water, the quantity of water available through the source and the topography of land around the source. It is these features of the sources of irrigation that make the difference between the different Waingan farms even in a single village. Each farm differs from the other in certain respects and each farm carries a separate local name. The individual plots in a Waingan farm are, like the Khazan farms, cultivated by one or a number of cultivators depending upon its size, ownership etc.

Selection of the Waingan farms for the survey

Since the nature of this resource varied in the different zones and depended upon the source of irrigation, it was decided to select four villages to represent the different zones and the different sources of irrigation. The village namely Morjim (Pernem taluka) was selected to represent the conditions obtained in the coastal villages having the temporary wells as the main source of irrigation. The village, namely Loutolim (Salcete taluka) was selected to know about the conditions in the interior villages in the coastal zone having the temporary wells as well as tanks as the chief sources. Marcaim (Ponda taluka) was selected to represent a village in the central part of the territory wherein big tanks, bandharas, ponds as well as wells had made it possible to have a large area under the Waingan cultivation. The fourth village namely Cudnem (Bicholim taluka) was selected to know about the conditions in the villages in the hilly areas wherein bandhara irrigation was possible on a large scale.

It was, however, difficult to make any ideal selection in these respects because of very large variations within a single zone. Quite diverse conditions could, therefore, be seen in some of the selected villages and their adjoining parts. The presence of only one tank, for example, characterised the Waingan cultivation at Morjim though there were many villages on the coast which had fairly big tanks. Similar was the case from the hilly area where bandharas formed the main source of irrigation. Tanks and wells did form the sources in the interior areas although on a small scale. However, inevitable in view of the village variations.

35 farms at Morjim, 5 at Loutolim and Cudnem. All the farms in a village were surveyed however, not all were immersed in water.

They was similar to the one adopted for

the study of the Khazan farms. The farms were surveyed partly by the case study method and partly through a schedule designed for an entire farm. Schedules were also filled for a few of the cultivators in each farm to note the cultivation practices adopted by the individual farmers in a particular farm. Generally two cultivators were selected from each farm by selecting one cultivator tilling the land near the source of irrigation and the other away from it. In case of small farms only one cultivator was selected per farm. It was, however, not possible to contact any cultivator where the cultivators had migrated out for seasonal employment. This restricted the number of cultivators available for the enquiry to 5 at Morjim, 8 at Loutolim, 23 at Marcaim and 14 at Cudnem. The total number of cultivators, thus, came to 50. The data from these enquiries have been analysed in the following sections as well as in a later chapter.

The names¹ of the selected farms have been given below.
Table 6.1 : Names of the selected farms

<u>Village</u>	<u>Names of the selected farms</u>
Morjim	Taê Shet, Khazani, Dhuval, Barpaye, Jagam-ati, Shelacha-tala and Katupan.
Loutolim	edde(Comunidade), Kotaro, Khazan-waingan Virkhonde, Xedde(Private).
Marcaim	Satak, Matul-kas, Kas, Votti, Keval, Karanzal, Kolamb-Ambari, Vatti, Paratangothar, Dyutali, Lavel, Khune, Khallagan, Aadverik.
Cudnem	Varsheti, Khunaye(including Erik, Malavate, Phankul), Aakh, Kole-Khazan(owned by Borker) Kole-Khazan(including Kothayo and owned by Pednekar and Gaonkar), Bonagi, Digane-shet, Kudgo, Nandivale

Ownership pattern

Out of the 7 farms at Morjim, only the Taleshet Waingan was owned by a temple whereas the remaining farms belonged to certain groups of families numbering 2 to 10 per group. Three of the farms at Loutolim also belonged to the groups of families. Out of the remaining two farms the Xedde(Comunidade) belonged entirely to the Comunidade whereas the Virkhonde farm was owned by the families as well as the Comunidade. There were practically three demarcated parts in this farm, out of which one was owned exclusively by the Comunidade, the other by a group of families whereas in the third part the Comunidade had the right only to the Kharif crop and the Waingana crop belonged to certain families. None of the farms at Marcaim belonged to the families in the village. As many as 12 of the 14 farms were owned exclusively by the Comunidade; the Kas Waingan was owned by a temple whereas the Keval Waingan belonged to both. In Cudnem again, 7 of the 9 farms were owned by the groups of families. The Akha and the Kudgo Waingans were owned jointly by the groups of families and the institutions as the Comunidade in the former case and a temple in the latter. The sources of irri-

1. Some of the large sized farms at Marcaim and Cudnem consisted of a number of homogenous sub-farms which have separate names. For the purpose of this enquiry, a farm itself represented all the homogenous sub-farms.

consist of a rope fixed on the top of the door & used to pull the door up & down

gation, however, belonged to the Comunidade in both cases. As in the case of the Khazan farms, in the Waingan farms owned jointly by a group of families, the individual families held rights to certain portions of the incomes from the farms and not to any demarcated areas. There were, however, a few exceptions to this as at Morjim wherein even the parts owned by the different families were demarcated in the farms.

Sources of irrigation

Four of the seven farms at Morjim received irrigation through the temporary wells (Vondakas). The Dhuval farm was irrigated by a pond whereas the Khazani and the Katupan farms were irrigated by putting bandharas across the stream. Quite diverse sources of irrigation were available at Loutolim. The Virkhonde farm was irrigated by constructing a provisional tank in the part of the farm itself. Both the farms known as Xedde had a pond as the source of irrigation. The Khazan Waingan farm received bandhara irrigation whereas the Kotaro farm was irrigated by a temporary well. Similar was the diversity of sources available at Marcaim. Four of the 14 farms namely Votti, Keval, Vatti and Lavel were irrigated by constructing provisional tanks. The Karanzal farm which was also a Khazan farm, was irrigated by a bandhara as already noted in the earlier chapter. The Satak and the Kolamb farms were irrigated through small ponds whereas temporary wells formed the source of irrigation in the remaining 7 farms. Six of the 9 farms at Cudnem were irrigated by the temporary bandharas put across the streams. The Varsheti farm had also a bandhara as its source of irrigation but Waingan crop was not being grown in this farm for the present for reasons which will be discussed later. The Bongai and the Digne farms were irrigated by springs. Out of the 35 selected farms, 11 farms had thus, bandharas as the source of irrigation; 12 farms were irrigated by well water; two farms by springs; 5 farms by the water through the ponds whereas 5 farms were irrigated by the tank water.

All these sources of irrigation in the selected villages existed as far as the people remembered, since generations. There was, therefore, no addition to these sources at least during the last 50 years. The bandharas were, however, being put across the streams regularly every year and the wells were also being deepened every year to remove the silt deposited in them during the monsoon. The tanks were also being constructed regularly in the farms themselves by simply closing the outlet for the drainage of water. There were no such problems with the ponds which were practically perennial constructions.

Means of lifting water

There was no need for lifting water through the tanks and bandharas as water was readily available from these sources by the natural flow. In case of ponds, however, farms had to be irrigated by lifting water especially from the middle or at the end of the season according to the level of water in a pond. Water had to be lifted through the wells invariably from the beginning of the season itself though it was possible in a few cases to get water even from the wells by natural flow at the commencement of the season.

The means of lifting water through the ponds and the wells, was the traditional device known as the 'Lat'. The 'Lat' 1. consisted of a rotatory horizontal bamboo with a pan attached Andhra Pradesh at one end and a heavy stone at the other, the bamboo tural Economics, frame over the well. Once the operator 11, it automatically came up because

of the weight of the stone at the other end on the rotatory bamboo. The operator had to empty the pan in the irrigation channel and immerse it in the well again.

The 'Lat' formed the only device of lifting water till very late. A few oil engines and pumps were, however, distributed after the liberation. Pumps and engines could not be, however, observed in any of the villages selected for this survey. Enquiries were, therefore, made in two villages, namely, Chandur in Salcete taluka and Bettivere in Bardez taluka, where such pumps had been installed. The pump distributed at Chandur was installed for lifting water through the Paroda canal for irrigating a coconut garden on the upper side of the canal. It was possible to use the pump very satisfactorily as there was a continuous flow of water through the canal. The pump distributed at Bettivere was being used for lifting water through three temporary wells for irrigating three-fourth hectare of irrigated paddy in the Aakh Waingan in the Ambekhan Khazan in this village. It was possible to irrigate this farm by the natural flow till the middle of December but water had to be lifted by a 'Lat' thereafter. The experience of the four farmers who were cultivating this farm indicated that they could save their labour by substituting the pump for their traditional 'Lat' but they could operate the pump only for half to one hour over a well as the rate of recuperation of water in the wells could not cope up with the rate of discharge through the pump. It was, therefore, difficult to irrigate the remote parts of the farm by this pump. This group of farmers, therefore, expressed an opinion that unless the wells were deepened and broadened it might not be possible to use machinery for lifting water as the wells were dug to suit not the machines but the traditional 'Lat'. The depth of wells everywhere in Goa varied from 5 to 10 feet and the breadth from 8 to 10 feet only.

The use of filter points was another remedy for lifting the underground water from lands having a shallow water table and a sandy sub-stratum. Normally, 10 to 12 thousand gallons of water could be made available by erecting such a device. It cost only Rs.350 to Rs.400 for erecting a filter point besides the cost of the pump and the engine. The filter points could be used not only for irrigating the Waingan crops in Goa but also for providing a few supplementary irrigations to the Kharif crop if the dry spells during the monsoon continued over longer periods.

Such filter points are being largely used in the Cauvery basin and parts of South and North Arcot districts of Madras State and they are also becoming popular in Kerala.¹ Nowhere had such filter points been tried in Goa.

Size of the farms :

As in the case of the Khazan farms it was also difficult to determine the size of the Waingan farms for want of any land survey. The size of a Waingan farm was reckoned by the villagers by the total quantity of seeds required for sowing in the farm. Use was, therefore, made of this knowledge of the farmers in determining the approximate size of a farm. Usually, 30 Gudavs of seeds were required for sowing one hectare of the Waingan land. It was, thus, possible to arrive at an approximate size of a farm from the quantity of the seeds sown

1. Report on outstanding agricultural practices in Andhra Pradesh, Gujarat and Punjab - Indian Agricultural Research, New Delhi pp.90-92

consist of a rope fixed on a post & no part of it is used

and the general seed rate. The selected farms have been classified according to their size in the table below.

Table 6.2 : Classification of the Waingan farms by their size

Village	Size of the farms (in hectares)				Total number of farms
	5 and below	5.1 - 10.0	10.1- 25.0	25.1- 50.0	
Morjim	7	-	-	-	7
Loutolim	4	-	-	1	5
Marcaim	9	3	2	-	14
Cudnem	3	2	4	-	9
Total	23	5	6	1	35

The table would indicate that most of the farms were quite small in size when compared to the Khazan farms discussed earlier. Twentythree of the 35 farms fell in the lowest group having a size of 5 hectares or below. All the farms at Morjim and 4 of the 5 farms at Loutolim fell in this lowest size group whereas only one farm at Loutolim had a size exceeding 25 hectares. A majority of the farms at Marcaim also fell in the lowest group but yet there were 5 farms in this village, which exceeded 5 hectares in size. Two of these farms had sizes of 15 and 20 hectares respectively. A majority of the farms at Cudnem were relatively big in size and 4 of the 9 farms had even a size varying from 10.1 - 25.0 hectares.

The sources of irrigation and the size of the farms

The farms have been classified again according to their size and the source of irrigation in the table below.

Table 6.3 : Classification of the farms according to the size and the sources of irrigation

Source of irrigation	Size of the farms (in hectares)				Total number of farms
	5 and below	5.1- 10.0	10.1- 25.0	25.1- 50.0	
Well	11	1	-	-	12
Pond	5	-	-	-	5
Spring	1	1	-	-	2
Bandhara	5	2	4	-	11
Tank	1	1	2	1	5
Total	23	5	6	1	35

The table would indicate that all the farms irrigated by the ponds belonged to the lowest size group. But for one farm the same was the case with the farms irrigated by well water. Nearly half of the farms benefitted by the bandhara irrigation also belonged to the lowest size group whereas the size of the remaining 6 farms varied between 5.1 to 25.0 hectares. Four of the 5 farms receiving tank irrigation had a size greater than 5 hectares whereas only one farm had a smaller size. Majority of the farms receiving bandhara and tank irrigation were, thus, bigger in size when compared to those receiving well and pond irrigation. At the same time, it is significant to note that bandhara and tank irrigation was existant even on farms which were quite small in size.

Owner and tenant cultivation

All the farms at Marcaim and Cudnem were cultivated by the tenants. Owner cultivation prevailed in only two of the 5 farms at Loutolim and 3 of the 7 farms at Morjim. One of the Waingan farms at Loutolim which was a very small farm, was cultivated entirely by the owner. In the other Waingan farm however, some of the parts owned by the owners, were cultivated by themselves whereas some owners had rented out their parts. A few of the owners in this farm cultivated only the Waingan crop as the right to grow the kharif crop in this farm vested with the Comunidade. One farm at Morjim was cultivated by the two families which owned it whereas in other two farms some of the owners were cultivating the parts they owned whereas the others had rented them out.

Number of cultivators per farm

The number of cultivators per farm varied from 1 to as many as 70 according to the size of the farm. The farms have been classified according to the number of cultivators tilling in a farm in the following table:

Table 6.4 : Classification of the farms according to the number of cultivators tilling in the farms

Number of cultivators per farm	Morjim	Loutolim	Marcaim	Cudnem	Total
1-5	4	3	8	-	15
6-10	1	-	-	2	3
11-25	2	1	3	4	10
26-50	-	-	3	3	6
51-100	-	1	-	-	1
Total	7	5	14	9	35

In 15 of the 35 farms the number of cultivators per farm varied only between 1 and 5 whereas there were only 3 farms in which the number varied between 6 and 10. Two of these latter 3 farms were from the village Cudnem. In none of the farms in this village the number of farmers was below 6. In 18 nearly half of the farms, the number of cultivators below 10. In 16 of the farms, however, the

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between 11 and 50 and there was only one farm in which the number was round about 70.

Combination of the different types of paddy cultivation by those engaged in Waingan cultivation

The fifty cultivators who were available for this enquiry have been classified according to the types of paddy cultivation in which they were engaged, in the table below.

Table 6.5 : Classification of the cultivators according to the different types of paddy cultivation

Village	Number of cultivators engaged in -				Total number of cultivators
	Waingan cultivation only	Waingan and Khazan cultivation	Waingan and Marad cultivation	Waingan, Khazan and Marad cultivation	
Morjim	-	-	5	-	5
Loutolim	-	5	2	1	8
Marcaim	5	18	-	-	23
Cudnem	13	-	1	-	14
Total	18	23	8	1	50

Out of the 50 cultivators 18 cultivators were engaged solely in the cultivation of the Waingan resource whereas the others had combined Waingan cultivation with Khazan and/or Marad cultivations according to the availability of these resources in the villages. All the 5 cultivators at Morjim were engaged in Waingan and Marad cultivation as there were no Khazan lands in this village. Thirteen of the 14 cultivators at Cudnem were engaged solely in the cultivation of the Waingan resource whereas only one cultivator had a small plot of Marad land in addition. Five of the twentythree cultivators at Marcaim were engaged purely in Waingan cultivation whereas 18 cultivators held lands in Khazan farms also. None of the selected farmers was engaged in Marad cultivation, even though there were some Marad farms in this village. At Loutolim, however, all the 8 cultivators had combined different types of cultivation. Five and two of them were engaged in Khazan and Marad cultivation respectively in addition to the Waingan cultivation whereas one cultivator had combined all the three types.

The proportion of cultivators engaged solely in the Waingan cultivation was on the whole small when compared to the proportion of cultivators solely in the Khazan cultivation. This was true in all the villages except in the village Cudnem where the Waingana resource was the main available resource. It, therefore, seems that even though many farmers could pull on with the cultivation of the Khazan lands alone, it had become necessary for many farmers cultivating in the Waingan farms to search for some other land resource. This may be due to the water demand for the Waingana resource as noted in the earlier 1. ~~Andhra Pradesh~~ and consequently the smaller size of the Waingan tural Economics, P

Average size of the holdings

The average size of the holdings cultivated by these farmers in respect of the three types of cultivation are given in the table below.

Table 6.6 : Average size of the holdings in respect of the Khazan, Waingan and the Marad cultivation

Village	Average size of the holdings in respect of-			Average size of the total holding
	Waingan cultivation	Khazan cultivation	Marad cultivation	
Morjim	0.44	-	0.61	1.06
Loutolim	0.31	1.22	0.30	1.74
Marcaim	0.38	0.69	-	0.92
Cudnem	0.58	-	Negligible	0.58

The average size of the Waingan holding varied from 0.31 to 0.58 hectares in the selected villages. The size was the least at Loutolim where the Waingan resource was available on a limited scale but where the Khazan and the Marad resources existed on a large scale. It was the largest at Cudnem where there were a number of big Waingan farms but where the Khazan land resource was absent and the Marad resource was available on a limited scale. The other two villages stood in between these. The average size of the total holding was consequently the largest at Loutolim and the smallest at Cudnem with the other two villages, standing in between these. The average size of the Khazan and Marad holdings exceeded the average size of the Waingan holdings in all the villages except in the village Loutolim where the average size of the Marad holding was somewhat smaller than the size of the Waingan holding.

Fragmentation of the Waingan holdings

Many of the cultivators engaged in Waingan cultivation held plots in more than one Waingan farm. The cultivators available for this enquiry have been classified in the following table according to the number of farms in which they held their plots

Table 6.7 : Classification of the cultivators according to the number of farms in which they held their plots

Village	Number of cultivators holding plots in				Total number of cultivators
	One farm	Two farms	Three farms	Four farms	
Morjim	5	-	-	-	5
Loutolim	7	1	-	-	8
Marcaim	13	9	1	-	23
Cudnem	8	2	3	1	14
Total	33	12	4	1	

Nearly two-third of the cultivators were cultivating in single farms whereas about one fourth of them were holding plots in two farms. The number of cultivators cultivating in two or more farms was large only in Marcaim and Cudnem where there were a large number of Waingan farms. Four of the 14 cultivators at Cudnem were cultivating even in three or more farms.

Uncultivated Waingan Farms

Only one of the selected farms, viz., the Varshet Waingan at Cudnem was remaining uncultivated in the rabi season. This farm was being used for Waingan cultivation about 50 years ago but the practice had to be abandoned later because of the rise in the level of the farm due to silt deposition. It was, therefore, impossible to irrigate the farm by flow irrigation. The farm was, however, situated near the main stream in the village as well as near the canal carrying water from a bandhara to the other farms. It was, therefore, possible either to lift the water from the stream or use canal water by connecting the farm to the canal through a channel as the canal was already at a higher level. Laying out of the channel however, involved certain difficulties. As the canal was at a much high level with a low lying land surface between the farm and the canal, the channel could be laid only by constructing a wall between the farm and the canal. The soils being at the same time excessively drained, the only remedy was to build a wall of cement and lay the channel over it. This being, however, costly no attempts were made in these directions. The farmers had at the same time no knowledge about the use of polythene paper or nonerodable plaster described in the earlier chapter. The use of oil engines for lifting water was also quite new to them. One of the farmers had made an attempt to secure an oil engine and a pump on credit but the owners were not prepared to mortgage their land. In view of these difficulties, it had not become possible to use this farm even though the farmers had a desire to grow a Waingan crop therein.

Partial utilization of the Waingan farms

Except for two of the farms namely the Bonagi farm at Cudnem and the Satak farm at Marcaim, Waingan crop was being grown over the entire areas in the other farms. The uncultivated part in the Bonagi farm was situated near a spring and was also low lying. Water, therefore, stagnated in this part practically for eight months in a year. The farmers tilling in this farm were of the opinion that if a regular tank was to be constructed in a corner of the farm, it would be possible to bring a large portion of this part under Waingan cultivation. The uncultivated part in the Satak farm was at a higher level when compared to the tank and it was, therefore, not possible to irrigate the part by natural flow like the other parts. The part was, however, lying uncultivated in the rabi season since the past. Digging wells and lifting water were the only remedies to grow a second crop in this part.

The problem of silt deposition in the Waingan farms

Because of the hilly nature of the terrain in Goa, the soils were subject to heavy erosion during the monsoon. The eroded material flowed to the Waingan farms through the irrigation water and got deposited in the farms. Deposition 1. ~~hence~~ thus, took place practically in every farm except in Andhra Pradesh farms in the village Cudnem where the irrigation tural Economics, ~~part~~ of these farms.

Deposition of silt in fact proved to be a boon except in those farms in which the farm levels coincided with the levels of the lands at the sources of irrigation. The problem, had, therefore, become severe in the farms which were being irrigated by constructing provisional tanks in the parts of the farms themselves. So was the case with the farms lying close and parallel to the streams and irrigated by putting bandharas on the same streams. In case of such farms, the cultivators were, therefore, compelled to remove the silt and adjust the levels in the farms practically every year to irrigate the farms by natural flow.

A practice had developed to heap the silt at convenient places in the farms and a number of such heaps of about 10 feet diameter had been formed in some of the farms. The heaps, locally known as 'Bohlas' or 'Avadis' were auctioned by the owners for planting coconuts and bananas. Since this practice reduced the area available for paddy cultivation in a farm, the Portugese Government had to ban the creation of new 'Avadis' sometime in the past and ask the farmers to throw the silt on the existing heaps or on the boundaries of the farms.

The problem of silt deposition was very severe in Marcaim where the silt had to be removed practically every year from every farm. The heaps of silt had occupied certain portions in 9 of the 14 farms irrespective of the nature of the source of irrigation for these farms. At Morjim the silt had to be removed from only two of the five farms. The silt was being thrown on the existing heaps in the Katupan farm whereas it was being thrown on the boundaries in case of the Khazani farm. Removal of silt in Loutolim had become needful only in the case of the Virkhonde farm which was being irrigated by a provisional tank. Here again Avadis had been formed in the farm since the past and the farmers were throwing the silt on these Avadis. There was no need for removing the silt from any of the farms at Cudnem as the canals irrigating these farms flowed over a much high level when compared to the levels of these farms. There was yet one heap of silt in the Nandiyale farm which must have been formed some time in the past.

In none of the cases except in the owner cultivated Virkhonde and the Khazani farms the farmers themselves could make use of the silt they had to remove from the farms. It is the owners who derived the benefits from this silt for planting crops as banana and coconut giving a steady flow of income for a number of years. Even with the tenancy legislation the ownership of the 'Avadis' and the bunds along the farms remained with the owners. In the opinion of the farmers, there was scope for creating additional subsidiary bunds in the farms or for broadening some of the existing bunds, for planting coconuts and bananas. This, however, needed joint ownership or joint cultivation of such bunds if they were to accrue equal benefits to all the cultivators tilling in a farm.

Utilization of the Waingan farms in the Kharif Season

Quite contrary to the general belief, there were certain irrigated farms in Goa which had to be kept idle in the Kharif season. Kharif paddy was not being grown in 2 of the farms at Morjim and in as many as 6 of the 9 farms at Loutolim. A part of the Kudgo farm at Cudnem was, however, being used for planting coconuts and bananas.

cultivation even in the Kharif season.

The reason for non-utilization of these farms in the kharif season was the stagnation of water in them. The courses of water at Cudnem viz. the Shasta river and the Dhadya nala carrying the drained out water from the farms to the tributaries of the Mandovi river, were so narrow that it impeded the free flow of water through them especially in the monsoon. This was resulting in frequent flooding in these farms since the beginning of the season itself and consequently in the rotting of the crops. Similar was the problem with the two above mentioned farms at Morjim which were lying along the streams and were also low lying.

All these farms were remaining uncultivated in the kharif season since at least the near past. In the opinion of elderly farmers in the village Cudnem the problem was not so severe in the past as it was now. According to them and the stories told in the village, a kharif crop was being grown at least in some of the sub-farms within these farms, in the remote past. It was, in their opinion, due to the encroachment of the owners of the coconut gardens along these water courses that obstructions had been created to the free flow of water through these courses. The owners had been always making attempts to extend the areas of their coconut gardens for fresh plantations by throwing silt on the banks of these water courses. This had resulted in making the courses narrow at certain places and in impeding the free flow of water. The recent reclamation of the Khazan lands in a nearby village namely Amoné, was also said to have aggravated this problem. The number of sluice gates provided in the past for the quick discharge of water through some of these farms was, therefore, proving inadequate day by day. As an immediate measure, it was, therefore, necessary according to these farmers to increase the number of gates as well as reduce their sil levels to bring at least the peripheral portions of some of the farms under cultivation in the kharif season.

This is, however, only a partial remedy to reduce the gravity of the problem. Quite different methods have been evolved in the other parts of the country as well as in the countries in South East Asia where the farmers have to face a similar problem. A number of varieties of paddy have been evolved in India which can be grown even under 8 to 10 feet of standing water. It is a common practice in the flood affected parts of Andhra Pradesh, Assam, Bengal, Bihar, Orissa, Madras and Uttar Pradesh to grow certain varieties of paddy in the fields subject to constant flooding. In the Collaire lake in Andhra Pradesh, for example, which gets submerged by floods during June-July upto 10 feet, the cultivators are able to grow a good crop of paddy. ^{1/} Such varieties are sown before the monsoon and the crop grows continuously in standing water. No weeding or any intercultural operations are needed for the crop. The crop is harvested in standing water itself through the use of boats. These varieties yield a good crop but paddy straw is lost as it gets mixed with mud. It is later incorporated in the soil to serve as manure. Besides the crop of paddy, the method also enables fishing in these farms and yields a good catch of fish after the harvest of paddy. The different

1. Report on outstanding agricultural practices in Madras, Andhra Pradesh, Gujarat and Punjab - Indian Council of Agricultural Economics, p.10.

improved varieties of deep water paddy used in some of the State in India have been noted in the table below. It would be worthwhile to select and try some of these varieties to know how they suit the Goan conditions.

Table 6.8 : Improved varieties of deep water or flood resistant paddy in the different States in India

<u>State</u>	<u>Improved varieties</u>
Andhra Pradesh	PLA 2, 3 and 4 (Burma Akkulu)
Assam	Kmj. Ar. 108-1, Kmj.Ar.G.353-148, Kmj. Ar.G. 614-25B
Bihar	BR-14, BR-15
Orissa	FR 13-A, FR 43-B
Madras	MTU 16, PTB 15
Uttar Pradesh	Dudhalchi, Jaisuria.

(Source:Compiled from - Hand Book of Agriculture- Indian Council of Agricultural Research and other sources).

Adequacy of available water for the Waingan crop

The adequacy of the water available for the Waingan crop varied from one village to the other and even from one farm to the other within a single village. The supply of water was proving to be inadequate in as many as 6 of the 7 farms at Morjim. It is only in the Dhuval farm irrigated by a pond that the supply was adequate. The problem was, however, being managed by deepening the existing wells at the end of the season in case of the four well-irrigated farms and by digging temporary ditches near the bandharas in case of the two bandhara - irrigated farms. At Loutolim, the inadequacy of water was being felt only in the Khazan-Waingan and the Virkhonde farms. In the Virkhonde farm, however, nearly one-sixth of the area was receiving regular irrigations. Except for this patch of land in the Virkhonde farm, the farmers in these two farms were unable to irrigate their crops for nearly a month by the end of the season. They were being compelled to leave the crop at the mercy of nature and face the situation at the cost of even a low yield. The Virkhonde farm yet formed the major resource for Waingan cultivation in the village.

The problem was also somewhat severe in case of 7 of the 13 farms at Marcaim. In two of the farms namely the Matulkas and the Partango-than farms irrigated by wells, the problem was being faced by deepening the wells and reducing the frequency of irrigation. Irrigations at long intervals was the only remedy for the Khune farm which was also irrigated by a well. In case of the Votti and the Lavel farms irrigated by a pond and a tank respectively, the practice was to supplement the water through the wells whereas in the Kolamb and the Votti farms, also irrigated by a pond and a tank respectively, the farmers were compelled to irrigate the crops at larger intervals at the end.

There was no problem about the shortage of water at Cudnem where the water was available in plenty. Water was, however,

proving to be inadequate in case of only one farm, namely the Kole-Khazan (Borkar) farm as this farm was situated near the end of the canal. Here also the farmers had to face the shortage of water at the cost of the yields which were distinctly lower when compared to the yields from the other farms.

Availability of water after the harvest of the Waingan crop

Despite this shortage of water for certain farms, water actually remained unused even after the harvest of paddy in the other farms. In some of the farms in which water was proving to be inadequate, some quantity of water became available after the harvest of paddy because of the recuperation of water. The quantities available thus, were being used for preparing the land for the sowing of the next Kharif crop.

Some quantity of water thus, remained in the two ponds irrigating the Xedde farms and the well irrigating the Kotaro farm at Loutolim. The water available through the ponds was not put to any use whereas the water from the well irrigating the Kotaro farm was used for preparing the land for the Kharif crop. So was the case with 10 of the 14 farms at Marcaim. The water remaining at the sources irrigating these farms was made use of exclusively for preparing the land for the kharif crop. The conditions in the village Morjim were, however, very severe in these respects as the sources nearly dried up after the harvest of the Waingan crop.

The village Cudnem was an exception in these respects and water was available in fact in great abundance for the farms known as the Khuniye (including the Erik, Halavate, Phankul parts), Aakh, Kole-Khazan (Pednekar), Bonagi and the Kudgo farms. No attempts were being made to utilise this surplus water and it flowed down to the rivers.

Wastage of water

Percolation of water was a great problem practically everywhere in Goa as most of the types of soil as noted earlier were highly drained. This was resulting in the inadequacy of water for some of the farms. At the same time but for this percolation, there would have been an abundant supply of water for the other farms. The shortage of water in the Virkhonde farm at Loutolim was due to heavy percolation of water through one of the sides of the tank formed by a village road. So was the case with the ponds and the tanks irrigating the Satak, Votti, Keval, Kolamb and the Vatti farms at Marcaim. This was the main reason for the inadequacy of water for the Votti, Kolamb and the Vatti farms. Though the inadequacy of water was not felt in Cudnem there was also a great loss of water due to the seepage of water through the canals irrigating the Khuniye, Aakh, Kole-Khazan (Pednekar) and the Kudgo farms. This wastage was resulting in the shortage of water for the Kole-Khazan (Borkar) farm. No specific indication about the percolation could be obtained in the village Morjim as the farms were irrigated only by wells and small bandharas.

In the opinion of the farmers cultivating these farms, it was necessary to build up certain portions of the ponds, tanks and the canals in cement. This, however, involved very high cost. The use of polythene paper or the non-erodable plaster made from bitumen or Janata Emulsion as mentioned earlier was not known to these farmers.

Utilization of the Waingan farms after the harvest of the Waingan crop

It would be evident from the above discussions that if the wastage of water was to be stopped, a considerable amount of water would be available for some other use after the harvest of the Waingan crop. Combined with the volume of water already remaining unused after the harvest of paddy in some of the farms and the potential for the development of the water resources, it would provide a great scope for the intensive use of these lands all the year round.

The common practice in the other parts of the country as well as in the countries in South East Asia having a similar problem was to grow three crops of paddy in succession or to rotate a green manure crop with two crops of paddy. The practice of triple cropping by using water from the wells, ponds and the streamas was quite common even in the nearby district of South Kanara itself. A survey conducted by the Gokhale Institute of Politics and Economics in one of the coastal villages in this district showed that paddy lands were so intensively cropped in the village that the percentage of the gross cropped area to the net paddy area worked out to 210 per cent. The winter crop was grown on 82 per cent of the land in addition to the monsoon crop and the summer crop was grown on 28 per cent of the land in addition to the two earlier crops. 1/ This was achieved mainly with the help of well and pond irrigation and the use of the traditional water lifting devices. Surprisingly, the average yield from the summer crop was found to be even larger than the average yields from the monsoon and the winter crops. The average yields from these three crops and their harvesting seasons have been given in the table below. 2/

Table 6.9 : Average yields of the monsoon, winter and the summer paddy crops and their harvesting seasons in the village Paduthonse in South Kanara district

Crop	Yield per acre (Bengali maunds)	Harvesting season
Monsoon	15.2	1st week of October
Winter	12.6	1st week of February
Summer	18.3	2nd week of May

The winter and the summer crops were short duration crops. There were certain reasons for the lower yields in the monsoon and the winter seasons. The summer yield was, however, quite high when compared to the average per acre yield of paddy elsewhere.

Where the water proved to be inadequate for the summer crop of paddy, a practice had developed in the other parts to grow either a green manure crop or a pulse crop in summer. These practices were, for example, largely and successfully

1. Survey of economic change in rural areas : Village Paduthonse, (1958-59) (unpublished), A.R.Rajpurohit, Agro-Economic Unit, Gokhale Institute of Politics and Economics, Poona, p.194
2. Ibid., p.214-

followed at the Chidambaram University Experimental Farm. So also a practice had developed in Taiwan to intercrop sweet potato with the second crop of paddy to put the land to some use in summer with the available water resource. Sweet potatoes were being grown in separate fields in Goa.

It is needless to emphasize that the adoption of similar practices had also great scope under the Goan conditions. The Khuniye farm at Cudnem including the Erik, Halwate and the Phanakul farms offered excellent opportunities to try out the practice of triple cropping of paddy. The Bonagi, Aakh, Kole-Khazan (Pednekar) and the Kudgo farms which grew only one crop of Waingan paddy also offered opportunities for growing a summer crop on similar lines. The Khuniye farm including the other sub-farms, produced about 1000 khandis of kharif paddy, and about 2000 khandis of Waingan paddy. In the opinion of the farmers cultivating in these farms, they expected to get an additional yield of 2000 khandis from summer paddy i.e. an increase of at least 60 per cent in their annual paddy production, if they were to grow a third crop in this farm. We were told that an attempt was made in the past to grow three crops of paddy in a farm in a village namely Shivolim in Bardez taluka. This had also resulted in giving very encouraging results but the people did not continue the practice on the ground that it might reduce the soil fertility. There were, no doubt, certain difficulties in the introduction of this practice in Goa and they pertained to the selection of the paddy varieties, methods of sowing, use of manures, organizational problems etc. These will, however, be discussed in a later chapter.

Utilization of the surplus water for irrigating the adjoining lands

The areas of the Waingan farms had been defined in these villages by the tradition. The existing surplus of water in some of the farms or the surplus that would be available through checking the percolation of water in the others, indicated possibilities of extending the boundaries of these farms even beyond the existing limits on the catchment side as well as in the valley portions. This no doubt would depend upon the extent of the surplus, the type of land available nearby and the means available for carrying water to the adjoining lands. It would also need a detailed technical investigation into the matter. In spite of such an investigation, the present survey and the discussions with the farmers cultivating in the selected farms brought out some indications about the use of water for the adjoining lands.

If the percolation of water through the canals irrigating the Khuniye, Aakha, Kole-Khazan (Pednekar) and the Kudgo farms at Cudnem was to be checked it would enable an all the year round irrigation for the adjoining lands besides the use of these farms for summer cropping. These farms were, however, surrounded by coconut gardens and land was not available for growing any irrigated field crops through the use of this surplus. The coconuts being grown without the use of irrigation, there was scope for irrigating the coconut gardens and even inter crop these gardens with other suitable crops. The canals were, however, owned by the comunidade in this village whereas the coconut gardens belonged to certain groups of families. This, therefore, involved some agreement between the parties concerned in the use of water. The case with the Bongai farm (including the Salwai Waingan) in the same village was, however, entirely different. A considerably big patch of Marad land known as the Karwal marad was available on one

side of this farm. It was cultivated by about 30 families and in their opinion it was possible to lift water accumulated in the part of the Bonagi farm to a height of about 40 feet for using it for supplementary irrigation for the kharif paddy grown on this land as well as for growing a Waingan crop on the same land. A similar attempt was already made at Bicholim quite lately and water was being pumped to a height of about 80 feet to grow a second crop on the Marad lands.

There was a surplus of water or at least a potentiality for creating a surplus in as many as 10 of the 14 farms at Marcaim. Most of these farms were, however, being irrigated by temporary wells and the scope for using the surplus was, therefore, limited only to small patches of land in the adjoining Khazan or the Ker farms or the coconut gardens. There was already the uncultivated part in the pond irrigated Satak farm which could be brought under Waingan cultivation by the use of the surplus available through checking the percolation from the pond or sinking wells in the uncultivated part. There was a possibility of using the surplus available from the tank irrigated Votti farm for irrigating an area in the Brahmipur Khazan farm. In case of the pond irrigated Kolamb farm, it was possible to use the surplus for irrigating a small patch in the Amre Khazan farm. So was the case with the Khallagan farm and it was possible to extend irrigation through the wells irrigating this farm to a small patch in the Adverik Khazan farm or to the coconut gardens near the water source.

Quite a small surplus was available from the two ponds irrigating the Kedde farms at Loutolim. There were, however, possibilities of increasing this surplus as well as extending irrigation to the nearby Khazan farms. The possibilities for any such effort in the opinion of the farmers at Morjim were somewhat limited in this respect as there was already a shortage of water for most of the farms.

In addition to the extensions of the present areas of Waingan cultivation, the high water table was itself a boon from the point of bringing very large areas under Waingan cultivation in Goa. It was possible to sink wells for irrigating many of the Ker and the Khazan farms if the farmers were to adopt the idea of lifting water mechanically for the cultivation of paddy. Experience in the village Paduthonse in the South Kanara District in which the conditions were similar to those as obtained at Morjim, indicated that it was possible to grow even three crops of paddy with the help of well irrigation. The device used by the farmers for lifting water in this village was again the traditional device similar to the one used in Goa. Because of the highly drained soils, the water used for irrigation percolated into the wells and it was again available for irrigation. There seems to be, therefore, a great scope even in the coastal villages in Goa to extend well irrigation on a large scale with the use of modern means of lifting water such as the pumps and the filter points which are now available.

The problem of paddy snails

The problem of paddy snails as discussed in the earlier chapter was quite common especially in the farms irrigated by tanks, ponds and wells. Snails were present in practically every farm at Marcaim except in the Karanzal and the Adverik farms irrigated by bandharas. Salt water was being admitted in these farms once in 12 to 15 years to kill these snails. The problem of snails was being faced by the farmers cultivating in the Taleshet farm at Morjim by applying turmeric powder

to the seeds before sowing. Snails were present on a small scale in the Katupan farm in this village and they were being picked up manually. There were no snails in the remaining four farms in this village. The problem of snails was not very severe in Loutolim and Cudnem and the snails present in some of the farms in these villages were being picked up manually. It was a practice at Cudnem to collect the snails for consumption as a food.

CHAPTER 7

MARAD AND DONGAR LAND RESOURCE AND ITS UTILIZATION

The Marad and Dongar type of land as understood by the people exists practically everywhere in the Goan territory. Even the coastal villages are not free from small hills, hillocks and elevated plateaux. Hence considerable patches of either reclaimed or unreclaimed Marad and Dongar lands can be seen even in the coastal villages. In the interior, however, the 'borod' type of land or lands which are very shallow and practically barren and rocky are predominant and the typical Marad and the Dongar land exists only on the low hills and hillocks in the valleys formed by the ranges of the high mountains.

Characteristics of the Marad and the Dongar farms

The marad farms were usually flat and located either on the top or at the foot of the hills. The Dongar farms, however, covered essentially the slopes of the hills. Different types of soil existed on these slopes according to the degree of slope at different points. There were the highly eroded soils at certain points whereas there were exposed rocks at the others. There were shallow soils over a patch of the land whereas at places the soils were quite deep, fertile and high in humus content. Though a Marad farm usually contained soils of a uniform type the soils on a Dongar farm, thus varied greatly. As in the case of the other farms, the Marad and the Dongar farms were demarcated by the traditional boundaries. The plots in a farm were, however, owned and cultivated by the individuals.

Selection of the villages for Marad and Dongar cultivation

Because of the presence of the Marad and Dongar lands over the entire territory, the selection of the villages was restricted to only three villages, each representing the coastal, transitional and the interior belts. So also for the convenience of investigation, the selection of villages was restricted to only those villages which had been already selected for the survey of the Khazan and the Waingan lands. Accordingly, the enquiry was carried out in the villages, namely Loutolim, Marcain and Cudnem each representing the coastal, transitional and the interior belt respectively.

As in the case of the Khazan and the Waingan farms, the patches of Marad and the adjoining Dongar lands carried separate local names. Only parts of such big patches were brought under regular cultivation and hence the enquiry was restricted mainly to the owners of the Marad lands and not to those patches as a whole as in the case of the other enquiries. Attempts were made to contact as large a number of owners in each village as possible. Due to the problems of temporary emigration and the staying of some of the owners in the nearby towns such as Margaon, Ponda and Sancolim for example, it was not possible to contact all owners. The collection of data was, therefore, possible in case of 12 owners at Loutolim, 16 at Marcain and 8 at Cudnem. A few of these owners and the patches of Marad land were studied by the case study method whereas a schedule was canvassed for the remaining owners. The data from these enquiries have been presented in the following sections as well as in a later chapter.

Ownership Pattern

Unlike the Khazan and the Waingan farms, the Marad and Dongar farms were owned exclusively by the families in the selected villages. Though the institutions such as the Communi- dades and the temples owned patches of land belonging to this category, they had remained unreclaimed. In most cases, they served as the patches for grazing the village cattle or were covered by a natural growth of cashew and the other trees which provided fuel.

Reclamation of Marad land involved capital investment and it was, therefore, impracticable to lease in the unreclaimed lands for cultivation as in the case of the Khazan and the Waingan lands. Pieces of such land were being sold by these institutions from time to time. It is only the individual families which could purchase and reclaim such lands and then cultivate them either on their own account or lease them out for cultivation. Though a direct tenurial relationship had developed between the tillers and the institutions in case of the Khazan and the Waingan lands, it was absent in the case of the Marad and the Dongar lands.

Usually a fragment of the Marad land carried along with it a patch of Dongar land along some of its peripheries or along the boundary opening the Marad patch to a road. At places however, the Dongar type of land existed separately. Out of the 12 owners contacted at Lontolim only 5 owners had separate fragments of the Dongar land. At Marcaim, three of the 16 owners held these lands separately, whereas at Cudnem in 7 of the 8 cases there were separate pieces of Dongar land.

Acquisition of the Marad and the Dongar lands

Though the Khazan and the Waingan farms existed in the surveyed villages since generations quite a number of the Marad and the Dongar farms were reclaimed during the past few decades. The classification of the owners according to the periods of purchasing and reclaiming the lands in Table 7.1 speaks of this trend.

Ten of the 36 owners holding the Marad lands had purchased and reclaimed their holdings during the last 50 years whereas the remaining 26 owners held their holdings since generations. Only one of the owners holding the Dongar type of land as a separate fragment, had purchased it about 15 years back whereas all the remaining 14 owners holding such separate fragments held them since generations. A large number of the owners at Marcaim had acquired their holdings in the near past. The number of owners acquiring their holdings in the near past in the other villages was however, quite small. It may be recalled here that there was a relative abundance of both the Khazan and the Waingan resources in the village Marcaim. On the contrary, though the Khazan resource was available in the village Lontolim, the Waingan resource was available on a limited scale only. So also Waingan resource was the only resource available at Cudnem. It may be therefore, possible that the need to acquire the more accessible Marad resource might have been felt too late in the village Marcaim whereas the more accessible Marad resources might have been acquired in the other two villages in the remote past.

The proportions of the Marad and the Dongar areas brought under cultivation by the owners contacted for the enquiry, during the last 50 years may be noted from Table 7.2.

Table 7.1 : Classification of the owners according to the approximate periods of purchasing and reclaiming their Marad and Dongar holdings

Village	Type of land	Number of owners according to the period of purchase					Total No. of owners
		Years ago				Since generations	
		15	20-25	30-35	40-50		
Lantolim	Marad	-	-	2	-	10	12
	Dongar	-	-	-	-	5	5
Marcaim	Marad	1	2	2	2	9	16
	Dongar	1	-	-	-	2	3
Cudnem	Marad	-	-	-	1	7	8
	Dongar	-	-	-	-	7	7
Total	Marad	1	2	4	3	26	36
	Dongar	1	-	-	-	14	15

Table 7.2 : Proportions of Marad and Dongar lands brought under cultivation during the last 50 years

Village	Total area of the Marad holdings (hectares)	Area of Marad holdings brought under cultivation during the last 50 years (hectares)	Proportion of area in Col.3 to the area in Col.2 (per cent)	Total area of the Dongar holdings (hectares)	Area of the Dongar holdings brought under cultivation during the last 50 yrs. (hectares)	Proportion of area in col.6 to the area in col.5 (per cent)
1	2	3	4	5	6	7
Loutolim	13.70	2.20	16.06	6.70	-	-
Marcaim	7.95	2.55	32.68	5.66	0.75	13.2
Cudnem	6.32	2.10	33.23	15.16	-	-
Total	27.97	6.85	24.49	27.52	0.75	2.72

The areas under Marad lands in the table also include areas under small strips of adjoining Dongar lands whereas the areas under the Dongar lands include only those areas which can be separately classed as the Dongar type of land only. As in the case of the other enquiries, the size of the holdings in this case also had to be determined from the quantities of seeds required to sow these lands. In case of even the uncultivated pieces of Marad land and the Dongar lands, the size had to be determined by asking the owners about the quantities of seeds that would be required to sow these lands if they were to be treated as the cultivated Marad type of land. The seed rate adopted for these measurements was 40 cudavs of paddy per hectare.

The table would indicate that about 1/4th of the area under Marad cultivation was actually brought under cultivation during the last fifty years. This proportion however, worked out to about 1/3rd in Cudnem, even though only one of the owners had purchased the Marad land during the last 50 years.

The area brought under Dongar cultivation during the period was, however, insignificant if all the three villages are considered together. For the village Marcaim, this area formed about 13 per cent of the area under Dongar cultivation. It may not be proper to draw any firm inference from these proportions as the owners could not be selected on a random basis. What seems from this enquiry is that the areas under Marad cultivation have tended to rise during the last 50 years even though the areas under Khazan, Waingan and Dongar cultivation have been more or less static as noted earlier.

Owner and tenant cultivation

Though tenant cultivation was very common with the utilization of the Khazan and the Waingan resources even in case of the farms which were owned by the individual families, only a few of the owners of the Marad and Dongar lands had leased out their holdings. The practices of leasing out again, differed for each of the Marad and the Dongar type /resource./of

The general practice was to lease out only those parts of the Marad land used for field crops for the purpose of cultivation whereas in case of the Dongar lands and the pieces of dongar lands adjoining the Marad lands, the practice was to lease out only the cashew trees grown over them. We shall, therefore, consider these two practices separately. The number of owners leasing out their Marad holdings and the areas leased out have been noted in the table below.

Table 7.3 : Number of owners leasing out their Marad lands and the areas leased out.

Village	Total number of owners	Number of owners leasing out their Marad lands	Total area of Marad land owned (Hectares)	Area of Marad land leased out	Proportion of Marad area leased out to the total Marad area owned (per cent)
Loutolim	12	3	13.7	3.7	27.0
Marcaim	16	4	7.9	1.7	21.5
Cudnem	8	1	6.3	2.5	39.6
Total	36	9	27.9	7.9	28.3

The table would indicate that at Loutolim and Marcaim 1/4th of the owners had leased out their Marad lands and the proportions of land leased out to the owned land also worked out to about one fourth. Only one of the owners at Cudnem had leased out his holding but his farm being quite big in size, a similar proportion worked out to about 40 per cent for this village. From this greater degree of self cultivation in respect of the Marad land in relation to the Khazan and the Waingan lands, it seems that it must be the cultivating class which must have attempted to secure the ownership of these lands since the past.

The leasing out of the cashew trees in fact amounted to giving a contract for watching and harvesting the crop on a cash or a share basis, as these two were the only processes involved in the cultivation of the crop. Out of the 12 owners at Loutolim, only 4 owners had grown cashew trees on their holdings. One of them had leased out his 100 trees for a cash rent of Rs.150 whereas two others had leased out their trees on a share rent amounting to 2/5th and 1/2 of the produce. The fourth owner watched and harvested his crop on his own account.

Out of the 16 owners at Marcaim, 11 owners had grown cashew trees on their holdings. Only two of them watched and harvested the crop on their own account whereas the remaining 9 persons had leased out their trees on a share rent basis which varied from 1/3rd to 2/3rd of the produce. At Cudnem again 7 of the 8 owners had grown cashew trees. To the exception of the one who had leased out his trees on a share rent basis of 50 per cent of the produce, the others watched and harvested their crop on their own account.

Combinations of different types of paddy cultivation by the owners of the Marad and the Dongar lands

In noting the combinations, the combinations adopted by the self cultivating owners and those by the lessors will have to be considered separately. The self cultivating owners have been classified according to the different types of paddy cultivation in the Table below.

Table 7.4 : Classification of self cultivating owners according to the combinations of the different types of paddy cultivation

Village	Number of self-cultivating owners engaged in				Total number of self-cultivating owners
	Marad cultivation only	Marad and Khazan cultivation	Marad and Waingan cultivation	Marad, Khazan & Waingan cultivation	
Loutolim	9	-	-	-	9
Marcaim	6	3	1	2	12
Cudnem	3	-	4	-	7
Total	18	3	5	2	28

All the 9 self cultivating owners at Loutolim were engaged purely in the cultivation of the Marad land whereas about half of the owners at Marcaim and Cudnem were engaged in such pursuit. Like the cultivation of the Khazan land but unlike that of the Waingan one, a large number of the cultivators owning the Marad lands were, thus, engaged in one type of paddy cultivation only. Only a few of the owners at Marcaim had combined Marad cultivation with Khazan cultivation whereas a few at Cudnem had combined it with Waingan cultivation. It is only in two cases at Marcaim that all the three types were combined together.

Cultivation of coconut was, however, very common with the owners engaged in Marad cultivation in the villages Loutolim and Marcaim. Seven of the nine self-cultivating owners at Loutolim and five of the 12 at Marcaim owned coconut gardens in addition.

Those owners who had leased out their Marad holdings were also engaged in coconut cultivation. All the three owners at Loutolim who had leased out their Marad lands, owned coconut gardens. One of these owners had even leased in a plot of Waingan land for cultivation though he had leased out his Marad holding. Similar was the case at Marcaim where all the four owners leasing out their Marad lands owned coconut gardens and one was engaged even in Waingan cultivation like the one at Loutolim. The only one owner leasing out his Marad holding in the village Cudnem was an absentee landlord and was not engaged in any other type of cultivation.

Average size of the holdings

The average size of the holdings in respect of the Marad and the Dongar lands and the Khazan and Waingan lands held by the contacted cultivators has been noted in the table below.

Table 7.5 : average size of the holdings in respect of Marad, Dongar, Khazan and Waingan cultivation

Village	Average size of the holding in respect of				Average size of the total holding
	Marad cultivation	Dongar cultivation	Khazan cultivation	Waingan cultivation	
Loutolim	1.14	1.34	-	*	1.70
Marcaim	0.49	1.88	1.24	1.00	1.64
Cudnem	0.79	2.17	-	0.66	3.02

* Only one owner held 0.2 hectare of Waingan land.

The average size of the Marad and the Dongar holdings was quite large when compared to the average size of the Khazan and the Waingan holdings as noted in the case of the Khazan and Waingan cultivations in the earlier chapters. The size of the Marad holdings at Marcaim was somewhat small but many of the owners had alternative sources in the form of cultivation of the Khazan and the Waingan lands. The size of the Waingan and the Khazan holdings held by those engaged in Marad cultivation at Marcaim was also exceptionally large, when compared to the average size noted in the earlier chapters. The size of the

Marad holdings was on the contrary the largest at Loutolim where the owners of these lands had no other resources of paddy cultivation. The size of the Dongar holdings was again the largest when compared to the size of the other types. It is on this account that the average size of the total holding for this group of Marad farmers is much larger than the averages for groups of the Khazan and the Waingan farmers, noted earlier.

Fragmentation of the Marad and the Dongar holdings

Apart from the separate locations of the Marad and the Dongar lands in a few of the cases, the Marad holdings were themselves found to be existing in a number of fragments. The classification of the owners according to the number of fragments in the table below would indicate the extent of fragmentation.

Table 7.6 : Classification of the owners according to the number of fragments

Village	Total number of owners	Number of owners having number of fragments as				Total number of fragments
		1	2	3	4	
Loutolim	12	7	4	1	-	18
Marcaim	16	12	4	-	-	20
Cudnem	8	1	-	7	-	22
Total	36	20	8	8	-	60

In a majority of the cases in Loutolim and Marcaim, the holdings were made of single fragments. About one fourth of the holdings in these two villages had two fragments each. At Cudnem, however, 7 of the 8 holdings existed in three fragments per holding. The fragmentation of the Marad holdings was, on the whole, like the one observed in the case of the Khazan and the Waingan holdings with about 50 to 65 per cent of the holdings existing in single fragments.

Location of the fragments

Some of the fragments of the Marad holdings were located at the foot of the hills whereas the others were on the tops. At Loutolim and Cudnem, 14 and 9 of the 22 and 18 fragments respectively were near the foot of the hills. On the contrary only 6 of the 20 fragments at Marcaim were near the foot. A majority of the fragments at Loutolim and about half of those at Cudnem were thus near the foot of the hills whereas most of the fragments at Marcaim were on the tops. On the whole about 50 per cent of the fragments in these three villages were on the tops of the hills. This had a bearing on the culturability of the fragments as it was difficult to carry certain inputs to those fragments which were on or near tops of the hills. This had also created the problem of approach roads as would be noted later.

Uncultivated Marad holdings

As there was a trend in the expansion of the area under Marad cultivation in the past, so was a trend said to have been developed recently in giving up this type of cultivation. The cultivation was said to be proving uneconomic because of the falling prices of paddy and the rising prices of the inputs. It was, however, very difficult to locate the farmers who had given up Marad cultivation. At Cudnem one of the owners holding $\frac{3}{4}$ th of a hectare in three fragments in the Vayale Kate, Tamati mal. and the Shelavali mali farms had given up Marad cultivation since the last five years. Another owner holding about 0.85 hectare in two plots in the Lonachi dat and the Karwal Marad farms had given up cultivation in the last decade but started it again since the year 1962. One of the owners at Marcaim owning 2 hectares of land in the Maddagal and the Damegal Marad farms had given up the cultivation of field crops in these plots since the year 1964 but had planted mango and cashewnut on those plots. There were no cases of abandoning the Marad lands at Loutolim at least among the owners who were contacted for the enquiry. There might have been even a few more cases in these villages which we could not notice but from the gravity of this problem of abandoning the Marad lands it appears that the problem would have only a marginal importance.

Utilization of the Marad lands

The Marad lands which were under cultivation were generally being used for growing the kharif crop of paddy only. Two of the owners at Marcaim, however, had used a part of their holdings for the cultivation of Nachani. It was, a common practice to grow Nachani on the borod type of lands which were inferior to the Marad type. Cultivation of Nachani was therefore, restricted to very inferior lands and the lands available for kumeri cultivation. It was a practice with some of the owners as we were told, to give the inferior lands to the farmers for cultivation of Nachani without charging any rent, as the cultivation improved the tilth and the fertility of the soil.

Attempts were being made through the Community Development Blocks to introduce groundnut on the Marad lands. The seeds were being distributed free in some of the villages for trial on the Marad holdings. Two of the cultivators at Marcaim who had tried groundnut were, therefore, contacted to note their reactions to this new crop. Both were progressive cultivators. They had, however, to sow the crop late in August as they could not get the seeds earlier. One of them had sown the whole pods as there were red ants in his plot whereas the other had sown the seeds after shelling the pods. For want of any seed drill, they had to dibble the pods. One of them dibbled the seeds at a distance of 15" x 15" whereas the other followed a spacing of 24" x 12". There being no suitable hoes for the purpose in Goa, weeding and interculturing had to be done by hand. Both had used ash and chemical fertilizers for their crops. One of them got on an average only 15 pods per plant whereas in the other case who had adopted wider spacing, the production was very satisfactory. Some of the plants in the latter case had borne as many as 100 pods per plant. Both were eager to continue the trial on a larger scale but absence of any suitable implements and the nuisance from the monkeys were the main handicaps. We were also told that the crop had become very successful in Bicholim Block and it was possible to market 600 bags of groundnut at the rate of Rs.90 per quintal at Bicholim during the year of this survey.

One of the above farmers was also growing kharif jowar on half an acre of his Marad farm. He used to sow the crop in June, transplant it by the end of the month and the crop matured in November. The crop in his opinion, gave a larger outturn even when compared to paddy though the cost of cultivation for both crops remained the same. Protection against parrots was, however, the main handicap with the cultivation of jowar as the parrots used to cut the earheads before harvesting. He was growing the crop continuously for the last four years, but during the year prior to the survey the parrots destroyed his entire crop and he could not get even the seeds for sowing. He was trying to secure the seeds again from outside.

Maize was another crop which was suited to the Marad lands as a kharif crop but we could not come across any case of the crop being grown on the Marad land. It was not a new crop in the area and it was being grown on a very small scale as an irrigated crop along with chilly, onions and vegetables in the rabi season for its cobs. The crop was, however, subject to the attacks from parrots and other birds as in the case of jowar.

Utilization of the Dongar lands

The Dongar lands were being used mainly for growing the cashew trees. Most of the cashew trees on these lands had, however, grown naturally but attempts were also being made by some of the owners to plant new trees on their holdings. The number of owners who had grown cashew trees on their holdings, the number of existing trees, the number of trees planted during the last two years and the other relevant details have been noted in Table 7.7.

Out of the 12 holdings studied at Loutolim, cashew trees had been grown on 4 holdings only. Two of these holdings had a separate component of the Dongar type of land whereas in the other two cases the Marad and the Dongar components were located together. Only one of these four owners had planted 30 cashew trees during the last two years whereas it was possible to plant 300 additional cashew trees on two of these holdings which had separate components of the Dongar type of land. There were, however, three more holdings having a separate component of the Dongar type of land but they were covered by wild trees.

Cashew trees had been planted on 11 of the 16 holdings at Marcaim. Only 3 of these holdings had a separate component of the Dongar land. As many as 10 of the 11 owners had planted 435 cashew trees during the last 2 years. It, therefore, appears that about 30 per cent of the existing trees on these holdings were planted only during the last two years. It was possible to nearly double the number of trees by planting additional trees on 9 of these 11 holdings.

There were cashew trees on 7 of the 8 holdings at Cudnem. All the 7 holdings had a separate component of the Dongar land. Cashew trees had, however, grown as a natural growth on all these holdings and no attempts were being made to plant the trees. It was possible to plant quite a large number of trees on these holdings but it was not possible to estimate their extent.

What seems from a study of these three villages is that it is only at Marcaim in the transitional tract that attempts

Table 7.7 : Details about the cashew trees on the Dongar lands

Village	Total number of holdings	The number of holdings having cashew trees	The number of existing trees on those holdings	The number of trees planted during the last two years	The number of owners planting the trees during the last two years	The number of holdings on which it is possible to plant additional trees	The number of additional trees that can be planted
Loutolim	12	4	1008	30	1	2	300
Marcaim	16	11	1375	435	10	9	1535
Cudnem	8	7	1205	-	-	7	N.A.

were being made to expand the number of trees by additional planting; planting of new trees was somewhat neglected in the village Loutolim in the coastal area where there were already a large number of existing trees whereas the owners had entirely depended upon the natural spread of cashew trees on their holdings in the village Cudnem in the interior tract.

Mango, jack fruit, pineapple, bamboo and coconut were the other crops that were being grown on the Marad and the Dongar lands on a small scale. Mango and jack fruit were, however, planted only on two of the holdings of Loutolim, and three of the holdings at Marcaim. These trees were being generally grown near the homesteads or on those holdings which were nearer the sources of water as they required irrigation in the early stages of their growth. The cultivation of bamboo was also restricted to plots nearby the homesteads as the crop had to be protected against the monkeys and the stray cattle which ate up the tender shoots. Mango, jack fruit and bamboo were, however, being grown where the soil was deep.

Pineapple was being grown on the Marad and the Dongar lands especially along with the cashew trees but this practice was prevalent only in certain groups of villages in the Ponda and the Sattari talukas. The practice had developed well especially where arecanut was being grown on a large scale. It was common practice in these areas to grow pineapple on the borders of the areca nut gardens, and at the same time extend its cultivation even to the upper slopes of the hills along with cashew. The village Concolem in the Ponda taluka which we visited for the purpose, provided a good example of this practice. Pineapple was being grown along with cashew practically on the outskirts of every arecanut garden in this village. It was only the local variety that responded well to this practice of rain-fed cultivation. The variety grew well under partially shady and slopy situations on the hills even without the use of irrigation. Once the crop was planted, it spread on its own account and harvesting of the fruits during the season remained to be the only process in its production. The fruits, however, attained a small size when compared to the improved varieties but they were greatly valued by the canning factories on account of their sweetness which the cultivators attributed to the method of dry cultivation. Watching the crop against the stray cattle and the monkeys was not difficult in this village as it was grown on a large scale and in the vicinities of the arecanut gardens. Moreover, because of the contiguity of the plantations, once a watchman in a garden raised an alarm against a troop of monkeys, it alerted the watchmen in the other gardens as well and they again used to repeat the alarm to drive the monkeys out of the village.

Coconut was also being grown on the Marad and the Dongar types of land especially on the lands lying at the foot of the hills. Some of the coconut gardens were found to be located even at higher elevations up a hill where the lands were flat and the soils were deep. Cultivation of the coconut crop will, however, be considered in a later chapter as an elaborate special enquiry had been designed for the purpose.

Coffee was another crop which was said to be suited to the Dongar type of land in Goa. Coffee plants were already being grown in some of the villages in Marmugao, Salcet and Sattari talukas. The cultivation of coffee in these villages was however, restricted to growing only a few plants for the production of coffee for home consumption. Plants cultivated

with this limited objective were observed by us even at Loutolim. Two of the owners who had grown coffee were contacted to know about the suitability of the crop to the area. They could not give us any idea about the productivity from their trees but they narrated how the trees got fully covered with berries during the fruiting season.

In spite of any detailed investigation into the productivity and the quality of the produce, however, it is not possible to draw any firm inferences from the cultivation of coffee in the area on such a kitchen garden scale. From the experience of some of the cultivators it, however, seems that the crop may compete well with cashew cultivation and forestry especially where the superior deep lands on the slopes are being used for such inferior uses of the land. Coffee is also a labour intensive crop and would naturally provide greater employment when compared to the employment provided by either cashew cultivation or forestry. A survey conducted by the Gokhale Institute of Politics and Economics in the village Aldur in the Chickmagalur district of the adjoining Mysore State, indicated that the wage component in coffee cultivation accounted for nearly 50 per cent of the cost of cultivation and that it was Rs.213 per acre in this village.

The soils in Goa are also well suited for the production of coffee. Surveys conducted in some countries of the world have shown that "good coffee was associated with soils quite arid and low in lime and phosphates but were significantly high both in potash and organic matter."² The results from the analysis of the hilly soils in Goa as noted earlier correspond to these requirements. Coffee is said to be requiring some elevation and slope for its successful cultivation. This view is, however, no more valid since the crop is being successfully grown even on the flat lands in Brazil, Kenya and Equador and almost at sea level in the latter country. Some of the highest coffee production in Costa Rica comes from plantations at an elevation of less than 2000 feet and even at sea level.³

Tapioca (Cassava) is another crop which as the experience on the Western Coast of India suggests, can grow well on the deep loamy Dongar type of soils especially near the foot of the hills. We could not, however, notice the crop anywhere in Goa.

Eucalyptus is also a crop of commercial and industrial importance which can grow well on the Dongar type of soil. The Forest Department has already undertaken the plantation of this tree and quite extensive areas of the hills have been brought under the tree in the southern part of Goa.

A number of crops are, thus, suited to the Marad and Dongar types of land. Paddy is being grown on the flat and the terraced lands having deep or shallow soils. Groundnut, jowar and maize can be the new introductions on similar type of land. Coconut is being grown on the flat lands which have essentially deep soils. Cashew is being grown on the flat as well as the slopy lands which may have rocky, shallow or even deep soils. Pineapple is being grown on similar type of soil but especially on

1 Survey of Economic Change in Rural Area : Aldur (unpublished) - C.S.Gajarajan, Agro-Economic Unit, Gokhale Institute of Politics & Economics, Poona p.337

2-3 Coffee - Botany, cultivation and utilization (World Crop Series) - Wellman, pp. 97-98

those which are not rocky. It is, however, being grown at locations which are partially shady. Bamboo, jackfruit, mango require deep soils. All these crops can be grown even on the slopes. Coffee requires deep soils having a high humus content and both coffee and bamboo require some degree of slope. Eucalyptus can also be grown on the slopes where the soils are deep. Tapioca can also be grown on gentle slopes which have deep soils. Different crops, therefore, require different combinations of locations, slopes and the depth of the soils. So also many of them require protection against wild animals though the problem of protection from common thefts would be common to all except for bamboo and eucalyptus. Even tapioca requires protection against the rats and bandicoots as the experience in Kerala indicates. This raises an important problem if it would be possible to plan for a whole hill and organize cultivation of these different crops using the specific soil formations and the topography for specific crops.

Let us consider the hill at Loutolim as an example. This hill stretches from the market place in the village to the chappel and runs almost parallel to the Khazan farms along the Juarai river. A road runs all along the foot of the hill and the boundaries of the Khazan and the Waingan farms and separates the hill from these farms. There are however the Xedde Waingan farms and the ponds and the provisional tank on the side of the road on the hill side. The Marad type of land on this side of the road is being used for coconut. Dwelling houses are found on both sides of this road though a larger number of houses are on the hill side. The hill, as we were told, is owned by about 10 to 12 families who have plots stretching from the top of the hill to the road. The top is flat and has been reclaimed for paddy cultivation. Foot paths running from the road to the top pass through the plots owned by different persons. There are a few cashew trees at the top and also a few on the slopes but a greater part of the hill is covered by wild trees which provide fuel and leaves for green manuring. Quite different types of soil formations exist on the slope of this hill. Rocks are exposed at certain places whereas there are shallow as well as deep fertile soils. At the foot of the hill there are houses and a few mango and jackfruit trees planted near these houses. There is also one arecanut garden on the slope which receives water through a perennial spring. For the absence of a good road, it is difficult to carry any heavy implements or carts of manure or silt to the top. Some of the owners had made an attempt in the past to lay out and construct an approach road for the top which naturally had to pass through most of the plots on the slope. One of the owners who had not reclaimed his land at the top, however, refused to permit the passage of road through his plot. The proposal had, therefore, to be postponed. The top of this hill is quite flat and wide and there is another hill which commences from the other end of this top. This hill is, however, owned by the Comunidade and it is being used for grazing cattle. None of the plots on the hill under consideration are fenced. Temporary stone walls are, however, put around some of the reclaimed Marad plots at the top.

The above description of this hill as an example would indicate that there are considerable potentialities for developing hills of this type by an integrated approach. It is necessary to lay out a proper road for the top. It is possible to terrace the lands at places near the foot as well as on the slopes and grow field crops as groundnut, maize and others and even grow tapioca near the foot. The areas of cashew plantations could be

restricted only to the shallow soils or the soils with exposed rocks. Mangoes could be planted near the foot whereas bamboo and eucalyptus can be planted along the slopes. Pineapple can be grown on very extensive scale practically over the entire hill. This would, however, require some technical survey and socialization of the whole development project so that the process of planting, providing irrigations wherever necessary and protection could be accomplished by mutual understanding. There are hills of a similar type practically in every village in Goa but systematic attempts seem to have not been made to use this resource optimally.

Development of Marad lands

The development of the Marad lands involved bunding and improvement of the soil tilth. No systematic attempts were however, being made to bund the fields and to control the erosion. The land owned by an individual was always divided into tiny plots and the plots were protected by bunds known as 'malis' which hardly exceeded a height and a breadth of about 9-12 inches. Such bunds had to be repaired after the heavy rains and had to be severely mended almost every year. The low bunds naturally impeded the water holding capacity of the fields which dried only after a short dry spell. This affected the productivity of the Marad farms. No systematic programme of contour bunding or terracing was adopted either by the people or the Agricultural Department.

The very idea of constructing bigger bunds seemed to have not been known to the farmers who were accustomed only to preparing 'malis' for the Khazan and Waingan plots. Though the technique of preparing 'malis' served the purpose of holding water adequately in these cases, there was definitely a need for a change in the technique in the case of the Marad farms.

The improvement of the soil tilth and the general fertility of the land was being achieved by adding mainly the river silt which considerably increased the water holding capacity of these highly drained soils. Silt could, however, be used only in those villages which were on the banks of the rivers and again on those farms which could be approached by bullock carts and trucks.

This practice was, being largely followed at Loutolim and Marcaim. It was not possible to adopt the practice at Cudnem where there was no major river. Out of the 12 owners at Loutolim only two had not added silt to their farms as their farms were away from the road. One of the owners had been adding the silt practically every year whereas three of the owners were adding silt in alternate years. Two more owners were following a routine of adding silt once in five years whereas in case of the remaining four owners, the practice was to add silt once in 5 to 10 years. Out of the 16 owners at Marcaim, only two were following a routine of adding silt in alternate years whereas others had added silt only sometime in the past but had discontinued the practice later on account of the high costs.

The quantity of silt used per farm in both villages varied from 2 to 10 trucks costing about Rs.100 to Rs.400 according to the distance of the farms from the river. It was also a practice in some of the villages to use farmyard manure for the Marad lands to improve the tilth. Only two of the owners at Loutolim were, however, using farm yard manure for the purpose. Common

salt was also being used to improve the Marad lands. The farmers were of the opinion that the salt dissolved the rocks and thus improved the texture of the soil. Only two of the owners at Loutolim had used common salt during the year of survey. The practice was also noted at Savai-verem which was selected for the general survey.

Approach roads for the Marad farms.

Though the Khazan and the Waingan farms were very well served with proper approach roads, for many of the Marad farms the problem of approach roads had become somewhat severe. This was evident since the Khazan and the Waingan farms had developed almost traditionally whereas many of the Marad farms were brought under cultivation somewhat lately. The Marad farms were, however, connected by foot paths but it was difficult to carry heavy implements, bulky manures and silt up the slopes for want of cartable roads. The problem of an approach road for the hill at Loutolim was already mentioned earlier. In spite of such roads, the owners had to carry silt as head loads from the nearest road to the farm. An enquiry in the matter indicated that as many as 14 of the 18 fragments at Loutolim, 19 of the 20 fragments at Marcaim and 7 of the 22 fragments at Cudnem were connected to the roads merely by foot paths. Farm roads for the Marad farms could, however, be planned economically mainly in the context of integrated farm plans for the entire hills as noted earlier.

Protection of the Marad and the Dongar farms against stray cattle

The Marad farms being located at isolated spots on a hill and nearby the grazing grounds, it created a problem in the protection of the crops against the stray cattle. The farms were protected at places by undressed stone walls but this was possible only where the stones were available in plenty. The cost of stones came to about Rs.30 to Rs.40 per thousand and it cost about Rs.80 to Rs.100 to construct a wall having a length of about 150 feet.

Only two fragments of the Dongar type of land at Loutolim were not fenced whereas all the other 16 fragments of the Marad and Dongar lands were protected by stone walls. Similar was the case at Marcaim where 2 of the fragments of the Dongar land had no fence. None of the fragments at Cudnem were, however, fenced. Only one of the 8 owners in this village was putting up a seasonal wooden fence for his farm at the time of sowing the crop.

Problem of irrigating the Marad farms

The Marad farms were cultivated exclusively without the use of irrigation. The soils over these farms being highly drained the cultivation of paddy under such conditions depended entirely upon the mercy of nature. The nature of rainfall especially at the end of the season largely determined the yield over these lands. Researches on the problems of water requirements of paddy have shown that the crop gives the highest production only when it gets standing water with frequent changes of water almost upto the stage of grain formation. Such ideal conditions cannot be expected over the Marad farms located on the hills. Research has, however, also shown that if such farms are given supplementary irrigations especially during the critical periods, there is an increase in the yield by about

one third. Use of supplementary irrigation for cultivating paddy on the Marad farms has, thus such a vital importance.

At the same time there are crops such as groundnut, maize and jowar which can be well raised on these farms without the use of irrigation. These crops cannot, however, suffice the needs for rice which is the staple food crop of the people. Growing paddy with supplementary irrigation wherever possible, therefore, remains the only solution from the point of optimum use of these lands.

It is possible to irrigate some of the Marad farms by lifting water through the nearby tanks or ponds as mentioned earlier. The effort made to grow even the Waingan crop on the Marad lands at Bicholim by lifting water as well as the possibilities of irrigating the Karwal Marad at Cudnem on similar lines have been mentioned in the earlier chapter. Such measures are, however, possible where the Marad lands are located near the foot of the hills. For the farms on the tops of the hills which account for nearly 50 per cent of the fragments in these three villages, efforts will have to be made to construct storage tanks on the tops of the hills themselves. Though this may not be possible in the case of all fragments, there are certain spots on the hills in these villages, where storage tanks can be constructed to provide supplementary irrigations to some of the farms. There is a spot, for example, near the manifest area of a mine in the village Cudnem where water can be stored by putting a bandhara between two small elevations on the hill surface. This spot has a completely rocky base. A spot of similar characteristics was observed near the Madvalgal marad at Marcaim. Fixing of locations and ascertaining the economies of such projects can, however, be possible only after detailed technical surveys.

CHAPTER 8

TECHNIQUES OF PADDY CULTIVATION ON THE KHAZAN, WAINGAN AND THE MARAD FARMS

An attempt was made in the earlier chapters to discuss only the problems relating to the utilization of the different resources available for paddy cultivation. The actual techniques of paddy cultivation over these different resources were not noted in each chapter to avoid repetitions on account of the commonness of certain techniques. Certain other techniques, on the contrary, varied greatly from one resource to the other. It was for these reasons that the techniques of paddy cultivation employed over the different types of resource have been discussed together in this chapter. The data available through the studies of the individual farmers have been made use of for this purpose. It may be recalled here that 30, 50 and 36 farmers were contacted for the enquiries relating to the Khazan, Waingan, and the Marad resources respectively and that these farmers were cultivating 48, 74 and 60 fragments of these types of land respectively. Paddy was, however, being grown on 40 of the 60 Marad and Dongar fragments only.

Wet and dry sowing

Paddy was being grown in Goa mostly by the method of sowing the seeds directly in the farms and not by the method of raising the seedlings and then transplanting them on the farms as in many other States in the country. Wet sowing and dry sowing were the two different practices adopted for sowing the seeds in the fields. In case of wet sowing the fields were being ploughed and puddled and pre-sprouted seeds were being sown in such puddled and levelled fields. In case of dry sowing, however, the fields were being ploughed, pulverized and levelled and dry seeds were being sown in such fields.

It is mainly the type of soil and the availability of water that influenced the adoption of a sowing method. It was possible to pulverize the soils and prepare a farm for sowing even before the monsoon if the soils in a farm had more or less a sandy nature. This was, however, not possible in the farms which had hard and clayey soils and the farmers had to wait till the land became soft after the first few showers. Consequently, the farms of the former type could be easily sown by adopting the dry method whereas wet method had to be followed in the latter type of farms. So also there was no need for puddling the farms lying in the valleys for growing the kharif crops because of the abundance of water during the monsoon. Puddling was however, necessary when paddy had to be raised over these lands by irrigations in the other seasons. So was the process indispensable where the crop had to be raised on the high-lying Marad lands. Wet sowing had to be followed where the lands had to be puddled whereas the dry seeds could be easily sown in farms which needed no puddling during the season. The classification of the fragments according to the method of sowing (Table Nos. 8.1 and 8.2) would indicate the extent of adoption of these practices over the different types of land in the selected villages.

Table 8.1 : Classification of the Khazan fragments according to wet and dry sowing

Village	Total No. of fragments	Number of fragments over which dry sowing was adopted	Number of fragments over which wet sowing was adopted
Marcaim	10	1	9
Borim	24	6	18
Cumbharjua	14	-	14
Total	48	7	41

Table 8.2 : Classification of the Waigan fragments according to wet and dry sowing

Village	Total No. of fragments	Kharif sowing			Waigan sowing		
		No. of fragments used for kharif sowing	No. of fragments over which dry sowing was adopted	No. of fragments over which wet sowing was adopted	No. of fragments used for Waigan sowing	No. of fragments over which dry sowing was adopted	No. of fragments over which wet sowing was adopted
Morjim	5	2	-	2	5	-	5
Loutolim	9	9	7+	1	9	-	9
Marcaim	35	35	35	-	35	-	35
Cudnem	25	5	5	-	24	-	24
Total	74	51	47	3	73	-	73

+ In one more case dry sowing seemed to have been adopted. But as the farmer who was contacted had sown only the Waigan crop (in the Comunidade owned Virkhonde farm) it was not possible to know what practice his predecessor sowing the Kharif crop, had adopted.

The above tables would indicate that the khazan farms were generally sown by the wet method. In case of the Waigan farms, however, though the Waigan crop was being sown exclusively by the wet method, the dry method was largely used for sowing the kharif crop. Table has not been given for a similar classification of the fragments of the Marad land. All the Marad fragments were, however, exclusively sown by the dry method.

There were certain exceptions to these general trends as the tables themselves would indicate. The method of dry sowing was for example, adopted on some of the Khazan fragments at Marcaim and Borim. These fragments were located in the Adan khazan at Marcaim and the Bet katar and the Adulshe khazan at Borim. The land in these farms could be easily ploughed and pulverized and at the same time the salinity in these farms was not anyway high to affect the growth of seedlings in the earlier stages. Farms with a high degree of salinity had to be sown only when there were enough rains to wash off the accumulated salts in the soil.

All the Waingan farms could be ploughed easily and the Kharif paddy was, therefore, sown in these farms by the method of dry sowing. In only 3 of the 51 fragments, the sowing had to be done by the wet method. For sowing the Waingan crop, however, the wet method was indispensable from the point of conservation of the available water. There, therefore, seemed to be a preference for the dry sowing of the crop where the problems of salinity or water retentivity were not involved and where the soils could be brought under ideal conditions for sowing just in the beginning or even before the commencement of the monsoon. This was, however, impossible in case of most of the fragments of the different types of cultivation except those fragments of the Waingon land used for the kharif crop. For a larger part, the paddy crop had, therefore, to be raised by sowing the crop by the wet method and not by the dry one as in many other parts of the country.

Preparatory tillage

Preparatory tillage consisted of the processes of ploughing or digging by manual labour, pulverising and levelling the soil and puddling the fields where necessary. These practices again depended upon the type of soil and the method of sowing.

It was not possible to plough the lands which became hard during the summer and very sticky during the monsoon. Such farms had, therefore, to be dug up by manual labour. The need for digging the lands by manual labour, however, varied from farm to farm and village to village. The number of fragments requiring manual digging for the different types of cultivation in the selected villages have been noted in Table 8.3.

It was mainly the fragments in the Khazan farms that required manual digging. Nearly 58 per cent of the fragments in the Khazan farms had to be dug by manual labour. It was only in one of the 10 fragments at Marcaim, located in the Adan khazan, that it was possible to cultivate it by using bullock labour whereas digging had to be resorted to in all the 9 fragments in the other farms. At Borim and Cumbharjua 16 and 3 of the 24 and 14 fragments respectively had to be dug up by manual labour. Digging had thus to be resorted to only a few fragments in the village Cumbharjua. The farms requiring digging in Borim were the Tamshire, Devate, Sarwade, Tishe and the Bor khazan farms whereas those requiring digging in Cumbharjua, were the collectively cultivated Durgapai and the Kotak farms and the Teer khazan. If we recall the Khazan farms in which dry sowing was followed, it would be observed that only three of the farms which were ploughed were sown by the dry method whereas the remaining farms were sown by the wet method even though the farms were ploughed. Wet sowing had to be resorted to in all the Khazan farms that required digging. This would indicate that the method of sowing in the Khazan farms was not only related to the texture of the soil but also the degree of salinity which determined the date of sowing for these farms.

Table 8.3 Number of fragments requiring manual digging for the different types of cultivation in the selected villages.

Type of cultivation	Village	Total number of fragments	Number of fragments requiring manual digging
Khazan cultivation	Marcaim	10	9
	Borim	24	16
	Cumbhorjua	14	3
	Total	48	28
Kharif cultivation in the Waingan farms	Morjim	2	-
	Loutolim	9	-
	Marcaim	35	4
	Cudnem	5	-
Total	51	4	
Waingan cultivation in the Waingan farms	Morjim	5	-
	Loutolim	9	-
	Marcaim	35	-
	Cudnem	24	-
Total	73	-	
Marad cultivation	Loutolim	11	-
	Marcaim	16	1
	Cudnem	12	-
Total	40	1	

Only 4 of the 35 fragments in the Waingan farms in the village Marcaim had to be dug up for sowing the kharif crop. The same were, however, ploughed when the Waingan crop was sown. These fragments were located in the Dyutali, Khune and the Khallangan farms. These farms could not be ploughed unless the soil became moist and there was, therefore, no alternative but to dig up these farms to suit the need for dry and early sowing. All the fragments in the Waingan farms in the other villages were ploughed for kharif sowing. So also puddling and wet sowing being inevitable for the cultivation of the Waingan crop, all the fragments in the Waingan farms had to be ploughed for sowing the Waingan crop.

There was no need for digging any of the fragments on the Marad farms as the crop had to be sown on these lands by the wet method. It is only in one case/Marcaim that a farmer had to dig up his farm as he could not hire a plough and a pair of bullocks.

The number of ploughings in the ploughed fields again depended upon the type of soil and the type of cultivation. The fragments which were ploughed have been classified according to the number of ploughings in Table 8.4. The table would indicate that it was mainly the cultivation of the Waingan crop that required a larger number of ploughings. In a majority of cases, these farms were ploughed 4 to 5 times and there were a few farms at the two extremes which had received either three or even six or more ploughings. Most of the fragments at Cudnem were ploughed 5 times whereas those in the other villages had received 4 ploughings. For kharif cultivation in the same farms, a majority of the fragments were, however, given 3 ploughings only. Here again a few of the fragments were ploughed either twice or 4, 5 and 6 times. The number of ploughings required for the Khazan farms

Table 8.4 : Classification of the Khazan, Waingan and the Marad fragments according to the number of ploughings

Type of cultivation	Village	Total No. of fragments	No. of fragments which were ploughed	No. of fragments according to the number of ploughings as				
				2	3	4	5	6 and more
Khazan cultivation	Marcaim	10	1	-	-	1	-	-
	Borim	24	8	4	1	3	-	-
	Cumbharjua	14	11	1	10	-	-	-
	Total	48	20	5	11	4	-	-
Kharif cultivation in the Waingan farms	Morjim	2	2	-	1	1	-	-
	Loutolim	9	9	-	5	3	-	1
	Marcaim	35	31	1	24	4	2	-
	Cudnem	5	5	-	-	5	-	-
Total	51	47	1	30	13	2	1	
Waingan cultivation in the Waingan farms	Morjim	5	5	-	-	3	2	-
	Loutolim	9	9	-	5	3	-	1
	Marcaim	35	35	-	5	18	9	3
	Cudnem	24	24	-	2	-	19	3
Total	73	73	-	12	24	30	7	
Marad cultivation	Loutolim	11	11	-	-	-	-	11
	Marcaim	16	15	-	7	7	-	1
	Cudnem	13	13	-	12	1	-	-
	Total	40	39	-	19	8	-	12

was - relatively small. Though in a majority of the cases these farms were ploughed thrice, there were a few farms which were ploughed only twice. The Marad farms were generally being ploughed either 3 or 4 times but at Lontolim, all the farmers had ploughed their Marad farms as many as 6 or more times.

None of the farms in the selected villages had the typical sandy soils found on the coast. It was learnt that it was possible to prepare the farms having such soils for sowing mostly by ploughing the land only twice.

The month of ploughing or digging a khazan farm was attached some importance in the area. When a farm was dug up or ploughed when it was about to dry, it helped in the breaking up of the clods into as small bits as desirable and this ensured a uniform distribution of seeds and a uniform germination. The practice of ploughing or digging up the Khazan farms in February and March was, therefore, attached great importance in the past. Even the Comunidades insisted upon the month of ploughing when the lands were distributed for cultivation. This practice was, however, not being followed lately and a section of the cultivating class attributed this failure to the employment generated by the mines in this specific period. It is interesting to note that only 2 of the 14 fragments at Cumbharjua but none of the 24 fragments at Borim were dug up or ploughed in February and March. Most of the fragments at Borim were ploughed or dug up in the

month of May and those at Cumbharjua by the end of May or even in June. It is only at Marcaim that 6 of the 10 fragments were dug up in March and the remaining in April and May. It is also worth mentioning that the group of farmers who were cultivating the Durga pai and the Kotak Khazan farms at Cumbharjua on the collective basis, had dug up their farms in February which was quite in routine with their traditional practice. The Waingan farms were being ploughed usually only a month before sowing whereas the Marad farms were being ploughed when the rains had commenced.

Usually every initial ploughing was followed by a process of crushing the clods and levelling. The ploughing was done with a small wooden plough operated by a pair of bullocks or he-buffaloes. The implement used for crushing the clods and levelling consisted of a toothed plank, locally known as 'Gute'. These two were the only implements possessed by the paddy cultivators. Besides the implements the farmers possessed some tools such as the pickaxe, spade and sickles, used for digging, harvesting and the other processes. Not all the farmers, however, possessed the implements. Generally, only those who owned either a single or a pair of bullocks or he-buffaloes had also a matching number of implements. The number of farmers possessing the ploughs as revealed through the earlier special enquiries may be noted from the table below.

Table 8.5 : The number of farmers possessing ploughs as revealed through the enquiries for the Khazan, Waingan and the Marad types of cultivation

Village	Khazan cultivation		Waingan cultivation		Marad cultivation	
	Total No. of cultivators	No. of cultivators possessing the ploughs	Total No. of cultivators	No. of cultivators possessing the ploughs	Total No. of cultivators	No. of cultivators possessing the ploughs
Morjim	-	-	5	5	-	-
Loutolim	-	-	8	3	12	3
Borim	12	7	-	-	-	-
Marcaim	7	4	23	22	16	11
Cumbharjua	11	8	-	-	-	-
Cudnem	-	-	14	14	8	4
Total	30	19	50	44	36	18

The table would indicate that quite a large proportion of the cultivators cultivating in the Waingan farms possessed ploughs when compared to those cultivating in the other types of farms. If the need for digging up the Khazan farms is taken into account, the number of cultivators cultivating the Khazan farms and possessing ploughs could also be said to be quite significant. It is mainly the cultivators engaged in Marad cultivation that seemed to be lacking in the possession of ploughs and subsequently they had to hire them for the purpose. If the different villages are compared one finds that it was mainly at Loutolim that a majority of the farmers did not possess ploughs. In all the other villages, taking into account again the need for digging the Khazan farms, most of the farmers excepting those engaged in Marad cultivation, possessed ploughs. All those who possessed a plough

also possessed a 'Gute'. Many farmers who did not possess a plough, however, always owned tools such as spade, pickaxe, etc., necessary for the hand operations.

The distribution relating to the possession of ploughs discussed above gives some idea about the ploughs possessed by a limited number of the farmers engaged in the different types of cultivation. A more clear idea can be obtained about the possession of the ploughs in the different regions in general through the data for the clusters of villages selected for the general survey. These data have been given in Table No. 8.6.

It would be observed from the column giving the proportion of paddy cultivators possessing ploughs, in the table that the proportion of paddy cultivators possessing ploughs in the villages in the coastal belt of Marmugao and Salcete talukas was very small and it varied between 12 and 18 per cents only. In the coastal village namely, Calangute in Bardez taluka, the proportion was 38 per cent whereas in Morjim in Pernem taluka it was 65 per cent. So also in Marcaim in Ponda taluka, which village was very near this coastal belt, the proportion was 48 per cent. In the other cluster in the same taluka and the remaining six clusters in the other hilly talukas the proportion varied from 80 to 93 per cents. It was only in one of the clusters in Sanguem taluka where coconut and kumri cultivation was predominant that the proportion was 71 per cent.

It may be inferred from the above analysis that the proportion of cultivators possessing the ploughs was less in the middle part of the coastal belt where the soils were sandy, and there were khazan lands as well as where the proportion of irrigated area itself was relatively small when compared to the interior region. The proportion went on increasing in the north and in the south and it was quite high in the transitional and the interior belts.

The average number of ploughs per paddy cultivator have been also worked out in the same table. Though the figures for the average number of ploughs follow the above trend, they do indicate certain marked variations from the earlier trend. Even though a small proportion of the cultivators in Morjim possessed ploughs, the average number of ploughs per cultivator was quite on par with the villages in the interior belt. So also though the proportion of paddy cultivators possessing ploughs was larger at Marcaim when compared to that at Calangute, the average number of ploughs per cultivator was much large in the latter village than in the former. So also though a larger number of cultivators in the clusters in Sanguem taluka were possessing ploughs, the average number of ploughs per cultivator was much small in relation to the average for the other clusters in the interior. It was the cluster Savai-verem in the eastern part of Ponda taluka that possessed the largest number of ploughs per paddy cultivator.

It was possible to use a number of improved implements for the cultivation of paddy in Goa as elsewhere. No improved implements were, however, introduced by any of these farmers or by the development agencies.

It may be possible to use the small iron plough recommended for paddy areas. This plough has, however, a limited value since it cannot be used for puddling the fields. It can, on the contrary, be very effectively used for opening the soil and thus it can reduce the number of ploughings considerably. The farmers have at present to plough the land at least twice to open the soil but it can be accomplished by a single ploughing with the iron plough. The wooden plough may have, however,

Table 8.6 : Number of farmers possessing ploughs in the clusters of villages selected for the general enquiry

Taluka	Village Cluster	Number of paddy cultivators	No. of paddy cultivators possessing ploughs	Total number of ploughs possessed	Proportion of paddy cultivators possessing ploughs (per cent)	Average No. of ploughs per paddy cultivator
Bardez	Calangute	29	11	26	38	0.90
Marmugao	Arossim and Quelossim	22	4	5	18	0.23
Salcete	Loutolim	17	2	6	12	0.35
	Velim	26	4	4	15	0.16
Pernem	Morjim	29	19	47	65	1.62
Bicholim	Navelim and Cudnem	19	16	27	84	1.42
Ponda	Marcaim	27	13	20	48	0.74
	Savai-Verem, Vagurbem and Volvoi	15	14	32	93	2.13
Quepem	Balli	23	21	33	91	1.43
Caracona	Gaondongrem	8	7	13	87	1.62
Satari	Nagargaon	15	12	24	80	1.60
Sanguem	Sancordem	14	13	17	93	1.21
	Bati	14	10	14	71	1.00

to be used for puddling the fields subsequently. This need may not arise in case of the Khazan farms and in case of the kharif crop on the Waingan farms. The iron plough would in short suffice completely the needs where the crop is sown by the method of dry sowing whereas it may have to be supplemented with the use of the wooden plough or other implements for puddling the fields where wet sowing is needful. The other implement suited for puddling is the wet land puddler which not only prepares a fine puddle but also enables a quick turnover of about 1 hectare per day. The wet land puddler suits, however, the lighter type of soil as found on the Marad and most of the Waingan lands. It may not suit those khazan farms which grow a second crop of Waingan paddy. The Orissa type of plough is another implement which is amongst the local implements suited well for puddling. It has a broad duck-foot type of base and hence it can puddle a larger area in a unit of time when compared to the ploughs used on the western coast. It can also be used for ploughing but has the same limitation of opening a V-shaped furrow and that of the need for repeated ploughings as in the case of the other wooden ploughs.

Tractors have been already introduced in Goa especially for ploughing the Khazan farms and the coconut gardens. There were 27 tractors with the Agricultural Department at the time of our survey and 27 additional tractors were ordered during the year. Only 17 of the 27 tractors were, however, in working condition and the hours of work put in by these tractors varied from about 12 to 15 thousand hours per year during the last three years. The service was charged at Rs.7 per hour and a tractor covered on an average one hectare in six hours. On this basis the area ploughed during the last three years seems to have varied from 2000 to 2500 hectares per year.

There was already a great demand for the use of the tractors especially for ploughing the Khazan lands which required manual digging. There was, however, no demand for their use on the Waingan farms which might be probably due to the lower costs and the relative ease in ploughing these lands when compared to digging up the Khazan lands. There was some demand for ploughing over the Marad lands but it was difficult in many cases to take a tractor up a hill as well as it was not possible to plough a whole Marad farm because of the unevenness of the fields. An attempt was made by one of the farmers at Cudnem to plough his Marad field with a tractor but as the ploughs could not touch the ground evenly he had to drop the programme and return the tractor. So also another farmer in the same village had made an attempt to use a tractor for ploughing his Waingan farm. The tractor could not again reach the farm because of an intervening irrigation canal and he had also to return the tractor.

A number of farmers in Marcaim and Cumbharjua had used the tractor for ploughing their Khazan lands in the years prior to the survey year. The experience of all these cultivators was that it was cheaper to plough the land with a tractor than to use a bullock plough or to dig it up by manual labour. There was, however, a great saving to the extent of about 30 to 40 per cent of the costs in the farms requiring manual digging. There was on the contrary only a 10 to 15 per cent reduction in the costs in the farms which could be ploughed with bullock power. Tractor ploughing had the other benefits of increasing the production and reducing the costs over weeding but there was no unanimity of experience among the farmers on these issues. There was, however, some additional cost over repairing the 'malis' destroyed by the tractors but this was almost a routine process that had to be performed in these farms every year.

The group of farmers who were cultivating the Durga pai and the Kotak khazan farms on collective basis had also ploughed their farms with a tractor during the last two years. In their case, however, there was a considerable reduction in the cost over ploughing and it was to the extent of about 70 per cent. The costs over digging the Durga pai and the Kotak Khazan farms came to about Rs.1200 and Rs.2000 respectively whereas the costs over tractor ploughing in these farms came to about Rs.400 and Rs.600 per year during the last two years. Similar was the experience of one of the progressive cultivators at Marcaim who was contacted specially, for the purpose. He had also experienced a rise in the yield during the year along with many other farmers but the others attributed the increase to the character of the season. There were also a few farmers in the same village who held that tractor ploughing had impeded the drainage in their farms. The progressive cultivator attributed this belief to some misunderstanding on the part of this section of the farmers. Even though the soils in many of the Khazan farms had a clayey nature, there was no possibility of formation of a pan due to the use of the tractors in their cases as only the disc ploughs and not the ploughs of the mould board type were being used in Goa.

The tractors were available only for ploughing. There were no rotavators with the Department for the purposes of either crushing the clods or puddling. It was, however, possible to use certain types of rotavators for these purposes. The 'Gem rotavator,' for example, was found to be quite successful and satisfactory for puddling in the Madras and the then Bombay State. It has even entered the wet paddy fields of Madras State.¹ The use of flotation methods by providing the tractors with track layers with wide plates, Bombardier half tracks or cage extensions etc. would be the other requisites if the tractors were to be used for puddling the paddy fields.

Puddling was, however, necessary only for the Marad farms and for growing the second crop in the Waingan farms. The Marad farms needed such timely puddling that it might not be possible to use the tractors over wider areas in a season. The provision of roads as mentioned earlier might again prove to be the other handicap. The problem of timely puddling may not arise so acutely in the case of the Waingan farms. The use of the tractor as mentioned above, would, however, destroy the channels and it may, therefore, require a complete change in the irrigation layout for the farm as well as some form of a joint management of a whole farm. It must be emphasized here that there is considerable scope at least on the technical grounds for mechanizing paddy cultivation in Goa because of the large size of the farms. The problem of bigger bunds encircling small patches of paddy fields as in the Konkan areas for example, does not arise in Goa. Even though the individual farmers put in 'malis' around their tiny individual plots, the farms themselves are quite big with the main bunds placed quite wide apart. Some form of joint management would, however, be the pre-requisite if agriculture is to be mechanised in the Khazan, Waingan as well as the Marad farms.

A few of the farmers possessed the walking type of tractors. The Agricultural Department had also one tractor of

¹ Rice - Cultural trials and practices in India, Subbiah Pillai, p.97.

the walking type. Most of the tractors including the one with the Department, were lying idle for want of spare parts. It was possible to locate two of the farmers who had the experience of using a tractor of the walking type. A progressive young farmer at Loutolim purchased a 4 H.P. German tractor including the plough and a rotavator for Rs.2350. He could, however, use it only for his Marad farm as the wheels of the tractor could not get a grip in his Waingan farm which was somewhat sandy. Because of these limitations, he could work the tractor only for 20 days in a year. As the tractor was working on petrol, the cost of operating came to about Rs.25 per day. He could plough the land deep and because of deep ploughing could succeed in getting higher yields. He was getting an average yield of about 18 khandis from his holding of 19,000 sq.metres prior to the purchase of the tractor. As a result of its use he succeeded in getting yields of 40, 33 and 28 khandis in the succeeding years. Because of the rise in the price of petrol, however, the use of the tractor became quite uneconomical and he, therefore, sold the tractor to another young progressive farmer in the village namely Chandur. The farmer in Chandur was using the tractor mainly for ploughing in his coconut garden. He was also growing paddy in the Waingan farms but he could not use the plough in these fields because of the sandy nature of the soil. He was, however, thinking of changing the wheels or using some attachments for the wheels for using the tractor in his Waingan fields. In his opinion, there was an acute need for the use of such tractors in the paddy fields as it was becoming difficult to get labour for the timely operations needed for the crop. There was no such rigidity about the time for operations in the coconut gardens and it was possible to adjust the supply and demand for labour. A number of cultivators with whom we discussed the matter were prepared to hire such tractors if they were to be made available through the Agricultural Department, along with competent and well trained operators.

Seeds and the process of sowing

The methods of sowing have been broadly mentioned in the beginning of this chapter itself. An attempt will be made here to give a few more details of the sowing operations over the different types of land as observed through the survey.

In the method of wet sowing, the sprouted seeds were being simply distributed over the entire puddled area by hand. In the method of dry sowing, however, two different practices were followed. One was to broadcast the seeds over the entire farm and then plough the field again to mix the seeds with the soil. The other practice was to sow the seeds after the plough by putting a few grains at intervals in the furrows opened by the plough and then use the plank to cover the seeds. This amounted to almost dibbling the seeds at specific distances almost in an irregular fashion. The method of dibbling had many advantages as it facilitated weeding as well as increased the productivity of the crop. Experimentation over these methods of sowing elsewhere in India have already shown that under ideal agronomic and seasonal conditions, the dibbled plots give as much or even higher yields than the transplanted ones.^{1/}

¹ Rice - Cultural trials and practices in India, Subbiah Pillai (ICAR), p.20.

The practice of dibbling was, however, being followed by a few cultivators only. Only 4 cultivators at Marcaim out of the 50 cultivators contacted for the enquiry for Waingan cultivation in the four villages, had dibbled the seeds for growing the kharif crop in their Waingan farms. In case of the wet sowing method, there was no other alternative than to spread the seeds over the entire farm as uniformly as possible even at the cost of the difficulties in weeding the fields.

The Khazan farms were also being sown by broadcasting the seeds. The same method was used even in the farms which had submerged in the previous years. It was already mentioned that the productivity of a Khazan farm got reduced to only one third^{of} its normal productivity in the first year after submergence because of the increase in the salinity. A unique method of sowing was, however, being adopted by the farmers on the Malabar Coast to save the crop from the increased salinity. The surface soil from each square yard of the area of a farm was being heaped into mounds before the monsoon and sufficient paddy seeds were being sown on each mound. The seed grew on the mounds till July and when most of the salts from the mound had leached down, the mounds were being levelled and the seedlings were being planted on the freshly spread leached out soil. The method was known as the 'Kaipad' method and it was largely practised in Tellichery district on the Malabar coast where the farms were subject to salt water flooding almost annually. ^{1/}

The seeds were being grown as such without any seed treatment. The only practice of seed treatment observed by us was that of treating the seeds with turmeric to save the sprouts from the paddy snails. This was also noticed only in Morjim in Pernem taluka. Certain methods of seed treatment were, however, being followed elsewhere to control the periods of maturity of the crop to suit either the soils or the availability of the irrigation water.^{2/} A method known as the Tarai system was being followed in parts of U.P. to advance the maturity of the crops by a few days. It consisted of sprouting and then drying the seeds for 30 days before sowing. A similar method was also followed in Travancore and Cochin. This amounted to vernalization of the seeds and the method might, therefore, prove suitable for bringing about an earlier maturity of the crops in the Marad and the Waingan farms facing a shortage of water at the end of the season.

The kharif crop in the Waingan farm was being sown by the end of May even before the commencement of monsoon. The crop on the Khazan lands was being sown in June after the monsoon had set in well whereas that on the Marad land was being sown generally in July when it was possible to puddle the fields properly. The sowing period for the second crop in the Waingan farms, however, depended upon the availability of water for a particular farm. These farms were being sown from November to January. The waingan farms, were being sown with the sprouted seeds immediately after puddling. Here again a unique experience was available in the Tirunelveli

¹Rice, Tropical Agricultural Series, D.H.Grist, p.16.

²Rice-Cultural trials and practices in India, Subbiah Pillai, p.25.

district of the Madras State where the crop was being sown nearly after two months after puddling, keeping some fresh water in the fields when needed. This method was known as the 'Palamthozi' method and according to the farmers themselves it enabled them to get bigger crops when compared to the method of sowing immediately after puddling. It was observed that the method stimulated the growth of blue green algae and promoted better aeration of the soil, which were probably the factors responsible for the greater yield. ^{1/} The method had, however, certain distinct advantages as it enabled the farmers to cover larger areas with a pair of bullocks and reduce the costs over weeding as most of the weeds decayed during this time.

Quite a large number of varieties of the local type were being sown in Goa. The seeds of the varieties sown for the second crop of paddy in the Waingan farms had always to be brought from outside as the farmers could not preserve the seeds of their earlier crop through the period of the monsoon. This difficulty did not arise with the seeds of the kharif crop as the seeds had to be preserved through a dry period only.

The selection of a variety for a particular type of land resource depended upon its having some of the characteristics as resistance to salinity, resistance to accumulation of water and resistance to drought. The varieties which resisted the salinity were being grown in the Khazan farms, those which could respond well to irrigation were being grown in the Waingan farms whereas those that were drought resistant were being grown in the Marad farms. The varieties namely 'Karangut', 'Mune' and 'Aajgo', were suited, to the Khazan farms; 'Babri', 'Damgo' and 'Khochari' were suited to kharif sowing in the Waingan farms whereas Shitto was suited to the second crop in these farms; and 'Damgo', 'Khochari', 'Patni' and 'Dongri' were suited to the Marad farms. Some of these varieties, however, possessed dual characteristics and were, therefore, suited to more than one type of resource. 'Shitto', for example, was suited to the Khazan farms as well as the Waingan farms and it had the property of resistance to some degree of salinity as well as could respond to irrigation. Khochari had also the property of responding to water at the same time resisting the drought conditions. It is on this account that it was being grown in the Waingan farms, Marad farms as well as in some of the Khazan farms.

In addition to the above varieties, there were other varieties which were being grown in certain specific areas. 'Doding' and 'Keval' were the names of the types grown in the kharif season in the Waingan farms at Majim whereas 'Naval' was the name of the variety grown as the second crop in the same fields. 'Patni' was the name of the variety that was grown on the Marad lands at Loutolim. 'Kendal' and 'Kusalake' were being grown in the kharif season in some of the areas. The farmers, however, always tried to select the varieties not only according to the general characteristics of their farms but even the characteristics of the particular patch of land within a farm. 'Karangut' was for example being grown only on the more saline lands near the bunds in the Khazan farms whereas Mune was being grown in the parts away

¹Rice - Cultural trials and practices in India, Subbiah Pillai, p.6.

from the bunds. These two varieties were being largely grown in Borim and Cumbharjua whereas the drought resistant Khochari variety was being grown on most of the farms at Marcaim. The Save banar in this village, was used for growing the variety 'Ajgo'. 'Khochari' was being grown in the kharif season in all the Waingan farms at Marcaim whereas 'Babre' and 'Damgo' were the varieties grown under similar conditions at Loutolim and Cudnem respectively. 'Doding' and 'Keval' were the kharif varieties at Morjim. 'Shitto' was the common variety for the second crop in the earlier three villages whereas 'Naval' was being sown only in the village Morjim. A majority of the Marad farms at Cudnem and Marcaim, were being sown with 'Khochari' and 'Patni' respectively whereas only a few were being sown with 'Damgo' and 'Ajgo' in these respective villages. 'Patni' was the only variety grown on the Marad farms at Loutolim. Karangut, Mune, Ajgo, Shitto, Khochari and Patni seemed to be the common varieties. Attempts were being made through the Agricultural Department to introduce improved varieties of similar types from the adjoining States but none of the farmers contacted had tried such improved varieties.

Though more than one of the varieties described above were being grown in a single farm of the Khazan or the Marad type, a Waingan farm had to be essentially sown as far as possible with one variety only, to suit the programme of irrigation. All the plots growing a kharif crop in such a farm had to be harvested before a specific date to suit the storage of water in a part of the farm or to plough and puddle the other parts. So also the sowing of the second crop had to be completed according to the irrigation programme drawn jointly not only by the farmers cultivating in a farm but also by the farmers from the other farms if they were to depend upon the same source of irrigation. It is on these accounts that there had been more uniformity in the cultivation practices in the Waingan farms than in the others. This also raised difficulties in the extension of improved seeds for the Waingan farms especially for those farms which were cultivated by a number of farmers. Unless the groups decided to try out the seeds on such farms or on parts thereof, it was difficult for an individual farmer, howsoever progressive he may be, to grow the improved variety in his plot at his own initiative.

Transplantation

It was noted earlier that paddy was being grown in Goa mostly by the method of sowing the seeds in the fields directly. Transplantation was, however, not an unknown practice to the people and the method was being followed at places within a farm where there was a danger to the crop in the seedling stage because of the excess of water. So also even in fields which were broadcast, the plants had to be thinned out at places where they had grown in abundance and had to be transplanted at places where the growth was thin.

An attempt was being made by the Agricultural Department to introduce the Japanese method of paddy cultivation in Goa. Four of the cultivators who had tried this method in Marcaim, Savai Verem and Navelim were, therefore, contacted to note their experiences about the method. Practically in every case, there was an increase in yield to an extent of about one and a quarter to one and a half times of their normal yields. The method however, involved transplanting which meant an introduction of an additional highly labour intensive operation in

the processes of paddy cultivation in Goa wherein already a shortage of labour was being felt at the time of puddling. Though the farmers who tried this method, had approved of it, it was not possible for them to extend it over a large area of their farms. It was again not suitable under many conditions in Goa. It could not be adopted in the Khazan farms as it was difficult even to enter these farms after the heavy showers. So also it could not be followed in the big sized Waingan farms unless all the farmers as a group adopted it to suit the irrigation programme. It was, however, suited well to the small Waingan farms and the Marad farms cultivated independently. Three of the four cultivators who had tried it, had followed the method in their independent Waingan farms and the remaining one cultivator had tried it on his Marad farm.

The Japanese method of cultivation had a main advantage over the ordinary method of transplanting rice in that it enabled proper interculturing and pruning of the roots which encouraged tillering as well as the formation of roots from the upper nodes. Experiments on the methods of planting paddy had shown that at many places there was not much difference in the yields from growing rice by transplanting or by broadcasting or dibbling. On the contrary under ideal agronomic conditions the dibbled plots gave as much or even higher yields than the transplanted ones.^{1/} There would be, therefore, no point in introducing transplanting in Goa, where the Japanese method was not practicable. Transplantation would be on the contrary indispensable in those farms which could be utilized for growing three crops of paddy as noted in an earlier chapter. Since there was little difference in the labour requirements of growing paddy by the transplanting method and by the Japanese method when compared to that of growing paddy by the transplanting method and by the broadcasting method, the Japanese method would, be more desirable only where transplanting would be inevitable.

Attempts are, however, being made even in Japan to experiment with the methods of direct sowing. The need for such experimentation has come through the difficulties in getting labour and in mechanizing the process of transplanting. It is on this account that direct sowing is being regularly practised in some parts of that country.^{2/} Even though direct sowing saves the costs over transplanting there is some increase in the cost over weeding. In view of the recent developments in weedicides as well as in methods of direct sowing itself there, however, appears to be a good scope for large scale adoption of direct sowing except where transplantation is inevitable.

Certain modifications in the cultural practices are being practised elsewhere to overcome the disadvantages of direct sowing. The methods known as 'biasing' or bushening in Madhya Pradesh, Bihar and Orissa ^{3/} and as 'Haud and Dhim'

¹Rice - Cultural trials and practices in India, Subbaih Pillai, p.20.

²Rice and Rice Cultivation in Japan, Takane Matsuo, p.175.

³Rice-cultural trials and practices in India, Subbaih Pillai, p.74.

in the Kangra Valley of Punjab ^{1/} are examples of these modifications. In these methods, land is flooded and ploughed after the seedlings grown in the broadcast fields have attained a height of about 9 inches. This serves the purpose of not only killing the weeds but also that of thinning the crop and disturbing the soil as in the case of the Japanese method of paddy cultivation. It serves as the cheapest method of weeding and because of the cross ploughings the seedlings get arranged as if in a field of transplanted paddy. A number of seedlings, however, get killed and there is some wastage of seeds. But the saving in the labour costs due to deleting transplanting compensates for more than the costs of seeds.

Experimentation with these practices in India have shown that 'biasing' is definitely superior to broadcasting in all the varieties whether early, medium or late. The increase in yield ranged from 9 to 40 per cent. When compared to the method of transplanting, however, it was found that there was no difference in the yields from the two methods at one research station whereas transplanting had proved superior in some years at the other station.^{2/} Some experimentation has been also done in this regard in Ceylon. Field trials in that country have confirmed the conclusion that the yield of paddy sown broadcast can be considerably increased by harrowing the crop when the seedlings are 3 to 4 weeks old. ^{3/} The practice is being already followed in Ceylon. The fields are drained leaving about 3" of water and toothed harrow yoked to a pair of cattle is then drawn over a field, returning over the same strip in the opposite direction. This operation is then repeated in the crosswise direction. The harrow is thus drawn over the field four times and it is possible to harrow 3 to 4 acres in a day. It is held in Ceylon that harrowing the standing crop increases the yield by four to ten bushels per acre. ^{4/}

Early maturity of the crop and conservation of water were some of the requisites of paddy cultivation in some of the Waingen farms as noted in an earlier chapter. The method of transplantation had, therefore, an advantage over the other methods in case of such farms in Goa. Transplantation reduced the water requirements of the crop as the crop occupied only a small area in the initial stage. Double transplanting was also being resorted to in some parts of the country to achieve this objective. Double transplanting had the other advantage of lessening the maturity period of the crop at least by a week. The method of transplanting either single or double, was, therefore, necessary in some of the farms facing a shortage of water at the end of the season. The practice of double

1 Report on outstanding agricultural practices in Madras, Andhra Pradesh, Gujarat and Punjab - Indian Council of Agri.Econs.p.8.

2 Rice-cultural trials and practices in India, Subbiah Pillai,p.22.

3 Rice-tropical agricultural series, D.H. Grist, p.121.

4 Rice - tropical agricultural series, D.H. Grist, p.129.

transplanting may also increase the yield. The adoption of these practices may not, however, be possible in many farms because of the demand for labour. There is one more interesting practice relating to the method of transplanting and the early maturity of the crop, evolved at the Maruteru Research Station. In this method, sprouted seeds are sown on the seedbeds and the usual wet treatment is given to these beds for the first three weeks. Thereafter, the water supply is completely cut off and the seedbed is allowed to dry up. Deep fissures and cracks develop on the bed and the seedlings look as if they are scorching up. After a fortnight, the seedlings are pulled out dry and are kept heaped up in a puddled plot for about 24 to 36 hours by which time the seedlings give out plenty of roots. Such seedlings when transplanted in the fields, establish comparatively quicker and the crop matures by about 10 days earlier. ¹/ The method thus leads to early maturity of the crop and a considerable conservation in the use of water due to transplanting, drying of the nurseries and early maturity. The method can, however, be followed only during the dry seasons. The use of manures and fertilizers, close planting, greater number of seedlings per hole and double transplanting etc. are the other general methods of bringing about an early maturity.

In the context of the above discussion it, therefore, appears that the Japanese method of cultivation would be worthwhile to adopt where there is an abundance of water to permit growing of three crops in a year and at the other extreme where there is a shortage of water needing conservation of water and early maturity. The methods of biassing or harrowing with a toothed hoe as in Ceylon might prove helpful in the other farms.

Use of manures and fertilizers

A variety of manures and fertilizers were being used for paddy in Goa. Farmyard manure, pig-droppings, fishmeal, ash, salt, ammonium sulphate, ammonium phosphate, urea etc. were the manures and fertilizers used during the survey/year. The number of paddy cultivators using the different manures and fertilizers for the different types of cultivation in the villages selected for the special enquiries have been noted in Table 8.7.

Practically all the farmers sowing the Waingan crop had used manures and fertilizers. For the kharif crop in the same farms, however, the proportion of farmers using manures and fertilizers had dropped down to two-third. On the contrary more than three-fourth of the cultivators had used such inputs for Marad cultivation. In case of Khazan cultivation, however, hardly half the number of cultivators had used any manures and fertilizers.

There were again variations in these practices from one village to the other as the table itself would indicate. Practically all the farmers at Loutolim and Marcaim had used manures and fertilizers for their Marad land whereas a few of the cultivators at Cuduem had used only ash for the purpose. In the latter village, having a very large area under Waingan cultivation, the Marad resource was considered as an inferior

¹ Rice - cultural trials and practices in India, Subbiah Pillai, p.34.

Table 8.7 : Number of farmers using different manures and fertilizers for the different types of paddy cultivation in the villages selected for the special enquiries.

Type of cultivation	Village	Total No. of farmers contacted	Number of farmers using						Total No. of farmers using manures & fertilizers	
			Farmyard manure	Fishmeal	Aah	Salt	Chemical fertilizers	Farmyard manure & chemical fertilizers		Farmyard manure & fishmeal
Khazan cultivation	Marcaim	7	-	-	-	-	4	-	-	4
	Borim	12	2	-	-	-	3	-	-	5
	Cumbharjua	11	1	-	-	-	3	-	-	4
	Total -	30	3	-	-	-	10	-	-	13
Kharif cultivation in the Waingan farms	Morjim	2	-	-	-	-	1	1	-	2
	Loutolim	8	-	1	-	-	5	-	1	7
	Marcaim	23	-	-	1	-	9	4	-	14
	Cudnem	4	-	-	2	-	-	-	-	2
	Total -	37	-	1	3	-	15	5	1	25
Waingan cultivation in the Waingan farms	Morjim	5	1	-	-	-	3	-	-	4
	Loutolim	8	-	-	1	-	3	2	2	8
	Marcaim	23	-	1	-	-	8	14	-	23
	Cudnem	14	-	4	-	-	-	-	10	14
	Total -	50	1	5	1	-	14	16	12	49
Marad cultivation	Loutolim	12	2	-	1	2	6	-	-	11
	Marcaim	16	-	10	-	1	4	-	1	16
	Cudnem	8	-	-	3	-	-	-	-	3
	Total	36	2	10	4	3	10	-	1	30

and a submarginal resource and the farmers were, therefore, reluctant to spend over the cultivation of the same. Similar was the nature of variation for the kharif crop in the Waingan farms. Practically all the cultivators who were available for the enquiry and who had grown the kharif crop in the Waingan farms in Lontolim and Morjim had used manures and fertilizers whereas only a little more than half of the cultivators at Marcaim had used such inputs for the crop. In Cudnem, again two of the four farmers had used only ash as a manure for the kharif crop. There were, however, no marked variations in these respects in the case of the farmers sowing the kharif crop in the Khazan farms and the rabi crops in the Waingan farms.

The table would further indicate that it was mainly the fertilizers that were being used for paddy by a large number of cultivators. They were also being used in addition to farmyard manure in some cases, especially in Lontolim and Marcaim. Fishmeal occupied the second place in this respect and like the fertilizers it was also being used in addition to farmyard manure in many cases. Its use was, however, restricted mainly to Waingan cultivation in Lontolim and Cudnem and to Marad cultivation in Marcaim. Practically all the cultivators growing the Waingan crop in Cudnem had used fishmeal whereas a majority of those cultivating the Marad lands at Marcaim had made use of this manure. Use of fishmeal for a particular resource was, however, rooted almost in the traditions in these villages. If we try to determine the number of cultivators using the farmyard manure either as a single type of manure or in combination with the others, we would find that it was being used mainly for Waingan cultivation and rarely for the kharif cultivation on the Khazan, Waingan and the Marad lands. Ash was being used by a few cultivators mainly for the kharif crop in the Waingan farms and that on the Marad lands. The use of common salt was restricted to only the Marad lands and the cultivators believed that salt had the property to "dissolve" (in fact to disintegrate) the rocks by its chemical action and thus improve the tilth of the soil. One of the farmers at Marcaim had used salty mud instead of salt. Ash and salt were, however, being used only once in a period of two or three years and hence the practice was observed in case of only a few of the cultivators. Green manures were being nowhere used for paddy cultivation even though they were being commonly used for the other crops as will be seen in the later chapters.

The above data relate to only a few villages selected for the special enquiries. The data from the general survey gives a more detailed idea about the use of manures for paddy in general over the entire territory. These data have been presented in Table 8.8. In view of the general purpose of this enquiry, the data are however, available only for the cultivation of paddy in the different seasons and not for the specific types of paddy land as noted above.

The table would indicate that different practices of manuring were being followed in the different parts of Goa. Farmyard manure was being used by a large proportion of the cultivators in the clusters in Bicholim, Ponda, Quepem, Canacona, Satari and Sanguem talukas but it was not so in the other talukas. Only a small proportion of the farmers in the clusters from Bardez, Marmugao, Salcete and Pernem talukas had used farmyard manure with the exception of only one village viz. Velim in Salcete taluka. The use of farmyard manure was very meagre in the clusters namely Calaugute from Bardez taluka, Arossim and Quelossim from Marmugao taluka and Loutolim from Salcete taluka whereas at Marjim in Pernem taluka about half the number of cultivators had used farmyard manure.

Table 8.8 : Number of farmers using different manures and fertilizers for kharif and rabi paddy in the thirteen clusters of villages selected for the general enquiry

Taluka	Village-cluster	K h a r i f P a d d y						
		Number of cultivators growing kharif paddy	Number of cultivators using					Fertilizers
			Home produced	Purchased	Total	Ash	Fish-meal	
Bardez	Calangute	29	6	2	8	11	9	22
Marnugao	Arossim and Quelossim	22	2	-	2	20	2	18
Salcete	Loutolim	2	-	-	-	1	2	-
	Velim	26	5	20	25	-	18	26
Pernem	Morjim	29	12	2	14	6	8	11
Bicholim	Navelim and Cudnem	5	-	-	-	-	-	-
Ponda	Marcaim	27	3	1	4	-	-	19
	Savai-verem, Vagurbem and Volvoi	14	-	-	-	13	-	2
Quepem	Balli	22	6	14	20	-	-	11
Canacona	Gaondongrem	8	7	-	7	-	-	-
Satari	Nagargaon	7	4	1	5	-	-	-
Sanguem	Sancordem	8	-	2	2	-	-	1
	Bati	10	3	-	3	-	-	-

(contd.)

Table 8.8 (continued)

Taluka	Village -Cluster	Rabi (Waingan) Paddy						
		Number of cultivators growing rabi paddy	Number of cultivators using			Ash	Fish-meal	Fertilizers
			Home produced	Pro-duced	Total			
Bardez	Calangute	13	2	2	4	-	5	12
Marmugao	Arossim and Quelossim	-	-	-	-	-	-	-
Salcete	Loutolim	5	-	-	-	1	2	3
	Velim	-	Not Available			-	-	-
Pernem	Morjim	4	2	-	2	1	1	2
Bicholim	Navelim and Cudnem	19	15	3	18	-	Not Available	-
Ponda	Marcaim	13	5	7	12	-	-	2
	Savai-verem, Vagurbem and Volvoi	14	9	5	14	2	1	4
Quepem	Balli	16	3	-	3	-	2	11
Canacona	Gaondongrem	-	Not Available			-	-	-
Satari	Nagargaon	14	9	4	13	-	-	2
Sanguem	Sancordem	13	6	7	13	-	-	1
	Bati	14	12	-	12	-	-	3

Even though a large number of cultivators at Velim on the coast in Salcete taluka had used farmyard manure, it was purchased from the other areas. The practice of purchasing farmyard manure was largely prevalent in another cluster namely Balli in Quepem taluka. Excluding these two villages from Salcete and Quepem talukas, the farmyard manure used in the other villages was produced mostly by the cultivators themselves. There were, however, a few cases of purchases being made by the cultivators almost in every village but the extent of such purchases was fairly small. Marcaim from Ponda taluka and Sancordem from Sanguem taluka were the other two clusters wherein about half the number of cultivators had used farmyard manure which was purchased. The practice of purchasing farmyard manure for paddy seems, therefore, to be restricted mainly to the southern talukas.

The use of ash, as the survey indicated, was restricted to only a few of the clusters viz. Calangute, Arossim and Quelossim, Loutolim, Morjim and Savaiverem, Vagurbem and Volvai. The use of ash seems to have been made mainly in the north-western part of the territory. Quite a large number of the cultivators at Calangute, Arossim, Quelossim, and Savaiverem, Vagurbem and Volvai had made use of ash for the kharif crop. The number of cultivators using ash for the rabi crop in these villages was negligible.

The use of fishmeal was restricted mainly to the villages on the coast and the villages in the north-west sector. The extent of its use, however, differed from one village to the other. It was largely used at Velim on the coast and at Cudnem in Bicholim taluka as observed earlier. Fishmeal was the principal manure for paddy in Goa sometime ago as we were told, but its use was being abandoned gradually because of the rise in its price. It was being used for both the kharif and the rabi crops. Quite a large number of the farmers in the coastal villages had used it mainly for the kharif crop whereas the farmers in Ponda and Bicholim talukas had used it mainly for the rabi crop.

Fertilizers were being used practically in every village. The proportion of cultivators using fertilizers was, however, large only in the clusters in all the coastal talukas except Canacona taluka but including Quepem taluka and the village Marcaim in the western part of Ponda taluka. They were being used by a few farmers in another cluster in the northern part of Ponda taluka and the clusters in Bicholim, Satari, Sanguem and Canacona talukas where farmyard manure was being used on a large scale. On the basis of these data it, therefore, seems that farmyard manure was the principal manure used for paddy in the northern, the southern most and the interior parts whereas fertilizers were being largely used in the middle coastal and the central parts. The use of either fishmeal or ash was also restricted to the coastal and north-western areas.

It may be recollected that the analysis of the soils as discussed in an earlier chapter had depicted certain deficiencies in the different types of soil. The practice of using manures and fertilizers have, therefore, to be examined in the context of the results of this analysis.

The analysis of the soils had indicated that the sandy and the hydromorphic soils and some of the saline soils were deficient in organic matter. The sandy and the saline soils were restricted mostly to the coastal belt whereas the hydromorphic soils were preponderant in the north-western part of the territory. In the context of the results obtained from

the analysis of the practices of using manures and fertilizers, it, therefore, appears that a larger proportion of the farmers were applying organic matter to the soil in the form of farmyard manure where the soils were not deficient in organic matter whereas only a small proportion of the farmers were using farmyard manure where the soils were highly deficient in it. This seems to be again so more with the sandy soils than with the saline and the hydromorphic soils as only parts of the saline soils were deficient in organic matter and the hydromorphic soils were found even on the non-coastal parts in the north. The farmers also seemed to be aware of such deficiencies as farmyard manure was being used even for the saline soils which were considered to have a natural high productivity potential.

The use of farmyard manure or compost had yet another significance in the context of the soils actually under cultivation in Goa. The analysis of the soils had indicated that for a larger part the soils under cultivation consisted of the coarser material. This attribute of the soils no doubt had made them well drained but it had at the same time an effect on their water holding capacity. Except for the saline alluvial soils, the soils used for paddy had a high permeability and a low retentivity of water. This was resulting in greater percolation, need for frequent irrigations and wastage of water. The use of farmyard manure had, therefore, an importance in the cultivation of these lands as a measure to increase the water retentivity of these soils.

The analysis of the soils had indicated that acidity was a major problem of the coarse soils. Only the sandy and the non-ferralitic alluvial soils had a normal pH. Attempts were being made by the farmers to counteract the acidity problem through the use of ash. But ash was being used on a limited scale and in limited areas and it also meant loss of organic matter where the ash was prepared by burning cowdung, coconut husk or other material. An important source of ash locally available was paddy husk. It was a quick acting material and had produced excellent results at the rate of one or two tons per acre on highly acid soils of North Bengal and elsewhere.^{1/} It was, however, not possible to know the exact source of ash used by the Goan farmers. But there is a great potential for using ash prepared from paddy husk over wider areas. Burning the soil was another method for correcting the soil acidity. One interesting soil management practice followed in the highly acid 'terai' soils of North Bengal was to collect the soil clods in a few heaps on the farm, burn them and again spread them over the entire field to reduce the acidity of the soils. It was observed in such farms that through burning the soil it was possible to raise the pH from 5.0 to 7.6.^{2/} Use of ash or burning the soil to reduce the acidity, however, meant wastage of organic matter which could be decomposed into compost or used as a fuel. Use of lime and basic slag were the improved methods available to correct the soil acidity. Use of such improved methods was, however, nowhere being made in Goa. There were other methods to counteract the effects of acidity on crop productivity and they were the use of organic manure and green manuring. These methods had, however, only an effect of soothing the gravity of the acidity problem and were not the corrective measures.

¹ Agricultural Production Manual - Indian Council of Agricultural Research, p.25.

² Ibid, p.26.

The analysis of the soils also showed that most of the soils were deficient in lime and this was one of the factors responsible for the higher acidity. The application of lime or basic slag had thus a two way importance. It was necessary to use them for supplying calcium for the vegetation besides their use for correcting the soil acidity. The analysis had shown that the problem of lime deficiency varied greatly with the different samples. The identification of the lime deficient soils was, however, possible only through a soil survey on a wider scale.

The analysis for the contents of the major plant nutrients in the soils had shown that the sandy and the hydromorphic soils were deficient in nitrogen; all the soils except the sandy soils were deficient in phosphoric acid whereas the sandy and the hydromorphic soils were deficient in potash. The deficiency of nitrogen in the sandy and the hydromorphic soils was due to the deficiency of organic matter. As noted above it was being recouped largely through the use of fertilizers. Attempts were being made to overcome the deficiency of phosphoric acid through the use of superphosphate. There was also a great demand for super phosphate as was noticed in the village Marcaim. Bonemeal was another phosphetic fertilizer which was suited more to the acid soils than the others but it was not possible to know about its use. The deficiency of potash was being made good by the farmers through the use of ash. Ash was being used even for the Marad lands as was noticed in the village Gudnem. It was, therefore, difficult to infer whether the practice of using ash had developed to meet the acidity and the potash deficiency in particular soils or it was a result of certain experiences in the past and tradition in general. Potassic fertilizers were, however, not being used by the farmers.

To derive the full benefit from the use of fertilizers it is necessary that the soils should have a normal pH. It is well known that farmers of the high acid soil regions cannot reap full benefit from the use of fertilizers unless soil acidity is corrected or conditioned. There was, however, no scope for the farmers either to know about the acidity of their soils or to select a suitable fertilizer. The fertilizer available through the co-operative society or the Gram Panchayat was the only criterion for the selection of a fertilizer. At Marcaim, as we were told, some of the farmers had through experience found that urea (which was less acidic than ammonium sulphate) was more suited to their farms than ammonium sulphate. But they had to use whatever fertilizer that was available through their society.

The farmers were accustomed in the past to the use of fishmeal which was neither acidic nor alkaline and which supplied all the major plant nutrients. With the introduction of fertilizers supplying only one or two plant nutrients and having varying acidities and alkalinities, there was a need to relate the fertilizer use to the specific soil conditions. There was a need to attempt this at least provisionally through the use of simple soil testing kits till any elaborate soil survey could be undertaken.

Along with the use of selected fertilizers it was necessary to promote the use of organic material in the form of farmyard manure, compost or green manuring. There was already a limited scope for increasing the production of cowdung manure in view of the need for keeping down the number of cattle

in the territory. Composting and green manuring, therefore, remained the only alternatives to increase the supply of organic matter to the soil. Attempts were already being made through the Development Blocks to promote the preparation of compost. There was already a scope for preparing compost through the use of green material growing on the hills. Such green material can even be dumped into the soil at the time of the first ploughing and be allowed to decay till the subsequent ploughings are given. It is a common practice in the Jaffina Peninsula in Ceylon, for example, to bring large quantities of green stuff from the jungles or the wild trees growing on the nearby islands even by train, cart or boat to manure the paddy crop. In some parts of Madras green leaves are trampled in the field about 3 to 4 weeks after transplanting. 1/ It gives a higher yield as ammonia becomes available to the soil at all stages of the decomposition processes which coincide with the active period of plant growth. Experiments have also shown that direct incorporation of the green matter in the soil is preferable to composting. 2/ It would not be difficult to adopt such practices in Goa in view of the vicinity of the wild trees practically to every village. Attempts were already being made on a small scale through the Development Blocks to introduce *Glyricidia maculata* in the area for planting nearby the farms to provide green leaves for composting or green manuring. The *glyricidia* plants were, however, introduced only during the year of this survey and some of the farmers planting the *glyricidia* cutting, whom we could meet, had planted them not on their farms but in their gardens. *Ipomea carnea* was another shrub which deserved attention in this respect. It had many advantages over the other shrubs in that it was resistant to drought as well as excessive moisture, grew well on too heavy as well as too light soils and was capable of withstanding a great deal of alkalinity or salinity. Moreover, it could not be eaten by the cattle; it was very quick growing and was capable of giving every year or twice a year a good deal of green matter which decomposed very early. It appeared to be an ideal plant for green manuring. 3/ *Tithonia diversifolia*, the wild sunflower which can produce much leaf and make a good hedge, 4/ also deserves attention in this respect. It is possible to introduce such plants even on the waste lands for the benefit of the whole community. Such pieces of waste land are already being used for planting perennial green manure plants in certain parts in South India. 5/

The sea weeds growing along the sea shore and the creeks can also be used after drying or composting to solve the problem of organic matter deficiency in the coastal areas. Sea

1 Rice-cultural trials and practices in India, Subbiah Pillai, p.79.

2 Green manuring of crops - review of experimental results in India - Panse, Abraham and Leelavathi, p.45.

3 Report on outstanding agricultural practices in Madras, Andhra Pradesh, Gujarat and Punjab - Indian Council of Agricultural Economics, p.70.

4 Rice - tropical agricultural series. - D.G.Christ, p.213.

5 Report on outstanding agricultural practices etc., p.69.

weeds have a high content of minerals and trace elements and a high water imbibing property which makes them useful particularly for the sandy soils on the coast which are highly drained. 1/

The above methods, though they are easier to practise, relate to incorporating materials grown outside the fields into the soil. A number of experiments have shown that green manuring in situ has given significantly high response to green manure brought from outside. 2/ Green manuring in situ is known to result not only in increasing the yield but also in steadying the yield irrespective of the vagaries of the monsoon. In Madras, for example, it was observed that in one plot the yield of rice was only half of the normal yield due to bad season but in the other plot which had received green manure continuously over six years, the reduction in yield was 17 per cent only. 3/ It is because of this attribute of green manuring that the use of green manures have to be given even a preference over the use of fertilizers where it is possible to use the green manures.

Attempts were being already made through the development blocks to introduce green manure crops such as Dhaincha for growing the crop in situ. We made an attempt to contact two of the farmers in the village Marcaim who had received the Dhaincha seeds from the Development Block. One of them had grown the seeds in a patch of soil in his mango orchard but found that only 10 per cent of the seeds had germinated. The plants were ready for burying late in September and he had no Waingan farms to use these plants for green manuring. He, therefore, totally neglected these plants. The other farmer did not know how to use the seeds but had merely accepted the packet of seeds because it was distributed free. This was, however, the first year of the introduction of Dhaincha seeds in the area. A study of these two cases would indicate that efforts would be needed on a more organized scale and not on an individual basis if such a programme of introduction of green manuring in situ is to be popularized in the area.

It must be admitted that there are a number of difficulties in adopting the practice of growing the green manure crops in situ in Goa. As paddy is grown by the method of broadcasting, it would not be possible to grow a green manure crop before the cultivation of paddy as in the areas where paddy is grown by the method of transplanting. Attempts are being made elsewhere to recommend the broadcasting of green manure seeds along with paddy seeds and trample the green manure plants at the time of weeding or adopt the practice of biyassing or bushening or interculturing as stated earlier. A number of experiments over this method have, however, shown that the method

1 Survey and utilization of agricultural and industrial by-products and wastes - Committee on Natural Resources, Planning Commission, Government of India,

2 Green manuring of crops - review of experimental results in India. Panse, Abraham and Leelavathi, pp.33-36.

3 Rice - Cultural trials and practices in India, Subbiah Pillai, p.79.

has failed to give the necessary response in the form of yield as well as has proved to be uneconomic which may be because of the small quantity of the green material available, competition with the paddy plants ^{1/} etc. It may, however, be possible to grow a green manure crop after the harvest of kharif paddy for the benefit of the Waingan crop or the subsequent kharif crop in the next season. Near Bezwada in Andhra Pradesh, for example, Dhaincha or Sannhemp seeds are broadcast in the standing crop of paddy after flowering when there is plenty of moisture in the soil. ^{2/} Even if a few of the plants of the green manure crop get cut while harvesting the paddy, the stubbles of the crop sprout again. It may not be difficult to adopt such a practice in Goa except in the highly sandy soils which may have to be irrigated even for growing a green manure crop. Moreover, the late rains which enable storage of water in the temporary tanks might also help in the growth of the green manure crop in the other than the sandy soils. A green manure crop can also be grown by the same method after the harvest of the Waingan crop where it is possible to irrigate the crop with the help of water left over in the irrigation ponds and tanks. It might, however, be possible to sow the green manure seeds on the Marad lands before the sowing of the paddy crop as the paddy crop is sown late in June or July on these lands. The economics of adopting the method on the Marad land may have however, to be worked out as the practice gives an economic response only when a green manure crop is buried at the age of 7 or 8 weeks. The use of green manure in situ would, therefore, be possible only after certain limitations are overcome and the methods are given fair trials in the fields. For a larger part however, green manure would have to be supplied in Goa mainly through the cultivation of the green manuring shrubs and through applying the green material directly to the field wherever possible or by converting it into compost.

There are, however, no suitable implements in Goa to bury the green manure if the green manure crop is either to be grown in situ or applied directly. It may have to be either ploughed up in the soil or trampled in the mud at a high cost over labour. Quite suitable implements have been developed in the other areas for burying the green manure crops in the paddy fields. They are known as the green manure trampler and the Burmese Setturn and they are capable of burying the green material at the rate of 2½ to 3 acres in a day. Any well organized and economic programme of green manuring paddy in Goa must also, therefore, involve the supply and use of these necessary implements.

Irrigation

The intervals of irrigating the Waingan farms depended upon the availability of water at each source in relation to the size of the farm and the type of soil. Some of the farms could, therefore, be watered daily whereas the others received water even once a week. There was never a discrimination in the allotment of water to individual plots within a farm and every farmer could, therefore, get water according to his turn. It is only in case of the farms in which water had to be lifted especially at the end of the season that the farmers away from

² Report on Outstanding agricultural practices in Madras, Andhra Pradesh, Gujarat and Punjab - Indian Council of Agricultural Research, p.64.

¹ Green manuring of crops - review of experimental results in India - Panse, Ibrahim and Leelavathi, pp.41-42.

the source could not get water for their plots because of the difficulties in supplying the limited quantities of water to the remote parts. The wastage of water due to percolation was also one of the reasons for this difficulty. Such farms were, therefore, divided into plots which were perpendicular to the main canal so that water could be distributed equitably among all cultivators.

The plots in a small Waingan farm and those irrigated through the ponds and the wells were always irrigated by the cultivators themselves whereas in case of the large sized farms, the practice was to assign the work of watering the whole farm to one or more persons who were given a piece of land in the same farm free of rent for their services. This practice was known as the Bhos system and was akin to the Kamate system of watching the bunds of the khazan farms. In spite of the appointment of such persons known as the 'Bhos', the cultivators had to keep a watch on the process of irrigation to verify the quantity of water given to their plots as well as to watch their plots frequently to assure that the water standing in their plots was not stolen by the neighbouring cultivators by creating breaches in the small bunds.

Out of the 7 farms at Morjim, the plots in five farms were being irrigated on alternate days whereas in the remaining two farms it was the practice to water the plots only 6 to 7 times during the whole period of the growth of the crop. The latter two farms were small in size and could get water through the natural springs flowing through the sides of the farms. It was, therefore, necessary to irrigate these farms only at the end of the season. Moreover, the sandy nature of the soils at Morjim had made it necessary to irrigate the farms very frequently.

Four of the five farms at Loutolim were being irrigated daily. These farms had either ponds, wells or bandharas as their source of irrigation. In case of the pond and the well irrigated farms, however, it was the practice to lift water only for a part of the farm daily and it, therefore, amounted to watering the farms on alternate days. In case of the fifth farm, the practice was to irrigate the plots once in 4 or 5 days for first 5 weeks and then water the crop daily till the tank was empty.

There was no problem of irrigation at Cudnem where the farms had bandharas and springs as their source of irrigation. These farms could be irrigated daily. On the contrary in some of the farms as the Khuniye farm, for example, it was impossible to check the percolation of water through the canal and water flowed over the entire farm throughout the day. The problem was, however, not so easy at Marcaim where the farms had to be irrigated at longer intervals. Nine of the 14 farms in this village could be irrigated once in 3 to 4 days whereas four of the farms could get water once in 6 to 8 days only. The latter four farms were being irrigated by constructing provisional tanks. All the tank irrigated farms in this village were thus, getting water at longer intervals whereas the farms irrigated through the ponds and the wells could be irrigated once in 3 to 4 days. The remaining one farm in this village, was being irrigated almost daily because of bandhara irrigation. It, therefore, seems that the farms having bandhara or spring irrigation could get water almost daily, those

getting pond and well irrigation could be watered within a reasonable time whereas there was no alternative but to irrigate the tank irrigated farms at longer intervals.

Because of the semi-aquatic nature of paddy cultivation, it was necessary to irrigate the crop at frequent intervals. Experiments in different parts of the country have shown that constantly maintaining a level of two inches of standing water with frequent changes in the water results in the highest production. 1/ Giving small quantities of water at frequent intervals has on the whole proved superior to giving larger quantities of water at longer intervals. The farms irrigated through the bandharas and the springs were, therefore, in a better position in this respect than the farms irrigated by the tanks and some of the farms irrigated by the ponds and wells. The scope for expansion of the existing Waingan farms as noted in an earlier chapter, was, therefore, greater in respect of the spring, bandhara, pond and well irrigated farms than the tank irrigated ones.

There was also a method available to drastically reduce the requirements of water for paddy without impairing the productivity. In Israel, for example, it was found that if spray irrigation was to be adopted, the cultivation of paddy required only one-fourth of the quantity of water required otherwise. 2/ The method proved successful especially on those soils which contained a high proportion of sand like the coastal soils in Goa. Spray irrigation may, however, prove costly in Goa where water is available by the flow method. It would be, however, worthwhile trying the method on those farms on the coast which are already being irrigated by lifting water. As an example one may repeat again the case of the Aakh Waingan in the Ambe-khan Khazan in Bettivere in Bardez taluka, where it was difficult to water the remote corners of the farm with the quantity of water available in the wells but where plenty of land was available for the extension of the Waingan cultivation in the same farm. Spray irrigation might prove useful in increasing the supply of water for such farms as well as in expanding their boundaries.

Weeding and interculturing

Weeding was a common operation and had to be exclusively followed by all. It was the usual practice to weed out the kharif paddy grown on the Khazan, Waingan and the Marad lands twice during the season whereas to give only one weeding to the Waingan crop. There were, however, some variations in this respect and some of the Khazan farms were being weeded only once whereas the kharif and the Waingan crops were being weeded thrice and twice respectively. Though no major differences existed in the general practice noted above, in Morjim and Marcaim, the Waingan farms were being weeded twice whereas at Cudnem, the kharif crop was being weeded thrice. So also the kharif crop in the Waingan farms was being weeded thrice at Loutolim though the Waingan crop was being weeded only once. These variations had no doubt an effect over the employment of labour in these villages in those respective seasons.

1 Rice - Cultural trials and practices in India, Subbiah Pillai, p.73.

2 Rice - tropical agricultural series - D.H.Christ, p.47.

Thinning and transplanting of the crop from the thickly grown patches to the thinly grown ones, were the other operations performed simultaneously with the first weeding. No importance seemed to have been attached to the process of stirring or repuddling the soil which was one of the productivity influencing process in paddy cultivation. Experiments with disturbing the soil at the time of first weeding in parts of India have already established that the process does lead to a greater production. 1/

References have been already made earlier to the method of 'biyassing' or interculturing the broadcast paddy. Introduction of such methods would no doubt solve the problems of weeding as well as repuddling or disturbing the soil. These methods would not be, however, suitable where paddy is sown dry and especially with the help of a plough. There is always a scope for greater growth of weeds in plots which are sown dry than those which are sown wet because of the process of initial puddling in the latter case which practically destroys all the weed seedlings. When the crop is sown behind a plough, there may not remain much scope for the use of any interculturing implements because of the crucked lines formed through the use of the plough. On the contrary if the crop is to be sown by using a seed-drill, it would be possible to form proper lines to facilitate the use of an interculturing implement such as the Japanese hoe. This can uproot the weeds as well as disturb the soil and at the same time enable a very quick turnover of about one hectare per day when compared to the turnover of about 0.25 hectare per day with the wooden plough. As many as six coultered seed-drills are already in use for sowing paddy in the neighbouring tracts of Mysore State. Seed-drills are also being used for sowing the dry sown up-land paddy in Japan 2/ as it enables proper interculturing and disturbing the soil which is an essential feature of the Japanese paddy cultivation.

It is likely that with the use of 'biyassing' or interculturing methods in broadcast paddy or interculturing even in dry sown paddy, weed control may not be as easy as in the case of the transplanted one. The development of modern weedicides however, has provided a great scope for controlling the weeds economically in broadcast or drilled paddy. Spraying of 2,4-D or M.C.P.A. at 1 lb. a.e. per acre in 50 to 60 gals. of water 5 to 6 weeks after sowing the broadcast paddy has given successful results in many parts of India. Use of weedicides, though slightly inferior as regards the increase in the yield, has proved economically more sound as the result of research at Gurdaspur, Nagpur, New Delhi etc. have shown. At Cuttack, there was even a 5 per cent increase 3/ in the yield due to the use of M.C.P.A. Use of only one interculturing as in Ceylon coupled with one spray of weedicides might, therefore, not only replace the need for two or more weedings as given in many of the farms but would also help in disturbing the soil and in arranging the crop in lines as in the case of the Japanese method of paddy cultivation, to enable further interculturings for higher

1 Rice - Cultural trials and practices in India, Subbiah Pillai, p.75.

2 Rice - World tropical series - G.H.Christ, p.147

3 Control of farm weeds by use of weedicides.- Indian Council of Agricultural Research, p.27.

production. The use of the weedicides would also prevent the lodging of the crop as 2, 4-D is being said to have the property of checking the extra vegetative growth of paddy. It may, have, thus, a double utility especially where the kharif crop is subject to heavy lodging.

Productivity of the Khazan, Waingan and the Marad lands

It was the general belief in Goa that the khazan lands were the most productive of all the types of land. In actual practice, however, the level of productivity in a farm depended upon a number of characteristics of a farm itself such as the composition of the soil, availability of water etc., apart from the exogenous factors such as the nature of precipitation, technological and human factors etc. As noted earlier there were variations in the soils even between two Khazan farms and variations in the salinity and drainage between two plots even in a single farm. The yields from the different Khazan farms, therefore, depended upon the number of dry days during the monsoon. With a prolonged dry spell, the crops in the farms having greater degree of salinity were subject to greater damage than those in the farms having a lesser degree. The same was true of the crops in the plots situated near the bunds which had to resist a greater degree of salinity than those in the plots away from the bunds.

The productivity of the Waingan farms was largely influenced by the soil and the availability of water and that of the Marad farms by the soil and the degree of slope of the land. The length of the dry spell was again an important factor to influence the productivity of the Marad farms. In view of all these endogenous and exogenous factors, it may not be possible to generalize the productivity level of these resources from the study of a few cultivators which were selected merely to identify the problems. Certain inferences can, however, be drawn even from the variations in the yields of the few cultivators, available for these enquiries.

It may be mentioned here that the crop estimation surveys conducted during 1964 in Goa had indicated that the productivity of the Khazan, Ker and the Marad farms during that year was 1875, 2259 and 1665 kgms. per hectare ¹/ respectively. We do not possess any data for the later estimations. The nature of variations as revealed through our survey may, however, be noted from Table 8.9 which gives the minimum and the maximum yield per hectare for the different resources as well as the frequency distribution of the plots according to the yield per hectare. It may be added here that the figures give merely an indication about the approximate yields in those plots as the figures were collected through the survey method and not through any crop cutting procedures. So also, the figures have been worked out by assuming that the seeds sown over a hectare of the Khazan, Waingan and the Marad lands amounted to 20, 30 and 40 cudavs respectively. This procedure was inevitable on account of the absence of any statistics about the size of the holdings as noted earlier. The inferences from these figures have, therefore, to be weighed in the context of these limitations.

The table would indicate that the minimum yield in case of the Khazan farms varied from 450 kgms./ha. to 1023 kgms./ha.

1 Goa, Daman and Diu - 1964, Government of Goa, p.16.

Table 8.9 : Table showing the minimum and the maximum yields per hectare and the frequency distribution of the fragments according to the yield per hectare in the selected villages

Type of cultivation and village	Minimum yield observed per hectare (kgm/ha)	Maximum yield observed per hectare (kgm/ha)	Number of fragments producing per hectare					Total number of fragments
			1000 & below kgms.	1001 to 1500 kgms.	1501 to 2000 kgms.	2001 to 2500 kgms.	above 2500 kgms.	
1	2	3	4	5	6	7	8	9
<u>Khazan cultivation</u>								
Marcaim	1023	2200	-	4	5	1	-	10
Bor'n	555	2050	3	14	5	2	-	24
Cumbharjua	450	2420	4	6	3	1	-	14 *
Total			7	24	13	4	-	48
<u>Kharif cultivation in the waingan farms</u>								
Morjim	1125	1500	-	1	1	-	-	2
Loutolim	810	3000	1	1	3	-	3	9 +
Marcaim	900	3800	2	1	11	12	9	35
Cudnem	1000	1590	3	1	1	-	-	5
Total			6	4	16	12	12	51
<u>Waingan cultivation in the Waingan farms</u>								
Morjim	1275	3000	-	3	-	-	1	5 +
Loutolim	810	3000	1	1	3	-	3	9 +
Marcaim	900	3200	2	3	15	9	6	35
Cudnem	1000	3000	2	3	3	12	4	24
Total			5	10	21	21	14	73

Table 8.9 (continued)

	1	2	3	4	5	6	7	8	9
<u>Marad cultivation</u>									
Loutolim		1540	3500	-	-	3	2	6	11
Marcaim		990	3500	1	-	1	1	13	16
Cudnem		800	3080	3	5	2	1	2	13
Total				4	5	6	4	21	40

+ The yield data was not available in one case.

* Cultivators could not be selected from the collectively cultivated Durga Pai and the Kotak farms. These farms gave a yield of about 2310 and 1540 kilos per hectare respectively.

in the different villages and it was very low in the villages Cumbharjua and Borim. The lowest yield of 450 kgms./ha. was recorded in one of the Khazan farms at Cumbharjua namely the Teer khazan which had formed a pan as noted in an earlier chapter. There were, however, two other fragments from this same farm in the sample wherein the yield was observed to be 520 and 880 kgms./ha. In the other farm namely, the Kundaikar Katar in the same village in which also pan formation had taken place, the yield was observed to be 690 kgms./ha. in one plot and 1100 kgms./ha. in the other. Barring these four fragments, the yield rate was more than 1000 kgms./ha. in all the other farms in this village. In a majority of the farms, however, the yield varied between 1000 and 2000 kgms./ha. The lowest yield of 555 kgms./ha. in Borim was recorded in the Adulshe farm. In two other fragments in the same farm also the yields were very low, they being 605 and 665 kgms./ha. In all the other fragments from the other farms in this village, the yield varied from 1000 to 2500 kgms./ha. In a majority of the farms in this village, however, the yield varied between 1000 and 1500 kgms./ha. only. It was, not possible to know if the Adulshe khazan which grew even a second crop in the waingan season had also formed a pan like the farms in Cumbharjua. The yields in the village Marcaim, were above 1000 kgms./ha. in all cases and in most of the farms, they varied from 1000 to 2000 kgms./ha.

The maximum yield in respect of the Khazan resource at Marcaim was 2200 kgms/ha. and it was recorded in the Adan farm, which was as seen earlier, a small owner cultivated farm. The yield was, in fact, the highest in the Karanzal khazan farm in this village but the fragments in this farm were included in the enquiry for the Waingan cultivation. The yield in all the fragments from this farm varied between 3000 and 3800 kgms./ha. The highest yield in respect of the Khazan resource at Borim was 2050 kgms./ha. and it was recorded in the Bet Katar. The yield was equally high in case of both the cultivators selected from this farm. The highest yield in respect of the same resource in the village Cumbharjua was 2420 kgms./ha. and it was recorded in the Dhume Katulli which was also used for Waingan cultivation. The yields recorded in the collectively cultivated Durgapai and Kotak farms in this village were 2310 and 1540 kgms./ha. respectively. The collective organization had succeeded in getting a greater yield from the Durgapai farm but not from the Kotak farm.

The minimum yields for the Waingan farms varied from 810 to 1125 kgms./ha. for the kharif season and 810 and 1275 kgms./ha. for the rabi season in the different villages. Practically there was not much difference in the yields in the two seasons in a village, as far as the minimum yields were concerned. The maximum yields in these villages, however, varied from 1500 to 3800 kgms./ha. in the kharif season and from 3000 to 3200 kgms./ha. in the rabi season. The yield from the Waingan crop was much larger than the yield from the kharif crop in Morjim and Cudnem, the farms in which villages were subject to water logging as noted earlier. There was no difference in the yields in the two seasons in Loutolim whereas the maximum yield from the kharif crop was much larger than the maximum yield from the waingan crop in Marcaim. The Karanzal Khazan at Marcaim was the only farm which had given this maximum yield in both seasons. A study of five fragments which had fallen in the sample for this farm, had shown that the yields varied from 2100 to 3800 kgms./ha. in the kharif season and 2000 to 3200 kgms./ha. in the rabi season. The Kas Waingan in the village Marcaim, which was cultivated by a single cultivator with the

help of well irrigation had also recorded a high yield of 3750 kgms./ha. in the kharif season and 3000 kgms./ha. in the rabi season. The maximum yield at Morjim was recorded in the owner cultivated part of the farm Shelacha tala and it was the maximum for both seasons. The maximum yield at Loutolim was noticed in the Khazan Waingan farm irrigated by a bandhara as in the case of the Karanzal Khazan at Marcaim, and it was 3000 kgms./ha. in all the three fragments from this farm for both seasons. There was only one farm namely the Kudgo farm used for kharif sowing at Cudnem and the yields from the different fragments from this farm varied from 990 to 1590 kgms./ha. only. The minimum yield of 1000 kgms./ha. in the rabi season was also recorded in the same farm whereas the Khuniye farm yielded a maximum production of 3000 kgms./ha. in the rabi season. A majority of the Waingan farms in all the villages had recorded yields varying from 1500 to above 2500 kgms./ha. and especially in Cudnem a majority of the farms had given a yield greater than 2000 kgms./ha.

The minimum yield in case of the Marad farms varied from 800 to 1540 kgms./ha. and the maximum from 3080 to 3500 kgms./ha in the different villages. The yield from a majority of the farms was higher than 1500 kgms./ha. and in nearly half the number of farms, the yield was above 2500 kgms./ha. These results are, however, very surprising since the cultivation of the Marad resource is considered as a play with an inferior land resource. One does not know if these results are due to assuming 40 cudavs of paddy as the seed rate for determining the size of the holdings or due to the use of river silt and fertilizers in these owner cultivated farms. It may also be a result of the season. Whatever may be the reason, it appears that the Marad resource may not be so inferior as is generally considered. The yields from the Khazan farms which were inadequately supplied with silt or with fertilizers appear, on the contrary, to be lower than what was stated in the beginning of this section. Where the Khazan farms were supplied with bandhara irrigation as in the case of the Karanzal Khazan at Marcaim and the Khazan Waingan farm at Loutolim, the yields were quite high. Some of the Khazan farms in which there was a pan, had on the contrary recorded a yield which would raise a doubt whether it would be economic to cultivate these farms.

Rotations

Paddy was being grown after paddy in practically every farm. Rotational crops had not developed in this territory as in many other paddy growing areas. It was only in a few isolated villages such as in Moira in Bardez taluka that a variety of banana was being rotated with paddy or as in Balli and some other villages in the Quepem taluka, in Rivona in Sanguem taluka and in Sal in Bardez taluka that sugarcane was grown in rotation with paddy in the Waingan farms. Some of the paddy farms were being, however, used for growing pulses in isolated patches or for growing chilly on a small scale for home consumption. No system of rotation as such was being followed in general in Goa. Rotational practices were, moreover, handicapped because of the limited scope for the extension of the existing rotational crops as well as due to the absence of any organized efforts to introduce the new crops.

Many practices of rotation for the paddy fields are being already followed in some of the rice growing tracts of India as well as South East Asia. Sugarcane forms one of the

rotational crops in the Eastern Delta of Godavari. In the Southern districts of Madras a catch crop of pulses like green gram and black gram is sown while the paddy crop is still standing in the field in case of both single and double cropped paddy lands. Cotton, tobacco, onions are also rotated with paddy in these districts. Sesamum, maize, onions are the rotational crops in Vizagapatnam district. It is a common practice to grow some pulse crops after rice in some of the southern districts as well as in the districts in the Eastern Rice Zone. 1/ In Japan even the upland paddy is frequently rotated with barley, wheat, soyabeans and even inter-planted with wheat, barley or cotton. 2/ In the Jaffina district of Ceylon, 3/ tobacco, chillies, green gram, sesamum, vegetables and sann hemp are rotated with paddy, the crops being irrigated from wells situated in the fields.

The protection of the crops against stray cattle and the absence of any large scale well irrigation or the proper planned utilization of the existing water resources were the main handicaps in the extension of the existing rotational crops or the introduction of the new crops in Goa. Chilly, vegetables or beans were for example, being grown in small patches on some of the Ker or Khazan lands after the harvest of paddy but even such small patches had to be provided with wooden fencing temporarily and with irrigation by sinking temporary ditches in the farm itself. Water was being taken out of these ditches with earthen pots and the crops were being sprinkled with water almost daily. Unless the problems of protection and irrigation were, therefore, met on an organized scale, there remained little scope for expansion of rotational practices on a larger scale. The problem of suitability of these rotational crops was another problem which has been considered in the next chapter.

1 Rice - Cultural trials and practices in India, Subbiah Pillai, p.85.

2 and 3 Rice - World tropical series - D.H.Ghrist, pp.143-147.

CHAPTER 9

COCONUT, ARECANUT AND OTHER CROPS

SECTION I - COCONUT

The cultivation of coconut as mentioned earlier is spread over the entire Goan territory and quite a large number of families in every village are engaged in it. In many a cases, these families, however, own a few coconut trees around their homesteads and the coconut gardens as such belong to a few families in a village. The crop is, again, grown under a variety of conditions in the different parts. On the coast, it is grown on the plains and hillocks consisting entirely of sandy soils. In the areas near the coastal belt and in the interior, it is grown on secondary bunds of the Khazan farms, bunds of the Waingan farms, stripes of land along the roads, streams and rivulets, broad belts of ker or Marad land at the foot of the hills and even on flat or terraced Marad and dongar lands along the hill slopes. Unlike the Khazan and the Waingan farms but like the Marad fields the coconut gardens are owned entirely by the families in a village. It is only at times as in the case of the 'Avadis' and the bunds in the Waingan farms that the institutions have leased out small parcels of land for coconut cultivation.

Selection of the villages for the survey

As in the case of the enquiry for Marad cultivation, it was decided to select three villages from the coastal, transitional and the interior tracts for the survey of coconut cultivation. While selecting the villages care was taken to select those villages where coconut cultivation thrived on a large scale. Accordingly the villages namely Calangute (Bardez taluka), Marcaim (Ponda taluka) and Rivona (Sanguem taluka) which were known for their coconut cultivation were selected from the coastal, transitional and the interior tracts respectively.

The coconut cultivators who owned large gardens were locally known as the 'Bhatkars'. Since other coconut cultivating families owned simply a few trees around or nearby their homesteads, the selection of cultivators for the survey was restricted only to the 'Bhatkars'. Some of the 'Bhatkars' again stayed outside these villages and were not available for the enquiry. An attempt was, however, made to contact as large a number of 'Bhatkars' in these villages as possible. A few of the 'Bhatkars' were studied by the case study method whereas a schedule was canvassed for the others. The number of 'Bhatkars' or coconut cultivators contacted for this enquiry came to 20, 10 and 19 in Calangute, Marcaim and Rivona respectively.

Size of the holding

As in the case of the earlier enquiries, for this enquiry also, it was not possible to determine the size of the coconut holdings very precisely for the absence of any land survey data. There were again variations in the spacings adopted for planting the coconut trees of the different varieties in the different areas and hence it was not possible to work out the size of the holdings, from the number of trees. The presence of wide gaps and changes in the spacing to adjust the trees at the margins also created problems in any precise estimations of the size. The concept of the tree-holding or the mere number of trees held by a cultivator is, therefore, made use of in place

of the concept of the size of the land holding in the discussions in the present chapter. The number of trees held by the selected cultivators are noted in the table below :

Table 9.1 : Classification of the cultivators according to the number of coconut trees held

Village	Number of cultivators holding coconut trees								Total number of cultivators
	50 and below	51-100	101-250	251-500	501-1000	1001-1500	1501-2000	Above 2000	
Calangute	1	3	10	3	2	1	-	-	20
Marcaim	1	2	6	1	-	-	-	-	10
Rivona	-	2	-	2	6	3	-	6	19
Total	2	7	16	6	8	4	-	6	49

The table would reveal that nearly half the number of the 'Bhatkars' in the villages Calangute and Marcaim held 101 to 250 trees. In the village Rivona, however, a majority of the 'Bhatkars' held more than 500 trees, six amongst whom possessed even above 2000 trees. A few of the cultivators at Calangute also held above 500 trees whereas all the cultivators at Marcaim held below 500 trees. A small proportion of the cultivators in every village possessed below 100 trees.

Fragmentation of the coconut holdings

The trees held by the cultivators noted above were scattered at a number of places in a village. Moreover, extreme fragmentation was a characteristic of the coconut holdings in these villages. The classification of the cultivators according to the number of fragments (Table no.9.2) would indicate the gravity of this problem.

Except in the village Calangute, wherein about one-third of the cultivators had their coconut trees in one fragment, the holdings were greatly fragmented in the other villages. There was no concentration of cultivators in any single fragment group as such. About two-third of the cultivators had, however, three to six fragments each. The average number of fragments per cultivator worked out to 3.0, 4.2 and 5.1 in the villages Calangute, Marcaim and Rivona respectively. The extent of fragmentation was, thus, lower in the coastal village than in the other two villages. The availability of big stretches of land for coconut plantation may be one of the many reasons for lower fragmentation of the holdings in the coastal village whereas the intervening ups and downs of the hills and hillocks may be the reason for greater fragmentation in the other two villages which were away from the coast.

Number of trees per fragment

The fragments noted above have been classified in table No.9.3 according to the number of trees per fragment. The table would indicate that most of the fragments at Marcaim had a size which accommodated upto 50 trees whereas most of those at Calangute consisted of upto 100 trees. It was only in Rivona in the interior that the fragments were quite large in size. About one-third of the fragments in this village had a size

Table 9.2 : Classification of the coconut cultivators according to the number of fragments per cultivator in the selected villages

Village	Number of cultivators having the number of fragments as-								Total number of cultivators	Total number of fragments	Average number of fragments per cultivator
	1	2	3	4	5	6	7	8 and above			
Calangute	7	2	4	2	2	2	1	-	20	60	3.0
Marcaim	-	1	3	2	1	3	-	-	10	42	4.2
Rivona	-	2	3	3	5	3	1	2	19	98	5.1
TOTAL	7	5	10	7	8	8	2	2	49	200	4.1

Table 9.3 : Classification of the fragments according to the number of trees per fragment in the selected villages.

Village	Number of fragments having number of trees as								Total number of fragments	Average number of trees per fragment
	25 and below	26-50	51-100	101-250	251-500	501-750	751-1000	above 1000		
Calangute	6	12	11	8	-	2	-	-	39*	95.2
Marcaim	20	17	5	-	-	-	-	-	42	30.4
Rivona	16	15	17	19	18	6	4	3	98	261.6
Total	42	44	33	27	18	8	4	3	179*	

* Data about the number of trees in each fragment was not available in case of 5 of the 20 cultivators at Calangute, having their holdings divided into a total number of 21 fragments.

which accommodated more than 250 trees and about 15 percent consisted of more than 500 trees. Consequently, the average number of trees per fragment in Marcaim, Calangute and Rivona worked out to 30, 95 and 261 respectively. It may be, thus, inferred that the size of the fragments was relatively much larger in the coastal village Calangute and the interior village Rivona even though there was a variation in the extents of fragmentation in these villages whereas at Marcaim, there was greater fragmentation of the holdings as well as the number of trees per fragment was very small. If we take up 100 trees or roughly an acre as a minimum unit from the point of organizing any improvements in these coconut gardens, it would be observed that none of the fragments at Marcaim reached this level whereas about one fourth and one half of those at Calangute and Rivona respectively were above this level.

Owner and tenant cultivation

Even though paddy was cultivated mostly by the class of tenants, coconut was cultivated mostly by the owners themselves. The cultivation of coconut required only occasional field operations such as digging and manuring once a year and hence the owners themselves could cultivate the crop through the employment of hired labour. Planting of new trees, watering them for the first three years and continuous watching for the thefts, however, required continuous use of labour and these processes were also being entrusted to the labourers or the tenants in lieu of payment either in cash or kind.

It is only under rare circumstances that the coconut gardens were being leased out. We could notice only three cases of this type two in Rivona and one in Calangute. One of the cultivators at Rivona had leased out only one of the six fragments he owned to a tenant on the basis of a kind rent of three-fourth of the produce. There were only 37 trees in this fragment. Another cultivator had leased out one of his four fragments on which there were 22 trees, for a cash rent of Rs.15. The cultivator at Calangute had leased out three of his six fragments on the basis that the tenant should plant new trees, take care of the young trees and receive all the income from the new trees only for the first eight years. There were 45 young trees and 16 old trees on these fragments. For the old trees he was to pay a cash rent of Rs.45 per year. After eight years all the produce was to be taken by the owner. We could also notice one more case of tenancy in one of the villages selected for the general enquiry, namely the village Savai-verem in Ponda taluka. A fragment of 75 trees in this village was leased out to one individual for a cash rent of Rs.100/-per year. Another interesting case of cooperative leasing in of a garden was noticed at Loutolim in the Salcete taluka. A fragment of about 200 trees in the Chappel Bhat in the Racein Wado in this village was leased out to a group of 25 families staying nearby. These families were also cultivating in the Khazan-Waingan farm mentioned earlier, which was owned by the same person owning these coconut trees. It was merely by tradition that all these families were leasing in these trees as a group. The rent, however, was being decided every year and it came to about Rs.100 to Rs.125 per year. It was considered as the duty of these tenants to plant new trees in place of the old dead ones as well as to manure the trees regularly according to the tradition. The rent, costs of planting and watering the young trees and the produce were being equally shared by these families. The leasing out in case of such few fragments seems to be determined mainly by the place of residence of the owner, the distance of the fragment from the owner's house and the owner and tenant relations in the specific cases.

The system of entrusting the watching of the crop was, however, very common and the care-takers, if one is to use the term in such cases, were known as the 'Mundkars'. It is moreover, only the fragments away from the owners' houses or the fragments which were liable to thefts that were entrusted for watching to the 'Mundkars'. We could not, however, notice any such watching being entrusted to the Mundkars among the cultivators contacted at Calangute but at Marcaim and Rivona, the proportions of fragments that were entrusted to the Mundkars for watching worked out to 38.1 and 57.1 per cents respectively. The Mundkars at Marcaim received from 5 to 8 per cent of the produce for their services whereas those at Rivona received from 6 to 10 percent for the same. In one case at Rivona, the Mundkar was being payed Rs.50 annually for watching 85 trees on one of the fragments.

The Mundkars generally stayed in the same gardens which they watched or in the 'wados' which were quite nearby. It was only in case of six fragments at Rivona that watching was entrusted to the Mundkars who stayed more than a mile away from those fragments. A Mundkar also watched a number of fragments belonging to different owners and the number of fragments which a Mundkar could get for watching depended upon his traditional relation with the owners.

The rate of planting new trees

New trees were being planted in place of the old trees which fell naturally as well as attempts were being made to plant new trees on the uncultivated parts in a fragment. It was, however, the custom in the area, not to fell an old unbearing tree. This had, in fact, impeded the plantation of new trees on some of the fragments as the land was unnecessarily being occupied by the old unbearing trees. The old unbearing trees formed about 12, 14 and 4 percents of the number of existing trees on the holdings studied in Calangute, Marcaim and Rivona respectively and the old trees existed on 87.1, 50.0 and 26.5 percents of the fragments in these villages respectively.

The details about the trees which died during the last five years and the new trees planted during the same period have been given in Table No.9.4. There were trees of varying ages in most of the gardens and hence the death of certain proportion of the trees was a natural process common to all the gardens. Except on 5 of the 20 holdings at Calangute which were small in size, a certain proportion of trees had died on all the other holdings in this village as well as in the other two villages. If we try to calculate the death rate from the figures given in columns 9 to 11, we would find that on an average 1.90, 2.50 and 1.19 percents of the trees died annually in Calangute, Marcaim and Rivona respectively. The larger death rates at Calangute and Marcaim near the coast were due to the cultivation of relatively early varieties, greater proportion of older trees as noted earlier as well as the predominance of the diseases. The disease known as 'Mundoli' had especially taken a greater toll at Calangute as we were told. From the above figures, it seems that roughly 2 per cent of the trees died annually.

The dead trees had not been replaced on all the holdings. This was, however, so only on 7 of the total 44 holdings in these three villages on which some trees had died. On the contrary, on 25 of these 44 holdings, the number of trees planted exceeded the number of trees which died. The proportion of holdings on which such exceedence was there, was about 1/4th at Calangute, 1/2 at Marcaim and more than 3/4th at Rivona. On three of the holdings at Calangute, again, new trees were

Table 9.4 : The details about the trees which died and the new trees planted during the last five years

Item	Village			Total
	Calangute	Marcaim	Rivona	
1 Total number of holdings	20	10	19	49
2 Number of holdings on which some trees died during the last five years	15	10	19	44
3 Number of holdings on which some trees died during the last five years but were not replaced by new trees	3	3	1	7
4 Number of holdings on which new trees were planted in place of the trees died during the last five years	12	7	18	37
5 Number of holdings on which the number of new trees planted exceeded the number of old trees died	4	5	16	25
6 Number of holdings on which new trees were planted even when old trees had not died during the last five years	3	-	-	3
7 Total number of holdings on which new trees were planted during the last five years (Col.5 + Col.7)	15	7	18	40
8 Number of existing trees	5712	1276	25637	32625
9 Number of trees which died during the last five years	496	144	1113	1753
10 Number of new trees planted during the last five years	501	125	7079	7705
11 Proportion of new trees planted during the last five years in the existing number of trees	8.8	9.8	27.6	23.6
12 Net addition to the number of trees during the last five years (Col.11 - Col.10)	+ 5	-19	+5966	+5952

planted even though any trees had not died. The proportion of holdings on which efforts were made to plant some new trees during the last five years, thus, came to about 3/4th in the villages Calangute and Marcaim and practically 9/10th in the village Rivona. The proportion of new trees, planted during the last five years to the existing trees, therefore, came to about 9 and 10 percents in Calangute and Marcaim whereas to about 27 percent in Rivona. With these proportions of new trees the net additions to the number of trees worked out to only +5 and -19 at Calangute and Marcaim respectively whereas to +5966 at Rivona. Because of the higher death rates, the negligence of many of the cultivators in the replacement of dead trees either partially or fully, the net addition to the number of trees turned out to be negligible in the former two villages, in spite of the efforts of a few cultivators to increase the number of trees on their holdings. It would be observed from the table that only 1/3rd and 1/4th of the cultivators (Col.6 + Col.7) in these two villages had made an attempt to increase the number of trees on their holdings whereas at Rivona efforts were made in these directions by as many as 16 of the 19 cultivators. This had led to quite considerable expanse of the coconut gardens in the village Rivona. To quote certain illustrations, as many as 650, 800 and 1000 new trees were planted in the 'Pedamal', 'Kukvay' and the 'Dayare-Kadil' Bhats (gardens) in this village during the last five years whereas in 22 other fragments the number of new trees planted varied from 100 to 400 per fragment.

Scope for planting new trees

The cultivators were asked about the scope for planting additional trees in their gardens. The enquiry revealed that there was no place for planting trees anymore only in case of 3 of the 19 cultivators at Rivona and 4 of the 20 cultivators at Calangute. It was possible to add new trees on all the ten holdings at Marcaim. The number of additional trees that could be planted at Calangute varied from 5 to 300 on the different holdings and in one holding cultivated by a priest it was possible to plant even 1000 or more trees. His holding was, however, on the shore itself but was full of small hillocks of sand and watering was a great problem in his case. A number of trees on his holding were also affected by the disease 'Mundoli'. The number of additional trees that could be planted at Marcaim varied from 25 to 100 on the different holdings and it was possible to plant 300 trees on one holding. At Rivona there was scope for planting 30 to 1500 trees on the different holdings whereas one of the cultivators had a scope for planting as many as 5000 trees. If we add up these number of additional trees that could be planted on these holdings as reported by the cultivators, there would be scope for planting 2300, 750 and 14030 additional trees on these holdings in Calangute, Marcaim and Rivona respectively. There was, thus, scope for increasing the number of trees by 40, 59 and 55 percents in these villages respectively as the enquiry revealed. The scope was naturally greater in the villages in the interior than in the coastal village. Moreover, the scope at Calangute was largely limited to planting the trees on sands and under adverse conditions as the case of the priest indicated. It is also interesting to note that there was a great scope even at Rivona where quite a large number of additional trees had been already planted during the last five years.

The scope for planting new trees discussed above relates only to the existing gardens and the unutilized components thereof. As a matter of fact, coconut grow well on all types of soil in the coastal climate. It grow well even on soil containing 97 percent sand to the heavy soils in the Philippines containing 70 percent clay and the peat soils of Malaya with

80 percent organia matter.¹ It can thrive even in the saline soils with proper drainage² and on the bunds of the paddy farms where they are broad. Viewed in the context of both the expansion in the existing gardens and that outside, there seems to be a great scope for the expansion of this crop in Goa. Further as estimated in the Report of the Working Group for the formulation of the Fourth Five Year Plan Proposals on coconut, there is only a limited scope for the expansion of this crop in the country. As estimated in the Report it would be possible to plant only upto 38,300 acres over the period in the States of Kerala, Mysore, Madras, Andhra, W.Bengal, Gujarat and Orissa/³. In the context of these limitations it, therefore appears that the scope for planting coconut trees in Goa needs to be utilized fully to increase the area and production of coconut in the country.

The problem of planting new trees in place of the old trees

The social resistance to fell the old unbearing trees as noted earlier was a handicap in maintaining and extending the production in these gardens. Attempts were being rarely made to underplant the trees which was the remedy to deal with this problem of old trees. Experimentation has shown that young plants can grow well between the rows of the old trees upto the 10th year of planting. So also if isolation trenches are dug between the old and the young plants, the old trees do not come in the way of promoting the growth of the young plants./⁴ Such trenches, about 18" wide and 18" deep, are needed to be dug on both sides of the young plants. This prevents competition of the roots of the old trees for moisture as well as plant nutrients and the young plants attain maturity by which time the old trees may die naturally. If such underplanting is made possible in Goa, it may provide a greater scope for planting the new trees than what was noted above. These trenches can also be used for filling with the coconut husks which have a manurial value as will be noted later.

Varieties and Spacing

Calangute, Benaullim and Nadora were the three local varieties that were being grown in Goa. It was, however, difficult to gather any information about the varieties from the cultivators who always reported a variety grown in their village as a common local variety. The Calangute variety was dwarf and was observed to be grown in the village Calangute and other villages on the coast. The variety Nadora or Rivona

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1. Coconuts - Tropical Agricultural Series, Reginald Child
- P 53
 2. Study on Coconut in India. Committee on Natural Resources, Government of India - P 38
 3. Report of the Working Group on the Formulation of the Fourth Five Year Plan Proposals on Coconut - P 9
 4. Report of the working group for the formulation of Fourth Five Year Plan Proposals on Coconut Indian Council of Agriculture - P.9.

as at times called, was tall and was being grown in the village Rivona and in the villages in the interior. The Benaullim variety which was also tall occupied the villages on the coast as well as near the coast and was known for its long productive life.

The Agricultural Department had undertaken the programme of distribution of seedlings and for this purpose healthy mother palms had been located in some of the gardens for the collection of seeds. It was a proved fact that the progenies of tall (mother) X dwarf crosses produced hybrid vigour 1/ and the programme of production of such hybrid seedlings had been already undertaken at the Kasargod Central Coconut Research Station 2/ in India. No such hybrid seedlings were being produced in Goa. It would not be, however, difficult to locate tall and dwarf varieties ⁱⁿ the coconut gardens especially near the coast on Goa and it might be, therefore, possible to collect such hybrid seeds even in this territory. The process of hybridization for this crop is, moreover, simple and it involves only the cutting away of all male flowers from tall varieties growing near the dwarf.3/

Another important practice in the propagation of healthy seedlings is to produce seedlings even from the palms which have been felled by gales and storms.4/ We could not notice any such practice in Goa. Such felled palms generally grow at right angles to the original stem. Soil is heaped at this point of curvature and the tree roots at this point if the soil is kept moist. The tree is later cut below the roots and the top is planted. It grows very quickly as well as matures early.

The spacing between the trees was being adjusted according to the varieties and the traditions in the villages. At Calangute where the dwarf variety was grown, the trees were planted about 18 to 20 feet apart whereas at Rivona the spacing varied from 20 to 24 feet. On the whole, however, systematic spacing was not seen to be adopted in many of these gardens and the number of trees varied from 75 to 100 per acre. When compared to the technological requirements of the plant and the general practices adopted elsewhere, there was overcrowding of the trees in the coconut gardens in Goa. The Indian Central Coconut Committee in their Bulletins and the Indian Coconut Journal had been advising not to plant coconuts less than 25 feet apart as overcrowding reduced the production of nuts. In Ceylon also the general rule was to plant coconuts 22 feet apart on the inferior soils and 26 feet apart on the superior ones. The planter's opinion in the country was to accommodate 65 trees on an acre of the inferior soils and only 55 trees on the superior ones.5/ In view of these technical requirements the spacing followed in Goa seems to be in accordance with the practice of growing coconuts mainly as a dry crop as will be noted later.

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1. Coconuts-tropical agricultural series, Reginald Child P 59
 2. The Indian Central Coconut Committee - Annual Reports
19th and 20th P 4-5
 3. Coconuts - tropical agricultural series, Reginald Child, P.59
 4. - Ibid - P.86
 5. Coconuts - tropical agricultural series, Reginald Child, P.70.

The technique of planting new trees

The seedlings were being generally planted in the beginning of the rains. It was the practice with most of the cultivators to hire labour for the purpose on the contract basis. The Mundkars themselves were many a times employed for this purpose. Pits were being dug for planting the seedlings before the commencement of the monsoon and the contract wage paid for digging a pit varied from Re.0.50 to 1.00 at Rivona and Marcaim and Re.1.00 to Rs.2.00 per pit at Calangute. The cost of a seedling also varied from Re.1.00 to Rs.1.50 in these villages. It was the practice to add ash, farm yard manure or green leaves to these pits and the cost over manuring varied from Re.0.30 to Re.1.00 in the villages Calangute and Rivona. No manure was being added to these pits at Marcaim. The seedlings had to be invariably watered for the first three years and it was the practice to assign the work either to the Mundkar or a family staying nearby on the basis of monthly wage per plant. The plants had to be watered for a period of about 6 to 7 months. The annual cost over the same varied from Rs.4 to Rs.8 per plant in these villages.

The problem of fencing

The seedlings had to be protected against the stray cattle. Some of the gardens in the interior villages had permanent stone wall fencings whereas in the others temporary fences were being constructed around the individual seedlings by using the fencings from the shrubs and wild trees. Such fencings could, however, give way easily and it was a common sight to see many of the seedlings being partially or fully eaten away by the cattle in gardens which had no permanent stone wall fencing. This not only actually killed some of the seedlings but also delayed the growth, maturity and the bearing age of the trees. Where the gardens were protected by stone wall fencing, the walls protected not only one or two fragments but a whole big garden or a 'Bhat' which may be belonging to one family in the past. There was no need for protecting the individual seedlings in the fragments located in such 'Bhats'.

The enquiry revealed that out of the 42 fragments at Marcaim, 29 fragments were being protected by such stone wall fencings whereas temporary fences had to be put around the seedlings in case of the other fragments. Similarly in the village Rivona 11 of the 98 fragments had stone wall fencing; 3 fragments were being protected by permanent wooden fencing; 6 fragments had a partial stone wall fencing and a wooden fencing for the other part; 2 fragments were being protected by mud wall fencing; 6 fragments had temporary thorny fencing whereas in case of the remaining 70 fragments the seedlings had to be protected individually by putting temporary fencings. None of the gardens in the village Calangute were fenced and the nuisance from the stray cattle had, therefore, to be managed by putting temporary fencings around the seedlings.

Irrigation :

Though the seedlings were being invariably watered for the first three years, the practice of irrigating the trees from the fourth year onwards varied from village to village. The soils at Calangute were sandy and, therefore, the trees had to be watered regularly at least for 6 to 7 months after the rains. Well was the only source of irrigating these trees in this village and the water was being lifted by manual labour and poured around the trees. The trees could, therefore, be watered once in three to four days only. The depth of these wells was round about 20 feet. The general practice in the other two

villages was not to water the coconut trees. Only one of the ten cultivators at Marcaim was irrigating his trees with the use of well water as in the case of the cultivators at Calangute, whereas one of the three fragments owned by another cultivator could get continuous irrigation through a stream. The depth of the wells in the gardens in this village, however, varied only between 10 to 15 feet and in one case the water table was only 6 feet deep. Yet the owner had never given a thought to watering his garden. Some of the gardens at Rivona had on the contrary, a very favourable location from the point of watering the trees and hence only those fragments which could get water through natural flow were being watered. Out of the 98 fragments in this village, 16 fragments could get water naturally through the springs; 7 fragments could get water through the tanks; stream water was being circulated through one fragment whereas only one fragment was being irrigated with well water. About one-fourth of the number of fragments in this village were, thus, being cultivated with the use of water. The depth of the wells, however, varied greatly in this village, the water table at certain places being even 30 to 35 feet deep.

Except for the villages on the coast, the coconut trees in the parts even a little away from the coast were being cultivated mainly without irrigation. In the adjoining Ratnagiri district, on the contrary, at least 50 per cent of the coconut crop was being grown with the help of irrigation.^{1/} It would be needless to say here that the absence of irrigation was one of the main factors for the lower productivity of the coconut gardens in Goa but this aspect will be discussed when we note the productivity of the crop later.

No specific attempts were even being made to introduce irrigation for coconuts. The progressive cultivator at Chandur, noted earlier, had made an attempt to irrigate the coconut trees by pumping water through the Paroda canal. He had, however, started irrigation very lately and yet his plants had a luxuriant growth. Sinking of wells or the use of filter points or the use of the available water through the tanks, ponds and bandharas as mentioned alongwith some concrete cases while discussing the Waingan cultivation, were the means available for introducing irrigation for this crop. There was, however, a need for some form of a cooperative approach in sinking the wells and watering the gardens as there was excessive fragmentation of the coconut holdings as well as the size of the fragments was too small to enable any investment for a single fragment.

Interculturing

The coconut gardens had to be dug up or ploughed in every August or September to loosen the soil after the rains as well as to conserve the moisture. The practice was not, however, being followed regularly. At Rivona, only three of the 19 cultivators were digging up the gardens every year; 10 cultivators were digging up their gardens once in three years; one cultivator could not dig up his garden since the last four years whereas in one more case digging had not become possible on account of financial reasons. Nine of the ten cultivators at Marcaim were on the contrary digging up their gardens regularly every year whereas only in one case digging was being undertaken in alternate years. All the gardens at Calangute were being dug up or ploughed invariably once in three years as the soils in this village were highly sandy. The costs over digging varied from Re.0.50 to Re.1.00 per tree at Rivona and from Re.0.25 to Re.0.37 per tree at Marcaim whereas the cost

1. Season and crop report, Maharashtra, 1961-62.

came to even below Re.0.25 per tree at Calangute because of the sandy soils. The costs were on the whole greater in the village Rivona where the soils were of the hilly type and where there was a great demand for labour in this season due to large number of coconut gardens.

Even though ploughing was an alternative to the manual digging in these gardens, only two of the cultivators at Rivona and three of those at Calangute had used a plough for the purpose. Most of the coconut cultivators being not engaged in the cultivation of paddy as noted in an earlier chapter, did not possess any implements or bullocks. The Government tractors were being hired for the purpose in Goa, though we could not notice a coconut garden being ploughed by a tractor in these selected villages. The case of the use of a walking type of tractor for shallow ploughing in a garden at Chandur has been already mentioned in the earlier chapter. Deep ploughing with tractors, especially in the light soils might have, however, undesirable effects on the trees as was confirmed by the results of deep ploughing on some of the plantations in Ceylon, whereon the adverse effects of deep ploughing on the palms persisted for many years.^{1/}

Use of manures and fertilizers

Green leaf manure, salt, ash and fish manure were the four varieties of manure used for the coconut crop in Goa. Green leaf manure and salt were the most common manures. It was generally the tradition to use green manure in one year, salt in the other and ash in the third year so that these manures could be supplied to the trees in a three-year rotation. Application of fish manure also formed a part of this rotation. This practice was, however, being altered according to the financial resources of the cultivators. Green leaf manure was being largely used in Marcaim and Rivona where green leaves from the hills were available in abundance whereas fish manure was largely being used at Calangute on the coast. All the 19 cultivators at Rivona were using green leaf manure once in three years. At Marcaim also 7 of the 10 cultivators were following the same practice; two of the cultivators were using green leaf manure in alternate years and the remaining one cultivator had made it a practice to use this manure every year. Use of green leaf manure at Calangute was very meagre and only two of the 20 cultivators in this village were using green leaf manure once in three years. Fish manure was being, on the contrary, regularly used in this village once in three years by as many as 10 of the 20 cultivators whereas 3 more cultivators were using it occasionally. Fish manure was not used by any of the cultivators in the other two villages.

Salt was being used regularly once in three years by as many as 18 cultivators at Calangute; only 12 cultivators were using salt once in 3 to 6 years at Rivona, whereas salt was being used by all the cultivators either every year or once in two to three years in Marcaim. Ash was being used occasionally by some of the cultivators at Marcaim and Rivona and it was being obtained by burning the coconut husks. The expenditure over these items of manure except the fish manure involved mainly the costs over labour. The expenditure over green manuring generally varied from Re.0.50 to 1.00 per tree and that over putting salt, from Re.0.25 to Re.0.50 per tree. The expenditure incurred over putting ash were the same as in the case of salt. The expenditure over using fish manure at Calangute, however, varied from Re.0.25 to Re.1.00 per tree and it depended upon the quantity and quality of the fish used.

Fish manure consisted at times of dried small fish whereas at times fresh mackrel fish was being used if there was a big rampan catch on the village shore.

Though chemical fertilizers were largely in demand for paddy, they were being just tried for the coconut crop. Two of the cultivators at Rivona had used ammonium sulphate merely to note the response of the crop to the use of fertilizers. Three more cultivators in the same village had used it only for the young trees to hasten their growth. So was the case with four of the cultivators at Calangute who had added ammonium sulphate only to the newly planted trees. Others either confessed their ignorance in the use of fertilizers for coconut or argued that it was very costly or that the trees may get habituated to the use of such fertilizers and may not respond in case of their absence. It is only the pure chemical fertilizers that were available to these farmers and special mixtures having some organic composition were not being distributed for this specific type of perennial cultivation.

Another important practice followed in these gardens, though it would not be akin to manuring as such, was to add soil in these gardens once in 3 to 6 years to replace the eroded soil and cover the exposed roots. This practice was being followed by all the ten cultivators at Marcaim and 17 of the 20 cultivators at Rivona whereas only two of the cultivators at Calangute were following the practice regularly once in three years. The cost over this process involved only the expenditure over labour and it varied from Re.0.75 to Rs.2.00 per tree according to the quantity of soil added.

It would be thus, seen that the cultivators had been laying more emphasis on the use of green leaf manure and salt. The use of fish manure was restricted to the gardens in the coastal village whereas ash was being used by a few cultivators in the interior villages. Fish manure and ash were the main sources of potash. Potash has been since long known to be the dominant nutritional requirement of the coconut palm. Experiments in Ceylon indicated that the palms on the plots receiving no potash showed signs of deficiency, thinness and yellowing of foliage.^{1/} The manurial trials which are in progress in India have also shown that application of potash improves both quality and quantity of nuts; that of nitrogen increases the yield of the nuts but adversely affects the quality of the nuts, the mean reduction in the copra content being 6.2 per cent at 0.63 kg/per tree whereas phosphoric acid and green manure do not have any appreciable effect on the yield or quality of nuts.^{2/} Phosphoric acid, however, gave some response where it was 40 parts per million but no response where it was 100 parts ^{3/} per million.

Fish manure and ash, no doubt, supplied a complete manure for the coconut crop ^{4/} but the prices of fish manure had considerably gone up during the last few years in Goa and hence it was becoming costlier to use it. There was, therefore, a need

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1. Coconuts - tropical agricultural series, Reginald Child, P.89.
 2. The Indian Central Coconut Committee, 19th and 20th Annual Reports, P.8 and 13.
 3. Coconuts - tropical agricultural series, Reginald Child, p.53
 4. Study on coconut in India, Committee on Natural Resource, P.15.

for substituting this manure by a cheap manure mixture to expedite the use of a balanced manure for this crop. A very promising approach in this respect had been that of the coconut fertilizer demonstration scheme started in 1952 on the west coast of south India by M/S Parry & Co., Madras, under the technical advice of the Indian Central Coconut Committee. At the recommended dose the manure mixture supplied 0.75 lb. of nitrogen 0.75 lb. of phosphoric acid and 1.5 lbs of potash per tree. A review of the scheme in five years showed that there was a rise in the yield by 44 per cent over the control plots. 1/ Nearly the same quantities are recommended in Ceylon according to the soil type as 0.50 to 0.75 lb. of nitrogen, 0.60 to 1.00 lb. of phosphoric acid and 0.75 to 1.50 lbs of potash per tree according to the soil.

Even with the use of fertilizer mixtures, some organic matter would have to be supplied to the soils to maintain the soil texture, water-holding capacity and fertility. This would be more so with the sandy soils on the coast than on the soils in the interior. Cultivation of shrubs and green manure crops for the purpose as mentioned in the case of paddy would be the means of obtaining green material instead of the present method of indiscriminate cutting and scraping the trees for the purpose even though they may be in plenty in the interior. The absence of the use of any organic bulky matter, not even the green leaf manure at Calangute where the soils were sandy and completely deficient in organic matter posed a problem in this respect.

Another source of organic matter for the coconut crop was the use of coconut husks where they were not in demand for the coir industry and where they were being wasted for fuel. The recommended method was to bury husks in trenches along rows of palms, 4 feet broad and 1-1/2 feet deep and 10 feet long, burying layer by layer husks and earth. Burying of husks on the West Coast of India had increased the yield of palms in the third year and the effect had lasted for six years. 2/ Burying of such 1000 husks per tree proved to be beneficial for 5 to 6 years even in the absence of other manures. Coconut husks provided a good source of potash and 1000 husks on an average gave 3 1/2 lbs of potash. Husks can be used even for mulching in a circle upto about 7 feet from the tree to supply the potash which is easily leached from the husks, and also to conserve the moisture .

The use of coir dust also helps in the supply of organic matter for improving the soil texture and the water holding capacity. It has, however, little manurial value. The dust from dry milling, however, retains a large proportion of potash and has, therefore, some value from the point of supplying potash when compared to the dust obtained after retting. 3/

Inter-cropping in the coconut gardens

Trees such as mango, jackfruit and cashew were being grown at places in some of the coconut gardens mainly with a view to get fruits for home consumption. Such trees had been planted in six of the ten gardens at Marcaim and 17 of the 20 gardens studied at Rivona and they gave a produce worth about Rs.750

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1. Coconuts - tropical agricultural series, Reginald Child, P.92
 2. Coconuts - tropical agricultural series, Reginald Child, P.10
 3. Coconuts - tropical agricultural series, Reginald Child,
P. 101

and Rs.2400 in these two villages respectively. The trees were being grown usually on the peripheries of the gardens and no systematic attempts were being made to intercrop the gardens as in some tropical countries. It was only in the case of the progressive cultivator in the village Chandur mentioned earlier that an attempt was made to intercrop the coconut garden with the 'kew' variety of pineapple.

As a matter of fact it is today the opinion in the tropical countries that "the day of coconut as mainly or solely a monoculture appears to be almost over"^{1/} and "it is being increasingly recognized that coconut growing under a system of monoculture is an outmoded concept".^{2/} These quotations have been mentioned from the latest (1966) Commodity Report on "Coconut as part of the mixed farming system" prepared by the Food and Agriculture Organization of the United Nations and the papers submitted for the report and the generalizations therefrom. A number of examples of inter-cropping of coconut can be mentioned from the same report. Cocoa and robusta Coffee is intercropped in Australia;^{3/} successful growing of cocoa as an intercrop on mature coconut plantations has been proved in Fiji as well as in Papua, New Guinea and on estates in Malaysia and the same is the case with banana in Malaysia.^{4/} In the Phillipines, 15 per cent of the coconut area is intercropped with rice, corn, cassava (tapioca), sweet potato, pineapple, cocoa, coffee, citrus, banana and abaca (manilla hemp) ^{5/} whereas the Food Production Act of Ceylon forced the coconut growers to intercrop at least 16 per cent of a holding under a food crop such as cassava, sweet potato, yam, banana and a variety of vegetables. ^{6/} Sweet potatoes, groundnuts and soya-beans are not favoured as intercrops in Malaysia as they attract rats and bandicoots which are serious pests on plantations.^{7/} Experience has, thus, shown that many seasonal crops such as rice, maize, tapioca, sweet potato and yam, semi-perennials as pineapple and banana and smaller perennials such as cocoa and coffee are suited for intercropping in the coconut gardens. Same has been the experience of the Indian Central Coconut Committee and it is suggested that crops like dry paddy, cowpea and tapioca etc can be raised profitably as intercrops provided adapted varieties are selected and proper manuring is given.^{8/} Coconut gardens are being already intercropped with pepper in North Kerala and pineapple and tapioca are being extensively grown in the coconut gardens round about Calcutta.^{9/}

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1. Coconut as part of a mixed farming system. Food and Agricultural Organization of the United Nations, P.2.
 2. - do - P.14
 3. - do - P.3
 4. - do - P. 9
 5. - do - P:22
 6. - do - P. 5
 7. - do - P. 9
 8. The Indian Central Coconut Committee, Annual Reports 19th and 20th.
 9. Handbook of Agriculture, Swaney and Daji, P. 188.

As the experience in the other countries reveals intercropping does provide a coconut farmer with a higher return per hectare than does monoculture. It frequently results in an increase in production from the coconut palms themselves as a result of better cultivation of the land because of proper weeding, use of manures and fertilizers and proper tillage. Moreover, no separate costs have to be incurred over digging or interculturing the gardens, as they form a part of the cultural operations for intercropping.

Absence of irrigation and narrow spacing are, however, the partial limitations if this practice is to be introduced widely in Goa. Absence of irrigation would limit the intercropping of these gardens only to the rainfed crops such as paddy, maize, pulses, tapioca and vegetables. Narrow spacing would mean only a limited area available for interplanting and would restrict the use of these gardens only to the plants which can grow in partial shade such as banana, pineapple and tapioca. Where the gardens are being already irrigated or where irrigation can be introduced as noted earlier, it would be, therefore, advantageous to intercrop these gardens with banana, pineapple and a variety of vegetables. Where irrigation is not possible only the partial shade tolerating plants such as tapioca, pineapple (dry) and sweet potato may have to be grown because of narrow spacing and where the spacing is wide but irrigation is not possible, it would be possible to grow a wide variety of seasonals and perennials such as paddy, maize, vegetables, pulses, tapioca, sweet potato and pineapples.

Productivity

The early variety viz., Calangute matured much earlier and the bearing started from the fifth year after planting. Benaolim and Nadora were late varieties and bore fruits from the 8th year. It was the experience of the cultivators that the trees matured earlier near the coast than in the interior. In Bicholim taluka for example, we were told that it took nearly 10 to 12 years for the trees to mature in that area. The trees usually came into full bearing after 10 years in case of the early variety and after 15 years in case of the late varieties and this stage continued upto 25 and 40 years in case of these two types respectively.

The productivity in case of the selected cultivators may be noted from Table No.9.5 :

Table 9.5 : Classification of the cultivators according to the number of nuts harvested per bearing tree and the average productivity per bearing tree in the selected villages.

Village	Number of cultivators according to the number of nuts per bearing tree as						Total number of cultivators	Average number of nuts per bearing tree
	Below 10	10.1-20.0	20.1-30.0	30.1-40.0	40.1-50.0	Above 50		
Calangute	3	4	7	1	3	2	20	25.3
Marcaim	1	5	3	1	-	-	10	17.1
Rivona	-	6	8	2	1	2	19	20.3
Total	4	15	18	4	4	4	49	

The table gives the average number of nuts per bearing tree per year for the selected villages as well as frequency distribution of the cultivators according to the number of nuts harvested per bearing tree. As in case of paddy, it was also difficult in case of coconut to estimate the productivity as nuts were being harvested in four instalments in a year and practically throughout the year. Figures for the yield had, moreover, to be collected by the survey method and not through any crop harvesting procedures. A cultivator had, therefore, to be interrogated on the yield from each fragment during each harvest as well as about the disposal of the produce to arrive at as far as possible a correct estimate of the productivity of his garden. These estimates have been made use of in the afore-said table to note the approximate extents of variation in the yields of the individual cultivators as well as of the three villages in the different tracts.

The table would indicate that in a majority of the gardens in every village the yield varied between 10 and 30 nuts per bearing tree. In a very few of the gardens the yield was below 10 nuts per tree. Nearly one-third of the gardens at Calangute and Rivona, however, produced more than 30 nuts per tree whereas the yield exceeded 30 nuts per tree in only one garden at Marcaim. The yields were, however, a result of a number of factors interacting together such as the age of the trees, use of irrigation, manures and other cultural practices. It would not be, therefore, possible to relate these yields to the individual factors. Certain cases may be, however, cited to explain the higher yields. The yield of about 34 nuts per tree in the village Marcaim was for the only one garden receiving perennial stream irrigation in that village. A yield of 54 nuts per tree was observed in a garden at Rivona in which the owner had used ammonium sulphate as a fertilizer. A yield as high as 90 nuts per tree was noticed in case of a cultivator at Calangute who owned only 20 trees in his 'Gharbhat' in which it was possible to irrigate the trees adequately as well as use fish manure lavishly because of the smaller number of trees.

On the whole the average yields for these cultivators in Calangute, Marcaim and Rivona worked out to 25.3, 17.1 and 20.3 nuts per bearing tree respectively. The yield was the highest in the village Calangute which was a coastal village and where the small fruited but more productive (in terms of nuts) variety was grown. Use of irrigation at some intervals and the use of fish manure appear also to be responsible for the higher yield. The yield at Rivona in the interior was somewhat low but it was higher than the yield at Marcaim as a number of gardens received irrigation in this village. The yield was the lowest at Marcaim where almost no attempts were made to irrigate the crop in spite of a favourable water table. The yields in these selected villages, two of which viz., Calangute and Rivona were noted for their coconut production in Goa, were quite low when compared to the yields in the other areas. In the adjoining Ratnagiri district for example, sample surveys had indicated that the average yield per tree in that district was 26.07 and 31.17 nuts per tree during the years 1959-60 and 1961-61.1/ There was, thus, a scope in Goa for not only increasing the yield to bring it on par with the adjoining areas but also increase it to even upto 40 to 50 nuts per tree as in some of the existing gardens. This required, however, large scale introduction of irrigation, use of proper fertilizers and organic matter which were at present the limiting factors in Goa.

1. Basic and current agricultural statistics of Maharashtra State - Agricultural Department, Govt. of Maharashtra, p.7.

Tapping :

As there was no prohibition, it was customary in Goa to sell out a few trees for tapping for a period varying from a few months to a year. Usually the smaller trees were being given for tapping for a few months whereas the contracts for tapping the bigger trees continued for a year. The tappers also generally entered into a contract only for the vigorous trees from which they could extract a sizeable amount of toddy. It was also a practice with the farmers to give out a vigorously grown up tree for tapping if there was more of vegetative growth but less fruiting.

It was observed that at Calangute, 4 of the 20 cultivators had given out their 25 trees for tapping at the time of the survey. The rate contracted in all the cases was Rs.12 per tree per year. At Marcaim, 7 of the 10 cultivators had given out their 54 trees for tapping and the rate varied from Rs.2 to Rs.3 per tree per month. At Rivona also 5 of the 19 cultivators had given out 109 of their trees for tapping at the rate of Rs.38 to Rs.40 per annum. On the whole the rate was low at Calangute because of the small size of the trees as only the early variety was grown in the area.

Much experimentation has not been done on the effects of tapping on the coconut palms and it is not, therefore, possible to comment on this practice. Some earlier experimentation had, however, revealed that tapping of palms definitely reduced the number of barren nuts in the post-tapping period.^{1/} At the same time there were evidences to show that prolonged tapping of the dwarf palms even for more than four months resulted in a severe physiological set back.^{2/} Further research on these lines was much needed. The experience of the young progressive cultivator at Chandur was, however, that there was a considerable increase in the productivity of a tree in the post tapping period and hence he had a plan to give out his trees for tapping once in four or five years in rotation.

Introduction of the oil-palm

The cultivation of the oil palm in place of the coconut palm for the production of oil is practically unknown in India even though its cultivation is widely spread in the African and Asian countries such as Nigeria, Belgian Congo, Indonesia and Malaysia. One finds just a beginning being made in this direction in India by the recommendations of the Committee on Natural Resources which state that "as palm oil is a good substitute for coconut oil in soap making, it is necessary to explore the possibilities of cultivation of African oil palm in areas suitable for the purpose so that more coconut oil may be released for edible purposes."^{3/} As far as the South East Asian countries are concerned, Indonesia is well-known for its very early introduction of the oil palm and it now appears that at least half of the area under coconut estates in Malayasia will shift over to the more remunerative oil palm within the next decade.^{4/}

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1. Study on coconut in India. Committee on Natural Resources, p.12.
 2. Coconuts - tropical agricultural series, Reginald Child, p.188
 3. Study on coconut in India, Committee on Natural Resources p. 43.
 4. Coconut as part of a mixed farming system. Food and Agricultural Organisation of the United Nations, p.10.

The palm is a native of West Africa. It begins to bear between 6 and 8 years, gives full production at the age of 30 to 50 years and lives for about 100 years.^{1/} The fruit grows in clusters resembling small dark plums and consists of a fleshy pulp surrounding a nut which contains the kernel. Fruits are formed throughout the year and they take 5 to 6 months for maturity. Two types of oil are obtained from the fruit, the palm oil being obtained by pressing the pulp and the palm kernel oil being obtained by pressing the kernels. The former oil is dark green in colour and is used for non-edible purposes whereas the latter oil is light in colour and is edible. Moreover, palm kernel oil has properties resembling the copra oil and hence it can replace the latter for most purposes.^{2/} The fruits, however, need quick transport to the processing centre. Otherwise, the quality of the oil is seriously impaired. For these reasons and also because of the expensive machinery required for extracting the oil, its cultivation was restricted earlier mainly to the estates.^{3/} It is, however, already being grown on the small holdings in West Africa and attempts are being made in Malaysia to make it a small holder's crop.^{4/} The oil palm has a much larger demand for labour when compared to the coconut palm. At the same time the yield of oil per acre is also much larger when compared to the yield of oil per acre of the coconut palm. The Sumatran oil palm, for example, yielded an average of 2880 lbs. of oil per acre but at the same time the Malayan coconuts averaged only 631 lbs. per acre. In India also the yield of oil varies between 400 to 600 lbs per acre and hence it would be possible to obtain at least a three to four times higher yield of oil per acre if it was possible to introduce oil palm in place of the coconut palm in the areas being newly brought under coconut cultivation. As there is a large scope for the extension of area under coconut in Goa, and more so in the context of the expansion of the area possible in the country as noted earlier, it would be worthwhile introducing the oil palm in this territory to try it out on a pilot basis. It would, however, require a very highly organized effort in view of the heavy investment over oil extraction, larger number of trees for an oil extraction plant and means of quick transport from the farm to the extraction plant. Some experience which has been gained so far in the growth of the oil palm in Kerala might prove to be useful in planning for the purpose in Goa.

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1. Geography of Commodity Production, Smith and Tenson, p. 88.
 2. Economic aspects of the coconut industry in the South Pacific, Lefort E.J.E., p.5.
 - 3,4, South East Asia, C.A.Fisher, p.168 and 169.
& 5.

SECTION II - ARECANUT

Arecanut cultivation as noted earlier is mainly restricted to Ponda taluka and to a lesser extent to Satari, Bicholim and Marmugao talukas. The crop is, however, grown practically over a large part of the territory and one does find small patches of arecanut gardens planted with a few trees in some villages almost in every taluka. The crop was being grown once on a sizable scale even in Bardez and Pernem talukas, as we were told, but there was a severe locust attack and it destroyed all the arecanut gardens in those areas. No attempts were made by the farmers to replant the gardens thereafter. Even today one finds the crop being grown on a somewhat large scale, in the isolated villages in the north such as the village Morjim in Pernem taluka for example.

The cultivation of the crop, wherever it is grown in Goa, is always restricted to the slopes of the hills along perennial springs which are in some cases fed through the high built irrigation and percolation tanks. Nowhere does one find the crop being grown on plane lands as in some other parts of the country such as Tumkur district of the Mysore State for example. It has become almost a tradition in Goa to use the land for arecanut cultivation where it is slopy but to use it for coconut where it is plane. Perhaps, the high rainfall in the area may be one of the reasons for this tradition as the cultivation of arecanut requires a proper draining system.

Selection of the villages for the survey

Since arecanut was not a major crop of the area, the survey was restricted only to two villages from among the talukas having some sizeable area under arecanut. Accordingly, the village namely Savai verem was selected from Ponda taluka and Nagargaon was selected from Satari taluka. Attempts were made to contact as large a number of arecanut growers in these villages as possible so as to cover all the arecanut growers in these villages. Schedules were filled in for all such arecanut growers in both villages, but some of the cultivators in the village Savai verem were also studied by the case method in addition. The number of cultivators covered by the survey came to 14 in Savai verem and 18 in Nagargaon.

Size of the holding

As in the case of coconut, the size of the holding for arecanut was also being reckoned in the area by the number of trees owned or cultivated by a farmer. The cultivators contacted in the two surveyed villages have been classified in the table below according to the number of arecanut trees held by them.

Table 9.6 : Classification of the cultivators according to the number of arecanut trees held

Village	Number of cultivators holding number of trees as-					Total no. of cultivators
	150-500	501-1000	1001-1500	1501-2000	2001-2500	
Savai-verem	7	4	2	-	1	14
Nagargaon	11	4	2	1	-	18
Total	18	8	4	1	1	32

1. Survey of Economic Change in Rural Area - Kyatsanda (Unpublished) - C.S.Gajarajan. Agro-Economic Unit, Gokhale Institute of Politics and Economics, Poona.

The above classification would indicate that a majority of the cultivators in both villages had only upto a thousand trees in their gardens and again in case of half the number of cultivators in both villages, the number of trees was upto 500 only. It is only in 6 of the 32 gardens that the number of trees exceeded 1000.

Fragmentation of the arecanut gardens

Except in the case of one cultivator at Savai-verem and two at Nagargaon, the trees held by the other cultivators existed in single fragments. In the case of each of these three cultivators, however, the trees were divided over two fragments which were again located not far from each other. There was, thus, no problem of fragmentation in case of the arecanut gardens which required very intensive cultivation. Moreover, in case of the owners who had planted arecanut trees in different parts of a village, the practice was to retain the trees in one part for self cultivation and lease out the trees in the other parts. So also whenever a tenant farmer had to lease in the arecanut trees, he always preferred to lease in the trees at one place either through a single owner or even a number of owners. Both the owners and the tenants thus, always tried to cultivate as far as possible pieces of arecanut gardens at one place as the crop required very intensive cultivation as well as closer supervision and protection from the wild animals.

Owner and tenant cultivation

Six of the cultivators at Savai-verem owned the gardens whereas the remaining eight cultivators had taken the gardens on lease. One of these owners had retained a part of his garden for self cultivation whereas he had leased out the remaining part to two tenants who had again taken on lease the adjoining gardens from the other owners. Out of the remaining six tenants also, two tenants had taken on lease trees from different owners whereas the other two tenants had taken on lease trees from a single owner.

Out of the 18 cultivators at Nagargaon as many as 14 cultivators were owner cultivators and only the remaining four cultivators had taken the gardens on lease. Compared to Savai verem, a larger proportion of the gardens at Nagargaon were, thus, cultivated by the owners themselves. Two of these four tenants had leased in the gardens from two owners in each case whereas in case of the other two tenants the gardens belonged to single owners. In case of arecanut cultivation, attempts were, thus, being made to lease in and lease out the gardens in such a way that a holding formed as far as possible a single fragment. This was inevitable as noted above, as the gardens had to be watched throughout the year and protected against the monkeys and the wild boars.

This practice of leasing in and leasing out was practically rooted in the tradition and some of the tenants had leased in the present gardens since generations. At Savai verem, for example, four of the tenants had been cultivating the same gardens since the last 100 years or a few generations whereas two more tenants had taken their gardens on lease since the last 35 and 25 years. In the other two cases, the gardens were leased out since the last 15 and 5 years. At Nagargaon, however, all the four gardens had been taken on lease during a period of the last 3 to 15 years.

The terms of contract varied from one garden to the other. At Nagargaon, one of the gardens was rented for a cash of Rs.100 per annum whereas in the case of two other gardens the

rent was fixed at one-third and one-half of the arecanut production during the year. In the fourth case, the owner had to be given a fixed quantity of the produce viz., 4 local maunds or 60 kilos per year. In all these cases, the produce from the mixed crops such as banana, mangoes, pomello and others which will be noted later, belonged to the tenants. At Savai verem in the case of four gardens, the practice was to assess the yield from the garden before the harvest and the owner had the right to decide the quantity of arecanut that he should receive from the tenant. This was, however, being amicably decided between the owners and the tenants every year and usually one fifth of the produce remained with the tenant. In addition the tenants had to pay small amounts varying from Rs.3 to Rs.22 for the produce from the mixed crops. In another case, the rent was fixed in kind at 25 local maunds in addition to a sum of Rs.30 for the other crops. In one more case, the rent was fixed at three-fourth of the produce from the arecanut trees and one-half that from the other crops, whereas in case of another tenant the rent was fixed in cash at Rs.49/- per year. In one more case, where the garden had been taken on lease from four owners, two of the owners followed the method of assessing the yield to decide the rent whereas the other two owners received a cash rent. As far as arecanut cultivation in these two villages was concerned, there was no fixed pattern for the owner and the tenant relations and the problems of leasing in and leasing out were being determined largely by the traditional relations between the owner and the tenant families. The tenants had to merely put in their labour in irrigating, watching and manuring the gardens whereas the requisities in farming such as manures and insecticides were either being supplied wholly by the owners or partly shared by the tenants according to their share in the arecanut production. In case of the fixed rent gardens, the cost over manures was being entirely borne by the tenants or shared with the owners according to the nature of the contract. A large part of the income to the tenant, however, came from the cultivation of mixed crops and the mixed crops, therefore, attracted his greater attention.

Rate of planting new trees

New trees were being planted in place of the old unbearing trees as well as attempts were being very lately made to plant new trees on the uncovered areas in the gardens. There was no social or religious barrier to cutting of the old unbearing arecanut trees as was the case with the coconut trees. Old unbearing areca trees were, therefore, being freely felled to make room for the new ones. Some of the trees also fell naturally because of the winds. Out of a total number of approximately 10,900 trees at Savari verem about 555 trees were either felled or fell naturally during the last five years. 65 of these trees were purposely felled on three of the holdings whereas the remaining trees fell naturally. As against these, 3245 seedlings were planted on all the holdings. This meant a net addition of 2690 seedlings on these holdings or a rise in the number of trees by about twenty four per cent during the last five years. This addition in the number of trees was made on all the holdings. If we calculate the death rate, taking into account the original number of trees prior to five years, we would find that about 6.8 per cent of these trees either fell or were removed during this period.

Out of a total number of approximately 10,650 trees at Nagargaon about 1920 trees were either felled or had fallen naturally. It is only on one of the holdings that 75 trees had been purposely felled whereas the other trees had fallen naturally. The number of new trees planted on these holdings

during the last five years was, however, 3550 which meant a net addition of 1630 trees or a rise in the number of trees by about fifteen per cent during the last five years. There was thus, a rising trend in the expansion of this crop in both villages. The death rate on the above lines for the village Nagargaon would indicate that about 21.3 per cent of the trees prior to five years, either fell or were removed during the last five years. The proportion of trees falling or needing removal, however, depended upon the age of the trees, but from the figures for these two villages it appeared that roughly 2 to 5 per cent of the trees needed replacement every year.

Scope for planting new trees

No specific enquiry as such was conducted to determine the number of new plants that could be accommodated in these gardens. An examination of certain cases, however, showed that the scope was very limited for this expansion in the village Savai verem where scarcity of water as will be noted later, was the main problem. Moreover, the expansion that had taken place lately in this village, was more to replace the trees which were neglected during the preliberation stage when the price for the produce had attained a very low level. One of the arecanut gardens in the village was even converted into a coconut garden during this period whereas quite large areas were traceable where arecanut cultivation must have thrived in the past. There was no such problem in the village Nagargaon where water was available adequately. Moreover, in one case, in this village there was scope for planting 1000 additional trees in a garden in which only 1000 trees were existant.

Viewed in the context of the overall demand for arecanut in the country in future, however, there does not seem to be much scope for additional arecanut plantation. As viewed by the Working Group for the Formulation of the Fourth Five Year Plan Proposals, arecanut is practically a non-essential crop and has no export value.^{1/} The statistics for the ten years, 1952-53 to 1961-62 also indicate that the consumption of arecanut during this period in the country has not only not increased, but has definitely fallen. It is, therefore, recommended by the Working Group that the gap between indigenous production and requirements for internal consumption should be made up by increasing the yields rather than by any material increase in the area under the crop. It would be, therefore, proper to lay more emphasis on increasing the per acre yields in Goa than on planting additional seedlings whatever may be the scope for this addition.

Spacing and intercropping

The spacing provided in the different gardens varied from 6 feet to 10 feet. Since there was only one variety which was reckoned as a local variety in Goa, there was no need to adjust spacing according to the varieties. The spacing was, therefore, decided according to the choice of the individual cultivator and the area available for accommodating the trees. Since the arecanut cultivation was restricted only to the slopes, the slopes had to be cut into narrow or broad steps according to the degree of the slope. Spacing had, therefore, to be adjusted to accommodate certain rows of the plant breadthwise. This gave rise to different spacings even in a single garden. The number of plants per acre varied from 450 to even upto 1000 because of these differences in the spacing. This practice was, however,

1. Report of the Working Group on Fourth Five Year Plan Proposals
- Arecanut, p.5.

commonly existant in India where the number of trees varied from 450 to even 1200 per acre. In Malaya and Ceylon on the contrary the practice was to plant only 450 to 650 trees per acre.^{1/}

A number of trees of the other crops were also being adjusted in these gardens to provide the shade and coolness required for the arecanut trees. Banana was the main crop that was being grown with these arecanut trees and it was the practice to plant a banana plant between every two arecanut trees within a row. Mango, jackfruit, pomello, coconut, Kokam, Vath and Bread fruit were being planted at the corners of the beds and on the peripheries of the gardens whereas Betelvine and Pepper vines were being trailed on the arecanut/palms. Pineapples were being grown along the fences and cashew trees were being grown on the upper side of the slopes which did not receive any irrigation. The number of cultivators growing these different crops in their arecanut gardens and the approximate number of trees, plants or vines grown in these gardens may be observed from Table No.9.7.

Banana was the most common crop grown in the arecanut gardens and it was grown by all except one teacher at Nagargaon who had leased in a small arecanut garden. The proportion of banana plants to the number of arecanut palms was much large at Savai verem than at Nagargaon. On the whole the number of banana plants was nearly 3/4th and 1/4th of the number of arecanut trees in Savai verem and Nagargaon respectively. The next important crop was the coconut and it was grown by all except one cultivator in each village. The total number of trees was also quite large and it exceeded a thousand for both villages. Jackfruit, Kokam and mango were the other important crops. Jackfruits were being grown by all the cultivators whereas mango and kokam were also being grown by a sizeable number. The total number of trees of jackfruit, kokam and mango in these gardens came to 305, 165 and 120 respectively. A few trees of breadfruit were being grown by 12 of the 32 cultivators in these villages whereas pomello had been grown exclusively in Savai verem by about half the number of cultivators. Pepper and betel vine were being trailed on the arecanut trees by more than half of the cultivators at Savai verem whereas only a few cultivators had tried these crops at Nagargaon. On the whole the total number of creepers was so small when compared to the number of arecanut trees that it was indicative of a great potential for the cultivation of these crops in these gardens. Pineapples had been planted only by four cultivators at Savai verem and two cultivators at Nagargaon and bamboos were being grown by only one cultivator in the former village and two in the latter. The arecanut gardens were on the whole mixed crop gardens with a sizeable number of trees of arecanut, banana and coconut supplemented with other fruit trees and vines.

There were yet considerable differences between the two villages in respect of growing these different crops in the arecanut gardens. Even though banana formed the main intercrop at Savai verem, four of the cultivators at Nagargaon had just planted a few banana plants in their gardens whereas in four other cases in this village the proportion of banana plants was very small when compared to the number of areca palms in their gardens. One school teacher had not planted banana at all. In a majority of the cases a few trees of mango, jackfruit, Kokam and coconuts had been planted mainly for shade and for

1. Report on the Marketing of Arecanuts and Betelnuts in India, Directorate of Marketing and Inspection, Ministry of Food and Agriculture, Government of India, p.3.

Table 9.7 : The number of cultivators growing the different crops in their arecanut gardens and the approximate number of trees, plants or creepers grown

Village		Banana	Jack fruit	Mango	Kokam	Vath	Pomelo	Coco-nut	Bread-fruit	Pine-apple	Pepper	Betel-vine	Bamboo	Cashew-nut	Areca-nut
Savai-verem	A	14	14	10	9	7	9	13	6	4	9	10	1	11	14
	B	7100	150	57	89	15	33	455	24	2060	59	165	1000	595	10900
Nagar-gaon	A	17	18	11	17	8	-	17	6	2	4	4	-	-	18
	B	2485	155	63	76	16	-	630	11	80	35	72	-	-	10650
Total	A	31	32	21	26	15	9	30	12	6	13	14	1	11	32
	B	9585	305	120	165	31	33	1085	35	2140	94	237	1000	595	21550

A - Number of cultivators growing the crop. B - Number of trees, plants or creepers grown.

getting the produce to meet the requirements at home. Perhaps the location of this village in the interior and away from the market areas may be one of the reasons for the negligence of the cultivators in this respect. After the liberation and the rise in the prices of arecanut and the other crops, the cultivators seem to have taken some interest in the cultivation of these gardens as is evident from the cases of new banana plantation in a few gardens. Besides the plantation of banana, two cultivators had lately planted pepper vines in their gardens; one cultivator had planted pineapples whereas one more cultivator had planted 25 grafts of Chickoo (Sapota) which crop was even unknown to the area.

It was possible to trail the pepper vines on every arecanut tree in every garden and add to the production of pepper which had a great demand in the country. There was, thus, a considerable scope for the expansion of the crop. It was also possible to expand the cultivation of pineapple as a dry crop on the peripheries of every arecanut garden. There was also scope for growing a large number of citrus trees such as lemons besides pemello, which were already in demand in Goa. Nutmeg and cardamon which have proved to be successful in the arecanut gardens in the other areas had not been, however, tried in the arecanut gardens in Goa. There was, thus, a great scope for converting these arecanut gardens into highly productive mixed crop gardens without impairing the productivity of the arecanut crop. In view of the non-essential nature of the arecanut crop and the falling demand for the produce, greater care may have to be taken in future in planting even the new irrigable areas on the slopes more with the perennial crops having a rising future demand than with the crops which are likely to face a fall in demand.

Irrigation

Arecanut had to be irrigated throughout the year except during the monsoon. Because of the location of the gardens on the slopes no special efforts were, however, required for providing drainage for the water.

The sources of irrigation in both villages were the perennial springs or streams and the high built perennial tanks. In some of the gardens, water was being let in through canals by constructing diversion bandharas across the springs whereas in the other gardens, water was being stored in a pond on an upper step and it was being sprinkled over the trees on the lower steps with the help of a 'lat' or a bucket like device operated by manual labour.

Scarcity of water was being felt in six of the gardens at Savai verem whereas there was an abundant supply of water in the other gardens in this village and in all the gardens at Nagar-gaon. The water lasted only upto the end of April in the above mentioned six gardens and the cultivators had either to stop irrigation thereafter or irrigate the gardens sparingly and at long intervals of 7 days. All the gardens were otherwise being irrigated once in 3 to 4 days during the dry period. Arecanut, however, required a continuous supply of water and the scarcity of water, though experienced in only one-fifth of these gardens, was a serious factor limiting their productivity.

There were two main high built tanks in Savai verem which ultimately fed the springs and streams irrigating the arecanut gardens. One was the "Bhutkhamb tale" and the other was the "Bonia tale". Both these tanks were heavily silted and it was not possible to hold water in them. The 'Bhutkhamb tale' was a

marvellous piece of old construction and it was built high up in a small valley up a hill by putting a stone bund. The way to this old tank was completely blocked by wild creepers and one could reach the tank only after removing such creepers. It had almost become a place of abode for the wild boars whose presence could be easily detected from the footsteps and the freshly dug up earth in the tank bed. A collapsible door had been provided in the bund of this tank but the door was completely out of order. The tank could not, therefore, any more serve the purpose of either percolating or storing water. There was a wide distance between the tank and the locations of the present arecanut gardens and all along the way one could find a few very old and tall arecanut trees which might be even 80 to 100 years old. This was a clear indication that arecanut cultivation must have thrived once throughout the course of the valley from this tank to the present arecanut gardens. This whole patch of land had been turned into a piece of waste land because of the negligence of the 'Bhutkhamb' tank. As a study of this tank indicated there was a tremendous scope for utilizing the area either for arecanut cultivation or for some other perennial form of cultivation if water supply through the tank was to be restored. There was also a great scope for planning for the land use in the whole valley on the lines suggested in an earlier chapter. The same was said to be the case with the other tank namely the 'Boniatale' which could also after repairs help the expansion of water supply and consequently the greater availability of land for perennial crops in this village. We could not, however, visit the latter tank.

Use of manures and fertilizers

Unlike the coconut palms, the areca palms were being manured very regularly and intensively. Farm yard manure and green manure were the two principal manures used for this crop. Green leaves were being buried around the areca trees in every August or September whereas farm yard manure was being put around the trees practically throughout the year. The quantity of farm yard manure used, however, varied from 1/2 to 1 basket per tree from one garden to the other. Moreover, the process being a continuous one the quantities varied according to the availability of manure with a cultivator and the age of the trees. The cost over farm yard manure in case of the cultivators who had purchased the manure varied from Re.0.06 to Re.0.15 per tree at Savai verem and from Re.0.05 to Re.0.19 at Nagargaon. It is only in one case at Savai verem and 4 cases at Nagargaon that the cost over farm yard manure came to around Re.0.30 per tree. These costs do not include the labour costs over spreading the manure. The cost of green manuring also involved only the labour cost and both processes of green manuring and spreading farm yard manure were being performed through the employment of casual labour or permanent farm servants. In addition to the above manures, 2 cultivators at Nagargaon had used ammonium sulphate in their gardens whereas one and three cultivators at Savai verem had used urea and ammonium phosphate respectively. The costs over the purchase of these fertilizers varied from Re.0.04 to Re.0.15 per tree only as the fertilizers were being used merely on a trial basis. It is interesting to note that two of the cultivators using fertilizers at Savai verem were tenant cultivators, who were paying a fixed rent in kind or cash. The remaining two cultivators in the village Savai verem and the two cultivators at Nagargaon who had used fertilizers, were owner cultivators.

There was much scope for increasing the productivity of the gardens through intensive use of fertilizers. Data

obtained from the manurial trials conducted by the Indian Central Arecanut Committee had indicated that it was possible to step up the yields by as much as 50 to 100 per cent if fertilizers were to be applied intensively.^{1/} Even though the above mentioned six cultivators had used fertilizers in the two selected villages, there was a general resistance to the use of fertilizers in the arecanut gardens either on the economic ground or on the common belief that the fertilizers deplete the soil or that the arecanut crop does not respond to the use of fertilizers.

Another practice, though not akin to manuring, was to add the loamy soil obtained from the hills around the arecanut trees to replace the eroded soil and cover the exposed roots. This practice was being followed once in 3 or 4 years. This was being regularly followed in every garden according to the gravity of the problem.

Interculturing

As in the case of the coconut gardens, the arecanut gardens had to be dug up in every September or October to remove the weeds and loosen the soil. This practice was, however, being regularly followed in every arecanut garden even though the coconut gardens were being irregularly dug up as noted earlier.

Fencing and protecting the crops

All the arecanut gardens except one in each of the two villages had been fenced. The fencings were made partly of stones and partly of barbed wires. The fences served the purpose of protecting the gardens against thefts and wild boars. For protecting the trees from the nuisance of the monkeys, however, the gardens had to be watched carefully and for this purpose usually the owners or the tenants stayed in the arecanut gardens themselves and or employed permanent farm servants to stay in the gardens. Two of the owners at Savai verem and one at Nagargaon had employed farm servants for this purpose. The monkeys were being driven out by throwing stones or loud shouts or at times even with the help of crackers and guns. For this purpose two of the cultivators at Savai verem and five at Nagargaon had maintained guns. The nuisance from monkeys was so severe that in no case could an arecanut garden be left unwatched on any day.

Productivity of the arecanut trees and the mixed crops

The areca palm begins to bear in Goa at the age of about ten years and reaches full bearing by the age of thirty. Full productivity continues thereafter upto the age of sixty years even though the palm lives for nearly 100 years. Compared to the coconut palm the areca palm attains full maturity somewhat later. The palm produces about 3 to 4 bunches during the year. Under the Goan conditions, the flowers are produced from February onwards and the crop is ready for harvest in November and December. The harvested nuts are dried in the sun and sold in the market after removing the husk.

The productivity per bearing arecanut tree in the case of the cultivators contacted for this enquiry may be noted from the table below. The cultivators have been classified in this table according to the yield per bearing tree and the average

1. Study on Arecanut in India, Committee on Natural Resources, p. 16.

yield per bearing tree for the selected villages in the aggregate has been also noted in the same table.

Table 9.8 : Classification of the cultivators according to the average yield per bearing arecanut tree

Village	Number of cultivators according to the average yield per bearing tree as					Total No. of cultivators	Average yield per bearing tree kgms per tree
	0.25-0.30	0.31-0.50	0.51-0.75	0.76-0.90	0.91-1.00		
Savai verem	1	3	7	2	1	14	0.72
Nagargaon	1	6	9	1	1	18	0.56
Total	2	9	16	3	2	32	0.64

The table would indicate that in the cases of half the number of cultivators in both villages, the yield varied between one-half to three-fourth of a kilogram per bearing tree. In the case of about one-fourth of the cultivators at Savai verem and one-third of those at Nagargaon the yields were below half a kilo per bearing tree whereas in case of one cultivator in each village the productivity was even less than 0.30 kgm. per tree. There were only three and two cultivators in these villages who could get an average yield varying from 0.76 to 0.90 kgm. and 0.91 to 1.00 kgm. per bearing tree respectively. The average yield per bearing tree worked out 0.72 and 0.56 kilogram for /to Savai-verem and Nagargaon respectively. Compared to the adjoining Ratnagiri district, these yields were quite low. Sample surveys conducted in Ratnagiri district during the years 1959-60, 1960-61 and 1961-62 had indicated that the average yields in these years were 2.40, 2.54 and 2.43 lbs. per tree respectively. ^{1/} In the light of these average yields in the adjoining district, there appears to be a considerable scope for increasing the productivity of the arecanut gardens in Goa even through the use of ordinary cultural practices as adopted in the Ratnagiri district. The scope would no doubt be much greater with the use of intensive use of fertilizers and other methods of cultivation. Moreover balanced fertilizer mixtures may have to be introduced even for this crop as in the case of the coconut.

The cultivators have been classified again in the table below according to the percentage of the gross value of the production from the mixed crops to the gross value of the total production from both arecanut and the mixed crop. The percentages of the gross values in the above respects for the two villages in the aggregate have been also noted in the same table.

It would be observed from the table that in a majority of the cases in Savai verem the gross value of the production from the mixed crops varied between 10 to 30 per cents of the gross value of the total production from both arecanut and the mixed crops whereas in Nagargaon the former value was less than 10 per cent of the latter in the cases of nearly half the number of cultivators. There were only two arecanut gardens at Savai verem and one at Nagargaon in which this percentage varied from

1. Basic and Current Agricultural Statistics of Maharashtra State, Agriculture Department, Government of Maharashtra, p.73.

Table 9.9: Classification of the cultivators according to the percentage of the gross value of the production from the mixed crops to the gross value of the total production from both arecanut and mixed crops

Village	Number of cultivators according to the percentages as						Total no. of cultivators	Percentage of the gross value of the production from the mixed crops to the gross value of the total production from both arecanut and the mixed crops.
	10% and below	10.1-20%	20.1-30%	30.1-40%	40.1-50%	50.1-55%		
Savai verem	-	5	7	2	-	-	14	21.75
Nagargaon	9	6	1	1	-	1	18	13.28
Total	9	11	8	3	-	1	32	18.35

30 to 40 per cents. In one case at Nagargaon the percentage worked out to as much as 53 per cent. The larger percentage in the last case was due to planting of bananas on a very large scale in that garden and it meant that the gross value of the production from the mixed crops was even larger than the gross value of the production from arecanut in this garden. For Savai verem and Nagargaon the percentages worked out to 21.75 and 13.28 per cents respectively and this difference was due to the more extensive cultivation of the mixed crops in the former village when compared with the latter .

The percentages of the gross values of the production from the different crops to the gross values of the production from all the mixed crops for the selected villages have been noted in Table no.9.10.

The table would indicate that amongst the mixed crops banana and coconut were the major crops to add to the gross income from the arecanut gardens. Bananas accounted for about 40 and 30 per cents of the gross value of the production from the mixed crops in Savai verem and Nagargaon respectively whereas coconut accounted for only 25 percent of the same in Savai verem and as much as 53 percent in Nagargaon. Betel vine and jackfruit were the two other crops to add to the gross income to an extent of about 5 per cent or so. Pepper accounted for a very small fraction of this income. The other crops noted in the table for the village Savai verem included cashewnut and bamboo and especially cashewnut had accounted for a substantial part of the value. Cashewnut, bamboo and pineapple were, however, the crops grown entirely on the peripheries of the arecanut gardens and not inside the garden like the other crops.

Table 9.10 : Percentages of the gross values of the production from the different crops to the gross values of the production from all the mixed crops in the arecanut gardens in the selected villages.

Village	Gross value of the production from the mixed crops	Percentage of the gross value of the production from -											
		Banana	Jackfruit	Mango	Kokam	Vath	Pomello	Coconut	Pineapple	Pepper	Betel vine	Bread fruit	Others
Savai-verem	7332	39.2	6.9	3.8	2.4	0.7	1.1	25.7	3.9	0.9	4.8	1.0	9.6
Nagargaon	3004	31.1	3.6	0.7	2.6	2.3	-	53.3	neg.	0.9	5.5	neg.	nil

neg. = negligible.

SECTION III : MISCELLANEOUS CROPS

References have been already made to a number of crops such as sugarcane, banana, pineapple, mango, jackfruit, cashew, pepper, betelvine, bread fruit, citrus fruits, bamboo, eucalyptus, jowar, maize, groundnut, sweet potato, vegetables and a variety of pulses such as cow peas, green gram and beans while discussing the different types of paddy cultivation and the coconut and the arecanut crops in the earlier pages. So also suggestions have been made for the introduction of altogetherly new crops such as coffee, tapioca, oil palm, nutmeg, cardamon etc. Suggestions have been also made for the expansion of some of the important crops such as dry and irrigated pineapple, pepper, citrus fruits, maize, groundnut, mango, cashew, eucalyptus etc. The characteristics of the soil and type of cultivation or land water combination required for these crops have also been noted at the relevant places. The two important crops which have not been discussed at length and which would, therefore, need some special elaboration in this section would, however, be the banana and the sugarcane for which there would be a considerable scope for expansion.

Banana as noted so far is a crop grown mainly in the arecanut gardens. Almost the entire production of bananas in Goa comes from the arecanut gardens and some of the gardens on a kitchen garden scale. 'Saldati' and 'Rasabali' are the main varieties grown in these gardens and 'Saldati' is preferred to all. It is only the 'Maindoli' variety of banana that is grown on a field scale in the village, Moira and the roundabout villages in Bardez taluka. The crop is grown in rotation with paddy in the Waingan farms in these villages and is cultivated very intensively. The suckers are planted by digging pits which are manured with either farm yard manure or even night soil. The crop is cultivated by the farmers in groups and the patches under banana are shifted from one place to the other in a farm. It is also possible to follow such a practice in the other areas and grow suitable varieties such as the local variety 'Saldati' or even 'Basarai' which grows successfully in the coastal areas of Thana and Kolaba districts of Maharashtra State. This would, however, be possible only in those Waingan farms in which some quantity of water remains even after the harvest of the Waingan crop and would require organised efforts and crop planning at the level of the individual Waingan farms.

A practice akin to this cultivation of banana in the Waingan farms was that of growing sugarcane on the same lines. Sugarcane was being cultivated in the Waingan paddy farms in some of the villages in the southern part of Goa though in very isolated villages such as Rivona in Sanguem taluka and Balli in Quepem taluka for example. The village, Rivona was specially visited for the purpose. Sugarcane was being grown by about 50 cultivators in this village in a Waingan farm which was owned by four families. It was optional on the part of the tenants in this farm either to grow sugarcane or paddy but the rent had to be paid in terms of a fixed rent in the form of paddy. The rent was for example five cudovs of paddy for an area which could accommodate about 1500 sugarcane sets. In case if any person other than the tenant wanted to grow sugarcane in this farm, he had to pay the owner a cash rent of Rs.2/- per 100 planting sets. The sets were being planted by digging trenches having a length, width and depth of 6 feet, 6 inches and 9 inches respectively. The trenches were being spaced two and a half feet apart. Cow dung and leaves were being burnt in these trenches to provide ash to the crop. Upper parts of the canes with 4 to 5 buds were being closely planted in these trenches in the first week of May after the harvest of

the Waingana crop. This cultivation was being irrigated only with the water left over after the harvest of the Waigan crop. There was no need of irrigation from the first week of June after the monsoon had set in. The crop had, however, to be irrigated at least 8 to 9 times during the month of May at an interval of 3 or 4 days. These trenches were being gradually filled with earth and later earth was being heaped around the plants as the shoots started growing up during the months of June to August. Ash was being again, added to these trenches in the month of May and the crop was being manured with chemical fertilizers twice or thrice upto September. The crop was also being supported with bamboos in the month of August so that the crop should not lodge because of heavy winds. Not much need was being felt for irrigating the crop after the monsoon and the crop had to be irrigated only once or twice before the harvest. The crop was being harvested from January to March according to the availability of crusher for the preparation of jaggery.

A number of jaggery makers as those at Savardem, Sanguem, Margaon and Cuncolim had maintained power crushers and learnt the technique of jaggery making. These persons were offering their services to the farmers along with their crushers, boiling pans, etc., and were moving from one village to the other after completing the jaggery making operations in each village. Their services for jaggery making continued from January to April. Their charge for jaggery making was Rs.2- $\frac{1}{2}$ per barrel of the cane juice extracted and this charge included the operations of crushing and boiling the juice to the final stage of making the jaggery. The fuel required for the purpose had, however, to be provided by the farmers. Lime and soda-bi-carb were being used as the purifiers and they were being supplied by the jaggery makers. The cultivators had to make contracts with these jaggery makers much before the harvest of the cane and fix a specific period for their operations in the village. These jaggery makers being very limited in number, the cultivators had at times to suffer a loss because of their non-availability in the specific periods. About three years prior to this enquiry, the cultivators in the village Rivona could not get a jaggery maker and the whole crop dried up and was wasted. The sudden fall in the prices of jaggery after liberation was also said to be responsible for the negligence on the part of the jaggery makers and the cultivators. Sugarcane cultivation was stopped thereafter in this village and was again taken up in the year prior to this survey. The quality of jaggery produced was quite inferior and it had a darkish colour though it was quite sweet. Such a colour was tolerated by the local consumers as we were told. The variety of cane grown during the year was also said to be responsible for this colour. The sets of this variety were obtained locally from the village, Colamb in the same taluka. No improved or carefully selected varieties were being grown or even known to these villagers. The darkness in the colour of the jaggery may also be due to the presence of the deeply coloured iron compounds of polyphenols because of the lateritic soil as it has been already proved that the iron phenol complexes cause such colourization,^{1/} It has been also shown that such compounds could be discharged by the use of chellating agents such as citrates, phosphates, etc.^{2/} Use of lime even in slight excess may also be responsible for such

1. Proceedings of the Annual Convention, Deccan Sugar Technologists' Association, 1953, Jatkar, p.65.

2. Proceedings of the Annual Convention, Deccan Sugar Technologists' Association, 1955, Leley and others, p.56.

colourization. But this would require a thorough training to these traditional jaggery makers in respect of jaggery making under different conditions.

It was not possible to estimate the per hectare productivity of sugarcane for these farmers as no measurement for the land used for the crop by a farmer was available. A farmer growing 600 sets in 100 trenches, for example, could get 320lbs of jaggery valued at Rs.110/. He had to pay Rs.10 to the jaggery maker and the quantity of cane he produced gave a juice of four barrels which required to be boiled in two pans. The other cash expenditure such a farmer had to incur was for the purchase of the sets and fertilizers. He had to spend Rs.18 for the planting sets at the rate of Rs.3 for 100 sets. He had to apply ammonium sulphate worth Rs.9 twice to his crop and had to add household ash before planting. He had to pay a rent of 2 cuds of paddy to the owner.

The above one was the traditional method of planting sugarcane as compared to the methods the other sugarcane growing areas. It had, however, certain unique characteristics such as burning the soil and adding the ash before planting to control soil acidity, planting in trenches, planting only the apical portions of the canes and providing bamboo stakes to prevent slanting growth and lodging which all had a scientific basis. Better results have been already obtained by planting sugarcane in trenches in the South. It has a number of advantages such as provision of a basal anchorage to prevent lodging against high winds, greater moisture retention in the soil, reduction in the incidence of shoot borers in the early stages, increase in the yield by about 2 to 5 tons per acre and better quality due to absence of lodging.^{1/} Experiments at Ankapalle have shown that if the sets are used only from the top, the quantity of planting material needed is nearly halved and hence it is recommended that this practice which was until recently being followed in North India needed a revival.^{2/} There was another practice that of using the 'rayungans' which was followed in Indonesia. In this method the standing canes are tapped off to sprout the auxiliary buds. Such sets when they are about 4 to 6 weeks old, are used for planting. This not only reduces gapping but is a very useful method for late planting to suit the shortage of water as in the above cases noted in Goa. Experiments at Ankapalle have shown that the method also increases the contents of sugar.^{3/} The sugar content of a cane depends upon the degree of inclination of the stalk and hence propping with the bamboos helps in greater content of sugar in the canes. It was also found in a field trial at the sugarcane liaison farm at Vuyyur that propping gave an increasing yield of 8 tones of cane per acre and an increase of sucrose to an extent of 1.7 percent.^{4/} Such techniques even though followed traditionally in the southern part of Goa were, therefore, superior to the techniques practised elsewhere. What was needed

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1. Outstanding Agricultural Practices in Madras, Andhra Pradesh Gujarat, and Punjab, Indian Council of Agricultural Economics, p.19
 2. Ibid., p.18
 3. Ibid., p.16
 4. Ibid., p.24

was the proper use of manures and fertilizers in adequate quantities. Neither farm yard manure nor green manure was being used for the purpose in these villages. The use of fertilizers also appeared to be inadequate. Sowing of green manure seeds in between two rows of sugarcane, use of larger doses of fertilizers, spraying the plants with 20 lbs. of nitrogen per acre in the form of urea dissolved in water in the month of September were some of the methods to increase the productivity. It was also necessary to mulch the soils with grass, cane trash etc. after September to conserve the moisture. It was observed in Barbados, for example, that mulching increased the yield by 5 tons per acre in that country.^{1/}

Quite contrary to this method in the South was the method of cultivating cane as a dry crop in a few villages in the North. The villages Sal and the round about villages in Bicholim taluka were noted for this practice. The village Sal was, therefore, specially visited for the purpose. It was observed that a part of the sugarcane crop was being grown in this village under the dry conditions whereas a part received regular irrigation. The Co 419 variety was grown in this village and it was obtained by one of the progressive cultivators from the village Chandwad in the Savantwadi area of Maharashtra. The dry cultivation was practised by a group of 12 tenants over an area of 5 acres. Sugarcane was being grown in rotation with rice in the kharif season and horse gram in the rabi season. The land was being ploughed for the purpose for about 10 to 15 times after the harvest of paddy until March to conserve the moisture. The canes were being cut into sets and heaped in a moist condition for about 8 days to sprout the buds and such sprouted sets were being planted after the plough in April. The method was somewhat similar to planting the 'rayungans' described earlier though the sprouting was less complete in this method. Farm yard manure was being used at the rate of about 8 cartloads per acre. The crop was, thereafter, being allowed to grow naturally and without irrigation. No earthing up was being done and the crop was allowed to grow on the plane land. Neither any mulching was being done nor any fertilizers were being used for this dry cultivation. Fertilizers were however, being used for the crop in this village when the crop was grown with irrigation. The cultivation of sugarcane under the dry conditions was said to be giving larger net returns than the cultivation of rice and 'kulthi' on the land. The jaggery makers were being called from the Kolhapur area for preparing jaggery in the village. No estimation of yield was possible but from what the cultivators had experienced there appeared to be a scope for the extension of this method where suitable. The cultivation of sugarcane as a dry crop under similar conditions was, however, quite common not only in the Tarai region of North India, but in many other countries such as Hawaii, Mexico, Brazil, Barbados, Dominion Republic, Jamaica, etc.^{2/}

A more modern practice of growing sugarcane in Goa was the one practised on an estate farm in the village, namely Shigav in Sanguem taluka, which was previously the farm of a sugar factory. A factory was started about 20 years ago in this village but the sugarcane farm of this factory had to be later on sold out as it proved to be uneconomic. Sugarcane

1. Sugarcane, A.C.Barnes, p.94.

2. Ibid., pp.83-100.

had been grown on about 65 acres of this farm in the survey year for the preparation of jaggery. The method of growing sugarcane was as the one practised in Maharashtra and the farm was receiving adequate irrigation through the Candepar canal. The cane was being planted in well prepared furrows in the month of February and it was being manured with farm yard manure at the rate of 8 cartloads per acre and with 1200 to 1300 kilos of fertilizers per acre in three doses. Earthing up was being done to prepare the ridges as in Maharashtra. The ratoon crop was also being taken for 3 years. It was not possible to go through the accounts of this farm as the managers could not cooperate with us in disclosing the information. The farm was said to be giving a yield of about 60 to 80 Bengali maunds of jaggery per acre.

Sugarcane was, thus, being grown in Goa by different methods in the different parts. Its cultivation was, however, restricted only to the Ker or Waigan type of lands and nowhere was it being grown in the Khazan type of land. It was possible to grow sugarcane even in the Khazan farms and it was already being grown under such conditions in parts of South India, as well as in Nigeria, British Guiana and Louisiana.^{1/} Moreover, cane is known to absorb large quantities of salts from the soil and is actually recommended for improving the salt lands. Quite different layouts have been developed for the purpose such as the Partha method in South India,^{2/} cambered bed method in British Guiana and the Bank and furrow method in Louisiana.^{3/} Suitable methods may have to be selected and tried for the different farms under different conditions. It would be, thus, possible to grow sugarcane in Goa on the Ker, Waingan as well as the Khazan farms if the methods of cultivation are properly introduced and measures are taken to increase the yield and the quality of jaggery. There would be also a scope for establishing a sugar factory if the crop would spread over large areas.

Bananas would also require identical land and water characteristics as sugarcane and it would be also possible to grow banana on a large scale throughout Goa if proper facilities were available to market the crop. The produce can be even exported to Bombay and other places. Moreover the crop can be planted in Goa in December or so after the harvest of Kharif paddy in the Waingan as well as the Khazan farms and it would thus, be possible to avoid competition from the crop production in the other areas. Sugarcane and banana would, thus, be two of the important cash crops which would largely benefit the tenant cultivators in the paddy farms if they were to be permitted to grow these crops in the paddy fields where optimum conditions were available for their cultivation. This would, however, require planning for the use of land and water resources at the individual farm level and the cultivators would have to be organized at the farm levels from the point of adopting an efficient production programme for each farm.

1. Sugarcane, A.C.Barnes, pp. 59, 95 and 128.

2. Outstanding Agricultural Practices in Madras, Andhra Pradesh, Gujarat and Punjab, Indian Council of Agricultural Economics, p.20.

3. Sugarcane, A.C.Barnes, p. 128.

It would not be improper to recapitulate and repeat here some characteristics of the cultivation of the other crops even though they have been already noted earlier in the different chapters. Next to sugarcane and banana, pineapple deserves a great attention in the territory. The crop can be grown as an irrigated crop in the coconut gardens or even in the banana and mixed crop gardens with widely spaced areca trees on the new lands on the slopes. As a dry crop it can be grown practically on the slopes of most of the hills. Very large areas can, therefore, be brought under this crop if organised efforts are made to plant the crop on the slopes and protect it from the monkeys and other pests. The crop has not only an importance from the point of the canning industry but also from the point of making fibre out of the leaves or preparing paper pulp out of them. There are already two canning factories in Goa. Fibre is, however, being produced from pineapple only in a few countries as Phillipines and Formosa.^{1/} The fibre is extracted either by mechanical means or retting but mechanical extraction is a very difficult process. Trials with Corona sisal decorticator have proved successful in South Africa and a mobile machine drawn by a tractor is being experimented.^{2/} Pineapple fibre is being extracted by hand in Travancore in India and used by the local fishermen for nets. There is a possibility of using the leaves also for paper pulp.^{3/} Through the extension of pineapple, it would be, therefore, not only possible to utilize the land in the coconut gardens and that on the hills but also to provide some raw material for the future industrial development of the area.

Crops such as pepper, nutmeg and cardamon can be very intensively cultivated in the arecanut gardens and their cultivation has a high value in meeting the demand for them in the country. The same can be the case with the cultivation of citrus fruits in the arecanut gardens. Mangoes and jackfruit are being grown near the households or in the arecanut and other gardens and there are also mango plantations at some places. Jackfruit has a limited importance but mangoes can be grown on the slopes and tops of the hills according to the nature of the soil giving a proper place for this crop in the hill development programmes. The same can be said about cashew, bamboo, eucalyptus etc., which can be grown on the slopes or tops of the hills in the context of the integrated hill development programmes. There is a great scope for extending the cultivation of groundnut, jowar and maize on the Marad lands if large areas are devoted to these crops at a place to facilitate protection of the crops. Sweet potato, cow peas and vegetables are being grown on the kitchen garden scale and in the paddy farms after the harvest of paddy by digging temporary wells. These crops can be given their due place in the farms adjoining the present Waingan farms by a rational distribution of water. Pulses such as beans, horse grams etc are being grown as a dry rabi crop in the paddy fields after the harvest of kharif paddy in those soils which can retain water. It may be possible to extend the cultivation of such crops over larger areas if organized efforts are made to protect the crops from the stray cattle. Tapioca can be grown under the dry conditions or as a mixed crop and has a great commercial and industrial importance as well as a high value as a food crop. Its introduction and expansion will, however, depend upon the facilities available for marketing and processing it. Coffee and oil palm are the other new crops which may play a major role in the development of the area. Their cultivation will, however, need much of investigations and piloting before the crops can be introduced in the area.

CHAPTER 10

PROBLEMS OF DEVELOPMENT OF PADDY AND GARDEN CROP CULTIVATIONS

Introduction

The structure, nature and the practices of utilization of the land and water resources and the resultant types of cultivation in Goa, have been noted in the earlier chapters. Facts about the use of such resources and the different techniques adopted in their use under similar conditions in the other parts of the country and in the tropical countries and those evolved on the experimental farms have also been noted wherever possible to consider whether the transplanting of such new techniques in the Goan territory would induce the necessary technological transformation so vital for economic development. It is the objective of this chapter to summarise and draw conclusions from these earlier data and discuss in their context the problems of development and use of the agricultural land and water resources in Goa.

Among the different types of land resources Khazan, Ker or Waingan and the Marad types of resources are being exploited since long past. In recent years there has been also a greater tendency to use the Marad lands either for paddy or coconut cultivation on a large scale. The Khazan resource is considered to be the most productive of all the resources but lately the productivity, as the figures indicate, has been dropping down because of either the breakages in the bunds or the increased salinity of the farms due to seepage of water, negligence of the drains, sluice gates etc. The productivity from the Marad resource which is considered to be the most inferior of the three resources is on the contrary proving to be somewhat satisfactory because of the land improvement measures such as addition of silt and use of manures which are being practised on some scale. This moreover, indicates that there are great potentialities for the development of even this resource if adequate development measures are undertaken. It would be, therefore, appropriate here to discuss what policies and development measures are necessary for the development of these various resources.

Khazan cultivation

The Khazan resource is mainly concentrated along the banks of the Juari and the Mandovi rivers in Salcete, Ponda, Bicholim, Bardez and Marmugao talukas. The only provision in the Fourth Five Year Plan for Goa for this resource is for reclamation of these lands and the programme, as is envisaged, is to benefit all the area under this resource in Goa. The policy in this respect has been, however, as in the past, to repair the embankments which have given way, at the cost of the Government and recover a part of the costs from the cultivators as a long term loan. The policy, therefore, implies more of curative measures than preventive ones. The survey, on the contrary, indicated that the number of breakages in the selected villages had been increasing since the last few years. This meant that preventive measures would have to be undertaken in many of the farms if the cost involving curative measures were to be avoided. Moreover, it took nearly one or two or even more years to reclaim the land from the farms which had once given way (e.g. the Wadso khazan and the Wagle katar at Chumbarjua) and this involved loss of production and employment in those years. It was, therefore, necessary to carry out a survey and demarcate

those farms which needed some preventive measures. The preventive measures as the survey indicated were the protection of the bunds by the willows, greater precautionary measures at the vulnerable points, broadening of the bunds and the use of the latest developments in technologies such as the use of emulsions for plastering the bund, use of impermeable materials such as alkathene papers etc. Details for these measures have been already discussed earlier. Broadening of the bunds at the more vulnerable points is, however, an important though a costly measure but the use of the mining refuse for the purpose where economical, would have to be given a thought in this respect. The willows also offer a considerable protection to the bunds in as much as they nullify the impact of forceful waves. Such precautionary measures can no doubt be expected to increase the longevity of the existing bunds.

Even though initially such programmes may have to be undertaken through the efforts of the Government it would be necessary to build organizations for the purpose at the farm level. As the survey has indicated, practically most of the Khazan farms are cultivated by tenants. The owners have lost their interests in the maintenance of the bunds because of the considerable reduction in the rent after the Tenancy Act. Unless, therefore, the tenants come together to set aside a part of their incomes for the preventive and the curative measures, it would be difficult to finance such measures indefinitely and also attend to these measures timely. The 'Bhos' system which makes provision for watching the bund and the collective cultivation of some of the farms as noted earlier are already the examples of organized efforts being made in this respect by the cultivators since the past.

The problem then would arise whether it would be possible to have such organizations for the individual farms. The survey data in this respect indicates that excluding a surveyed village which was an island, in the other villages most of the farms exceeded 5 hectares in size. So also in more than $\frac{3}{4}$ ths of the farms, the number of tenants also exceeded 10. So also nearly $\frac{2}{3}$ rds of the cultivators were engaged solely in Khazan cultivation and most of the cultivators tilled their lands either in one or at the most two Khazan farms. This indicates that it would be possible to organize the cultivators in a majority of the farms on the farm level basis and only a few of the cultivators may have to become the members of more than one organizations. In case of the other farms, the farms may have, however, to be merged with the adjoining farms for the purpose of such organized efforts.

In addition to the savings from the incomes of the farmers for preventive and curative works it should be necessary that a farm organization as a whole should be in a position to plan and raise the productivity of the farm as well as raise the income of the organization through overhead incomes. This is, however, not new and the old comunidades in the past made attempts to follow the same. The overhead incomes can be raised in two ways. One way would be to put the common lands of the members such as the bunds and the boundaries to some specific use such as growing Ragi on the bunds or planting coconut trees where the bunds are broad. This practice is already prevalent in some parts of Goa. The second way would be to practice intensive fishing in a farm as a whole to derive the additional income and meet the costs of maintenance and prevention of breakages in the bunds. No experiments have been, however, conducted as yet in Goa on the possibilities of fishing in the Khazan farms though various measures are being adopted in this respect in the other parts of the country and the other countries.

The method of flood following as practised in British Guiana, introduction of certain varieties as could grow along with fish culture as in West Bengal, Assam and Kerala, introduction of sweet water in the farms after the harvest of paddy where the water remains sweet for a few months after the monsoon, are the different methods to achieve this objective. As was observed through the survey only 8 of the 27 farms in the selected villages produced fish worth Rs.500 and above but this amount being realised by the owners of the farms, it could not be linked up with the development measures in these farms. The linking of such overhead incomes of the farms with the development of the farms would not only enable financing the preventive and curative measures but also could be used to raise the productivity of the farms in the long run. The upkeep of the sluice gates and the drainage system deserve the greatest attention in this respect. It was revealed through the survey that some of the big sized farms were provided with only one or two drains. Again, no attempts were being made to clean the drains in some of the farms whereas even though such attempts were undertaken in the other farms, they were meant only to take out only a small quantity of mud just to repair the bunds of the individual plots. No systematic attempts were being made to regularize the drainage system. Against this background, it was observed that not only the number of gates for some of the farms was inadequate, but there was a considerable leakage of salt water through the doors in many farms and the doors in 11 of the 27 farms needed some repairs. This must have had an immediate bearing on the productivity of these farms though the problems of loss of productivity due to a small rise in the salinity were not being properly reckoned even by the cultivators tilling in these farms. It should be possible to raise the productivity in such farms if proper measures were taken to provide proper drainage, adopt measures for graded bunds of small heights and reduce the salinity in these farms. Removing the mud from the drains and spreading it on the farm had also a significance from the point of raising gradually the level of these lands which cannot be expected to remain under the tidal level for ever. A local organization consisting of the tillers of the land in a farm and entrusted with the objective of developing a farm would no doubt be in a position to undertake such measures in the long term interests of the members.

The other aspects which could be undertaken by such an organization could be raising the productivity of the farm through crop planning and the use of well organised production methods. It was noted in the earlier chapters that nearly $\frac{1}{3}$ rd of the farms in the three villages grew two crops of paddy, and vegetables were being grown on a small scale in the parts of the other farms by sinking seasonal wells. It was, thus, possible to grow either paddy or a variety of crops, if arrangements were to be made to irrigate these farms. As the experience in the other countries indicated, it was possible to grow even sugarcane in such farms and sugarcane had the property to reduce the salinity of such lands. There was, therefore, ample scope to tap the water resources for these farms and plan the cropping pattern accordingly only if a farm was to be taken up as a single unit for the purpose of exploitation of the resources and planning. Besides the attempts to raise the overall productivity of a farm through crop planning there was also scope for increasing the productivity through adoption of new technology even in case of the existing crops. It was noted earlier that in case of the farms submerged due to the breakages of the bunds, there was a loss in productivity to an extent of about two-thirds of the production in the first year. The 'kaipad' method practised on the Malbar coast for example was

a remedy worth trying to save this loss in production in the first few years. Deep ploughing with a tractor was the other method of increasing the production and it was being already adopted by the farmers in isolated areas. Since most of the Khazan farms were sown by the wet method, there was, however, no scope for introducing the method of dibbling to raise the production. There was, however, a considerable scope for introducing the new varieties and this would be largely possible if all the farmers in a Khazan farms agreed to grow the same variety to suit simultaneous harvesting and the conversion of the farms into the fishing tanks after the harvest of paddy as noted earlier. So was the scope for the use of fertilizers which were being used by a few cultivators at present. Moreover, the soil analysis had shown that the Khazan soils were deficient in phosphates and it was, therefore, necessary to raise the use of phosphatic fertilizers on these soils.

The formation of pan was an important problem in some of the Khazan farms and it was, therefore, necessary to rectify this through suitable measures. The use of subsoil plough was one of the remedies for the breaking up of the pan. At the same time, it was also a remedy to even out the differences in the two soil layers which were very conspicuous in case of the Khazan farms.

Waingan Cultivation

Though the Waingan crop is raised practically in every taluka, its cultivation is concentrated mainly in Marmugao, Ponda and Bicholim talukas and to a lesser extent in Sanguem and Satari talukas. A major part of the area under the Waingan resource is used for growing two crops of paddy but in Bicholim, Sanguem, Satari and Canacona talukas, there are farms which grow only a single irrigated rabi crop of paddy because of flooding and stagnation of water in the farms during the monsoon. Such areas yet form nearly 10 percent of the area growing the productive Waingan crop. Being a productive and a secured enterprise, the utilization of the Waingan resource was characterized by a preferential demand for the resource and the smaller size of the holdings when compared to the utilization of the other resources. This indicated the importance which the tillers attached to this resource. It is mainly the source of irrigation which influenced the economy of these farms like the bund in case of the Khazan farms. The nature of water supply through the source, therefore, determined the varieties and the crops that could be grown in a farm. At present, it was generally only paddy that was being grown in these farms but there was a considerable scope for diversification of production over these farms from the point of very rational use of water. Here again there was a need to have an organized approach if water was to be used rationally to increase the total productivity of these farms. There was also scope for building organizations at the farm level for these farms as the factors such as size of the farms, dependence of the farmers on the exploitation of different resources etc., were favourable for such organization as in the case of the Khazan farms. So also only a few of these farms were cultivated by the owners themselves.

The survey revealed that there were considerable variations in the irrigable areas and the actual irrigated area in case of many of the farms. Though a scarcity of water was felt in some of the farms, there was an abundant supply of water enough to grow even three crops of paddy in the other farms. There were also a few farms in which the water could be used for growing two crops of paddy followed by a short vegetable

crop or a green manuring crop. In case of some other farms it was possible to irrigate the adjoining unirrigated farms by utilizing the excess water. This indicated that there was a considerable scope to increase per acre productivity from these lands if plans of rational utilization of water were to be oriented around each of the sources of water irrigating these farms. It was possible to grow a number of other crops in such farms and their adjoining Sard farms after the harvest of kharif paddy and grow them even in rotation to maintain the soil fertility. The crops suitable for such a change were sugarcane, banana, summer maize and a number of vegetables which were already scarce in Goa. Such an approach, however, needed full co-operation from the farmers benefitting from such crop plans. If some of these farms were to be used for growing three crops, there was need for full cooperation even in the dates of sowing and harvesting the crops.

The problem of disutilization of some of the Waingan farms in the kharif season was severe in certain villages even though such areas formed a small proportion in the total. As the survey revealed it was possible to utilize such farms even in the kharif season by increasing the number of sluice gates and by growing certain flood resistant varieties already grown in the other parts of the country such as Assam, Bengal, Bihar, Andhra Pradesh, Orissa etc.

The above discussion pertains to the use of the water available for these farms. There was already a great potentiality for increasing the water supply through repairs to the existing source of water and tapping additional sources for which there was already a provision in the Fourth Five Year Plan. One new method for tapping the additional source of water was the use of filter points which was nowhere tried in Goa. It needs to be specifically mentioned here that the tapping of the new sources of water would provide greater scope for planning around a source in as much as quite new lands would receive irrigation.

There were also means of increasing the productivity of paddy through a number of measures evolved on the experimental farms and adopted in the other parts of the country and other countries. These methods have been already mentioned in Chapter 8 on the techniques of paddy cultivation. There were thus, methods available to regulate even the maturity of the crop, as the methods followed in U.P. and Travancore-Cochin and those evolved on the experimental farms such as the Maruteru farm. There were methods of using the green manure for the different crops in a variety of ways, as through growing the green manure in site or growing it outside the farm or collecting it from outside and dumping it into the soil as in the southern part of India and Ceylon. A variety of green manuring plants, sea weeds etc were also available for the purpose. Use of organic material for the cultivation of crops in Goa had a special relevance especially in view of the acidic and sandy nature of the soils. There were also methods to control the acidity of the soils as most of the soils were acidic. Again, there were methods available to raise the productivity of paddy through adopting different systems of irrigation, use of the Palamthozi method etc. It was also necessary to concentrate more on the use of organic matter in certain areas than in the others. So also there was a need to proceed quickly in the matter of soil testing as the analysis of the soils had indicated considerable variations in the availability of the plant nutrients in the different soils. Unless the farmers were, therefore, advised in the matter of the use of the proper fertilizers for the specific soils, it was likely that the use of fertilizers, if made in the wrong directions might either lead to negative

response to its use or to the depletion of soils. Since a number of methods pertaining to the above problems have been elaborated in the aforesaid chapter, it would not be proper to repeat them here. Many of these methods would have, however, to be initially tried on a pilot basis to test their suitability under the Goan conditions.

There was, however, a need for a radical change in the method of sowing and cultivating paddy in Goa through the introduction of the process of either drilling or interculturing the brood cast paddy with the help of hoes. Practices in the other parts of the country and the experiments in India and other countries had indicated that through dibbling the seeds or through interculturing the broadcast fields after a few weeks after sowing, it was possible to get the same benefits as obtained from growing the transplanted paddy. There was, therefore, no need to introduce the labour involving Japanese Method of paddy cultivation unless under special circumstances if it was possible to achieve similar results through the less labour intensive methods. Such methods would, however, need some piloting initially under the Goan conditions.

There was also the problem of snails which impeded the production of the paddy farms to some extent. It was necessary to introduce the scientific methods for their control.

Marad cultivation and the cultivation of hills

The Marad lands are being cultivated practically in each and every part in Goa. The low hills which afford a scope for the development of a hill as a whole are, however, mainly found in the coastal and the transitional zones of the territory. A part of these lands as the survey revealed had been brought under cultivation only during the last fifty years. A few of the holdings of the Dongar type of land had remained completely unutilized even though they had been purchased by the present owners quite in the past. A characteristic feature of the Marad land cultivation was that unlike the Khazan and the Waingan lands, a larger part of the Marad lands was being cultivated by the owners themselves. So also a majority of these cultivators were engaged solely in the cultivation of the Marad lands and the adjoining Dongar lands. The average size of the holdings held by these Marad cultivators was also larger than the average size in case of the Khazan and the Waingan cultivations. The problem of fragmentation existed in case of even the Marad lands but the number of fragments in a majority of the cases did not exceed two fragments per holding.

The spread out nature of Marad land cultivation, however, imposed certain restrictions on any organized approach in the use of these lands except in case of the low lying and extensively cultivated hills. In such cases, it was possible to diversify production and plan for a whole hill. It was possible to grow a number of crops on the Marad lands, such as jowar, maize and groundnut besides the conventional paddy and ragi. So also it was possible to grow tapioca on the lands nearer the foot of the hills where the soils usually retained greater amount of water. Protection of crops against the stray cattle was, however, a major problem with these lands because of their scattered nature. It was, therefore, necessary to have an organized approach in this respect if the farmers were to diversify the production on these lands. The absence of roads also created a problem as these lands were situated up the hills. This affected the improvement of these lands especially through adding the river silt. There was already a provision in the plan for reclaiming these lands through the addition of silt and bringing additional

lands under cultivation through terracing. There was, however, no provision for soil conservation through systematic contour bunding which was a necessity for the permanent improvements of these lands.

Barring a few cases, no attempts were generally made to tap the sources of water for irrigating the Marad lands. The irrigation facilities over these lands were, again, used for growing the Waingan crop only. There were, on the contrary, possibilities of introducing supplementary irrigation for paddy cultivated on these lands in the kharif season through building bandharas on the tops of the hills where the base was rocky. Such a measure had a great importance in cultivating these lands as it was difficult to hold water over these soils once the monsoon receded. The use of only a few supplementary irrigations, on the contrary, made a wide impact on the productivity of paddy under such conditions. With favourable cultivation practices, even the Marad lands proved to be highly productive as the examination of certain cases indicated.

Cashew was the main crop grown on the Dongar type of land. There was provision in the Fourth Five Year Plan to extend the cultivation of cashew, mangoes, jackfruits and pineapples. Coconut cultivation was also suited to the Marad type of land where these lands were at the foot of the hills. Coconut cultivation, however, proved to be highly productive where there was scope for irrigating the crop. Hence in the interest of overall economy it would be proper to encourage the use of unirrigated Marad and Donger lands for the use of crops which thrived well even without irrigation. The soil depths and the qualities of soil differed on the different patches on a hill. There was, therefore, a necessity to encourage the use of these specific types of soil for specific purposes instead of growing only cashewnut on all types of soil on the Donger land. This approach, however, involved area planning with the cooperation of all the cultivators tilling an area. Problems such as construction of farm roads for which there was no provision in the plan and protection of crops against the stray cattle would have to be solved again through an organized effort and through such area plans. It was possible to extend pineapple cultivation over larger areas on the Donger lands but this also needed planting of the crop at a time over large areas to protect it against the monkeys during the fruiting season. Bamboo was another crop which faced the same problem.

Since coffee was being grown in Goa practically on a kitchen garden scale, it was not possible to work out its economics for a large-scale adoption of its cultivation. The problem of introducing coffee as a regular crop in Goa would, however, need some further probing and experimentation on a somewhat large scale especially in the interior talukas to determine the comparative advantages of the alternative uses of those lands.

Coconut cultivation

Coconut cultivation was spread practically over the entire territory. It was, however, concentrated in the coastal talukas and in the talukas adjoining them. Lately, attempts were being made by the cultivators themselves to plant coconut trees on a large scale even in the areas in the interior parts. Expansion of coconut cultivation and raising the productivity of the crop per acre were the basic problems in the development of coconut cultivation in Goa. A study of the death rate in these trees in the selected villages showed that about 2 per cent of the trees died annually. The death rate was more in the coastal areas

where the early variety was grown as well as where the plantations were old. The attempts made in planting new trees, however, indicated that the planting of such trees led to almost a negligible net addition to the number of trees in the coastal areas whereas in a village selected from the interior, it was observed that there was a considerable increase in the number of trees. There was yet scope for planting new trees to the extent of about 40 to 60 per cent in all these villages. Moreover, the scope for expanding coconut cultivation in the other parts of the country, being limited as noted earlier, there were greater prospects for expanding coconut cultivation in Goa.

The smaller size of the holdings and the extent of fragmentation especially in the coastal and the adjoining zone, however, created problems in this expansion. Since most of the coconut gardens were managed by the owners themselves, it was a factor favourable for planning the expansion.

The problems of irrigation, spacing, fencing, inter-culturing, inter-cropping and use of improved seeds, manures and fertilizers were the main problems affecting the productivity of the coconut gardens in Goa. Though the yield was somewhat satisfactory in the selected coastal village, the yields in the other villages were quite low. On the whole the yields in Goa were low where compared to the yields in the adjoining territories.

The coconut trees in the coastal villages were watered irregularly whereas the trees in the other parts generally did not receive any irrigation. Lack of irrigation was thus the main factor to hamper the productivity of these gardens and the resultant initiative in adopting other better practices of cultivation. As noted in the earlier discussion, there was scope for extending irrigation for this crop over large areas if wells, filter points etc., were to be sunk to tap the favourable water table. At the same time, it was possible to bring certain coconut cultivations under the command of the existing sources of water if the crops were to be planned rationally around a source of water.

The use of improved seeds, manures and fertilizers, spacing, fencing and intercropping were all related with the use of irrigation. It was possible to raise and use the hybrid seed of coconut as both the tall and the dwarf varieties were being grown in Goa. Lack of fencing served as the major limitation to filling the gaps and planting new trees in place of the old ones. So also the social taboo in felling a living coconut tree increased the number of unproductive trees in the gardens. It was possible to underplant such unproductive trees with modern methods of underplanting such as trenching for example, as noted earlier. It was also possible to replant the naturally fallen young productive palms and adoption of such a method had an importance especially in minimizing the losses through the storms. Spacing had, however, an impact on the productivity per tree and there was a need for wider spacing if irrigation was to be undertaken regularly in the coconut gardens. At the same time, the experience all over the south east Asian countries showed that coconut as a mono-culture had become an outmoded concept and it was profitable to intercrop these gardens. A number of suitable crops as mentioned earlier were suitable for intercropping in the coconut gardens in Goa under varying conditions. The use of manures and fertilizers would naturally gain an impetus if all such interrelated problems were to be solved. Even at the time of the survey some of the cultivators had adopted the use of fertilizers for the

crop / but no specific fertilizer mixtures were available for the purpose. Moreover, no special attempts were being made to introduce the high potassic fertilizers for the crop even though it is a well-known fact that coconut responds highly to potassic fertilizers. Moreover, it was possible to make available potash to the plants even by the indigenous methods through burying the husks, use of the coir dust, green manuring practices etc., as noted in the earlier discussions. Such practices had a great importance especially in the context of the sandy nature of the soils and rising prices of fish meal which till lately provided a complete manure for the crop.

It was not possible to interculture the gardens regularly in many cases because of the rise in the wages and the scarcity of casual labour. Mechanization of the process with the use of suitable shallow tillers needed some thought in this matter as deep tractor ploughing was likely to have adverse effects on the growth of the palms.

The fragmentation of the coconut holdings and the small size of the fragments would, however, create some difficulties in investments over irrigation, fencing, protection, intercropping etc., if these measures were to be introduced as a strategy for expanding the production. Organization of cultivators for such purposes was, therefore, a suitable remedy to achieve this purpose as in the case of the paddy cultivators noted earlier.

As an alternative to the expansion of coconut cultivation in the territory, there was also some scope for introducing the cultivation of oil palms. The per acre productivity of oil from such palms was very high and the oil had demand both for edible as well as nonedible purposes. This would, however, need considerable experimentation and piloting before plans could be formulated to introduce the crop on a large scale in Goa. Moreover, for the extraction of oil on a commercial scale, it would be necessary to organize the programme on a very large scale in the initial years themselves. The experience gained in cultivating this crop in Kerala may prove to be useful in undertaking fresh experimentation in the matter in Goa.

Areca nut cultivation

Areca nut cultivation is concentrated mainly in Ponda and Bicholim talukas whereas in the other talukas the cultivation is restricted to the hills in a few villages. Compared to the other types of cultivation, areca nut cultivation was in some respects in a favourable position as far as the problems of size of the holding and fragmentation were concerned. This made the gardens practically self contained units. A majority of the gardens were also cultivated by the owners themselves and a practice had developed to lease in and lease out the gardens to make the units as far as possible manageable by a single family or the family of a farm servant.

The problems of development of the areca nut cultivation could also be viewed from the points of expansion and increasing the productivity of these gardens. Even though there would be scope for physical expansion of the areca nut cultivation in Goa, recent trends in the demand for the produce in the country and the views expressed by the Working Group on the Fourth Five Year Plan indicated that it might not be worthwhile to expand this cultivation beyond certain limits. It is not an essential crop and it was observed that the demand for the produce had been persistently falling. It has also no export value and in case

of a large production there is, therefore, likely to be a steep fall in its price. If these factors are taken into account, it would be worthwhile to adopt cautious policies in this respect in Goa. There were at the same time, many sites for the arecanut gardens in Goa. At some of the sites there were gardens in the past but they had been abandoned in the due course. There were also new sites which were slopy and had adequate source of water as needed for arecanut cultivation. Physically, there were, therefore, resources for expansion of the crop. At the same time, the arecanut gardens being mainly mixed crop gardens, it was possible to grow more of the valuable mixed crops such as pepper, nutmeg, cloves and cardamon which had also an export value and hence some expectation for a reasonable price. There was also wide scope for the cultivation of banana and pineapple in these gardens which had an indigenous as well as a market in the other parts of the country. In view of these possibilities, it, therefore, appears that such sites could be fruitfully utilized for growing mainly the mixed crops with arecanut as a subsidiary crop. Moreover, it is also a fact that an arecanut tree is likely to produce more when wide spacing is adopted than when the trees are crowded up as in the existing gardens. At present the mixed crops accounted for only about one-fifth of the value of gross production from a garden but if the crops are planned appropriately and intensive methods of cultivating these crops are adopted, it should be possible to get larger returns from such new gardens when compared to the returns from the existing old ones. The present gardens consisted of large trees of even mango, jackfruit, breadfruit, kokoam and vath which reduced the returns per unit of land and which did not require a perennial supply of water. The problem of expansion of area under arecanut cultivation may have, therefore, to be thought out under such conditions of mixed cropping as noted above.

The productivity of the existing gardens was quite low as noted during the earlier discussion. There was, therefore, considerable scope for increasing the production from the existing gardens and consequently the net returns to the arecanut cultivators. This could be achieved through wider spacing, cultivation of the more productive mixed crops, intensive use of fertilizer mixtures suitable for the purpose and adequate supply of water throughout the year. Recommendation of a proper fertilizer mixture, repairs to the existing sources of water and proper advice on the planning of crops were thus, badly needed to achieve the rise in productivity.

Major strategies for agricultural development in Goa

It is evident from the above discussion of the problems that certain clear steps are necessary for the development of agriculture in Goa. One of these basic steps would be to plan the existing crops and introduce new crops according to the available land and water resources at specific sites. It has been already noted above that crops will have to be planned after taking into account the nature of an individual Khazan, farm or an individual source of water or the nature of an individual hill. If these land-water relations are taken into account, it is evident that the Goan territory would be suitable to quite sizable changes in the crop pattern and not merely to the monocultures of paddy in the low lying land, coconut on the flat lands on the shore and in the interior and cashewnut on the hills. It would be possible to grow crops such as sugarcane, banana, pineapple, maize, tapioca, spices and even oil palm if possible. All these crops are already known for their impact on the development of industry and commerce and the development of the economy as a whole. This should not,

however, displace the area under paddy which is a staple food crop of the area and in respect of the production of which Goa is already deficient. Moreover, if we try to recapitulate the changes envisaged in the crop pattern through crop planning for the different land resources during the earlier discussions, we would find that there is no scope for any major change in the areas under paddy except over the Marad lands which account for only a fourth of the area under paddy. The changes expected over the Khazan and the Waingan lands are likely to be marginal though they are likely to benefit a large number of the tillers in rotation. Moreover such minor losses in the areas under paddy in case of these latter resources and the major loss in case of the former are likely to be more than compensated for by the additions to the gross paddy areas under the same resources. There is already a considerable scope for bringing additional area of the Marad resource under cultivation whereas it should be possible to grow Waingan paddy over larger areas through the reorganization in the use of water and through bringing additional areas under irrigation. It would on the contrary be possible to expect a sizable rise in the output of paddy through this new land under paddy cultivation, introduction of the high yielding varieties, increase in the sources of irrigation and the capacities of the existing sources, cultivation of two crops of paddy in place of one with this additional irrigation, cultivation of three crops of paddy where there is adequate water for the purpose, change in the technique of cultivation through introducing dibbled or intercultured paddy in place of the broadcast one and finally through the use of manures and fertilizers in adequate doses and many other methods mentioned earlier. There should be, therefore, no difficulty in raising the production of rice in Goa simultaneously along with reorganization of the crop pattern. This reorganization must, however, achieve certain objectives. Firstly, it must ensure a maximization in the use of the land-water combination and ensure higher returns to the farmers. Secondly, a part of these additional returns must find its way to the maintenance of the bund, the source of water or the road on a hill which are concerned with the development of the whole farm enterprise. It must thus relieve the state partly in financing merely for the maintenance of these resources. It must be noted here that the functions which were performed by the comunidades, temples and other organizations in the past have gradually to be taken up by the tillers themselves in the interest of conservation and development of these physical resources on the lines mentioned earlier.

This would, however, need efforts on a highly organized level and a form of organization suitable for the individual farms would have to be worked out for the purpose. It should not be, however, difficult to foster such organized efforts under the Goan conditions because of the jointness in many actions in agriculture prevalent in the area since the long past.

Changes in the cropping pattern and the techniques of cultivation would, thus, lead to increase in the gross product and attempts can be made to invest a part of the gross product over the development of the resources themselves. Such changes would, no doubt, lead to some displacement of labour at places though there would be also increase in the demand for labour at the others. Compared to the conditions in the other parts of India, the Goan agricultural labour derives a higher wage rate because of the employment offered in the mines. This has also an adverse effect on the techniques of cultivation in certain respects such as for example, delayed digging in the

Khazan farms or digging the coconut gardens at long intervals or sticking up to the method of growing paddy by the method of broadcasting. There is, therefore, a case for mechanization of agriculture and changing to the labour saving techniques in certain respects. There is, therefore, a scope for increasing the production of paddy even by adopting the methods of dibbling behind the plough or drill sowing or interculturing broadcast paddy to reduce the requirements of labour for weeding and harvesting and for the use of the labour saving implements such as the different types of ploughs, drills, green manuring trawlers etc., mentioned in the earlier chapters. The walking type of tractors or the small tractors as are in use in Japan need also to be introduced in the territory to meet the high costs over labour and the scarcity of labour. It should be, however, necessary that development in such strategic respects must, however, proceed not helter skelter all over the territory but by bit by bit and by steps after careful selection of the areas.

CHAPTER 11

FORESTS, THE PRACTICE OF SHIFTING CULTIVATION (OR KUMRI) AND WASTELANDS

The problems of the development of much of the C-Class forest land and government and private wastelands were almost similar. Since both these resources were damaged due to the practice of shifting cultivation on large areas, the topics of forests, wastelands, and shifting cultivation are discussed together in this chapter.

Forests :

The total area of forests in Goa is 1053 square kilometers which is about 29 percent of the total geographical area of the territory. Approximately 250 kilometers, or about 24 percent of this area is wet evergreen forest, classified as A-Class. The remaining area, about 800 square kilometers is the moist deciduous forest, about 400 square kilometers of which is teak-bearing forest, classified as B - Class, and the remaining 400 square kilometers is non-teak-bearing, classified as C-Class forest.

Most of the forest area is concentrated in Quepem, Satari, Sanguem, and Cancona talukas, in that these talukas account for more than 95 percent of the total forest area in Goa. Salcete, Marmugao, Goa, and Bardez talukas have no forests. The relevant information regarding the forest area, as also about the extent of cultivable wastelands, is given in table 11.1. Under the Portuguese regulations the A-Class forests were set aside for the regulation of water flow and the conservation of soil. Part of this area is characterised by extreme difficulties of logging and low timber values, while the remaining area is easy to operate, and the timber is, reportedly, of better quality and size. The B-Class forest was the important teak-bearing area and was exploited for the purpose of commercial timber sales, while the C-Class forest being mainly non-teak-bearing, and located near the populated village areas, was earmarked for the use of the local population. Formal legal rights were not recognized in this respect by the Government, but certain privileges were allowed. These included unrestricted lopping, free and unregulated grazing, free use of firewood, and of timber for agricultural implements and construction of huts and cattlesheds, removal of leaf manure, and the practice of shifting cultivation (Kumri).

The most damaging and ruinous of all the privileges was the practice of shifting cultivation or Kumri. It was estimated that this practice has completely denuded about 50,000 acres, mostly in Sanguem, Satari, Canacona, and Quepem talukas, and still continued to damage large forest areas and wastelands. This practice had not only damaged the tree growth, but it was reported, had ruined the top soil through repeated burning. The privileges allowed in the C-Class forests were extended by the people to the B-Class forests as well, and since there was no organized systematic management, B-Class forests have also been seriously damaged and degraded due to overcutting, unsupervised felling, and fire. The problem of Kumri cultivation is dealt with in details in the subsequent paragraphs.

Forests in Goa formed an important natural resource in the economy of the territory especially in the economy of the talukas of Quepem, Sanguem, Canacona, and Satari. This resource

Table 11.1 : Talukawise figures of land utilization in Goa district

(Figures of area in hectares)

Taluka/District	Total geographical area	Net cropped area	Area under forests	Cultivable waste	Area not available for cultivation	Total area under forests and cultivable waste (Cols.4+5)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Goa	16,611.66	12,622.05	-	261.58	3,728.03	261.58
	(100.00)	(75.99)	-	(1.57)	(22.44)	(1.57)
Salcete	27,718.95	17,604.85	-	5,420.44	4,693.66	5,420.44
	(100.00)	(63.51)	-	(19.56)	(16.93)	(19.56)
Bardez	26,479.71	18,168.38	-	2,872.75	5,442.58	2,872.75
	(100.00)	(68.60)	-	(10.85)	(20.55)	(10.85)
Marmugao	7,830.78	2,987.84	-	1,368.60	3,474.34	1,368.60
	(100.00)	(38.15)	$\frac{3}{4}$	(17.48)	(44.37)	(17.48)
Ponda	25,228.52	12,107.86	2,931.14	7,805.40	2,384.12	10,736.54
	(100.00)	(48.00)	(11.61)	(30.94)	(9.45)	(42.55)
Bicholim	23,633.05	15,869.99	715.24	3,146.62	3,901.20	3,861.86
	(100.00)	(67.16)	(3.02)	(13.31)	(16.51)	(16.33)
Pernem	24,199.78	11,350.82	1,319.12	9,577.90	1,951.94	10,897.02
	(100.00)	(46.91)	(5.45)	(39.58)	(8.06)	(45.03)

(Figures in brackets indicate percentages to total geographical area in each talukas.) (Continued)

Table 11.1 (continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Quepem	34,731.17 (100.00)	9,240.33 (26.61)	11,678.96 (33.62)	12,559.27 (36.16)	1,252.61 (3.61)	24,238.23 (69.78)
Sanguem	88,659.80 (100.00)	12,574.67 (14.19)	50,070.21 (56.47)	21,850.90 (24.66)	4,149.02 (4.68)	71,936.11 (81.13)
Canacona	34,736.14 (100.00)	5,055.55 (14.55)	14,327.76 (41.25)	14,118.42 (40.65)	1,234.41 (3.55)	28,446.18 (81.90)
Satari	51,283.99 (100.00)	11,431.32 (22.29)	24,252.37 (47.29)	13,370.32 (26.07)	2,229.98 (4.35)	37,622.69 (73.36)
Total Goa district	361,113.55 (100.00)	129,009.66 (35.72)	105,294.80 (29.16)	92,367.20 (25.58)	34,441.81 (9.54)	197,662.00 (54.74)

(Figures in brackets indicate percentages to total geographical area in each taluka)

was neglected for quite a long time with the result that large parts of the forest area have been destroyed through either traditional or government sanctioned privileges. The neglect was reflected in the facts that Goa had no technical forest administration, that proper records of the area under different classes of forests were not available, that boundaries of forest were not demarcated, that reliable information of the volume, species and the quality of timber harvested in the past was not available, and that no working plans were prepared for long-term exploitation of forests.

This situation demanded a carefully planned programme for conservation, development and proper utilization of the territory's forest estate. The important preliminary steps were to organize a regular forest department for the territory and to put a stop to all the traditional or government sanctioned privileges which ruined the forest wealth. Immediately after the liberation the Government took the first step and organized the department of forest which began its work by October, 1963. Simultaneously all the practices which damaged the forests were discontinued.

For any action regarding the conservation, development, and proper utilization of forest resources, reliable and adequate data were an absolute necessity. The first step in this respect was, therefore, a detailed survey of the forest area which would throw up information regarding boundaries topography, soil, and development potentialities. The Land Survey Department had taken up the work of surveying the entire area of the territory. In the area thus surveyed, the Land Survey Department decided the boundaries which the forest department maintained by clearing the lines of vegetation and by erecting stone-cairns. The progress of the work, however, was slow because of the non-availability of the previous records, and frequent disputes about the boundaries and the ownership of the land. The entire work of surveying and demarcating the forest area was expected to complete by the end of the Fourth Five Year Plan. The Department also took steps to collect and compile data regarding growing stock, increment, preparation of stock-maps etc so that working plans could be prepared for systematic long-term exploitation of the forest resources. These data were, however, being collected by ground methods. Use of the modern techniques of aerial photography, supplemented wherever necessary by ground work, would provide sufficient and reliable data, not only for initial forest development planning, but also for use in agricultural, industrial and mining development.

For continuous economic exploitation of the forest resources a permanent road system was most essential. At present only 300 kilometers of roads, mostly public roads or private mining roads, could be used for the purpose of forest operations. Considering the area covered by the forests, these roads were entirely inadequate (only about 0.3 kilometers per square kilometer). For efficient operation and management of the forests, at least two to three kilometers of permanent roads per square kilometer were required. This would mean a huge road construction programme of not less than 2000 kilometers for the forest area. For year-round administration, supervision, protection, fire control, and management of the stands, from seedling to thinning, salvage cutting, harvesting and renewal, an all-weather road system was necessary. Therefore, in many cases the new roads would have to be metal surfaced at the outset. Moreover, some of the existing roads would have to be upgraded into all-weather roads.

The forests in Goa were neglected for such a long time that it was almost incumbent on the Government to take up both intensive and extensive development programmes so that the back-log could be made up within a reasonably short period. More than half of the area of the wet evergreen forests was inaccessible and it was reported was still in the primeval condition. The remaining portion could be exploited commercially, but being equally inaccessible, it was not possible to do so till a workable road system was developed in the area. With the opening up of this area it would be practicable to execute schemes of improvement and renewal from the point of view of commercial exploitation as also from that of the preservation of scenery, wild life and recreation. The B and C Class forests require to be cleared and restocked with suitable species. In this respect several development schemes were being implemented during the Third Plan period and were proposed to be implemented during the Fourth Plan period. These included new plantations of teak, eucalyptus, softwood, rubber, bamboos and khair; forest research, publicity, farm forestry, rehabilitation of degraded forests, development of pastures, etc. Working plans for systematic exploitation of the forest produce were proposed to be prepared during the Fourth Plan period. It was also proposed to establish a complete unit of integrated wood industry with wood seasoning kiln, wood preservator plant, a saw mill, and a carpentry section during the Fourth Plan period.

In the absence of the detailed forest data, it was not possible to estimate the forest produce of various kinds, and think of long-term development programme. Under the circumstances most of the development schemes have to be carried on as experiments, so that future programmes could be built up on the experience obtained and the information collected in the process. However, some of the development schemes proposed to be implemented in the Fourth Plan require detailed working out. The scheme of farm forestry, for example, proposed to raise wood lots through the agency of village panchayats. Smallest unit for this scheme was to be 25 acres and the amount of subsidy per acre was Rs.250, being the part cost of barbed wire fencing and raising of plantation. The scheme assumed the availability of suitable pieces of land for this purpose, its extent, and the readiness of the concerned village panchayats to execute the scheme properly. It was likely that detailed investigations might prove these assumptions wrong. Under these circumstances it was difficult to lay down specific targets and to achieve them during the specified period. Similar was the case with the scheme of the development of pastures. Pasture development programme required to be integrated with the entire animal husbandry programme, instead of executing it merely as a forest development programme.

The forestry development programmes would create many job opportunities. Considering the shortage of labour in many areas, this point required careful consideration. Mere provision of certain amenities like temporary hutments and drinking water facilities to the labour gangs which would work in the interior forest under difficult conditions would not be sufficient. The entire programme has to be looked upon as a part of the total development programme of the territory and integrated with it. In the first place, location of these development schemes has to be in such areas where it was necessary to provide additional job opportunities. These areas were obviously those other than the concentrated mining areas, where abolition of Kumri cultivation has created serious problems of rehabilitation. Secondly, these new job oppor-

tunities could be utilized to organize the landless labourers, and to a certain extent small cultivators, in some kind of suitable organizations, preferably forest labour societies, so that they could look after their own interests and help the smooth implementation of future programmes. Careful planning and building up of cooperative institutions in this sphere would make possible the smooth implementation of the integrated wood industry scheme in the cooperative sector.

The Shifting Cultivation (Kumri) :

The shifting cultivation, or Kumri, was one of the important forest privileges exercised by the people. The word Kumri meant wood-ash, and this type of cultivation consisted in clearing and burning of forest patches on hill slopes for the growth of coarse grains, mainly nachni, vari and pakal. The tillage was shifting, in that, after cultivating one patch the cultivator shifted to another patch, and these patches were taken up for recultivation after a period of 5 to 9 years, depending upon the soil.

The practice of shifting cultivation was very old, and though, as far as the Goa territory was concerned, no historical records (in English) were available as to when, how, and why it came into being, and how it continued for such a long time, the available records in the adjoining district (e.g. Kanara) showed that Government used to grant the rights of wood-ash tillage (Kumri) as far back as in the later 18th century. This was shown by the case of Santaya Shamaya vs. Govt. of India (1874) in which the former brought a suit against the Government to restore the right of wood-ash cultivation which had been granted to his father in 1806 and withdrawn in 1861. The claim of the plaintiff was settled by the payment of £400.* In Goa, it seemed that permanent rights of Kumri were not granted, either by the Government or by the private land holders like Commindades and Bhatkars. Still a considerable portion of the population in particular areas came to depend upon this type of cultivation for part of their sustenance, so much so that abolition of this practice without providing alternative opportunities for better livelihood was bound to create serious economic, political and social problems. In fact, the Portuguese Government which discontinued the practice, so far as the Government lands were concerned, in 1952-53, had to restart it in 1954-55.

The problem was complex, and no records were available to indicate the degree of its complexity or the extent of the area and the population involved. It was, therefore, decided to study this problem in some details. Preliminary investigations revealed that Kumri cultivation was practised extensively in the talukas of Satari, Sanguem, Canacona and Quepem and to a small extent in Bicholim and Pernem. We had already selected some villages for our general enquiry and it was decided to study the problem of Kumri cultivators in the villages selected from Satari, Sanguem and Canacona talukas. These were Nagargao in Satari, Bati and Sancordem in Sanguem and Gaodongre in Canacona. In Nagargao and Gaodongre, the two interior villages

* The District Gazetteer, Kanara District.

more than 70 percent of the families were engaged in Kumri cultivation, while in Bati and Sancordem this percentage was 35 and 55 respectively. It may be mentioned that these two villages were in the important mining areas of the Sanguem taluka, and the availability of the additional job opportunities on mines had probably reduced the incidence of Kumri cultivation.

For our detailed study we selected a sample of 163 Kumri cultivators, or about 26 percent from the total of 630 Kumri cultivators in the four villages, after arranging these cultivators in each village in the descending order of their total cultivated holding. A special schedule was canvassed for these families in which relevant information regarding Kumri cultivation was collected. These data are analysed in the following paragraphs.

Before discussing the details regarding the Kumri cultivators it would be proper to describe how Kumri was practiced. As stated above, the land which was given out for Kumri cultivation belonged either to the State, Commindades, Bhatkars, or the Temples. It was all hilly area classified as C-Class forests or either as Government or private waste lands. Part of these lands was auctioned annually by the owners. These auctions were bid by Mukadams or Budhwants, as they were called in certain areas, on behalf of a group of families. After finalizing the terms with the owner the Mukadam used to divide the land among the families which he represented. He, in turn, used to charge some rent to the cultivators, usually ranging between Rs.5 to Rs.8 per Khandi (about 2½ maunds) of production. The rent which included his commission was usually paid in cash, and the defaulters were not given Kumri again till the dues were paid by them. No case of such a default came to our notice during the course of our investigation. In fact, it was reported that in some villages Kumri cultivators were ready to pay double the amount of rent since the same land was claimed to be owned both by Commindade and by the Government. The dispute was going on between the parties and both recovered the rent from the cultivators. In the absence of any redress, therefore, the cultivators had to suffer the loss.

The rent was fixed on the basis of the quality of the soil. The land being hilly, the soil was usually inferior. Only coarse grains like nachani, pakal, or vari could be grown in this soil. But there were patches of better soil which could be utilised for the production of inferior paddy, or chillies, or tur. The inferior soils with a greater degree of slope were taken up for cultivation only ones in five years, and utilised for growing nachni, pakal, or vari; whereas slightly better soils with a smaller degree of slope were taken up for three years of continuous cultivation with a gap of about 8 to 10 years in between. The crops grown in these lands were paddy, tur, chillies, and nachni or vari, following the same rotation for three years. The rent for the inferior land was usually Rs.5 per Khandi of production, and for the better land Rs.8 per Khandi of production. The rent was collected after the crops were harvested and threshed.

No definite system was followed for distributing the land among cultivators. It was expected that the two main factors, viz., the number of working members in a family and the quantity of land already being cultivated should influence the distribution. But the data showed that none of these factors had any relation to the area obtained for Kumri cultivation. It seemed, therefore, that the distribution was carried on by the Mukadam arbitrarily, with small adjustments here and there.

Immediately after the distribution of land, each cultivator identified his piece and started clearing it with the help of his family members. It was very seldom that outside help was engaged for this purpose. According to the understanding with the owners, the cultivator could cut the small branches of large trees, and burn these on the land. The cultivator was allowed to make use of the small pieces of wood. He could either burn them on the land or could take them away for use as fuel. Large pieces of wood were the property of the owners who used to auction them. After burning the land the cultivators loosened up the soil a bit by slightly digging it immediately after the first pre-monsoon rains. These were the only pre-sowing operations carried on by the cultivators. Sowing, in case of paddy, nachani, vari and pakal, was through broadcasting, while in case of tur the seeds were placed in a small hole after every four to six feet in a row with a distance of about three feet between the rows. In case of chillies the method of sowing was usually broadcasting, but in some cases, as reported in Gaodongre, the cultivators used to transplant the seedlings. One or two weeding operations were carried on in case of chillies, otherwise no intercultural operations were done in respect of any other crop. Paddy and chillies were harvested during the month of October, and nachni, vari and tur were harvested in December and January. In order to protect the crops the cultivator family stayed near the field for a few days before harvesting. Threshing was done on the field itself in case of paddy, tur, nachni and vari. Chillies were picked up and brought over to the house for drying up.

The data indicated that almost 92 percent of the Kumri cultivators belonged to the Maratha and the Kunbi castes. Only a few families belonged to castes like Devali, Gaydi, and Velip which were considered as coming under backward classes and tribals. Even if Kunbis were included under backward classes, the data showed that majority of these cultivators were Marathas, and no problems peculiar to the backward classes and tribals existed so far as the rehabilitation of these cultivators was concerned. Mainly landless labourers and small cultivators were engaged in this type of cultivation. About 23 percent of the Kumri cultivators belonged to the former category while the percentage of small cultivators, i.e., those cultivating below 1.5 acres of land per cultivator was about 55. About 18 percent were medium cultivators, i.e., those cultivating between 1.5 to 4.5 acres of land per cultivator, and the remaining 4 percent cultivated more than 4.5 acres per cultivator. The problem of Kumri cultivators was, therefore, essentially the problem of the landless labourers and the small cultivators. The average cultivated holding of these families, excluding the area of Kumri cultivation, was about 1.70 acres, varying between 1.8 to 2.18 acres in different villages. The area taken up for Kumri cultivation was, on an average, 0.63 acres in Bati, and about 2.25 acres in other villages. Relevant information in this respect is presented in table 11.2. The data for village Gaodongre in Canacona taluka for cultivated land was highly unreliable and therefore, are not included in these calculations. Since the number of Kumri cultivators as well as the area cultivated was comparatively small in Bati, the problem was relatively less acute in this area, the southern part of the Sanguem taluka, than in other areas, i.e., the northern parts of Sanguem and Satari talukas and the western part of Canacona taluka.

The information about the average income received by these families from different occupations is presented in table 11.3. These data showed that in Bati the average earnings of a Kumri cultivator, from Kumri cultivation, were only 6.36 percent of

Table 11.2 : Showing the number of selected shifting cultivator families, their classification according to cultivated land, and average cultivated area.

Village	No. of select- ed Kumri culti- vators	Classification according to cultivated land(excluding Kumri area)				Total cultivated area		Average cultivated land(exclud- ing Kumri area) per family (A. - G.)	Average Kumri area per family (A. G.)
		Land- less	Small (cultivat- ing upto 1.5acres)	Medium (cultivat- ing between 1.5 and 4.5 acres)	Large (Cultivat- ing above 4.5acres)	Land exclud- ing Kumri area(acres & Gunthas)	Kumri area (acres and gunthas)		
Bati	26	3	14	5	4	50 - 00	16 - 21	2 - 7	0 - 25
Sancordem	42	7	28	7	-	41 - 00	88 - 30	1 - 7	2 - 5
Nagargaon	47	17	20	9	1	57 - 20	105 - 30	1 - 37	2 - 10
Total	115	27	62	21	5	148 - 20	211 - 01	1 - 28	1 - 33

Table 11.3 : Average income per Kumri cultivator family from different occupations in the selected villages

(Figures in Rupees)

Village.	Income from					Total per family
	Cultivation	Kumri cultivation	Agricultural labour	Mine labour	Other misc. labour	
Bati	264 (34.97)	48 (6.36)	6 (0.79)	375 (49.67)	62 (8.21)	755 (100.00)
Sancordem	184 (13.59)	192 (14.18)	44 (3.25)	735 (54.28)	199 (14.70)	1354 (100.00)
Nagargao	189 (17.42)	209 (19.26)	666 (61.38)	21 (1.94)	-	1085 (100.00)
Gadongre	557 (50.55)	475 (43.10)	14 (1.27)	-	56 (5.08)	1102 (100.00)
Total	304 (27.59)	257 (23.32)	208 (18.87)	255 (23.14)	78 (7.08)	1102 (100.00)

(Figures in brackets indicate percentages to total income)

his total earnings, while the major portion of his earnings were from regular cultivation and mine labour. In Sancordem, though the average earnings of the Kumri cultivators, from Kumri, were higher than that in Bati, the main source of earnings was mining labour. In Sancordem and Nagargao the average earnings from regular cultivation were slightly less than those from Kumri cultivation. However, whereas in Sancordem mining labour was an important occupation, in Nagargao the major source of income for these families was agricultural labour. More than 19 percent of the earnings of these cultivators in Nagargao were from Kumri cultivation. In Gaodongre the situation was different. For almost 43 percent of their income, these cultivators were dependent on Kumri cultivation. The problem of Kumri cultivators in Gaodongre area, and to a certain extent in Nagargao area, was therefore, more pressing than that in other areas.

As mentioned earlier the practice of Kumri cultivation had damaged large forest areas and still continued to do so. However, on the basis of the available data it was not possible to estimate the extent of the entire area so damaged. But the data revealed that in the three villages of Bati, Sancordem, and Nagargao almost 1000 acres of land was being cultivated as Kumri, and it could be safely assumed that all this land and it/the tree growth on/were getting damaged annually. In respect of the entire area covered by Kumri cultivation, therefore, this practice created, with varying degrees in different areas, two types of problems. One type of problem arose out of the damage done to an important resource of the area. This has to be arrested in the first place, and to do this it was necessary to stop Kumri cultivation and to think of developing the resource systematically. The stoppage of Kumri cultivation was bound to involve considerable hardships to those landless labourers and small cultivators who depended, on an average, for about 23 percent of their earnings on Kumri cultivation. These earnings were in the form of grains which supplemented their requirements of food, and therefore, were important to them. Another type of problems, therefore, referred to the provision of alternative opportunities of better livelihood to these families.

Immediately after liberation, the Government of Goa had to consider this problem in the course of their development activities. They appointed a special officer to study it and to suggest suitable measures to solve it. After studying the problem this officer recommended the following measures :

- (i) Kumri cultivation was to be stopped with immediate effect;
- (ii) The landless among the Kumri cultivators were to be given suitable pieces of land, not exceeding 5 acres, from the C-Class forests for clearing and planting cashew trees;
- (iii) Whole of the cost of planting cashew seedlings and of replacements was to be borne by the Government;
- (iv) During the first three years of growth the cultivators could grow suitable crops in this area. Burning was allowed only to the extent that it did not damage the cashew plants;
- (v) If the Government considered that the cultivator had grown cashew trees satisfactorily, then the title to the land was to be transferred to the cultivator;

(vi) The cashew trees would start bearing fruit in the fifth or sixth year of their growth. For the first two or three years the cultivators would be able to grow either nachni or vari on this land. Then for three or four years they would neither be able to grow nachni or vari on this land nor obtain any income from the cashew trees. After this the cashew trees would yield a steady cash income for them. This cash income, about Rs.100 per acre, and in any case not more than Rs.500 per family per year, would not be sufficient to meet all their requirements, and the problem of the supply of food grains would remain unsolved. As mentioned earlier, it was mainly for the purpose of obtaining food grains that these families engaged themselves in Kumri cultivation. It was, therefore recommended to distribute to these families, cultivable waste lands, sufficient to produce foodgrains required by them.

The Government accepted the recommendations of the special officer, and as a result, Kumri cultivation was stopped in 1962-63. Measures for rehabilitation were immediately taken up and by the end of 1964-65 more than 2000 landless Kumri cultivators in 105 villages of six Development Blocks were given about 1.25 to 2.5 acres of C-Class forest land. Information as to the number of Kumri cultivators and the land distributed to them is given in table 11.4. As per conditions under which the C-Class forest area was distributed, the recipients were required to plant cashew trees. However, it was reported that this work of cashew plantation was not taken up seriously for the important reason that the locations of these lands were invariably far away from the present homes of the families. As a result the saplings could not be paid due attention, and the mortality of the plants was reportedly very high. Instead of applying the scheme to all the blocks, it would have been proper to experiment it in certain areas, evaluate it and then consider its further application. In addition, the annual income of Rs.500 per rehabilitated family, calculated on the basis of Rs.100 per acre, was itself arbitrary. This was indicated by the fact that, on an average, each family was given about 2.5 acres which meant an average income of not more than Rs.250. In view, however, of the high cost of living, even this income would fall down further in real terms. Again to complete the rehabilitation, these cultivators had to be provided with some cultivable land where they could grow food crops to meet the requirements of their families. However, no data were available regarding the extent, ownership, location and the quality of the wastelands. In the absence of such data, this second step to the solution of the problem could not be taken. Therefore, a Committee was specially appointed to assess, tentatively, the availability of suitable wastelands for distribution to these families. This Committee had completed, by the end of 1964, a survey of 10 villages where they found that about 625 acres of Government waste land was available for distribution. The Committee was going to submit their report within a few months. The Government also wanted to take over the uncultivated portions of the Concessao Provisoria and Aforamento and distribute them to the Kumri cultivators. In Satari and Sanguem talukas the cultivable waste lands owned by Government were handed over to private parties under two systems: Concessao Provisoria - under which 6 ha. of land was given to any local villager who intended to bring it under cultivation; and Aforamento - under which 20 ha. of land was given to anybody who wanted to settle in this area. Concessao Provisoria could be converted into Aforamento by paying a prescribed fee. For all practical purposes the rights held under these systems were permanent. It was, however, stated that many of these

Table 11.4 Blockwise information regarding the settlement of Kumri cultivators

Development Block	No. of villages in which Kumri existed	No. of Kumri cultivators settled	Area allotted (acres)	Average area per cultivator (in acres)
Satari	46	1,105	2,464	2.23
Bicholim	1	16	20	1.25
Quepem	14	311	1,593	5.12
Canacona	16	120	260	2.17
Sanguem	23	526	985	1.87
Pernem	5	146	200	1.37
Total	105	2,224	5,522	2.48

concession holders have left portions of their lands uncultivated and the Government wanted to take over these portions. As far as Satari taluka was concerned the officials estimated that about 1500 acres would be reverted to the Government in this case and these could be distributed to the Kumri cultivators. The feasibility of this programme was, however, not certain since it involved spot investigations and transfer of rights which might lead the Government into legal complications. Again, the entire work had to be completed within two or three years when the Kumri cultivators would face the problem of the requirements of foodgrains. All this indicated that if these steps could not be taken in time, the whole problem would remain unsolved.

While thinking of the solution to the problem of Kumri cultivation, it seemed that the Government had taken into account only the landless among them i.e. so far as cultivation was concerned those who were engaged only in Kumri cultivation. However, our data showed that about 23 percent of the Kumri cultivators were landless in the sense that they cultivated only Kumri and the remaining were either tenant or owner-cum-tenant cultivators. This meant that in their solution to the problem the Government had covered only about 23 percent of the Kumri cultivators. Majority of the remaining Kumri cultivators were small ones and their problem, after the abolition of Kumri, was equally important. The present Government measures were, therefore, doubly inadequate in that they did not provide complete solution to the problems of landless Kumri cultivators as also did not take into account the equally important problems of the small cultivators.

As mentioned above, Kumri was extensively practiced in Satari, Sanguem, Canacona, and Quepem talukas. The data showed that not less than 43 percent of the families (in some of the interior-villages even more than 70 percent) were engaged in Kumri. The solution to the problem, therefore, assumed importance, not as an isolated programme of providing alternative to the Kumri cultivation, but as a part of the entire development programme of the territory. The areas where Kumri was practiced could be divided into two distinct regions. One was that region where mining operations provided a continuous alternative occupation to the landless labourers and small cultivators. This region covered those parts of Satari, Sanguem and Quepem talukas where mining was concentrated. Another was that region, covering the remaining parts of these talukas and the taluka of Canacona, where no such alternative occupation was available and people were engaged only in primary activities like agriculture and forestry. So far as the mining areas of the region were concerned, there was a distinct indication that Kumri cultivation was being abandoned in favour of jobs on mines. The percentage of families engaged in Kumri was less than 55 percent of the total number of families in the villages near the mining areas, whereas in the interior villages where no alternative occupations like mining were available, the percentage of families engaged in Kumri exceeded 70. In the mining areas where marginal cultivation was being slowly reduced in favour of wage work on mines, the policy of distributing C-Class forest area or wastelands to Kumri cultivators was improper from the point of view of the development of the territory. The protection, maintenance, and the proper utilization of these resources, along with the suitable measures of the development of primary sectors like agriculture, animal husbandry and forestry, taking into account the shortage of labour due to mining industry, would form the basis of the development programme in this area. So far as the other region was concerned, the main emphasis would have to be on the proper

utilization of the available resources, as a result of which alternative opportunities could be created. This, along with the programmes of transport and communications, which would open up the region, could provide sufficient basis for development planning. The problem of developing part of the C-Class forests and wastelands for fuel supply, for which a sizable demand exists in coastal talukas should be considered in this connection. This demand is at present being partly satisfied by using coconut husks, an important resource with a better alternative use. Whether the problem of Kumri cultivators should be solved by distributing wastelands to them, would depend mainly upon the particular conditions obtaining in particular areas. However, taking into account that the distribution of small pieces of land to these cultivators would maintain the pressure on agriculture, and add to the problems of small cultivators, it would be proper to apply this solution in such areas where the possibilities of organizing these cultivators were such as to be beneficial for the purpose of development.

To summarize briefly, the problem of Kumri cultivators had two important aspects. One aspect referred to the proper development of natural resources which were both being misused and also malused. Another aspect referred to providing alternative opportunities to those families engaged in Kumri cultivation, ones this type of cultivation was discontinued by the Government. The development of natural resources had to be looked at from the point of view of the overall development of the territory. The problem in this respect was, how best these resources, particularly the C-Class forest lands, and the Government and the private wastelands, could be utilized, so that the overall objective of increase in production could be achieved. So far as the provision of alternative opportunities to those engaged in Kumri was concerned, the problem was relatively acute in those interior areas where alternative opportunities like jobs on mines were not available. The two situations, therefore, demanded different types of solutions. A blanket decision like distribution of C-Class forest lands and waste lands to these cultivators was likely to create additional problems, instead of solving the already existing ones.

Wastelands :

The problem of the development of wastelands, both Government and private, presented almost the same difficulties as that of the C-Class forest lands. The main difficulty was the relative absence of the reliable preliminary data. The major part of the presently available data regarding land was based on the survey carried on in 1904, and abandoned afterwards due to various circumstances. Even the records of the survey, though incomplete, were not maintained upto date. This was mainly because proper administrative machinery for maintenance of records did not exist at the village and taluka levels. Detailed information about the extent, ownership, location, and the quality of the wastelands, was not available. In fact, this absence of basic land records was considerably hampering the preparation and the execution of programmes particularly in respect of land development. The available data regarding the extent of wastelands are presented talukawise in table 11.1. The total area classified as cultivable waste was about 92,367 hectares, or about 230,917 acres. In the talukas of Ponda, Pernem, Quepem, Sanguem, Cancona and Satari more than 25 percent of the total geographical area was classified as culturable wastelands. The problem of the development of culturable wastelands was important in these talukas, and more

so in the talukas of Pernem, Quepem, and Canacona where more than 35 percent of the total area was culturable wastelands. As stated at the beginning, Quepem, Sanguem, Canacona and Satari were also the talukas where large percentage of the total geographical area was under forests. As shown in table 11.1, culturable wastelands and forest together covered about 70, 81, 82 and 73 percent respectively of the total area in these talukas. This obviously indicated that the major part of the developmental effort in these talukas had to be concentrated on the proper maintenance, development and utilization of these resources.

The first step in respect of a proper development programme for wastelands was, as stated above, the correct assessment of the extent, ownership, location and the quality of the available government and private wastelands. These data would enable the authorities as to the best manner in which the wastelands could be utilized. Immediately after liberation the Goa Government became aware of this situation and started the cadastral survey of the area. In the first instance the survey was to cover Pernem, Bicholim, Ponda, Goa, Bardez, and part of Salcete taluka where the problem of tenancy being very acute, immediate implementation of the survey scheme was necessary. During the Fourth Five Year Plan the survey would cover an area of about 112,000 hectares, or about 277,000 acres, in these talukas. The cadastral survey, however, would only determine the boundaries, the ownership and the location of the area covered, and would provide data for the preparation of basic maps. It would not give information about the land use and the quality of the land covered. In the absence of this information, it would not be possible to prepare development programmes for wastelands. Initial requirement in this respect was, therefore, to obtain this information.

The present approach to the utilization of wastelands was to locate the area and distribute it to the landless labourers and/or political sufferers, for the purpose of cultivation. Two such attempts were made in Sanguem and Satari Development Blocks. Of these the collective farming society at Kalay in Sanguem taluka was formed by distributing for cultivation, Government wastelands to political sufferers. Initially about 500 acres of land was to be distributed to 40 political sufferers. However, only 15 political sufferers came forward, and about 100 acres of land was reclaimed and distributed to them. Government spent about Rs.200,000 for reclamation of this area, for construction of 40 residential blocks, drinking water well, for purchase of buffaloes for starting a dairy, and for the provision of bullocks, implements and other accessories. Out of the 15 families who wanted to settle there only 3 were cultivators, and the remaining were either teachers, traders, or were engaged in service somewhere. Nobody belonged to nearby areas, except a few who came from Sancordem, a distance of about 6-7 miles. Majority came from villages in Salcete, Bardez, Bicholim, Goa, and Ponda talukas. By the end of the second year of the operation of the society only 3 families were staying there, the remaining having left for their original villages. At the time of our investigation cultivation was almost stopped, and only the dairy was being operated at a substantial loss. The milk was sold in Sancordem. The collective farming society at Kopardem in Satari had started operations very recently. About 90 acres of land was expected to be cultivated by 40 members of the society. Out of this land 60 acres could be brought under irrigation. This society was part of the scheme prepared for the settlement, of Kumri cultivators. The members were given about 152 acres of C-Class forest land for planting cashew trees. For two three years, till the growth of cashew

trees allowed, they could grow some coarse grains from this land. In the meantime the 90 acres of cultivable land could be reclaimed and developed. This along with the cashew trees was expected to provide a permanent solution to the problem of some Kumri cultivators in Kopardem. In the case of the Sanguem society the approach was piecemeal, without integration with other programmes, and without taking into account the potentialities of the resources. In the case of the Satari society potentialities of the resource were considered to a certain extent and an attempt was made to integrate the programme with those of the C-Class forest development and rehabilitation of Kumri cultivators. Even here the approach was piecemeal, in that the scheme was not integrated with the general development programme of the taluka and the territory.

CHAPTER 12

ANIMAL HUSBANDRY

Just as data in respect of other sectors of the Goan economy were inadequate, both qualitatively and quantitatively, similarly adequate information regarding animal husbandry was also not available in the official records. This was mainly because there was no separate animal husbandry department during the Portuguese regime, and only a skeleton staff of one animal husbandry officer and five veterinary assistants was working under the Department of Agriculture at Panjim. This staff was engaged in arranging poultry, cattle and canine vaccinations only. No schemes of developmental nature were undertaken, and no attention was paid to improve the breed, to supply better fodder and feed, to provide proper veterinary facilities, and to build up livestock-based industries. However, after the blockade of the territory the authorities gave some thought to the animal husbandry development, and as a result a small poultry farm was established at Panjim in 1956 with New Hampshire breed of fowls. A dairy farm was also started in 1960 at Dhat with a herd of 36 Sindhi cows brought from Pakistan. This farm was later taken over by the Indian Military Farms Department immediately after liberation.

The livestock population and their significance in Goan economy

The latest figures available about the livestock in Goa were the 1953 Census. These data are presented in tables 12.1 and 12.2. According to this Census the number of bullocks and cows, in the district of Goa, was 101,082, that of male and female buffaloes 27,067, hogs and pigs 38,579, and goats and sheep 17,481. Information regarding non-working bullocks and dry cows and female buffaloes was not available. It seemed from the data available for 1863* that over a period of about 100 years the population of cattle and buffaloes in Goa increased by about 50 percent, while that of goats and sheep declined by about the same percentage. The concentration of hogs and pigs, about 84 percent of the total could be seen in Goa, Salcete, Bardez and Marmugao talukas, the area known as 'Velhas Conquestas', and where almost 57 percent of the population was Christian. This was about 83 percent of the total Christian population in Goa, and the concentration of hogs and pigs in this area reflected, to a certain extent, the food habits of a large population there. The data in tables 12.1 and 12.2 give a broad picture of the cattle population in Goa district. The number of buffaloes was less than one-fourth of the total number of bullocks, which indicated broadly that mainly bullocks were used for agricultural purposes, and the talukas which showed relatively large number of bullocks, as shown by the number of bullocks per hectare of net cropped area, were Pernem, Quepem, Canacona and Marmugoa, followed by Salcete, Bardez, Ponda, Sanguem and Satari. Being paddy cultivated area, the number of bullocks was, however, only 0.3 to 0.9 per hectare of cultivated land. Most of the animals were of nondescript type. Cows were maintained mainly to replace the bullocks, and not for milk production. Whatever milk was supplied locally was mainly from female buffaloes, the number of which, as seen in the table was approximately not more than 0.1 to 0.2 per hectare of net cultivated area in most of

* Lopez, Mendez : "A India Portuguesa", 1867, p.115, (quoted in NCAER, Techno Economic Survey of Goa, Daman and Diu, 1963).

Table 12.1 : District and talukawise figures of cattle in Goa(excluding Diu and Daman)
according to age and species (1953 census of livestock).

Taluka/District	Upto 2 years old					Above 2 years old				
	Bullocks	Buffaloes	Cows	Female buffaloes	Hogs & Pigs	Bullocks	Buffaloes	Cows	Female buffaloes	Hogs & Pigs
Goa	939	258	1109	413	2161	2285	819	1613	1117	446
Salcete	2227	475	2715	835	15644	4864	1842	4497	1852	1706
Bardez	1675	242	2012	464	8106	4859	859	3802	1590	741
Marmugao	387	97	520	136	3103	1266	368	922	442	469
Ponda	909	210	1128	377	1028	3542	944	2556	1578	433
Bicholim	863	141	1292	275	91	4002	1100	2979	965	95
Pernem	890	156	1368	388	1172	5851	1518	2612	1121	237
Quepem	969	94	1188	164	1425	4028	414	2320	362	290
Sanguem	1089	176	1537	328	429	3477	443	6236	540	171
Canacona	977	130	1082	188	665	3860	306	2376	450	138
Satari	1084	324	1485	376	22	2813	1204	2877	986	7
Goa District	12009	2303	15436	3944	33846	40847	9817	32790	11003	4733

Continued

Table 12.1 : District and talukwise figures of cattle in Goa (excluding Diu and Damian) according to age and species (1953 census of livestock) (contd.)

Taluka/District	Total				Total number of cattle*
	Bullocks	Buffaloes	Cows	Female Buffaloes Hogs & Pigs	
Goa	3224	1077	2722	1530	11160
Salcete	7091	2317	7212	2687	36657
Bardez	6534	1101	5814	2054	24350
Marmugao	1653	465	1442	578	7710
Ponda	4451	1154	3684	1955	12705
Bicholim.	4865	1241	4271	1240	11803
Pernem	6741	1674	3980	1509	15313
Quepem	4997	508	3508	526	11254
Sanguem	4566	619	7773	868	14426
Canacona	4837	436	3458	638	10172
Satari	3897	1528	4362	1362	11178

* This excludes goats, sheep and the equine population. (Source: Statistical Year Book; Goa, Daman and Diu, 1961)

the talukas. There was an acute shortage of milk in the district.

The data collected in our surveyed villages generally indicated the same trends. These data are presented in tables 12.3 and 12.4. Pigs and poultry were seen to be relatively concentrated in Morjim, Calangute, Arosim, Velim and Loutolim. Except Loutolim, all the villages represented the coastal areas of Pernem, Bardez, Marmugao and Salcete, where a large percentage of population was Christian. Though Loutolim was slightly away from the coast, it also represented an area of Christian majority. The interior areas of Pernem on the eastern side, it was reported, did not have such a large concentration of pigs and poultry. In Cudnem, Verem, Nagargao, Sancordem, Bati and Bali, there were more than two working animals per hectare of cultivated area. These areas represented parts of Bicholim, Ponda, Satari, Sanguem and Quepem talukas respectively. In the coastal areas, Calangute, Arosim and Velim, the number of working animals was relatively smaller. As indicated above, the Marmugao talukas, however, showed a relatively larger number of cattle population, while Arosim, the village surveyed in this taluka indicated a smaller number of cattle as was the case with other coastal areas. In fact, the central portion of the Marmugao taluka had a large agricultural population and was slightly hilly. This might explain the larger number of cattle in the area. Broadly, therefore, the number of cattle as related to the net cultivated area went on increasing towards the eastern parts of the district, particularly the areas where forests dominated. The number of working buffaloes was less than 17 percent of the total working animals, and it was only in Cudnem, Verem, Marcaim and Nagargao, parts of Bicholim, Ponda and Satari talukas respectively, that these were used for cultivation. So far as milch animals were concerned the same trends as indicated in the paragraph above were observed in the surveyed villages.

On an average a pair of working animals was maintained by those cultivator families which reported bullock-buffalo holding. Higher the cultivated holding, the larger was the holding of working animals. But the proportion of cultivator families reporting holding of working animals varied considerably from area to area. As shown in table 12.5, in Arosim, Loutolim, and Velim, villages near the coastal areas, less than 19 percent of the cultivating families reported bullock and/or buffalo holding. We have seen that it was in these villages that the holding of working animals as related to cultivated land was very small. It was also in this area that the majority of the Christian population lived. Generally, paddy cultivation required bullock power for ploughing, levelling and puddling. In many places these operations (digging instead of ploughing) were done by human labour. For all other operations, interculturing, harvesting, and threshing, human labour was employed. It was observed that an average Christian cultivator did not maintain draught animals which could be used for few operations over a short period, but required to be maintained throughout the year. The cultivated holding in this area was relatively smaller than in the eastern areas. Cultivation was carried on more intensively, in that, comparatively larger amounts of fertilizers were used by the cultivators in this part. In addition, the proportion of tenant cultivated land, was very high, in this area, more than 80 percent of the total cultivated land, as against less than 60 percent in the areas represented by villages like Sancordem, Nagargao and Gadongre, in Sanguem, Satari and Canacona talukas respectively. Again, in the areas where the system of communications was well developed, it was easier to hire bullocks or buffaloes, even from a relatively

Table 12.2 : District and talukawise figures of milch and working animals as related to total net cropped area in Goa (excluding Diu and Daman)

Taluka/ District	Net cropped area (Ha.)	No. of bull ocks	No. of bull- ocks per ha. of net cropped area	No. of buffa- loes	No. of buffa- loes per ha. of net cropped area	No. of cows	No. of cows per ha. of net cropped area	No. of female buffa- loes	No. of female buffa- loes per ha. of net cropped area	Total No. of cattle and buffa- loes.	Total per ha. of net cropp- ed area
Goa	12622	3224	0.3	1077	0.1	2722	0.2	1530	0.1	8553	0.7
Salcete	17605	7091	0.4	2317	0.1	7212	0.4	2687	0.2	19307	1.1
Bardez	18168	6534	0.4	1101	0.1	5814	0.3	2054	0.1	15503	0.9
Marmugao	2988	1653	0.6	465	0.2	1442	0.4	578	0.2	4138	1.4
Ponda	12108	4451	0.4	1154	0.1	3684	0.3	1955	0.1	11244	0.9
Bicholim	15870	4865	0.3	1241	0.1	4271	0.3	1240	0.1	11617	0.8
Pernem	11351	6741	0.6	1674	0.1	3980	0.4	1509	0.1	13904	1.2
Quepem	9240	4997	0.5	508	0.1	3508	0.3	526	0.1	9539	1.0
Sanguem	12575	4566	0.4	619	0.1	7773	0.5	868	0.1	13826	1.1
Canacona	5556	4837	0.9	436	0.1	3458	0.6	638	0.1	9369	1.7
Satari	11431	3897	0.4	1528	0.1	4362	0.4	1362	0.1	11149	1.0
Goa Dist. trict	129514	52856	0.4	12120	0.1	48226	0.4	14947	0.1	128149	1.0

Table 12.3 : Livestock population in the surveyed villages

Village	Working animals		Non-work- ing bull- ocks and buffaloes	Milch animals		Young animals		Pigs	Total (Cols.2 to 9)	Poultry
	Bullocks	Buffaloes		Cows	Buffaloes	Calves	Heifers			
1	2	3	4	5	6	7	8	9	10	11
Morjim	467	17	12	228	68	131	33	334	1290	1287
Calangute	254	15	73	127	80	71	26	491	1137	1063
Cudnem	308	189	24	132	51	99	26	2	830	406
Verem	282	76	19	193	141	130	57	4	902	254
Marcaim	177	89	62	142	60	46	3	29	608	392
Nagargao	152	106	100	241	97	182	61	-	939	380
Sancordem	335	21	160	376	46	253	42	6	1239	529
Bati	201	33	30	226	64	201	51	13	819	263
Arosim	103	16	23	91	13	55	5	348	654	1576
Loutoulim	135	62	10	109	56	11	3	398	784	1622
Velim	36	13	5	186	75	109	38	1144	1606	2304
Bali	488	10	46	215	12	181	13	9	954	577
Gadongre	406	4	227	334	3	230	2	-	1206	-

Table 12.4 : Number of livestock in the surveyed villages, as related to the number of cultivators and total cultivated land

Village	No. of cultivator families	Total cultivated area (Ha.)	No. of working animals		No. of milch animals		Total working and milch animals	No. of working animals per ha. of cultivated area	
			Bullocks	Buffaloes	Cows	She-buffaloes		Bullocks	Buffaloes
Morjim	479	268	467	17	228	68	780	1.7	0.1
Calangute	360	476	254	15	127	80	476	0.6	0.03
Cudnem	291	215	308	189	132	51	680	1.4	0.9
Verem	194	141	282	76	193	141	692	2.0	0.5
Marcaim	321	156	177	89	142	60	468	1.1	0.6
Nagargao	170	122	152	106	241	97	596	1.2	0.9
Sancordem	238	157	335	21	376	46	778	2.2	0.1
Bati	147	111	201	33	226	64	524	1.8	0.3
Arosim	289	331	103	16	91	13	223	0.4	0.05
Loutoulim	361	203	135	62	109	56	362	0.7	0.3
Velim	355	491	36	13	186	75	310	0.1	-
Bali	248	121	488	10	215	12	725	4.1	-
Gadongre	225	809	406	4	334	3	447	0.5	-

Continued...

Table 12.4 : Number of livestock in the surveyed villages, as related to the number of cultivators and total cultivated land

(contd)

Village	No. of milch animals per ha. of cultivated area		Total cattle per ha. of cultivated area	No. of working animals per cultivator		No. of milch animals per cultivator	
	Cows	She-buffaloes		Bullocks	Buffaloes	Cows	She-buffaloes
Morjim	0.9	0.2	2.9	1.0	0.03	0.5	0.1
Calangute	0.3	0.1	1.03	0.7	0.04	0.3	0.2
Cudnem	0.6	0.2	3.1	1.1	0.6	0.5	0.2
Verem	1.4	1.0	4.9	1.4	0.4	1.0	0.7
Marcaim	0.9	0.4	3.0	0.5	0.3	0.4	0.2
Nagargao	2.0	0.8	4.9	0.9	0.6	1.4	0.6
Sancordem	2.4	0.3	5.0	1.4	0.1	1.6	0.2
Bati	2.0	0.6	4.7	1.4	0.2	1.5	0.4
Arosim	0.3	0.0	0.75	0.4	0.1	0.3	0.04
Loutoulim	0.5	0.3	1.8	0.4	0.2	0.3	0.1
Velim	0.4	0.2	0.7	0.1	0.04	0.5	0.2
Bali	1.8	0.1	6.0	2.0	0.04	0.9	0.05
Gadongre	0.4	-	0.9	1.8	0.02	1.5	0.01

Table 12.5 : Showing the percentage of cultivators in the surveyed villages reporting working animals, and average number of working animals per reporting family, according to the size of cultivated holding

Size of cultivated holding (acres & guntas)	Morjim		Calangute		Cudnem		Verem		Marcaim		Nagargao	
	1	2	1	2	1	2	1	2	1	2	1	2
0.0 - 0.20	25.5	2.1	12.5	4.0	34.5	2.0	46.4	1.6	20.0	2.0	34.1	2.0
0.21 - 1.00	43.9	2.0	12.1	2.5	55.0	2.3	50.0	2.0	38.2	2.2	55.5	2.0
1.01 - 1.20	29.8	2.0	12.5	2.5	63.6	1.9	78.1	2.0	43.6	2.0	67.7	2.0
1.21 - 2.00	38.8	2.3	22.5	1.8	63.3	2.0	80.6	2.1	38.5	3.2	66.7	3.2
2.01 - 2.20	39.3	2.2	29.1	2.3	94.3	2.2	86.4	2.6	53.3	1.4	100.0	2.2
2.21 - 3.00	65.2	2.6	14.2	4.0	100.0	2.0	85.7	2.5	40.0	2.5	77.7	2.7
3.01 - 4.00	88.2	3.3	23.6	2.2	95.8	2.6	100.0	2.1	54.5	1.9	50.0	3.5
4.01 - 5.00	62.5	2.0	35.9	2.0	81.8	2.7	100.0	3.2	75.0	4.0	100.0	3.2
5.01 - 7.20	71.4	4.9	42.1	2.4	100.0	2.0	75.0	2.6	-	-	16.7	2.0
above 7.20	100.0	3.4	90.5	2.7	-	-	100.0	5.5	33.3	2.0	80.0	2.0
Total	38.8	2.4	31.9	2.1	69.4	2.2	72.2	2.3	33.6	2.1	58.8	2.3

(1) = Reporting families as percentage of total cultivators

(2) = Working animals per reporting family

Continued

Table 12.5 : Showing the percentage of cultivators in the surveyed villages reporting working animals, and average number of working animals per reporting family, according to the size of cultivated holding

Size of cultivated holding (acres & guntas)	Sancordem		Bati		Arosim		Loutoulim		Velim		Bali		Gaodongre	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
0.0 - 0.20	43.2	1.9	14.3	1.7	-	-	7.7	2.1	-	-	48.4	1.9	-	-
0.21 - 1.00	53.1	2.0	32.0	1.6	9.5	2.5	11.2	2.0	-	-	67.5	2.0	-	-
1.01 - 1.20	79.7	2.0	35.7	2.8	9.6	2.4	13.6	1.9	2.5	2.0	74.4	2.2	25.0	1.3
1.21 - 2.00	68.4	1.7	81.8	2.6	8.5	2.4	19.4	2.7	2.4	2.0	100.0	2.4	25.0	1.0
2.01 - 2.20	77.3	2.2	70.0	1.9	13.3	2.6	31.3	3.5	3.8	2.0	92.3	2.8	26.9	1.7
2.21 - 3.00	33.3	2.0	66.7	2.7	-	-	50.0	3.2	10.7	1.6	88.9	2.7	-	-
3.01 - 4.00	57.1	2.0	100.0	2.3	14.6	1.8	47.1	2.1	-	-	100.0	3.0	63.1	1.9
4.01 - 5.00	66.7	2.2	71.4	4.5	30.0	3.0	100.0	2.9	-	-	100.0	4.0	52.0	2.2
5.01 - 7.20	75.0	2.0	50.0	3.0	35.7	2.6	33.3	2.0	2.2	1.0	100.0	4.5	64.0	2.2
above 7.20	40.0	3.0	100.0	1.6	28.5	2.5	50.0	5.0	6.3	2.0	50.0	4.0	88.5	3.5
Total	64.7	2.0	53.7	2.5	14.5	2.5	18.6	2.6	2.3	1.8	77.4	2.5	64.4	2.8

(1) = Reporting families as percentage of total cultivators
(2) = Working animals per reporting family

distant village. All these factors must have influenced, to a large extent, the holding of working animals in this area. Towards the eastern side of the territory, wherever agriculture and forestry predominated, the proportion of families holding working animals was relatively larger. In the coastal areas of Pernem and Bardez, as also the area represented by Marcaim in Ponda, the proportion of families reporting working animals was between 30 and 38. These areas were slightly hilly, and agriculture was the major occupation. In Bicholim, Satari, Sanguem and Canacona, again a larger proportion of cultivator families reported working animals. These were mainly agricultural and forestry areas, though in Bicholim and parts of Sanguem and Satari mining industry also dominated. These being areas where a large proportion of land was under forests, there was no scarcity of fodder, as in coastal areas during summer, particularly in Salcete.

Most of the animals, as indicated above, were of non-descript type, lean and emaciated, with low milking and draught capabilities, and suffering from heavy incidence of epizootics. In the first place, the items of fodder were paddy straw, karad, and other crop residues. The nutritive value of this type of fodder was initially poor and was further reduced by the manner in which the hay was made, and the fodder was fed to the animals. This naturally resulted in the stunted growth and low productivity of the animals. Secondly, feeding and breeding of animals was neglected by the farmers because the necessity of improving the stock was not felt by them. The reason was that the draught power required for the cultivation of paddy, the main and almost the only crop of the region, was relatively less. In addition, food habits of the population gave secondary place for milk production. The cows were maintained mainly for replacing working bullocks. In the agriculturally dominated hilly areas, e.g., in parts of Satari, Sanguem, Canacona, Pernem, Bicholim, and Quepem where the cattle population was relatively larger, the holders sometimes maintained more animals for the purpose of manure supply. Whatever little milk was produced, from cows or buffaloes, was either consumed in the family or was sold in the village itself. During the Portuguese regime milk and milk products, e.g., condensed milk, butter, cheese, etc., were imported in large quantities and people depended largely on these imports. Though data on consumption were not available, it was observed that the food items of the majority of the population generally included rice, fish and coconut and in addition, pork, meat and eggs in the western areas of the territory where majority of the population was Christian. In fact, for majority of the people, coconut served, to a certain extent, the purpose of milk which, therefore, had little demand, and whatever demand was there was being met largely from imports. There was, therefore, no urge for improving the breed, in order to have more draught power and/or more production of milk. Since the liberation of the territory, however, the imports of milk and milk products have discontinued, and the situation in this respect has undergone considerable change.

The data presented, and the discussion so far, have revealed the following points which are important from the point of view of the development of animal husbandry in Goa:

- (i) During the Portuguese regime, there was no animal husbandry department as such, functioning separately in Goa, and the development of animal husbandry was completely neglected;
- (ii) The recent data available regarding livestock were the talukawise consolidated figures compiled from the Census data collected in 1953. Villagewise figures and other information

about the non-working animals and dry cows and buffaloes was not available;

(iii) Mainly bullocks were used for the purpose of cultivation all over Goa, except in some areas represented by Cudnem in Bicholim, Marcaim in Ponda, Loutolim in Salcete and Nagargao in Satari taluka, where, as against the bullock/buffalo ratio of 5:1 in the district, almost one-third to one-half the population of working animals was buffaloes;

(iv) Pigs and poultry were observed to be concentrated in the areas known as Velhas Conquestas where majority of the population was Christian;

(v) In the coastal areas, particularly Goa, Salcete and parts of Marmugao a very small proportion of cultivators maintained working animals, whereas the proportion of such cultivators went on increasing in the eastern areas of the district;

(vi) The animals were of non-descript type and small in size. This was because feeding and breeding was not paid sufficient attention since the need for it was not felt as paddy cultivation required relatively less draught power, and milk and milk products had less demand because of specific food habits. The demand for milk and milk products was largely met by imports.

Development of animal husbandry in Goa

Though the data were inadequate for the purpose of planning, the available information pointed out certain directions of development. In the coastal region, particularly the talukas of Bardez, Goa, Salcete, and Marmugao where relatively very small proportion of cultivators maintained working animals, and where cultivation was more efficient and intensive, the policy of animal husbandry development required to be modified, accordingly, to suit the existing conditions. The cultivators already used relatively less bullock labour, in that, majority of them hired it for only those operations which could not be carried out by human labour. Under these conditions, instead of introducing a new breed of bullocks, it would be proper to introduce, experiment and propagate mechanization suitable for paddy cultivation in small holdings. Similarly, as indicated above, the food habits of the population showed that milk did not occupy a very important place in their consumption schedule. Any dairy development scheme based on the projected calculations of certain consumption of milk and milk products, therefore, would not be proper in this area. On the other hand, development schemes of piggery, poultry and fishery were more appropriate in the area. Even in the eastern region of the district, viz., Satari, Sanguem, Canacona and parts of Quepem and Pernem talukas, the conditions regarding the quality of the working animals were similar, though relatively larger proportion of cultivators maintained them. Improvement in the quality of the existing animals was necessary here, but not the introduction of big and hefty breed for the purpose of cultivation. From this point of view it is felt that introduction of Dangi or Sandhi bulls which could withstand the high rainfall was advisable. This area is suitable for the development of dairy industry, and with the stoppage of imports of milk and milk products there was likely to be a steady minimum demand for milk, at least in the major urban areas of the territory. Since these urban areas were within a radius of 25 to 30 miles, a nucleus dairy farm could be set up at a central place, with about 200 to 300 animals, and an organization, preferably co-operative, for collection of milk in the neighbouring areas. A big dairy unit complete with large number of animals, pasteurising and chilling plant, bottling unit etc., would not be proper in the area, since it would obstruct the spread of benefits to the rural areas. This being forest and hilly area, grazing was

available almost throughout the year. It was, therefore, advisable to encourage that type of breed which is accustomed to grazing, and not the type which preferred stall feeding. Pandharpuri and Dharwar breed was, therefore, likely to be suitable in the area.

The Animal Husbandry and the Veterinary Services Department of Goa, Daman, and Diu was started in 1962, and by the beginning of 1963 the Department was implementing the schemes prepared for the period of the Third Five Year Plan. These schemes pertained to the organization of the animal husbandry department, provision of veterinary services, training of technical personnel, breeding for improvement of local cattle, and the development of dairy, poultry and piggery. In details the development schemes included distribution of premium bulls, establishment of a composite livestock farm at Dhat, pilot pasteurisation plant at Panjim, 150 she-buffalo units, expansion of poultry farm at Panjim, starting intensive poultry development blocks, distribution of improved variety of boars and sows, and provision of veterinary aid at taluka places. At four taluka places, viz., Bicholim, Panjim, Margao and Wasco, fullfledged veterinary dispensaries were being established, while at the remaining taluka headquarters only veterinary aid was provided through veterinary extension officers. A few veterinary aid boxes were also distributed to the gramsevaks for use in their areas. The Fourth Plan envisaged intensification of these schemes, as also development of fodder resources and provision of efficient marketing organization for milk, meat, and poultry products. This was expected to be effected through schemes like establishment of key villages, castration programme, rehabilitation of nomadic breeders, mixed farming, bacon factory, marketing centre for poultry products, new veterinary dispensaries, rural dairy centres and research and training programmes. The proposed outlay of the animal husbandry department for the Fourth Plan period was Rs.336 lakhs, almost Rs.54 per capita.

A programme of this magnitude, which concerned majority of the families in rural areas, required preparation of schemes in good deal of details, well spread over space and time, and integrated and coordinated with other schemes of the same department as also those of other departments. It also required an efficient organization for successful execution. It seemed that sufficient thought was not given to these aspects while preparing the Third and the Fourth Plan schemes. Though almost all the schemes were either an extension or intensification of the programmes tried elsewhere, these required to be adjusted with the local conditions of Goa. For instance, conditions in the western parts of Goa, as indicated above, were suitable for the introduction, experimentation, and propagation of mechanization, and hence more emphasis was required to be placed on mechanization than on the use of bullock labour. The policy of animal husbandry development was, therefore, required to be coordinated with that of the agricultural development. The extension personnel, it was observed, were far from coming to grips with the local problems, because of the fact that most of them were deputationists from the adjoining states, and lacked the knowledge of the local language. In addition, the location of the villages and wadis was such that it was difficult for them to establish continuous contacts with those for whom the extension service was necessary.

The Animal Husbandry Department distributed several loans, for individuals as well as for cooperative societies, under the scheme of intensive poultry and dairy development. For indivi-

dual poultry keepers the amount of loan was Rs.3,500, while for cooperative societies it was Rs.16,000. Dairy loans for individuals ranged between Rs.3,000 to Rs.5,000, and for cooperative societies between Rs.10,000 to Rs.22,000. Poultry loans for 100 layer birds were distributed by the Department, till the end of 1964, to 23 individuals in different areas, of which 7 were political sufferers, and 2 poultry cooperative societies at Margao and Mapuca. Similarly, dairy loans were distributed to 20 individuals and 10 cooperative societies. So also, 54 boars and 56 sows were distributed under the piggery development scheme to different individuals and institutions, mostly in the western part of the territory. The loans distributed from the Block Development funds were smaller in amounts ranging between Rs.200 to Rs.500 per individual. Such loans were distributed in almost all the Development Blocks.

There was no regular follow up of these loans distributed to the individuals and to the cooperative societies. The conditions of the poultry farms to which financial assistance was provided by the Department was not very encouraging except in a few cases. The sheds built up for the purpose were faulty, proper technical advice, guidance and veterinary services were not sufficiently available to the loanees, the accounts of production and sales were not kept properly and were not checked by the officers periodically, and effective marketing organisation was not available to the producers. It was only in the areas around Panjim, Margao and Mapuca that the poultry business was being carried on successfully. Even here some factors hampered the development on proper lines. The maintenance cost of the newly started poultry units was so high, the major item being the cost of feed, that it was not possible to sell the eggs below Rs.2.75 per dozen. Eggs of local fowls were being sold in the market at a much lower rate. Even eggs from Belgaum were being sold cheaper. Again, a fish eating population generally preferred fish to eggs, and fish were relatively cheaper than eggs. All these factors indicated the necessity of quick action in respect of the marketing of poultry products. It seemed that this aspect was either not given sufficient thought before implementing the fowl distribution scheme, or the different related schemes of the distribution of birds, feed, production of eggs, and marketing were not integrated with reference to the time of detailed actions of particular schemes. As a result when several birds began laying eggs simultaneously the problem of marketing became acute and the Animal Husbandry Department was required to assist the sales of the surplus eggs of the private producers by opening a stall in the Department itself. Large stocks of eggs remained unsold for many days. With the present speed of the distribution of poultry loans, the problem of marketing was likely to be more and more acute, when still larger number of birds started laying eggs. The poultry cooperative societies at Margao, Mapuca and Panjim were very recently started and had not begun their operations at the time of our survey. The position of dairy development was not much different from that of poultry. Most of the cooperative dairy societies were yet to start their work, and those which had started working were experiencing difficulties of marketing and management. For instance, the society at Margao was not able to sell its entire production of milk at the rate which it decided to charge, and had to think of further processing. As a result it was incurring substantial losses. The management was not as it should be and required good deal of improvement and supervision. Consequently, there were internal factions among the members which hampered the smooth working of the society. The societies around Panjim worked relatively better, because

of the availability of large market at Panjim, but required to be managed more efficiently. There were eleven dairy societies in all, four around Panjim, four in Ponda taluka catering to the local demand as also to that at Panjim, and one each at Margao, Canacona and Sanguem. The dairy societies at Canacona and Sanguem were yet to start functioning. All these were given Murha buffaloes which required stall feeding. As indicated above, in the talukas where forests predominated a breed accustomed to heavy rains and grazing required to be introduced. So far as individual loans were concerned, a few cases came to our notice, where, due to the lack of proper follow-up, the loans were misutilized, either deliberately or because of the lack of proper knowledge of keeping dairy animals. The distribution of the improved variety of pigs, mainly Yorkshire, was working smoothly. This was mainly because most of the boars and sows were distributed in Bardez, Goa, Salcete and Marmugao, where the maintenance and production was taken up seriously by those, mainly the Christians, to whom these were distributed. As for the boars and sows at Block Headquarters, they did not even serve the purpose of demonstration.

Some of the loanees were political sufferers. In order to rehabilitate them, they were given loans under the schemes of poultry and dairy development. No doubt, political sufferers required to be given every assistance after the liberation of the territory. It was, however, found that in most cases the loans were not properly utilized. By the end of February, 1964, seven political sufferers were given poultry loans, and twenty were given dairy loans. Almost majority of these did not utilize it properly. In a few cases it was found that the poultries did not exist, or existed with only a few fowls here and there. Similarly, with reference to the distribution of milch animals, in many cases either the animals were not maintained properly or were disposed of without the knowledge of the authorities. The extreme case in point was that of a political sufferer at Canacona. The Jawahar Collective Farming Society at Kalay, Sanguem, was also an example of stereotyped and inadequate planning. The Society was formed to resettle 40 political sufferers on 500 acres of waste land. Government spent about 2 lakhs of rupees to reclaim 100 acres of land and built 40 houses for accommodation. By the beginning of 1963 the 100 acres of land was given to 15 families for cultivation. Of these 15 families only 3 were cultivators and 7 came from Sanvordem, a village about 5-7 miles from the actual site. The remaining families belonged to places in Salcete, Bicholim, Bardez, Goa, and Ponda talukas. It was the most heterogeneous group, with nothing in common except, possibly, political suffering. They had their own occupations of some type at their places of residence. Under these circumstances, it was but natural that they were not interested in working collectively in the society. At the end of two years, therefore, only 3 families remained at the site. The Society had purchased 22 she-buffaloes to start a dairy, and the milk was being sold at Sanvordem. It, therefore, neither remained a collective farming society, since farming was almost abandoned, nor did it serve the purpose of resettling the political sufferers.

As indicated above, the pattern of development schemes was stereotype and unintegrated. Intra-department and Inter-department integration required to be effected in respect of livestock, dairy and poultry schemes. For instance, popularisation of mixed farming should go hand-in-hand with the development schemes of dairy, poultry, and piggery. Is a separate scheme necessary for this purpose? Again, development of good fodder was the concern of both the animal husbandry and the forest departments. Hence, the schemes of the forest depart

ment in this respect required to be integrated with those of the animal husbandry department. If, with the area under forests and grazing land in Goa, sufficient grass could be produced for the cattle in the area, then it would not be necessary to divert additional land for the production of fodder. The problem then would be proper utilization of the available fodder. This would involve consideration of popularizing chaff-cutting and silage. Again, the establishments of marketing centres for poultry products, veterinary dispensaries, aid centres, rural dairy extension service, etc., had to be integrated with the location of other aids and assistance like godowns, banking services, communication and education facilities, administrative services etc. The transport system also had to be geared to the development of such centres which provided almost all production aids and other social services. Regarding the schemes of the development of sheep and goat, if they are to be introduced in future, some caution has to be exercised, because these animals which are known as browsers have proved to be a great nuisance, especially in the areas where forests dominate.

The staff component of the animal husbandry and the veterinary services department required examination from the point of view of rationalization. For the new schemes suggested in the Fourth Five Year Plan the additional executive staff required was 5 class I officers, 21 class II officers, 20 veterinary officers, 75 assistants, including veterinary, poultry, dairy, cooperative and statistical assistants, and one agricultural officer, in addition to a large number of ministerial and lower technical staff. As the plan progressed and new schemes were introduced it was necessary to increase the staff to cope up with the increased work. But the staff must have a definite relation with the total investment and expenditure, and the area covered by the programmes. From this point of view, consideration of the rationalization of whole of the staff would be proper at this time.

CHAPTER 13

THE FISHING INDUSTRY

For convenience of discussion this chapter is divided into three parts. First part deals with the availability of fishing resources, techniques of fishing, details of investigation, and the analysis of the data collected. This is followed by a brief account of the marketing of fish. An attempt is made to estimate the total production of fish in the district. The Fisheries Department of Goa has introduced mechanized fishing through the fisheries cooperative societies. These cooperative societies were studied and their case studies are also given in this part. The second part which is devoted to a discussion of the implications of the findings of the investigation indicates the broad directions along which development programmes could be meaningfully undertaken. The third part is mostly given to an analysis of the Draft Fourth Five Year Plan formulated by the Fisheries Department.

I. Fishery Resources and Their Utilization

The territory of Goa* has a coastline of about 100 kilometers, about 250 kilometers of inland waterways and a number of tanks. All these could be considered as basic resources for the fishing industry. About 80 percent of the total number of workers in the industry were engaged in seafishing. Fishing in the sea was carried on with three types of fishing techniques namely the joint onshore fishing by beach-seines (locally called Rapanis), individual throw-net-fishing in creeks and shallow sea waters, and deepsea fishing by gill nets. The remaining 20 percent of the workers were engaged in river fishing, the main types of fishing being stakenet fishing and creek fishing by throw nets. The tanks and water reservoirs in the territory could be used for fish-culturing, that is breeding and fattening certain known varieties of fish. A little fishing was pursued with the help of sluice-gate nets and throw nets at the sluice gates of Khajan lands and in Khajan drains respectively.

Fishing Seasons :

As an industry, fishing was subject to 'seasons', based on the availability of different varieties of fish at different periods of the year and at different areas in the sea and the river. The principal season was that of shoaling fish, the mackerel and the sardine, that arrived in large numbers seeking shelter in shallow waters. The season began in mid-September and ended by January. Smaller shoals were also found in the months of February and March. The season for the larger varieties of fish began in January and lasted upto April. Fish of mixed varieties was, however, found all through the dry months between September and May in creeks and river estuaries. The quantities available were, however, small compared to the efforts put in. Fishing for these varieties was resorted to during lean periods. The seasonality compelled the fishermen to resort to more than one type of fishing. Different types were combined in an effort to maximise the returns by keeping themselves busy throughout the dry season. Sea fishing had to be discontinued as soon as the monsoons started, and the fishermen generally utilised the four months of rainy season in renewing damaged nets and manufacturing new nets for the next season.

* excluding Daman and Diu

Techniques of Fishing :

For purposes of analysis, four different types of fishing are identified. They are beachseine fishing, creek-fishing by throw-nets, gill net fishing and stake-net fishing in the rivers. There were other types of fishing also such as fishing by barrier-nets, river gill net fishing, hook and line and fishing in the drains of Khajan lands. All these, however, were minor types and were highly localised activities.

The beach-seine type of fishing was the largest type. It was carried on by an organisation of thirty to forty fishermen who contributed equally towards the acquisition of the boats and the huge net required for the purpose. Each member participated in all the operations and shared the profits and losses equally. The beach-seine, a large dragnet operated from the shore was used for the specific purposes of catching shoaling fish. The net was cast around the shoal as soon as it was sighted. The net was subsequently pulled ashore by the members from both its ends. The fish trapped within the net was thus dragged ashore. The activity was carried out at all the coastal points in the territory where the conditions were suitable; these being the availability of a length of shore line from where the net could be operated, relative evenness of the sea-floor and relative freedom from heavy surf. According to our survey there were 101 beach-seine organisations (Rapan companies) in the territory.

The next important type of fishing was the creek or shallow water fishing done by throw nets. The fishing was done with individually-owned boats and nets. The fishermen formed into small groups of three or four persons, one of them owning a boat and as such claiming a part of the catch by way of hire charges. During the shoaling seasons fishing took the form of the small boats rowing in the midst of the shoal and fishing by thrownets. It was resorted to by fishing communities that were situated away from the sea in the interior and as such could not form into a beachseine organisation or by those situated at points where the coast did not permit the formation of Rapan company for aforesaid reasons.

Creek fishing was also an important activity at river points providing known varieties of choice fish. At all other places where either the beachseine type or the stake net type of fishing was carried on, creek fishing assumed a subsidiary type of activity resorted to in the lean periods only.

The next important type of marine fishing was gill net fishing, carried on by groups of three to five persons in deeper sea-waters. The nets and boats were individually owned, the other members of the group paying the boat owner in kind for the use of the boat. Fishing by gill net was a relatively specialised type of activity. It also entailed sea-faring hazards like loss of life, encounter with sea-monsters or thieves, being carried away by currents etc. The gill nets were used for catching larger sized fish like the shark, the ray-fish, the seer fish, the jew fish etc. The nets had a larger mesh and had to be manufactured at home according to requirements. Gill net fishing was also carried on in the rivers and at the estuaries for catching medium sized fish like mullets, lady fish etc.

Our enquiry revealed that gillnet fishing was regularly pursued, in combination with other types of fishing at the Canacona coast in the south. It was, however, absent in the coast between Salcette and Bardez reportedly due to lack of expertise and presumably due to the adequacy of beachseine fishing. The activity was pursued to a small extent on the Pernem coast.

The fourth important type of fishing was that carried on with stakenets in the rivers. A row of long stakes, mostly the trunks of the Areca plant, was embedded in the river and tapering bag nets were secured to these stakes between the interspacings, according to the direction of the tide. Fish flowing with the tide was thus trapped. Stake net fishing was pursued all through the year except during exceptionally high tides during the monsoons. As the activity depended upon tides, actual fishing took place for about seven to ten days during a fortnight. The right to operate the interspacings had to be acquired from the State. The method was that the State held three yearly auctions of these interspacings and the highest bidder got the right.

The special inquiry :

According to the census undertaken by the former administration in 1960, the number of active fishermen was 5183. The estimates made by the Fisheries Department on the basis of a quick inquiry undertaken in early 1965 were 5929 active fishermen with 4216 households and a total population of 25,286 dependent on fishing. The two estimates separated by four years appear to be fairly reconcilable. The industry supported about four percent of the total population of the territory. The village-wise figures of working fishermen, fishing households and the total population, as collected by the Department is given in table 13.1. The locations of these villages are shown in Map 3.

The sample villages :

The six villages selected for collecting fishing data were as follows : (i) Morjim (Pernem taluka), (ii) Calangute (Bardez taluka), (iii) Marcaim (Ponda taluka), (iv) Durbhat (Ponda taluka), Betul (Salcette taluka) and Talpana (Canacona taluka). The location of these villages is shown in Map 3.

The first three of the above villages were among those selected for general survey also. The last three were specially selected for studying only the fishing communities resident at these villages, in order to collect information as regards stake-net fishing at Durbhat and to allow for regional variations at the other two places. The villages Durbhat and Talpana had, in addition, fishing cooperative societies.

It has been seen that the selection of the types of fishing was mostly dependent on the location of the particular community and the nature of resource, such as the coast, the sea, the creek, the estuary, the river etc. available to it. Brief description of the selected villages is, therefore, given below.

The village Morjim lies at the estuary of the river Shapura. It has a sea coast in the west where beachseine (Rapan) fishing was carried on. The fishing community was organised into three beachseine organisations. About two-thirds of them were also engaged in estuarine fishing. The village had only two rows of stakenets in the river providing stakenet fishing. The notable point as regards estuarine fishing was that it was an organised type of throw-net fishing. Gillnet fishing either in the sea or in the river was absent. In this context it may be mentioned that the village was a predominantly agricultural one and three-fourths of the fishing households were engaged either in cultivation or agricultural wage labour as a secondary source of livelihood.

TABLE 13.1 : Blockwise and villagewise population of fishermen in Goa

Sr. no.	Block / Village	Number of fishermen households	Total fishermen population	Number of active fishermen
<u>Pernem Block</u>				
1.	Arambol	89	429	139
2.	Mandrem	120	489	85
3.	Morjim	86	486	148
4.	Chopdem	15	101	21
5.	Querim	40	400	125
	Total	350	1904	518
<u>Panjim Block</u>				
6.	Caranzelem	84	440	80
7.	Dona-Paula	58	268	64
8.	Marvel	25	140	26
9.	Siridona	150	780	180
	Total	317	1628	350
<u>Margao Block</u>				
10.	Colva	95	450	100
11.	Betalbatim	240	1000	350
12.	Benaulim	285	1400	400
13.	Varca	150	760	130
14.	Cavelossim	65	230	50
15.	Majorda & Utorda	200	1200	100
16.	Cansaulim	225	1500	450
17.	Betul	130	670	160
18.	Assolna	50	200	48
	Total	1440	7410	1788
<u>Mapuca Block</u>				
19.	Calangute	325	2750	550
20.	Candolim	125	950	200
21.	Saligao	40	337	75
22.	Nerul	110	900	175
23.	Oxel	100	850	350
24.	Chapora	80	750	250
25.	Siolim	40	350	75

(continued)

Table 13.1 (continued).

Sr. no.	Block / Village	Number of fishermen households	Total fishermen population	Number of active fishermen
<u>Mapuca block(contd.)</u>				
26.	Vegalim	47	335	70
27.	Assagao	60	475	125
28.	Colvale	100	725	132
29.	Aldona	30	162	40
30.	Brittona	47	325	65
31.	Camorlim	22	220	55
32.	Ecossim	35	250	50
33.	Pomburpa	75	625	90
34.	Revora	35	312	65
35.	Reis-Mago	15	150	25
	Total	1286	10466	2392
<u>Canacona Block</u>				
36.	Talpona	60	226	54
37.	Palolem	104	450	110
38.	Saleri	65	324	70
39.	Agonda	60	350	70
40.	Patnem	38	162	41
41.	Pariphon	26	111	35
42.	Quindolbag	65	281	69
43.	Colamba	45	100	40
44.	Nuven	20	98	22
45.	Galzibag	25	96	25
46.	Polem	14	60	16
47.	Muttal	14	69	16
48.	Sadolsem	12	41	13
	Total	548	2378	581
<u>Marmugao Block</u>				
49.	Vasco and Baina	275	1500	300
	GRAND TOTAL	4216	25286	5929

Calangute is a coastal village with a three-mile shore line that was considered to be extremely well suited for beachseine operations. There were ten beachseine organisations operating at the coast of the village. Some of the organisations belonged to other villages in the interior, while some belonging to the village were operated by members drawn from other villages. The village was well connected with the urban taluka place of Mhapsa and as such was assured of a good market. Fishing at the village was, however, restricted to the beach seine type only. The fishing community was christian and, reportedly, did not possess the skill for deepsea gillnet fishing.

The village Marcaim is situated at the confluence of the river Zuary and the Kumbharjuwa canal. Both creek fishing by thrownets and stakenet fishing were practised with about three fourth of the fishing community engaged in the former. River fishing was reported to be particularly remunerative here.

The village Durbhat is situated much more to the interior on the Zuary river. The small fishing community had only the river to carry on its fishing. Some of the households were, nonetheless, organised into a Rapan organisation and operated a small river dragnet locally called 'hat-rapan'. The principal activity was stake net fishing partly combined with thrownet fishing. The community was organised into a fishing cooperative society.

The fishing community at Betul is situated at the estuary of the river Sal in the south. Beach-seine and gill net fishing in the sea were the main fishing types practised. Except for a small proportion, the fishermen combined all the three types of marine fishing.

The village Talpana is a coastal village in the Canacona taluka with three beach-seine units operating at its shore. There was a fishing cooperative society also. The fishing types and combinations were similar to those of Betul.

The inquiry and analysis of data :

A total of 153 households from the above six centres were covered by the fishing schedule. This formed about 20 percent of the fishing households of the selected villages. Related to the total fishing households of the territory the sample formed about 4 percent.

The details as regards the population and earner ratios of the selected households are presented in table 13.2. It may be seen that the average size of the household was 6.35 members, ranging from 5.41 at Betul to 8.31 at Durbhat. The latter also showed a higher average of earners per family, which at other places varied between 1.26 (at Kalangute) to 1.46 (at Talpan).

Earners :

Table 13.3 classifies the earners in the sample according to types, and their combinations, of fishing pursued by them. While the purposive nature of the sample severely restricts broad generalisations, the table does indicate the more common types of fishing and their combinations.

According to the estimates of the Fisheries Department, 80% of the total number of active fishermen were engaged in marine fishing. After adjusting our sample to this ratio, the sample proportions of the occupational combinations projected for the total number of active fishing population of the territory are given in table 13.4. The broad pattern of combinations that emerges is as follows :

TABLE 13.2 : Average size and number of earners of the selected fishing households

Name of the Centre	No. of Families	No. of Members	No. of Earners	Average size of the family	No. of earners per family	Dependent per earner
1. Durbhat	13	108	30	8.31	2.31	3.60
2. Talpan	13	74	19	5.69	1.46	3.89
3. Calangute	35	192	44	5.49	1.26	4.36
4. Morjim	32	219	45	6.84	1.41	4.86
5. Marcaim	33	232	43	7.03	1.30	5.40
6. Betul	27	146	35	5.41	1.30	4.17
TOTAL	153	971	216	6.35	1.41	4.49

TABLE 13.3: Classification of earners according to fishing types

Name of the Centre	Total Earners	Beach Gill- net		Creek Stake- net		I+II	I+III	I+IV	II+III	II+IV	III+IV	I+II+III	I+II+IV	I+III+IV	II+III+IV	I+II+III+IV
		I	II	III	IV											
1 Durbhat	30	7	-	-	14	-	-	-	-	-	9	-	-	-	-	-
2 Talpan	19	-	2	6	-	4	1	-	4	-	-	2	-	-	-	-
3 Calangute	44	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4 Morjim	45	18	-	-	-	-	19	1	-	-	-	-	-	7	-	-
5 Marcaim	43	-	-	32	4	-	-	-	-	-	7	-	-	-	-	-
6 Betul	35	-	1	8	-	-	1	-	14	-	-	10	-	-	-	1
TOTAL	216	69	3	46	18	4	21	1	18	-	16	12	-	7	-	1

TABLE 13.4 : Distribution of the total number of working fishermen according to sample proportions in each combination

Types of fishing	Sample (earners)	Coastal		Interior		Corrected sample	%Distri- bution	Distri- bution of total of active fishermen	No. engaged in				Total	
		Actual	Corrected	Actual	Corrected 20/36				Beach seine	Gill net	Creek	Stake net	No.	%age
1. Beach- seine	69	62	77.50	7	3.89	81.39	37.71	2236	2236	-	-	-	2236	25.1
2. Gill-net	3	3	3.75	-	-	3.75	1.74	103	-	103	-	-	103	1.2
3. Creek	46	14	17.50	32	17.78	35.28	16.35	969	-	-	969	-	969	10.9
4. Stakenet	18	-	-	18	10.00	10.00	4.63	275	-	-	-	275	275	3.1
1+2	4	4	5.0	-	-	5.00	2.32	138	138	138	-	-	276	3.1
1+3	21	21	26.25	-	-	26.25	12.16	721	721	-	721	-	1442	16.2
1+4	1	-	-	1	.55	.55	.25	15	15	-	-	15	30	.3
2+3	18	18	22.50	-	-	22.50	10.42	618	-	618	618	-	1236	13.8
3+4	16	-	-	16	8.89	8.89	4.12	244	-	-	244	244	488	5.5
1+2+3	12	12	15.00	-	-	15.00	6.95	412	412	412	412	-	1236	13.8
1+3+4	7	3	3.75	4	2.22	5.97	2.77	164	-	164	-	164	492	5.5
1+2+3+4	1	1	1.25	-	-	1.25	.58	34	34	34	34	34	136	1.5
Total	216	138	172.50	78	43.33	215.83	100.00	5929	3720	1305	3162	732	8919	100.0

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Of the total, 61 percent were engaged in single type of fishing pursued exclusively. A little over half of these were engaged in beach-seine fishing. Those that combined two types formed 29 percent with a little over one-third engaged in beach-seine and creek fishing and about one-third in gill net and creek fishing. The remaining 10 percent combined three or more types, more than half being engaged in the combination of the beach-seine, gillnet and creek types of fishing.

The relative importance of the four types of fishing is arrived at by aggregating all the jobs whether pursued exclusively or in combination. We find that of the total, 41.7 percent were in beach-seine fishing, 35.5 in creek fishing by throw net either in the sea or the river, 14.6 in gill net fishing and 8.2 in stakenet fishing.

Holding of nets and boats :

The average holding of nets is given in table 13.5. In the case of beach-seine nets, the net holding represents the number of net pieces contributed to the organisation. The units vary in size to some extent. At Calangut and Durbhat the nets were of the improved variety. It was reported that mechanically manufactured fishing nets were being imported from Japan during the former administration. The beach seines at other centres were prepared locally by members of the organisations. The average indicates the minimum holding of the different types of nets whether the fishing is carried on exclusively or in combination.

Data as regards the total holding of boats and nets in the territory are presented in table 13.6. They were supplied by the Fisheries Department. The former administration required every working fisherman to procure a licence for the pursuit of fishing and to declare his holding of boats and nets. The table is an aggregation of such registrations. Information as regards the dates and ownership types was not available.

Estimation of the different types of nets is attempted, in table 13.7 on the basis of the sample inquiry. As stated earlier, the averages are taken as minimum requirements necessary for pursuing a particular type either exclusively or in combination. As stated earlier, the number of beach-seine organisations operating in the territory was 101 according to our inquiry. The departmental data show that there were 110 beach-seines.

The Departmental data do not give the holding of stakenets. The number of interspacings, according to the Department's record was 804. According to our estimates the number of fishermen and the number of nets engaged in this activity were 732 and 1464 respectively. Taking the two together, we find that the total net holding was adequate.

The inadequacy of net holding in the remaining two types, gill net fishing and throw net fishing, is apparent from tables 13.6 and 13.7. It was, however, possible that there was an element of under-reporting in the case of the departmental data. Only new acquisition of nets might have been reported to the Government instead of the total net-holding as in the case of our inquiry.

As regards small boats, our estimate appears to be comparable with that of the Department, the two being 2062 and 2050 respectively. In the matter of bigger boats of the capacity of 3 tons and above and used mainly by the beach seine organisation, the Departmental figure of 233 appears to be inadequate when compared to our estimate of 402.

TABLE 13.5 : Average net-holding per earner

Centre	Beach-seine		Gill-net		Throw or cast nets (creek)		Stake-nets		Total Average Rs
	No.	Value	No.	Value	No.	Value	No.	Value	
1. Morjim	7.3	369	-	-	10.5	227	1.25	88	551
2. Calangute	.8	97	-	-	-	-	-	-	97
3. Betul	3.7	217	4.8	116	4	151	1.5	175	453
4. Talpan	2.3	164	5.1	173	1.6	98	-	-	345
5. Marcaim	-	-	3.0	175	3.7	395	3.7	641	624
6. Durbhat	.8	82	-	-	6.1	389	1.6	238	410

TABLE 13.6 : Total boats and fishing gear in GOA. (Fishing Department Data)

Name of the Block	Boats(Sea)		Boats(River)		Beach-Seines		Gill-nets		Caste-nets		O t h e r s			
	Small	Big	Small	Big	Small	Big	Sea	River	Sea	River	River dragnet	Barrier net	Sluice net	Hook and line
1. Pernem	38	12	72	4	7	5	13	86	31	56	24	48	208	7
2. Bardez	217	35	880	12	5	6	53	135	230	197	64	21	79	18
3. Panjim	94	29	109	8	12	11	15	-	27	-	-	-	-	-
4. Marmugao	92	23	17	2	15	6	12	3	12	-3	-	-	-	9
5. Salcete	122	83	281	4	26	8	68	48	107	109	-	51	53	58
6. Canacona	93	18	35	3	6	3	5	10	52	65	1	1	1	13
TOTAL	656	200	1394	33	71	39	166	282	459	430	89	121	341	105

Table 13.7 : Estimates of nets

Sr. no.	Types of fishing	No. of earners	No. of nets		
			Gill-nets	Creek-nets	Stake-nets
1.	Beach-seine	2236	-	-	-
2.	Gill-net	103	494.4	-	-
3.	Creek-net	969	-	5038.8	-
4.	Stake-net	275	-	-	550
5.	1 + 2	138	662.4	-	-
6.	1 + 3	721	-	3749.2	-
7.	1 + 4	15	-	-	30
8.	2 + 3	618	2966.4	3213.6	-
9.	3 + 4	244	-	1268.8	488
10.	1 + 2 + 3	412	1977.6	2142.4	-
11.	1 + 3 + 4	164	-	852.8	328
12.	1+2+3+4	34	163.2	176.2	68
		5929	6264.0	16442.4	1464

Employment in Fishing :

The employment aspect of fishing is presented in tables 13.8A, 13.8B, 13.8C and 13.8D. The reported employment was classified according to the four types whether followed exclusively or in combination. Each table gives the number of days spent in the different types of fishing at different centres and in all the available combinations. The proportions of the type of fishing in each combination are also given.

As regards employment in fishing types pursued exclusively it showed considerable variations. In Terms of number of days of employment, the averages were 100, 108 and 180 for stakenet, beach-seine and creeknet fishing respectively. As regards gill net fishing, the number engaged was three only and the average employment was 180 days.

The above tables also give the proportion of employment of each of the four type in different combinations. The types engaging the fishermen for relatively greater number of days were the beach-seine, creek fishing and gill net in that order. In the combination of stakenet and creek fishing the latter was more important from this point of view.

The average number of days of employment in each type and combinations of fishing and the ranges thereof are presented in table 13.9. Similar data as regards average income are also given.

Taking into consideration the combination only, we find that the combination of gill net and creek fishing provided for the largest quantum of employment on the average. The combination was available at Betul and Talpana only. The next combination in this respect was that of beach-seine and creek fishing providing for an average of 203 days of employment. The combination was mainly found at Morjim. This was followed by the combination of beach-seine, gill net and creek fishing with 175 days on an average and available at Betul and Talpan. It is evident from the data that combinations of different types of fishing provide for a larger quantum of employment as compared to the types carried on exclusively. The average for the former was 180 days while that for the latter was 128 days.

Income :

The average incomes earned in the different types of fishing and their combinations are given in tables 13.10A, 13.10B, 13.10C and 13.10D. Their proportion in the total fishing income is also given.

As regards income earned in types pursued exclusively, we find that creek fishing appeared to give the highest average of Rs.840. It was followed by stakenet fishing with Rs.822 and beach-seine and gill net fishing both with Rs.533 on an average. Creek fishing also provided the largest proportionate contribution to the total fishing income of the average household. It was followed by beach-seine, gill net and stakenet fishing in a descending order.

Table 13.9 giving average incomes and their ranges in different types of fishing, reveals the fact that combination of fishing types rather than the exclusively pursued ones gave better incomes. The combination of creek fishing with stakenet fishing gave the highest average of Rs.1084, with a maximum of Rs.1293 at Marcaim.

TABLE 13.8 A : Beach-seine : Average employment per working fisherman

S.No.	Fishing types and combinations	Number of Days					Percentage to total fishing days						
		Durbhat	Talpan	Calangut	Morjim	Marçaim	Betul	Durbhat	Talpan	Calangut	Morji	Marçaim	Betul
1.	Beach-Seine	86	-	96	144	-	-	100	-	100	100	-	-
2.	Gill-net	-	-	-	-	-	-	-	-	-	-	-	-
3.	Creek-net	-	-	-	-	-	-	-	-	-	-	-	-
4.	Stake-net	-	-	-	-	-	-	-	-	-	-	-	-
5.	1+2	-	90	-	-	-	-	-	70	-	-	-	-
6.	1+3	-	180*	-	131	-	30*	-	75	-	67	-	10*
7.	1+4	-	-	-	180*	-	-	-	-	-	60*	-	-
8.	2+3	-	-	-	-	-	-	-	-	-	-	-	-
9.	3+4	-	-	-	-	-	-	-	-	-	-	-	-
10.	1+2+3	-	55	-	-	-	18	-	55	-	-	-	10
11.	1+3+4	-	-	-	83	-	-	-	-	-	66	-	-
12.	1+2+3+4	-	-	-	-	-	150+	-	-	-	-	-	50*

* One earner in the sample

TABLE 13.8 B : Gill-net : Average employment per working fisherman

S.No.	Fishing types and combinations	Number of Days					Percentage to total fishing days						
		Durbhat	Talpan	Calangut	Morji	Marcaim	Betul	Durbhat	Talpan	Calangut	Morji	Marcaim	Betul
1.	Beach-seine	-	-	-	-	-	-	-	-	-	-	-	-
2.	Gill-net	-	210	-	-	-	120*	-	100	-	-	-	100*
3.	Creek-net	-	-	-	-	-	-	-	-	-	-	-	-
4.	Stake-net	-	-	-	-	-	-	-	-	-	-	-	-
5.	1+2	-	38	-	-	-	-	-	30	-	-	-	-
6.	1+3	-	-	-	-	-	-	-	-	-	-	-	-
7.	1+4	-	-	-	-	-	-	-	-	-	-	-	-
8.	2+3	-	68	-	-	-	61	-	83	-	-	-	28
9.	3+4	-	-	-	-	-	-	-	-	-	-	-	-
10.	1+2+3	-	45	-	-	-	45	-	31	-	-	-	25
11.	1+3+4	-	-	-	-	-	-	-	-	-	-	-	-
12.	1+2+3+4	-	-	-	-	-	30*	-	-	-	-	-	10*

*One earner in the sample

TABLE 13.8 C : Creek net : Average employment per working fisherman

S.No.	Fishing types and combinations	Number of Days					Percentage to total fishing days						
		Durbhat	Talpan	Calangut	Morji	Marca	Betul	Durbhat	Talpan	Calangut	Morji	Marca	Betul
1.	Beach-seine	-	-	-	-	-	-	-	-	-	-	-	-
2.	Gill-net	-	-	-	-	-	-	-	-	-	-	-	-
3.	Creek-net	-	153	-	-	157	219	-	100	-	-	100	100
4.	Stake-net	-	-	-	-	-	-	-	-	-	-	-	-
5.	1+2	-	-	-	-	-	-	-	-	-	-	-	-
6.	1+3	-	60*	-	66	-	270*	-	25*	-	33	-	90*
7.	1+4	-	-	-	-	-	-	-	-	-	-	-	-
8.	2+3	-	135	-	-	-	157	-	67	-	-	-	72
9.	3+4	37	-	-	-	80	-	44	-	-	-	38	-
10.	1+2+3	-	45	-	-	-	117	-	31	-	-	-	65
11.	1+3+4	-	-	-	17	-	-	-	-	-	14	-	-
12.	1+2+3+4	-	-	-	-	-	60*	-	-	-	-	-	20*

* One earner in the sample

TABLE 13.8 D : Stakenet : Average employment per working fisherman

S.No.	Fishing types and combinations	Number of Days						Percentage to total fishing days					
		Durbhat	Talpan	Calangut	Morji	Marcaim	Betul	Durbhat	Talpan	Calangut	Morji	Marcaim	Betul
1.	Beach-seine	-	-	-	-	-	-	-	-	-	-	-	-
2.	Gill net	-	-	-	-	-	-	-	-	-	-	-	-
3.	Creek-net	-	-	-	-	-	-	-	-	-	-	-	-
4.	Stake-net	90	-	-	-	135	-	100	-	-	-	100	-
5.	1+2	-	-	-	-	-	-	-	-	-	-	-	-
6.	1+3	-	-	-	-	-	-	-	-	-	-	-	-
7.	1+4	-	-	-	120*	-	-	-	-	-	40*	-	-
8.	2+3	-	-	-	-	-	-	-	-	-	-	-	-
9.	3+4	47	-	-	129	-	-	56	-	-	-	62	-
10.	1+2+3	-	-	-	-	-	-	-	-	-	-	-	-
11.	1+3+4	-	-	-	26	-	-	-	-	-	20	-	-
12.	1+2+3+4	-	-	-	-	-	60*	-	-	-	-	-	20*

* One earner in the sample

TABLE 13.9 : Showing average employment and income and their range for different types of fishing

S.No.	Types of Fishing	EMPLOYMENT				INCOME				No. of Earners		
		Average for all Centres	Highest average No. of Days	Centres	Lowest average No. of Days	Centres	Average for all Centres	Highest average Rs. Centres	Next highest Rs. Centres			
1.	Beach-seine	108	144	Morji	86	Durbhat	533	729	Durbhat	258	Morji	69
2.	Gill-net	180	210	Talpan	120	Betul	533	600	Talpan	400	Betul	3
3.	Creek-fishing	167	219	Betul	153	Talpan	840	973	Madkai	467	Talpan	46
4.	Stakenet fishing	100	135	Madkai	90	Durbhat	822	1050	Madkai	757	Durbhat	18
5.	1+2	128	128	Talpan	128	Talpan	600	600	Talpan	600	Talpan	4
6.	1+3	203	300	Betul	196	Morji	653	1500	Betul	589	Morji	21
7.	1+4	300	300	Morji	300	Morji	600	600	Morji	600	Morji	1
8.	2+3	215	218	Betul	203	Talpan	690	694	Betul	675	Talpan	18
9.	3+4	138	209	Madkai	83	Durbhat	1084	1293	Madkai	922	Durbhat	16
10.	1+2+3	174	270	Betul	145	Talpan	542	550	Betul	500	Talpan	12
11.	1+3+4	126	126	Morji	126	Morji	393	393	Morji	393	Morji	7
12.	1+2+3+4	300	300	Betul	300	Betul	1350	1350	Betul	1350	Betul	1

† Combination available at one centre only.

* One earner in the sample.

TABLE 13.10 A : Beach-Seine : Average income per working fisherman

S. No.	Fishing types and combinations	Average Income					Percentage to total fishing income						
		Durbhat	Talpan	Calangut	Morji	Marcai	Betul	Durbhat	Talpan	Calangut	Morji	Marcaim	Betul
1.	Beach-seine	729	-	614	258	-	-	100	-	100	100	-	-
2.	Gill-net	-	-	-	-	-	-	-	-	-	-	-	-
3.	Creek-net	-	-	-	-	-	-	-	-	-	-	-	-
4.	Stake-net	-	-	-	-	-	-	-	-	-	-	-	-
5.	1 + 2	-	150	-	-	-	-	-	25	-	-	-	-
6.	1 + 3	-	400*	-	308	-	100	-	40*	-	52	-	7*
7.	1 + 4	-	-	-	400*	-	-	-	-	-	67*	-	-
8.	2 + 3	-	-	-	-	-	-	-	-	-	-	-	-
9.	3 + 4	-	-	-	-	-	-	-	-	-	-	-	-
10.	1+2+3	-	200	-	-	-	65	-	40	-	-	-	12
11.	1+3+4	-	-	-	143	-	-	-	-	-	37	-	-
12.	1+2+3+4	-	-	-	-	-	400*	-	-	-	-	-	30*

* One earner in the sample.

TABLE 13.10 B : Gill-net : Average income per working fisherman

Sr. no.	Fishing types and combinations	Average income					Percentage to total fishing income						
		Durbhat	Talpan	Calangut	Morji	Marcaim	Betul	Durbhat	Talpan	Calangut	Morji	Marcaim	Betul
1.	Beach-seine	-	-	-	-	-	-	-	-	-	-	-	-
2.	Gill-net	-	600	-	-	-	400*	-	100	-	-	-	100*
3.	Creek-net	-	-	-	-	-	-	-	-	-	-	-	-
4.	Stake-net	-	-	-	-	-	-	-	-	-	-	-	-
5.	1 + 2	-	450	-	-	-	-	-	75	-	-	-	-
6.	1 + 3	-	-	-	-	-	-	-	-	-	-	-	-
7.	1 + 4	-	-	-	-	-	-	-	-	-	-	-	-
8.	2 + 3	-	350	-	-	-	404	-	52	-	-	-	58
9.	3 + 4	-	-	-	-	-	-	-	-	-	-	-	-
10.	1+2+3	-	150	-	-	-	160	-	30	-	-	-	29
11.	1+3+4	-	-	-	-	-	-	-	-	-	-	-	-
12.	1+2+3+4	-	-	-	-	-	50*	-	-	-	-	-	3*

*One earner in the sample

TABLE 13.10 C : Creek-net : Average income per working fisherman

S.No.	Fishing types and combinations	Average Income					Percentage to total fishing income				
		Durbhat	Talpan	Calangut	Morji	Marcaim Betul	Durbhat	Talpan	Calangut	Morji	Marcaim Betul
1.	Beach-seine	-	-	-	-	-	-	-	-	-	-
2.	Gill-net	-	-	-	-	-	-	-	-	-	-
3.	Creek-net	-	467	-	-	973 588	-	100	-	-	100 100
4.	Stake-net	-	-	-	-	-	-	-	-	-	-
5.	1+2	-	-	-	-	-	-	-	-	-	-
6.	1+3	-	600*	-	281	- 1400*	-	60*	-	48	- 93*
7.	1+4	-	-	-	-	-	-	-	-	-	-
8.	2+3	-	325	-	-	- 290	-	48	-	-	- 42
9.	3+4	444	-	-	-	407 -	48	-	-	-	31 -
10.	1+2+3	-	150	-	-	- 325	-	30	-	-	- 59
11.	1+3+4	-	-	-	150	- -	-	-	-	38	- -
12.	1+2+3+4	-	-	-	-	- 700*	-	-	-	-	- 52*

* One earner in the sample

TABLE 13.10D : Stake net : Average income per working fisherman

Sr. no.	Fishing types and combinations	Average income					Percentage of total fishing income						
		Durbhat	Talpan	Calangut	Morji	Marcai	Betul	Durbhat	Talpan	Calangut	Morji	Marcai	Betul
1.	Beach seine	-	-	-	-	-	-	-	-	-	-	-	-
2.	Gill net	-	-	-	-	-	-	-	-	-	-	-	-
3.	Creek net	-	-	-	-	-	-	-	-	-	-	-	-
4.	Stake net	757	-	-	-	1050	-	100	-	-	-	100	-
5.	1 + 2	-	-	-	-	-	-	-	-	-	-	-	-
6.	1 + 3	-	-	-	-	-	-	-	-	-	-	-	-
7.	1 + 4	-	-	-	200*	-	-	-	-	-	33*	-	-
8.	2 + 3	-	-	-	-	-	-	-	-	-	-	-	-
9.	3 + 4	478	-	-	-	886	-	48	-	-	-	31	-
10.	1+2+3	-	-	-	-	-	-	-	-	-	-	-	-
11.	1+3+4	-	-	-	100	-	-	-	-	-	25	-	-
12.	1+2+3+4	-	-	-	-	-	200*	-	-	-	-	-	15*

* One earner in the sample.

It has been noted that fishing was largely dependent on the resources available to a community. While our data bring out the fact that a particular combination was particularly productive of income, the constraint of location might delimit the choice of fishing types to a given community. Substitutability of fishing types was therefore not always possible. It has also been seen that the quantum of employment does not necessarily correlate with that of income. Our data show that the average income reported from all combinations (Rs.713) was only 5 percent higher than that (Rs.675) from exclusive types, while the employment in the former was higher by 40 percent from 128 to 180 days as compared to that in the latter.

Table 13.11 brings together the various averages for a general indication of the fishing industry as practised at the six centres. It may be seen that the deviations from the general averages for all the centres were large. The fact may be taken as indicative of the chance factor, operating in the industry in general. The table shows that fishing at Marcaim was the most remunerative both from the point of view of employment and income. The two southern centres, Betul and Talpana compared fairly with one another in the matter of employment and income. Durbhat showed the highest per working day return but the lowest quantum of employment. Fishing at Morjim appeared to be most discouraging.

Marketing of fish :

The location of the fishing community influences the industry in yet another way. The necessity of fishing where the fish are, makes for the creation of small and highly monopolised markets, because landings are scattered all over the coast. The actual buying areas are so small that the buyers that reach them are small in number and the need of quick disposal often results in the fishermen getting low prices. The village Morjim provided a near example, where the fishermen had to cross the estuary to seek a market and delays caused in this resulted in pushing down the prices.

Depending upon the size of the catch, a portion of it was hawked through the surrounding localities by fisherwomen who were family members of the fishermen. A part of the remaining fish was purchased by bicyclemen who could reach longer distances. The proximity of an urban place also attracted bigger dealers to the landing place. The dealers purchased the fish, transported it to the urban place by truck and then distributed it to retailers and hawkers. During seasons of large catches, the dealers also took the fish over larger distances to other urban places.

The preference of fish in fresh condition by the consumer and the highly perishable nature of fish also presented a marketing problem when fish were in abundance during the shoaling season. One of the traditional solution was dry salt-curing of the quantities in excess. This was however done by individual members and not by the beach-seine organisations. As such the practice was linked up with the financial resources of the individual fishing household.

The practice of preservation of fish in ice was absent. There were only three ice factories in the territory. In the second place ice was relatively costly and the practice could only be adopted if fish were to be sent to more distant urban places like Kolhapur, Dharwar, Belgaum etc., outside the territory. In this context, it was reported that the local consumers did not relish fish preserved in ice or cold-storage.

TABLE 13.11 : Average employment and income per working fisherman in different centres

Name of the Centre	No. of Earners	Average dependence per earner	Average employment per earner	Average income	Average investment per earner	Average income per working day
1. Durbhat	30	3.6	86	800	410	9.30
2. Talpan	19	3.9	168	584	345	3.47
3. Calangute	44	4.4	96	614	97	6.39
4. Morjim	45	4.9	167	426	551	2.55
5. Marcaim	43	5.4	163	1032	624	6.33
6. Betul	35	4.2	209	662	453	3.16

The point, however, was not relevant in the sense that fish in a fresh condition could reach almost all over the territory if quickly transported. Fish was caught daily and the landings were distributed at all points on the coast thus making for a certain regional distribution.

The process of freezing and cold storage could be more effectively utilised during the beginning and the end of the season for evening out the supplies. During these periods prices fluctuate to a large extent. The reported dislike of ice-preserved or frozen fish was occasioned by the fact that the fish that was so preserved had remained unsold and had by that time reached a certain of decomposition. If fresh attempts were to be undertaken to regulate the supply of fish by freezing and cold storage, it would have to be seen that the fish to be so preserved was in a very fresh condition.

The problems of marketing were confronted mainly by the beach-seine organisations and the fishing cooperative societies that landed large quantities with the help of mechanised boats. The fish caught was mainly of the shoaling variety. Marketing of river fish, caught by thrownets or stakenets was reported to be less difficult on account of three reasons. Firstly, the fish varieties found in the river were said to be choicer ones fetching better prices. Secondly, the quantities were much smaller as compared to those caught by beach-seines or trawling nets. And thirdly, the river fish were landed at more interior points where the shoaling fish supplies and the sellers took a relatively longer time to reach. Even where the market was common, the river-fish was reported to be in greater demand at better prices.

Estimates of fish production :

The method adopted for estimating the total fish production of the territory is given in table 13.12. The estimates are based on average incomes. During the investigations it was found that responding fishermen were unable to quantify the fish caught by them. Secondly, fish were largely sold on the unit basis rather than by weight. A third difficulty was that while some fish was caught in the individual capacity, part of the total fishing income was earned in cash as share of the total of cash proceeds especially by members of beach-seine organisations. A minor difficulty faced was in the form of varieties which were large in number .

The total number of working fishermen is classified into two categories, the marine and the river. The total income is arrived at on the basis of the average income reported by the two categories. The income is then converted into quantities at the lowest landing prices reported. In the case of river fish, the prices are assumed to be one and a half-times those of marine fish. Both the prices are the lowest, resulting in a probable overestimate of production. The total production thus estimated was 13,687.5 tonnes.

To the above estimates are added the quantities of fish caught by the eleven mechanised fishing boats that were operating in the territory at the time of the survey. The estimates are for a period of 12 months on the basis of the average monthly catch for each boat. The estimates also contain an element of overestimation as the boats are scarcely put out for fishing during the initial two months of the monsoon when the sea is very rough. Secondly, the average catch per boat has been calculated on catches during the period between October 1964 and February 1965 which is the most productive period of the fishing season. The total estimated production by the

TABLE 13.12 : Estimates of Production and Consumption of FishI. Estimates of Production

Total No. of earners (Estimate of Fisheries Dept.)	5929
i) No. engaged in marine fishing	4733
ii) No. engaged in river fishing	1196
i) Income from marine fishing 4733 x Rs. 563 Average per earner (marine)	Rs. 2,664,679
Quantity of fish produced at Rs. 0.25 / kilogram	10,658,716 Kgs.
ii) Income from river fishing 1196 x Rs. 937 Average per earner (river)	Rs. 1,120,652
Quantity of fish produced @ Rs. 0.37 / kilogram	3,028,789 Kgs.
Total quantity produced	13,687,505 Kgs.
Add: Annual catch by Dept. Boats	739,560 (Monthly average x 12 months)
Annual catch by/boats of cooperatives	264,204 " " "
Annual catch by 3 private boats	221,784
	<hr/>
	14,913,053 Kgs
or	<hr/> 14,915 Tonnes

II. Estimates of consumption

Total no. of households (1960 census)	126,335
Consumption estimated @ 80 ks per year	10,106,800 kgs.
	or 10,107 Tonnes
Consumption estimated @ .25 kg per household per day or 91.25 kg per annum	11,528,068.75 kgs
	or 11,528 Tonnes

mechanised boats amounts to 1225.5 tonnes. The total estimated production of fish in the territory was 14,915 or fifteen thousand tonnes. According to the fisheries department, the total production of fish was 20,000 tonnes. The basis for this estimate is not known. It is also not known if the estimates include production of fish by the mechanised boats. The estimates after deducting the fish production by the mechanised boats, amount to an average catch of about 21 kgs per day per fishermen. This rate appears to be very high on the basis of data collected in our survey.

The table also contains estimates of consumption. For this purpose the average annual consumption of fish per household from Mithbav, a coastal village in the southern half of the Ratnagiri district are used. The average was about 80 kgs per household per year at the village. A second estimate based on reported average consumption of a quarter kilogram per day per household, has also been calculated. The two consumption estimates varied between 10,107 tonnes and 11528 tonnes. They may be taken as lower limits because the income level of the village Mithbav was lower than that in the territory and consequently the consumption of fish was relatively higher in the territory.

A large part of the difference between the production and consumption estimates could be accounted for by the quantities of beach manure prepared by the beach-seine organisations by sun-drying sardine catches on the beaches. The beach manure was said to be in much demand by the cultivators of the territory. Our inquiries revealed that the practice of giving beach manure to the paddy crop was being abandoned on account of increase in its price.

Action taken by the Fisheries Department :

The Fisheries Department was constituted in early 1963. It had undertaken a number of schemes for the promotion of the industry as well as the socio-economic welfare of the fishing population. The most important measures undertaken were : (i) the introduction of mechanised fishing and (ii) the formation of fishing cooperative societies. It had introduced eleven mechanised boats for deep-sea-fishing, the type that was relatively absent in the territory. Of these, four were departmentally operated. Of the rest, four were operated by fishing cooperatives and three by individuals. All the seven boats were given on a loan-cum-subsidy basis by the department.

Departmental operations :

Departmental fishing was undertaken for the purpose of exploration as well as for demonstrating the benefits of mechanised fishing. The Departmental boats carried on two types of fishing namely trawling and purse-seining. Trawling was a relatively simpler operation. It involved the fixing up of a trawl net, a bag type of net tapering at one end and speeding up the boat. All the fish on the course got trapped in the trawl net. The main advantage was that the boat could travel long distances facilitating fishing the relatively more virgin areas in the sea. This also lessened the dependence of the fishermen on 'seasons'. Likewise fishing could be resorted to all through the year. The second advantage was that trawl net fishing could be used with effect for catching shoals of prawns which had a good demand particularly in the United States.

Fishing by the purse-seine nets was carried on by the two larger-sized (45 ft.) Departmental boats. The operation was a

complicated one and required greater skill. Tye type was used for catching shoaling fish in deeper sea waters. The casting of the net, manouvering the boat so that the net got under the shoal, bringing together the four ends of the net and lastly drawing it in with the help of mechanically operated winches needed skilled hands as well as greater capital equipment in the form of the purse seine, mechanical winches, more powerful engine etc.

The performance of the Departmental boats is given in table 13.13. The average catch per boat per day amounted to about 500 kgs. The Director of the Fisheries Department appeared to be satisfied at this level of performance. The actual working costs were being calculated in order to examine the profitability of the operations.

Table 13.13 : Fish landing by the mechanised boats of the Fisheries Department

Months	Weight of catch (kg)
October 1964	70,704
November 1964	87,576
December 1964	86,286
January 1965	45,279
February 1965	18,305

The fish caught by the Departmental boat were landed at Panjim where the Department had opened a retail sales shop for disposing it off. Fish was sold at a fixed price Re.0.50 a kg. at this shop. The price was on the average about 30-50 percent below that available at the Panjim market. The Department also supplied fish to large-scale buyers like the hotels and eating houses. Catches of prawns were preserved in the deep-freeze plant situated at the landing site. The prawns were later packed and transhipped to America.

The Department had, for making facilities for fish preservation available, commissioned the cold storage plants at Panjim and Marmugoa after making necessary modifications to the plants. A deep freezer had also been installed at Panjim. These facilities available to the fish trading community, were, however, not being taken advantage of by them reportedly on account of high costs. An ice factory of ten tonnes capacity was also reported to be faced with the same problem.

For promotion of the mechanisation scheme the Department had actively encouraged the formation of fishing cooperative societies. The societies were given financial assistance in the shape of loans and subsidies for purchase of engines and for the construction and repair of boats etc. Brief case studies of the societies are given in the following paragraphs.

The Department had also established a training centre for fisher-youths at Dana Paula, near Panjim. The six-monthly course of instruction at the Centre included subjects relating to the various aspects of mechanised fishing like preparation of nets, navigation, elements of marine engineering etc with a high practical bias. The trainees received a stipend of Rs.60/- per month during the period of training.

Fishing Cooperative Societies :

It has been noted above that one of the significant actions taken by the Fisheries Department had been its efforts to popularise cooperation in fishing. Four societies at (i) Harmal (Pernem taluka), (ii) Varem (Bardez taluka), (iii) Durbhat (Ponda taluka) and (iv) Talpana (Canacona taluka) had already been formed and been given mechanised boats. A society at Assolna (Salcette taluka) had been established a little prior to our survey. Another society was being formed at Dona Paula near Panjim.

The information as regards the date of registration, number of founder-members and present membership, number of servants engaged by the societies for operating the mechanised boat etc is given in table 13.14. It may be seen that the societies were of recent origin. Three had been formed in 1963 and only two in 1964 including society at Assolna which had not undertaken any active scheme by the time of the survey.

Brief case study accounts of the four societies and the difficulties faced by them are given below:

(i) The society at Harmal in Pernem taluka in the north was not enthusiastic about acquiring a mechanised boat in the beginning. The members of the society were also members of the local beach-seine organisation and it was feared that the Department would attach their beach-seine and the boat in the event of their being unable to repay the loan. The mechanised boat was acquired in September 1964, more than a year after the inception of the Society.

The mechanised boat was operated by the members themselves. The boat was used for trawling only. The catches were reported to be promising during the first three months. Since February 1965, the mechanised boat was taken to Marmagoa for fishing as the quantities of catch around Harmal declined. The society had also to face the problem of marketing the fish. Buyers were few at Harmal and the prices realised were low. The village lay in the western corner of the taluka and the road system was very unsatisfactory. It was reported that good catches of prawns in the months of September and October had to be disposed off at low prices on account of the absence of quick transport.

The Society with a view to commercially utilise their beach-seine catches of shoaling fish, mackerel in particular, had decided to undertake curing of the fish and subsequently exporting it to northern markets like Vengurla, Malvan etc in the Ratnagiri district. The Society was however unable to do much in the absence of curing facilities such as cement platforms, supply of fresh water and the availability of cheap commercial salt etc required for the purpose.

A notable practice of the society was to give loans to its members. The society was safely situated in the matter of recovery of the loans since the members were also the members of the beach-seine organisation which had its cash earning through sales of the shoaling fish caught daily. The repayments took the form of transfer entries from the cash account of the organisation into those of the society.

The very unsatisfactory system of roads of the taluka has been referred to. The transport system was also ill-organised. This caused the community at Harmal much hardships by way of getting their provisions also. The society had

TABLE 13.14 : Membership and servants of the cooperative fishing societies

Name of the Cooperative Society	Date of registration	No. of members		No. of operators		Date of acquiring the mechanised boat	Remarks
		At inception	At present	Skilled	Unskilled		
1. The Harmal Fishing Cooperative Society Ltd.	30.6.63	25	80			16th Sept.1964	Members man the mechanised boat
2. The Bardez Fishing Coop.Society Ltd.	30.4.64	83	122	3	5	1st Oct.1964	
3. Durbhat Fishing Coop. Society Ltd.	19.3.63	188	140	2	7	26th March1964	
4. The Canacona Fishing Coop.Society Ltd.	2.3.63	355	419	2	7	10th April 1964	

therefore applied for a licence to set up and operate a fair price shop. Our inquiry also revealed that the fishing community at Morjim were also thinking of organising themselves into a cooperative society, primarily for the purpose of running a fair price shop.

(ii) The Bardez Fishing Cooperative Society at Verem

The Society encountered difficulties from the formation stage itself. The fishing population of the region was largely Christian. The community had grave doubts as regards the success of such (cooperative) efforts. A reported reason was that since a cooperative society was taken to mean mechanised fishing alone, the community did not think that the society would be helpful in their traditional beach-seine type of fishing. The result of this reluctance was that the society had to be formed with nearly half of its members belonging to the non-fishing communities.

The Society appeared to be satisfied as regards the performance of its mechanised boat. The problem of marketing the production was, however, reported to be grave. The fish was landed at Vernem which was situated near Panjim across the ferry. Between these two places seven mechanised boats, four belonging to the Fisheries Department and three to individuals, landed their daily catch. The retail sale of fish by the Department at a fixed price affected the sales of the Society also.

The problem could be tackled, according to the Society, by seeking other markets in the interior. Towards this, it had formally resolved to purchase a small pick up van for transporting the fish. The Department had, however, not permitted the purchase.

The Society was anxious to acquire a bigger mechanised boat for purse-seine fishing so that it could get larger catches provided by the seasonal shoals. It was contended that the shoaling season between November and January could not only compensate for the maintenance expenses for the entire year but would leave a residual income to the Society.

(iii) The Fishing Society at Durbhat appeared comparatively to be the most active one. The mechanised boat was operated regularly irrespective of the size of the catch. The fish was sent to urban places like Margao and Vasco for retail disposal. Manufacture of trawl nets was undertaken jointly by the members. As regards breakdowns of the marine engine, the Society employed at its own cost expert mechanics from Ponda at a distance of 3 miles for even major repairs. There was a reluctance for waiting for the Departmental mechanic and wasting time in the process.

The Society had requested the Department for a bigger mechanised boat for undertaking purse-seining and gill-net fishing. The acquisition of the bigger boat would also help provide employment to four youths of the locality that were undergoing training at the training centre at Dona Paula.

The Society had prepared five nylon-gill nets for the purpose of deep-sea-fishing. They were, however, very inadequate for undertaking this type of fishing. The Society expressed a need for additional finance for manufacturing more gill-nets as also to prepare nylon hook and line gear. The absence of an owned pick-up van for seeking distant urban markets was also badly felt.

The society ran a fair price shop for the benefit of the community along with a cooperative consumer store.

The village Durbhat was an inland place on the bank of the river Zuari. Extensive stakenet fishing was carried on in the region around the village. As noted earlier, the right to operate the interspacings had to be acquired at open auctions held by the Government. In this context it was reported that local rivalries which in recent period had sought shelter in political groupings often resulted in reckless biddings against one another thus rendering the fishing relatively uneconomic. The practice of subletting by the successful bidders to needy fishermen caused additional distress to the tenants.

The Society at Durbhat together with the society at Verem had requested the department to entrust to them the distribution of the interspacings for the benefit of their members. Such an arrangement would lessen the burden on the operators of the interspacings by dispensing with open auction and resultant high biddings and the exploitation of the poorer fishermen by the middle fishermen.

The request was accepted in principle by the Fisheries Department. The Department, however, was reluctant to put it into practice before satisfying itself of the fact that the societies adequately represented the fishing communities dispersed in the region. It, therefore, placed a condition to the effect that the societies should first prove their representativeness by having at least a fifty percent membership of each fishing community situated near respective interspacings in each locality.

As the condition could not be fulfilled by the two societies within the given time the Department announced its decision to hold the three yearly auction. An agitation followed and representations were made to the Government. The auctions were bycotted. The Department reconsidered its decision and gave an extension of one year during which the societies were to fulfil the condition. It, however, announced its decision to hold the auctions for a period of one year only instead of three years.

Discussions with the office bearers and members of the Durbhat society as regards the proposed method of distribution of the interspacings after their acquisition of the rights, revealed that the problem had not been given careful thought. It was vaguely imagined that the interspacings could be leased out to the needy and poor fishing households, or to those with old or infirm earners. They agreed to the fact that a change in tenancy affected both the households, obsolescence of fishing gear of the outgoing tenant and the necessity of new investment for the new leaseholder. They were not quite sure as to how a beneficial distribution could be carried out nor were they certain of keeping out considerations like politics or vested interests from the issue.

Our inquiries as regards the attitude of holding tenants disclosed the fact that the fishermen were disinclined to become members of the society. They had been carrying on their fishing activity at the local interspacings for a number of years, had created some of the interspacings themselves and had solely depended on the fishing type for their livelihood. They were not sure as to whether the society would ensure the continuation of their leases, as and when the interspacing were handed over to the society. They were opposed to the idea of collectivisation of the interspacings alone and not of other economic

activities pursued by other members of the society. The society could obviously not agree to such proposals and as a result found it difficult to claim representativeness by controlling a fifty percent membership.

The problem could be viewed like that of the land tenancy. The right of distribution of the use of the interspacings could be entrusted to the society in principle and on considerations of justice. The duration of fishing, the duration of tenancy in each case could be carefully gone into and protected tenancy rights could be given to those deserving them. The rest of the interspacings could be distributed on the basis of priorities which would take into consideration the location, investment in fishing gear, availability of alternative or complementary fishing techniques etc. The holders would pay a rent to the society instead of fees to the Government.

(iv) The Fishing Cooperative Society at Talpana in the Canacona taluka in the south employed its mechanised boat both for trawling and gill net fishing. The repair as well as manufacture of nets was done by the crew employed by the Society.

Like the Society at Harmal in the extreme north, the Talpana Society also faced the problem of marketing. The taluka was a hilly one with widely dispersed consumer localities. The existing roads were either bad or ill maintained. They were also not adequate. The Talpana society had only the town of Canacona and its adjoining localities as its market. The marketing problem assumed serious proportions during the shoaling season when fish from southern centres was taken to Canacona for sale.

As the village lay at a considerable distance from bigger urban places like Margao or Panjim, the transport costs prevented the society from taking the catches to these centres and sell at a profit. A good deal of the effort of fishing was thus wasted according to the society.

The distance from Panjim was also instrumental in another type of wastage namely that of employed labour caused by breakdowns of the engine. While routine repair work was carried out by the crew, serious breakdowns caused considerable delay. The society had to await the arrival of the Departmental mechanic for long periods.

The society had undertaken to procure, at subsidised rates, raw materials/the cotton twine for distribution to its members on a loan basis. The society also ran a fair price shop for the benefit of the community.

The case study accounts of the fishing cooperative societies show that all of them were of recent origin and that their functions were restricted to the operation of the mechanised boats and procurement of subsidised raw materials for their members. The societies could undertake a variety of other functions like trading in fish, fish preservation and curing, credit facilities, better housing conditions for their members etc. Some of these had been undertaken by some of the societies as noted in the case studies.

The difficulties experienced by the societies have been indicated. They were related ones. The main difficulty was that of inadequate transport without which good catches turned into wasted effort. A related difficulty was the restriction and/or overlapping of market area and low prices resulting from competition. The societies at Verem (Bardez) and Darbhat (Ponda)

had requested the Fisheries Department to allow them to purchase pickup vans for speedier transport. The Department had, however, refused the permission because the mechanised boats given to the societies were being handled carelessly. The boats being the property of a corporate body, the individual members were not mindful of the need of careful handling, maintenance or repair of the boat or the engine. The Department thought that the pick up vans would share the same treatment. Apart from being carelessly handled, there was every chance of their being misused for private purposes.

Wastage of work-days in mid-season owing to breakdowns were also reported by all societies. All major repairs had to be referred to the Department. Delays were caused owing presumably to the Department's mechanic having to attend to the Department's boats. The high cost of major repairs could not be undertaken by the societies on account of financial reasons also.

Mechanised fishing by individuals :

The Department had given mechanised boats to three individuals, in addition to those given to the societies. The terms were similar, namely, a 25 percent subsidy on the boats and a 50 percent subsidy on the marine diesel engines. Like the societies, the individuals carried on mechanised fishing by employing fishermen on a salary basis to operate the boat. The performance of all the mechanised boats, as reported to the Department, is shown in table 13.15. The quantities of catch of the societies' boats are taken from the monthly returns that were to be sent by them to the Department. The individuals were also expected to submit such returns. The figures of catch of the society at Harmal were not available.

From the table it can be seen that the performance of the individually owned mechanised boats was about 12 percent better than the societies' mechanised boats. It is presumable that the former, operating to maximise their profits, arranged for timely repairs on their own as well as explored more distant areas in the sea.

The average performance of all these boats, however, compared very unfavourably with that of the departmentally operated boats. The latter appeared to operate with almost twice the efficiency shown by the former. This was presumably because of the Departmental mechanical attendance available to the Department's boats thereby cutting down the number of days wasted. Secondly, the Departmental catch included huge-shoaling catches netted by purse-seine fishing operations carried on by the two bigger boats of the Department.

Fish was an important source of protein in the diet of the local population which consisted mainly of cereals. About 80 percent of the population relished fish. The Department viewed the industry as a producer of food and as such was of the opinion that apart from planning to increase the production of fish, it should also popularise fish consumption by making it available at fixed or controlled prices. Reference has been made to the retail sales of fish by the Department at Panjim.

The scheme of making fish available to the people at fair prices was proposed to be extended to other urban places like Margao, Ponda, Quepem, Bicholim etc. Towards this end, the Department planned to put on the road an insulated van for collecting fish landed by the cooperative societies for subsequent delivery to the proposed selling points to be established

TABLE 13.15 : Monthly landings of fish by the mechanised boats of Cooperative Societies and individuals

Boats	Nov. 1964 kgs.	Dec. 1964 kgs.	Jan. 1965 kgs.	Feb. 1965 kgs.	Average per month Kgs.
1. Bardez Fishing Cooperative Society	3177	6535	9274	4079	5766
2. Durbhat Fishing Cooperative Society	6175	10687	7236	-	8033
3. Canacona Fishing Cooperative Society	2680	2705	2730	2740	2714
4. Bhavani	4796	7305	8453	5408	6491
5. Sagar Kanya	5302	6595	11017	5878	7198
6. St. Anthony	4449	6489	4740	3495	4793

in other urban places. The quantities so collected could be set off against loan repayments due from the societies. Such a scheme would also solve part of the transport problems faced by the societies.

Practice of fish fattening :

It has been stated that the territory of Goa had a number of tanks and water-reservoirs which could be considered as basic resources of fish production. There were also khajan lands in which river water was impounded periodically. Fishing in the drains of the Khajans and at their sluice gates was currently being done on a contract basis.

The process of fish breeding and fattening required that all the inland water reservoirs had to be carefully cultured beforehand in order to do away with the predatory types of fish that preyed on the smaller varieties. The culturing process also included cleaning the reservoirs, manuring the waters and fixing steel meshes at the drains in order to prevent escape of the fingerlings. In this context the Department held the view that while the possibilities of extending pisciculture did exist in the territory, the schemes need not be hurriedly undertaken at present. It was more concerned with developing sea-fishing and with better exploitation methods of the rich harvests of the sea.

Our inquiries disclosed the practice of fish fattening in the village Arpora in Bardez taluka. The practice was reported to be in vogue for the last 70 years. It was carried on by about 30 families that were mainly engaged in the production of salt from salt water. A local variety of fish called Gholshi was fattened in the plot of land adjoining the salt pans. The fingerlings were caught at the local river bank between March and May. The nearness of the plot facilitated the watching of the fingerlings by the salt producers till about the end of May when the season came to an end and by which time the fingerlings attained a bigger size. The selling of the fish began by August or September when the fish grew to a size of 6 to 10 inches. The variety was reported to have a high preference and fetched a price ranging from Rs.0.50 to Rs.1.50 per unit. The sales continued intermittently till November-December. It was reported that the families engaged in the fattening practice earned an average income of about 300 rupees from the occupation.

II Findings of the inquiry and directions of development

The implications of the findings of the survey are discussed in this part. The findings can be broadly grouped under two categories, namely, those that relate to the production of fish and those concerning their disposal. The existence of fish seasons dictated the adoption of different techniques of fishing. Four of these have been identified. It has been seen that on the basis of our data (table 13.4), 42 percent were engaged in beach-seine fishing, 15 percent in gill-net fishing, 35 percent in creek fishing and 8 percent in stakenet fishing. Further classification according to the combination of more than one type of fishing showed that about 60 percent of the fishermen were so engaged. It has also been seen that the choice of technique was also dictated by the location of the community and that of the resource available to it.

The two constraints namely the seasonality and the location have to be kept in view while formulating any developmental schemes for the industry. The introduction of new techniques

such as fishing by mechanised boats, is a time-taking process dependent on its acceptance by local fishermen, availability of boats and engines, creation of facilities for obtaining diesel oil and other raw materials and quick repair services. Secondly, while the new technique might minimise the effects of seasonality, it can hardly provide any solution to the problems arising out of location during the transition period.

Beach-seine fishing :

It has been seen that fishing by the beach-seine was the largest activity. The technique required an organisation of 30-40 fishermen, jointly participating in the operation. Accordingly, the traditional organisation that has evolved, imposes a set of duties, obligations and rights on each member in the contribution of materials and labour as well as in the sharing of proceeds. It is a carefully worked out type of cooperative organisation wherein every member contributes and receives equally.

The technique is labour intensive and while the principal operation of pulling the net ashore can be mechanised, thus replacing more than half the labour requirements, the innovation, it is presumed, will take a considerable time before it becomes general. The implications, practical as well as financial, of introduction of mechanical power in this technique also remain to be worked out.

The existing organisation during the period of transition is ideally suited for being formalised into a cooperative fishing society. The example of the fishing co-operative society of Harmal which was formed by the members of the local beach-seine organisation, showed that such a society could undertake a greater variety of cooperative functions like provision of credit, curing of undisposed fish for export etc. The mechanised boat of this society was operated by the members themselves presumably because of this identity of the two organisations, the traditional and the formal.

Formalising the beach-seine organisation into a cooperative society would answer a second and a very keenly felt need of the fishermen namely the timely availability of raw materials like cotton twine, hemp etc. Every member of the beach-seine organisation was expected to contribute specific types of net pieces for making the seine. It was an individual responsibility. As such, they faced two difficulties, namely, that of finance and the high prices charged by local shop-keepers. If formed into a cooperative society, the organisation could make bulk purchases and could also avail itself of the subsidies provided by the Government. The latter would in its turn be in a position to assess the requirements of the territory and buy the materials directly from the mills. It could also maintain a central stock at Panjim from where the primary societies could draw their supplies periodically.

Procurement and distribution of subsidised materials had been reported by two societies. Initially the societies made their purchases from dealers and later claimed rebate from the Department. This method would have to be replaced by the one mentioned above and the entire scheme systematised accordingly.

It has been noted that 60 percent of the fishermen in beach-seine fishing were solely dependent on it. In particular these were comprised of the Christian fishermen fishing at the long and unbroken coastline of Salcette and Bardez. Providing an alternative type of fishing would result in a fuller

utilisation of their labour, especially during the lean period of the shoaling season.

The two types that had been pursued in combination with beach-seine fishing were deepsea fishing by gill nets and creek fishing by throw nets. The unbroken shore line of Salcette and Bardez restricts the pursuit of the latter type. The only alternative appears to be deep sea fishing by gill nets in which both the boat and the gill nets are operated manually. The Christian fishermen at the above coasts reportedly lacked the skill for gill net fishing. The possibilities of introducing this type would have to be first ascertained by exploring the sea-waters within navigable distances by the manually operated boats, that is within a distance of ten to fifteen miles. If the sites are found to be fertile in fish, the fishermen could be provided with necessary gear on the usual loan-cum-subsidy basis and skills could be imparted for purposes of training the local fishermen. It is presumed that the beach-seine organisations would have been formalised into cooperative societies for this purpose.

The foregoing discussion as regards the possible directions for the development of beach-seine fishing and that of the fishermen engaged in it is based on the assumption that fishing by this technique would be continued to be carried on for some years in the immediate future. In the main the technique waits for the shoals to approach the shore. And hence its dependence on 'seasons' i.e. on the arrivals in the natural way.

It can be conceived that as the industry develops the fishermen, equipped with bigger boats, more powerful engines and purse-seines would seek out the shoals in mid-seas as is at present being done by British and Norwegian fishermen. During the sardine season, the British and Norwegian fishing boats, equipped with insulated holds and stocks of ice, go over long distances to the known and well-charted breeding grounds of the sardines. After fishing in these sardine beds for about a week, they return to their harbours for disposing off their catch to sardine-canners. The practice calls for precise scientific information regarding the breeding grounds and habits of the shoals, acquisition of equipment and skill and finally the provision of a steady, predetermined offtake of the catch. Some of the difficulties in the above are discussed under mechanised fishing.

Creek fishing :

The next type of fishing engaging large numbers was creek-fishing. In the main, the fishermen pursuing this type belonged to inland fishing villages, fishing mainly in the rivers and estuaries. It was also pursued by fishermen belonging to the Canacona taluka where the sea shore was much broken. The type was largely pursued in combination with the remaining three types. According to our data about 30 percent of the fishermen reporting creek fishing were solely dependent on it. From the point of view of development, facilities for providing an alternative type of fishing will have to be created for this group in the first instance.

Unlike ^{beach-seine} fishermen, these groups are dispersed over a wider area and are not organised into any sort of organisation. While possibilities of providing assistance to individual fishermen could always be explored, it would be necessary to form them into some type of organisation such as the co-operative society. Provision of assistance can be made more

systematically by such organisations. The main difficulty in this regard is the location and identification of such fishermen.

The possibilities of forming boat organisations is elsewhere discussed. The fishermen that are solely dependent on creek fishing could be brought under such organisations comprising of eight to ten such people. The boat organisation would necessarily be a cooperative one. Mechanised fishing would, for these fishermen situated in inland centres, provide an alternative type of fishing to be pursued by going to the sea. It would retain a subsidiary character as the fish varieties caught in the rivers have a high preference.

As regards the larger proportion that combine creekfishing with some other types of fishing, the general schemes of the Department of Fisheries is to organise the fishermen into co-operative societies and provide assistance by way of subsidised raw materials, grants against sea hazards, cash loans etc. The need to provide assistance of this type appeared to be particularly great for creek fishermen fishing in the sea-coast at Canacona taluka. While the fish caught by them has no particular consumer preference like that reported in the case of river fish, their catches were also small as compared to those of the beach seines. Their competitive ability was thus seriously impaired. Our inquiries revealed that these fishermen were anxious to adopt other fishing types that would increase their fish production. Specifically they thought of purse-seining, that is, catching of shoaling fish in mid-waters with the help of small mackerel or sardine nets that could be operated by five or six small boats. The boats as well as the nets were to be manually operated at a distance of two or three miles from the shore. The proposals were postponed as the investment was large and hence beyond the financial abilities of individual fishermen.

Gillnet fishing :

The next fishing type engaging a significantly large number was that of gillnet fishing. Our data show that more than 92 percent of the fishermen engaged in this had one or two other types in combination. It has been noted earlier that gill-net fishing was a highly skilled technique as compared to the two referred to above. Since this type of fishing had to be done in deeper waters, about eight to ten miles away from the shore, the fishermen had to know navigation techniques in addition to fishing skill. The gill net fishermen were thus better fitted for deep sea fishing methods. In the initial period in the development planning of the territory, their experience could be made use of firstly in imparting instruction as regards gill-net fishing to the beach-seine fishermen on the Salcette and Bardez coast; secondly their skill could be capitalised for experimenting with either gill-net fishing or purse-seining in deep waters by mechanised boats.

Stakenet fishing:

The stakenet fishermen, dispersed in a number of river points in the interior, was a small group forming about 8 percent of the total. To a major extent they combined creek fishing with stakenet fishing. Our data, however, show that about 38 percent were engaged in this type exclusively.

A point in this regard is the fact that stakenet fishing was carried on throughout the year except on the few occurrences of exceptionally high tides during the monsoons. The fishing

operations were carried on for about 8 days in a fortnight. Those that combined it with other types of fishing, engaged themselves in the other types during the rest of the days. The principal type combined with stakenet fishing was creek fishing carried on along the river bank. We have seen that stakenet fishing was relatively more remunerative and as such having to attend to it, the stakenet fishermen were less mobile. The location of the interspacings also contributed to their low mobility in many instances.

It has been already stated that the Fisheries Department had agreed in principle to entrust the right of exploiting the interspacings to local fishing cooperative societies. It has been suggested that the problems of distribution on the basis of justice may have to be solved on the basis of duration, location and other socio-economic characteristics of almost each of the families engaged in stakenet fishing and protections granted. The Department may have to set up a machinery for this purpose and to frame rules as to the conduct of the inquiry and the principles to be followed.

Mechanised fishing :

The Fisheries Department, started by the Government of the territory in 1963 has decided to introduce mechanised fishing on an extensive scale for the most important purpose of increasing fish production. It is a new technique and bypasses the existing techniques dealt above. The implications of the techniques and the adjustments that are required to be made for employing it successfully are discussed in the light of our inquiry. The adoption of the technique has been recent and as such the data are not adequate.

It has been stated that mechanised fishing is a full-time occupation in the sense that it can hardly be combined with any of the existing techniques. When introduced on a large scale it will displace some of the fishermen engaged in any of the four techniques dealt above. It cannot, however, be of any help in putting to a maximum use the unutilised part of the fishermen's labour.

The types of fishing that can be employed with the help of a mechanised boat are (1) trawling, (2) purse-seining and (3) fishing by gill nets. Fishing by hook and line can also be done as a subsidiary aspect of production. Most of the boats that were introduced by the Department were, however, engaged in trawling alone. Purse-seining was done only by the two bigger boats of the Department. The co-operative society at Durbhat intended to experiment with gill-net fishing by the mechanised boat. The members had manufactured nylon gillnets for the purpose. Two societies, those at Durbhat and Verem, expressed their desire to acquire bigger mechanised boats for undertaking purse-seining in order to take advantage of the large shoals that visit the Goan coast every year.

Our inquiry indicated that the principal objective of increase in fishing production was being achieved to a certain extent. It also indicated that the co-operative societies which were the first recipients of the mechanised boats were becoming increasingly aware of the benefits of mechanised fishing. The societies, however, utilised the boats by employing a crew for fishing purposes. The only exception was that of the society at Harmal where the members of the co-operative society undertook the fishing. In the rest of the cases, the members did not participate on grounds of inexperience. The mechanised boat was viewed as an independent commercial venture of the society.

The non-participation was presumably one of the reasons of the lower efficiency of the society boats. The three other boats loaned to individuals and operated by a paid crew showed a better efficiency by way of catch. It could also be argued that the non-participation would result in other types of losses such as careless handling of the boat and the engine, higher fuel expenses, appropriation of a part of the catch and above all under utilisation of the capacity of the unit. This could be corrected in the first instance by enrolling the crew as members of the society. Such an action would give additional incentive to the crew as well as minimise avoidable losses. The efficiency could also be improved by providing a set of incentives directly linked to the quality and size of the catch.

The fishing cooperative societies were of the type of multipurpose societies with a variety of functions to be undertaken. They might be spared the extra responsibility of the upkeep of the mechanised boat, disposals of the daily catch, labour attendance etc. Instead, independent cooperative boat units could be tried out, in particular from the point of view of performance. The advantages are obvious. In the first instance, it will be a participating unit with built in incentives for maximising the effort. The members would be the direct recipients of the increased output. By the same criteria, the members can be expected to maintain the boat and engine in good working condition, to minimise working costs and take quicker decisions as regards repairs for minor breakdowns for cutting down wastage in working days.

The organisational details could be worked out after the experiments. If the formation of seven or eight members into a co-operative society is not permissible under the co-operative law, units of two boats could be formed with fourteen or sixteen members. Alternatively, it could be a single unit with two types of boats, one for trawling and gillnet fishing and the other, a bigger one for purse-seining.

The principal difficulty to be faced would be the security for such costly gear as the boat, the engine and the nets. This could be solved by postponing their cooperativisation to a latter date and by placing such unit under the direct supervision of the Department or its extension officers in the respective Development Blocks. The co-operativisation could take place after a year or two or after a certain proportion of the loan is recovered. In any event, the experimentation that is suggested could be tried out if found technically feasible. Organisational adjustments would automatically evolve out of the experiment itself.

Our data do not include information as regards either the extent of the availabilities of fish in the sea or the specific 'sites' in it. Exploration of the local waters and investigations as regards the availabilities is being undertaken by the Department under a distinct scheme. Our data are therefore inadequate as to where such boat units could be tried out. It has been, however, suggested that some of the gillnet fishermen in Canacona, who are solely dependent on that type, should be employed for the purpose, firstly in order to benefit by their deep sea fishing experience and secondly to rehabilitate them on a better economic basis.

Maintenance of the mechanical gear :

Mechanised fishing has brought with it the problem of repairs also. It has been noted that fishing had to be stopped because of engine breakdowns in the case of society boats. Such wastage of working days increased the overhead costs of mechanised fishing.

The mechanic attached to the mechanised boat was expected to attend to the normal repairs and upkeep of the engine and the boat. In the event of major breakdowns which were beyond the technical skill of the boat's mechanic or which involved replacement of parts, the societies were expected to approach the Fisheries Department for the services of the Departmental mechanic. It was reported that there were many delays in this. The Department's mechanic was presumably engaged in attending to the mechanised fishing boats operated Departmentally. Secondly, the landing sites of the societies' boats were located at places which were difficult to reach quickly.

The Fisheries Department was apparently aware of the need of such repair services and has provided for the setting up of a number of such service stations at different points along the coast under ancilliary schemes of production in the Fourth Plan. The Draft of the Plan, however, does not indicate the number of the service stations to be created, the criteria for fixing the locations of the stations or the linking of the scheme with that of the gradual increase in the number of mechanised boats to be introduced during the Fourth Plan period.

Training for mechanization :

It has been mentioned earlier that a training centre of fisher youth had been started near Panjim. Small batches of trainees were given a course of instruction that included navigation, fishing techniques, elements of marine engineering etc. The trainees had to undergo a practical course in these subjects also.

It could be expected that employing the successful candidates in the above course would enable a better maintenance of the mechanised boats owned either by individuals or co-operative societies. It would, however, be necessary to link up the training programme with that of introducing the mechanised boats. The cooperative society at Durbhat was anxious to acquire the additional bigger boat at an early date because four youths belonging to the locality were to complete their training in the near future. These youth could be employed to run the new boat. The earlier batch of four students that had completed the training course were already employed on the present mechanised boat. This suggests that the training facilities could be made fuller use of the scheme, that is admission to the course, were to be linked with specific schemes of the introduction of new boats in specific localities.

Marketing :

The new technique introduced by the Fisheries Department would make a net additional contribution to the fish production of the territory. The technique does not compete with the traditional ones, does not trespass the latter's fishing area and does not draw out the fishing labour on a sizable scale. Increased output, however, brings its own problems regarding its marketing, preservation or disposal otherwise.

The difficulties faced by the co-operative societies as regards marketing the daily catch landed by their mechanised boats have been mentioned. They are principally connected with transport.

The transport system of the territory is well organised and the average number of vehicles is also large. These facts are, however, true only in the case of certain regions in particular the coastal talukas between Salcette and Bardez. We have

mentioned that the talukas of Pernem in the north and Canacona in the south have very few good roads and the transport in these talukas is badly organised. Likewise the talukas that form the interior part of the territory are also not properly served by the transport system particularly from the point of view of fish marketing.

The need for providing marketing facilities as well as arranging for proper and speedy transport will have to be faced by the Fisheries Department. The difficulties are faced by the co-operative societies as well as individual fishing communities unfortunately situated as regards markets. The Department proposed to put on the road an insulated van for collecting fish landed by the co-operative society boats for subsequent distribution to the retail stalls proposed to be opened and operated by the Department in a number of urban places.

It is feared that the proposal would solve only a very small part of the marketing problem faced by the fishing community. Fish is a fast perishing commodity and the prices begin falling as the period between its catch and the sale lengthens. This fact decides the initial price which is always low. In these circumstances, the possibilities of evolving a different marketing organisation may be explored.

The establishment of cooperative fish marketing societies may be given serious consideration in this context. The society would operate with one or two insulated vans and arrange for fish supply on a planned regional basis. It would undertake to sell, on a consignment basis, fish available within its region of operation. Since it would be in a position to assess the total catch in the region on any particular day, it would be in a position to divert supplies either to other consuming centres or to storage centres from where it could be either exported or processed.

The co-operative fish marketing society could, in this way, assume the position of a middleman and undertake to perform different types of intermediary functions such as buying and selling, transport, preservation, processing, exporting etc. The initial finance for fixed and working capital could be made available by the government. The whole region could be split up into three or four operative zones, each under such a society. The primary producing societies, the cooperative boat units and individual fishermen would comprise the membership.

The existing scattered pattern of the location of landing sites and of local domicile has evolved a retail marketing mechanism wherein fish is vended through localities either by fishermen or by bicyclemen. The mechanism need not be changed. The possibilities of bringing the itinerent sellers into the cooperative fold could, however, be contemplated.

The marketing societies could operate more efficiently if a certain minimum off-take is guaranteed. The example of British and Norwegian fishing industry shows that the producing units could put in their maximum effort because of the assurance of the offtake by processing and canning firms. The Fisheries Department could consider the establishment, on an experimental level to begin with, of small canning or bottling units scattered along the coast. The scheme would, however, bring in various related problems such as supervision, storage, marketing etc., of the canned products. Likewise, the marketing societies could undertake to supply fish, at predetermined prices, to the two existing canning factories in the territory.

III. Draft Fourth Five Year Plan of the Fisheries Department

The discussion in Part II was based primarily on the information collected during the inquiry. Some possible directions as regards development, as emerging from the implications of the findings, were indicated. Attention has already been given to some of these by the Fisheries Department in some of its plan schemes. This part attempts an analysis of the schemes as laid down in the Draft Fourth Five Year Plan.

The principal stated objective of the planning effort is to increase fish production and to improve fish marketing conditions. The introduction of mechanised fishing appeared to be fulfilling the first objective to some extent. The second objective had received little attention. The mechanisation scheme is the only scheme that states physical targets, the remaining schemes being proposals for expenditure. Since increase in fish production is the main objective, the Draft allocates 41 percent of the total outlay for schemes directly related to production, and schemes ancilliary to production claim another 30 percent of the total.

Schemes for mechanisation of Fishing :

Mechanisation of fishing is by far the largest single scheme as regards expenditure which is estimated to be 100 lacs. The target is to assist in mechanisation of 100 fishing vessels, construction of 75 new decked boats (and of course fitted with diesel engines) and provision of 25 winches for trawling purposes. This target appears to be a little on the high side if the performance during the Third plan is taken into consideration. The target for the Third Plan was the introduction of 90 mechanised boats. A memorandum giving the proposed outlay for the final year of the Third Plan, the year 1965-66, expected that 25 mechanised boats would be introduced during that year. Upto that period 28 mechanised boats had been introduced. The total for the Third Plan thus amounts to 53, falling short of its target of 90 by 37. It is, however, stated, in the Draft Fourth Plan that no spill over was expected. The two statements cannot be reconciled.

Mention may be made in this regard of the fact that the Department had to depend on boat building yards outside the territory for the supply of boats to which marine engines could be fitted as the local country-craft used in the territory were found to be unsuitable for mechanisation. The delays caused in the execution of the orders placed by the Department reportedly extended to more than a year. The unsuitability of local fishing crafts and the delays in the acquisition of new boats were serious limitations retarding the fulfilment of the schemes.

The Fourth Plan draft, however, includes a proposal for the erection of a boat building yard within the territory. The scheme is a major one. It is stated that Goa had good potentialities for the establishment of a boat building yard for construction of steel boats. There were some barge repair workshops and barges were built or reconstructed in some of them. Technical knowhow for such construction would have to be made available and given the quota of steel and designs for boats of various dimensions, it would be possible to undertake construction of steel boats for fishing.

The target of mechanising 175 boats during the fourth plan can be expected to be achieved partly if the proposed boat building yard comes into existence soon. As it is, the scheme

is dependent on the availability of the technical knowhow and that of the raw materials. In its absence, it is difficult to see, particularly in view of the earlier experience, how the target of 175 mechanised boats is proposed to be achieved.

The scheme likewise does not explain the types of boats to be introduced, their phasing (except notional allocation of expenditure over the five years) and coordination with the proposal of undertaking their construction in the boat-building yard. Details as regards the location, the size, the rate of production of the latter are apparently in the process of formulation.

Production of inland fish :

The second major proposal under production schemes is that of production of inland fish from reclaimed swamps and from brackish water fish farms. It is stated that financial assistance in the shape of loan and subsidy would be given to the prospective pisciculturists for construction and renewal of bunds, provision of sluice gates and establishment of fish farms.

The scheme necessitates charting the available areas where the proposed farms could be located, cost of their acquisition, cost of reclamation and protection against tides etc. These are slow procedures depending upon the availability of proper personnel for systematic planning and execution.

The more important point that appears to be implicit in the scheme is that the scheme is expected to be executed by private interests and that the Department would be satisfied by creating conditions of easy finance only. Similar schemes proposed by other State Governments viz., Maharashtra, Mysore, Kerala, etc., are essentially departmental enterprises. By its nature the scheme is a slow-moving and long-term proposition and it is doubtful whether private enterprise would evince the expected response.

Stated performance of such schemes in other States show that they are taking more time than expected to mature, the principal difficulty being the absence of trained personnel. The allocation of 50 lacs of rupees by the Fisheries Department of Goa in the five year plan appears as such very large.

Off-shore fishing by power boats :

The third largest scheme under production schemes is for off-shore fishing by powered boats with an allocation of 15 lacs of rupees. It is stated to be a continuing scheme and that the Departmental boats would be operated as usual for commercial fishing. Commercial fishing by definition would mean that the returns would offset the costs involved. It has/observed earlier that the costs of working the scheme have not been worked out by the Department. It is probable that the policy of the Department to dispose off the catches at predetermined retail prices, was resulting into a net loss. The allocation of the proposed expenditure would not be justifiable in such an eventuality.

Landing and berthing facilities :

The provision of landing and berthing facilities for the proposed increase in mechanised fishing boats is the single largest proposal with an allocation of 35 lacs in the ancilliary schemes of production. The scheme visualises the undertaking of a hydrographic survey of fishing ports to find out suitable

sites for the construction of jetties. It also visualises the provision of approach roads linking fishing villages to nearby marketing centres.

The scheme is directly related to the scheme of mechanisation. It has been suggested earlier that mechanisation could be undertaken on the basis of boat units so that over a period of time a boat-organisation on the lines of the traditional beach-seine organisation would evolve. The location of such units would have to be taken into consideration while deciding the sites where the jetties could be constructed. The possibilities of beaching, depending upon the size and capacity of boats, could also be explored. Small boats of the local variety that are used in gillnet fishing particularly in the taluka Canacona could be fitted with outboard engines at a much smaller cost for increasing their range of operations. Such craft would not need the construction of jetties or other landing facilities as they can be easily beached.

The scheme visualises the construction of approach roads linking the fishing villages with marketing centres. The absence of such roads has been noticed in the case of a majority of the survey centres as well as other fishing communities. The scheme of such roads could therefore be planned independently and in collaboration with the concerned Department.

Service Stations :

A smaller and important related scheme, shown separately under ancillary schemes of production is that of establishment of service stations. Apparently the service stations would have to be situated where they would be of benefit to a maximum number of mechanised boats, which is where the birthing and landing facilities would be.

There would again be locations where the provision of subsidised high speed diesel oil depots would have to be situated. The Department partially allocates the scheme of this/assistance to fishermen for/purpose. It proposes a subsidy of 33- $\frac{1}{2}$ percent for making available the high speed fuel oil to the boats.

It may thus be seen that the four schemes, mechanisation programme, construction of jetties, provision of service station and situation fuel depots are integrally linked.

Schemes relating to preservation and marketing :

Under the ancillary schemes is included the scheme of establishment of ice and cold-storage plants and allied units with an allocation of Rs.5 lacs. It has been seen that the facilities of fish preservation are not meaningful in the context of local supply and consumption of fish. They, however, serve an important purpose in the context of exports outside the territory.

Reference has been made to the possible co-operativisation of fish marketing. It has also been suggested that the marketing cooperative societies could fulfil a number of intermediary functions such as transport, processing, export etc. They would thus be the bulk purchasers of ice and cold storage facilities proposed by the Department. It may be mentioned in this context that the Fisheries Department of Andhra Pradesh has established two apex co-operative societies for the purpose of exporting fresh fish to the cities of Cuttack and Calcutta.

The establishment of the ice factories and cold storage plants would thus be contingent upon the creation of marketing societies mentioned above. Current experience as regards the use of ice was much disappointing.

Fish curing yards :

A related scheme that is conspicuously absent in the Draft Plan is that for providing fish curing yards along the coastline of the territory. It has been noted that the society at Harmal in Pernem felt the absence of such a yard. Curing of excess fish was being done by all the fishing communities along the coast. Fish curing facilities such as fresh water, cement platforms and supply of subsidised commercial salt are made available by such yards established by the Maharashtra and Mysore Governments all along the coastline. In addition to being of financial and other assistance to local fishermen, the yards also insure sanitary methods of curing and maintenance of statistics.

Remaining fishery schemes :

The Draft of the Fourth Five Year Plan allocates the remaining 29 percent of the proposed expenditure for various other schemes. The proportions are as follows :

Research and investigations	10 percent
Demonstration and training	4 "
Evaluation and Statistics	1 "
Supervision	5 "
Socio-Economic activities	9 "
	<hr/>
	29 "

It may be seen that the schemes are technical, routine and administrative. Except the scheme for supervision providing for staff and office building, the remaining are independent of the schemes meant for achieving the two objectives of increased fish production and improvement of marketing conditions. Examination of these schemes is not attempted for want of more detailed information.

Before concluding, it has to be kept in mind that the Fisheries Department of the territory of Goa was, in addition to being a very recent one, particularly handicapped in the matter of information and recorded data. The draft plan for fisheries appears disproportionately large as compared to those of neighbouring states, presumably because of the absence of data. The second reason is that the territory has not had the initial start and experience that the other states had during the first two five year plans. The draft plan as such appears to attempt to cover up the lag in as few strides as possible and towards that end, plans at a disproportionately high level.

In conclusion it may be stated that there is a greater need for undertaking systematic studies of the immediate problems faced by the fishing community. The short inquiry indicated that the principal difficulty was that acquiring fishing gear and other requisites for undertaking additional types of fishing with a view to ensure greater level of employment. Other types of difficulties encountered in the spheres of marketing, transport, preservation etc. have also been described. The directions in which the proposed rapid mechanisation could be shaped have also been discussed. The need for coordination and integrating the various related schemes and phasing thereof has also been emphasised.

CHAPTER 14

EFFECTS OF THE AVAILABILITY OF JOB OPPORTUNITIES IN MINING ON AGRICULTURE

The mining industry in Goa has expanded considerably since 1950 owing mainly to three important factors : (i) demand for minerals in foreign markets, (ii) availability of good port facilities near the deposits, and (iii) easy transport through navigable rivers. The deposits, mainly iron ore, occur in Bicholim, Sanguem, Satari and to a small extent in Quepem talukas, and therefore, the industry is located in these areas. The entire production is exported, the export being channelled through the exporting firms. The mining concessions are operated both by a few big firms, each holding a number of concessions, and by a number of small firms, each holding a few concessions. Four of the iron ore mines, located in Bicholim taluka, are mechanized, and a few others are semi-mechanized.* Otherwise majority of the mines are non-mechanized.

The exports of iron ore have increased steadily from 72,000 tonnes in 1950, valued at Rs.18 lakhs, to 6.5 million tonnes in 1961, valued at more than Rs.18 crores. During this period the occupational distribution of the working population also showed a noticeable shift towards mining and quarrying, transport and communications, and services. Correspondingly there has been a pronounced decrease in the population engaged in agriculture. The following statement which compares the occupational distribution of the working population between the two censuses, for the district of Goa, is instructive in this respect.

Statement showing the Occupational Distribution of the Working Population in the District of Goa in 1950 and 1960 censuses. (As percent of total working population)

Occupation	District of Goa	
	1950	1960
1. Agriculture	66.9	58.2
2. Forestry, Orchards and allied activities	0.1	0.2
3. Mines and Quarries	2.6	9.0
4. Livestock, hunting and fishing	4.0	3.0
5. Manufacturing and household industries	8.4	7.5
6. Construction	1.2	1.5
7. Trade and Commerce	4.8	5.0
8. Transport and communications	4.2	6.3
9. Services	7.8	9.3
Total	100.0 (191,607)	100.0 (244,261)

(Source: "Some Demographic Aspects of Goa, Daman and Diu", by Dr. Jose C. Almeida, 1964).

* Mechanisation included mechanized drilling both for primary and secondary blasting, use of power shovels for loading the run of mine ore into dumpers which take it to the mill where they are crushed and upgraded by washing. At least four mines are fully mechanized, and in a few others some of the operations are mechanized. Many mines make use of air compressors and jack hammers.

The mining operations are concentrated in the Bicholim, Sanguem and Quepem talukas, and therefore a similar noticeable shift, in fact more prominently, of the working population towards mining and quarrying, must have occurred in these areas. However, data regarding the occupational pattern of the talukas for 1950 are not available, and hence, comparison between the two censuses cannot be made in this respect. According to the 1960 census the talukas where a good percentage of the working population was engaged in "mining, quarrying, livestock, forestry, fishing, plantation, orchard and allied activities" were Ponda (11.3%), Bicholim (26.5%), Quepem (14.9%), and Sanguem (45.8%). In the remaining talukas, viz., Goa, Salcete, Bardez, Marmagao, Pernem, Cancona, and Satari, the percentage of workers engaged in these occupations was between 3.0 to 8.2. Though the census category included all types of primary occupations, excluding agriculture, the large percentages under this category in Bicholim, Quepem, and Sanguem talukas were mainly due to the concentration of mining and quarrying in these areas.

Details of the Enquiry :

The special enquiry regarding the mining labour was, therefore, conducted in the talukas where the proportion of population working in mines was relatively larger, viz., the talukas of Bicholim, Quepem, and Sanguem. The main objective of this enquiry was to ascertain as far as possible the effects of the availability of work in mines on agriculture. The development of mining industry in Goa created a large demand for labour which was met mostly from the local population.* On the one hand, this demand for labour was likely to divert the landless labourers and small cultivators towards mining, thereby affecting the supply of labour to agriculture. On the other hand, these job opportunities would also improve the economic conditions of labourers, and so far as the cultivators were concerned, might lead to some investment in agriculture as a result of increased earnings. Again, it was reported that due to mining operations some cultivated land was covered with earth from mines, either directly by overburdens being deposited over them, or indirectly by the earth from overburdens being carried to the fields during rainy season. This earth which contained a small amount of iron ore, reportedly damaged the soil, and in the course of time rendered it uncultivable. In the special enquiry we have tried to study these points in the particular conditions obtaining in the different mining areas.

For our general socio-economic study some villages were already selected in the areas where mining industry was operating. These were Cudnem-Navelim in Bicholim taluka, and Sancordem and Bati in Sanguem taluka. Since our enquiries showed that more than 60 percent of the cultivator families in these villages were engaged in mining labour as their main or subsidiary occupation, it was decided to conduct the special enquiry also in these villages. For selecting a sample of

* The total labour employed in mines, in the district of Goa in 1960 was 33,611 (vide Statistical Year Book of Goa, Daman and Diu, 1961) while as per 1960 census (Some Demographic Aspects of Goa, Daman and Diu, by Dr. Almeida) the working population engaged in mines and quarrying was 22,078.

cultivator - mine workers for study, those cultivators engaged in mining labour were listed according to the descending order of their cultivated holding, and out of the total number of 441 cultivator -mine labour families in the three villages 128, or 29.0 percent, were selected randomly. Data were collected from these families in respect of their earnings from different occupations, their cultivated holding and production, livestock, employment in mining, pattern of expenditure, and the effects of these jobs in mining on their agriculture. These data are analysed in the following paragraphs.

The selection of the three villages mentioned above for the special enquiry left out some of the important mining areas, and it was, therefore, decided to select additional mine labourers from two important mine areas, viz., Pale and Cavarem-Mina mines. Owing, however, to various practical difficulties it was not possible to obtain a complete list of workers from different mines operating in these areas, and therefore, a definite sample of labourers from a particular village could not be selected. From whatever lists were made available by the mine owners, 41 labourers were selected, and similar information was collected for them. These data are used, wherever possible, while analysing the information collected for labourers in the above three villages.

Analysis of the data : Occupations

Almost 80 percent of the cultivator - mine labourers were tenant cultivators. Only 6 percent were owner cultivators, while 14 percent were owner-cum-tenant cultivators. Relevant information about the caste and the size of holding of the selected families is given in table 14.1. The average cultivated holding of these cultivator-mine labourer families in the three villages, excluding the area taken for Kumri or shifting cultivation, was about 1.67 acres, or slightly more than half an hectare. In Bati it was slightly more than two acres, in Sancordem about 1.25 acres, while in Cudnem it was nearly 1.75 acres. If we consider cultivators cultivating upto 1.5 acres as small and those cultivating between 1.5 and 4.5 acres as medium, then majority of the cultivator - mine labourers belonged to small and medium groups of cultivators. In Bati, Sancordem, and Cudnem about 91, 100 and 96 percent respectively of the cultivator - mine labourers belonged to small and medium groups. The percentage of those having a cultivated holding of less than 3 acres per family was 66, 80 and 84 respectively. It was but natural that the availability of work on mines would attract, initially, in addition to the landless labourers, workers from the small and medium groups of cultivators rather than from the large group. In the villages where the average cultivated holding was relatively small, as for instance in Sancordem, a large percentage of cultivators came under medium and small groups, and therefore, proportionately more cultivators from these groups took advantage of the job opportunities in mines.

The cultivator - mine labour families were engaged, in addition to cultivation and mine labour, in agricultural and other miscellaneous labour like wood cutting and sawing, and minor services like vegetable sales, pot-making, and carpentry. The average total earnings of these families were about Rs.1,300 per year, varying between Rs.884 to Rs.1525 in different villages. The relevant data are presented in table 14.2. The important occupation from the point of view of earnings was, however, mine labour which contributed about 71 percent of the total earnings of these families. Cultivation accounted for

Table 14.1 : Information regarding the caste and the size of cultivated holding of the selected families

	Total number of selected families	Distribution of selected families according to :														Average size of cultivated holding (acres/guntas)	
		C a s t e			S i z e o f c u l t i v a t e d h o l d i n g (a c r e s a n d g u n t a s)												
		Vaishya	Kurbi	Devali	0.0	0.21	1.1	1.21	2.01	2.21	3.01	3.21	4.01	4.21	5.01		5.21
			0.20	1-0	1.20	2.0	2.20	3.0	3.20	4.0	4.20	5.0	5.20	6.0			
Bati	32	-	29	3	5	3	3	4	6	3	1	2	2	-	2	1	2-22
Sancordem	45	-	42	3	4	12	6	7	7	5	1	2	1	-	-	-	1-25
Cudnem	51	23	28	-	5	6	15	11	6	2	1	2	1	2	-	-	1-75
TOTAL	128	23	99	6	14	21	24	22	19	10	3	6	4	2	2	1	1-67

Table 14.2 : Average income received from different occupations by families engaged in mine labour

Village	Average per family income (in Rs.) received from -				Total
	Cultiva- tion	Agri- cultural labour	Mine labour	Other misc. labour	
Bati	270 (30.55)	7 (0.79)	532 (60.19)	75 (8.47)	884 (100.00)
Sancordem	451 (29.54)	16 (1.03)	1,012 (66.46)	46 (3.07)	1,525 (100.00)
Cudnem	282 (20.70)	-	1,080 (79.29)	-	1362 (100.00)
Total	338 (26.00)	8 (0.62)	919 (70.69)	35 (2.69)	1,300 (100.00)
Cavarem-Mina	108 (10.93)	-	880 (89.07)	-	988 (100.00)
Pale	178 (15.16)	2 (0.20)	694 (59.23)	297 (25.41)	1,171 (100.00)

about 26 percent, the remaining 3 percent being earnings from agricultural and other labour. The share of agricultural labour in the total earnings was about 0.6 percent, showing that those families engaged in cultivation and mine labour very seldom went in for agricultural labour. As seen in table 14.2 no mine-labour family from Cudnem and Cavarem-Mina engaged itself in agricultural labour, except on the field cultivated by themselves. In fact, the data showed that about 29 percent of the cultivator -mine labourers entirely left their former occupation of agricultural and/or forest labour in favour of work on mines. Similarly, about 80 percent of the landless labourers left agricultural and forest labour for labour in mines. Our sample in case of landless labourers, however, was not proper, and the data may not be taken as conclusive on this point. But considering the natural impact of such job opportunities, that of attracting landless labourers first, it could be stated that the availability of jobs on mines definitely caused a good deal of diversion of labour from agriculture, at least in the areas surrounding the centres of concentrated mining activity.

Employment on Mines :

The villages selected for study were situated within a very short distance of one or two miles from the mines. The workers could go to the mines in the morning and come back to their homes in the evening. It seemed that in the villages within such a short distance of the mines almost two persons on an average, from every cultivator -mine labour family of five members, worked on mines. Relevant data regarding the average days of employment per mine worker are given in table 14.3. The average annual employment obtained was 174 days for males and 149 days for females. If we consider June to September as rainy season, October to January as winter and February to May as summer, then it was observed that the season-wise employment obtained by the mine workers generally increased from rainy season to winter, and from winter to summer. This was obvious because the sample families being cultivators, the workers did not go for mine labour whenever they were required to work on their fields. The work on fields mainly consisted of pre-sowing operations, sowing, one or two weedings, and harvesting. The relatively lower employment on mines in rainy season indicated that during this season the workers worked on their farms. Conventionally, (probably on the basis of a directive from the Portuguese government) the mines were required to discontinue their operations at least for two months in June and July when there was peak demand for labour in agriculture, so that the pull which the mines generally exerted on cultivators and labourers would not operate and agriculture would not suffer due to shortage of labour. Another factor which acted in favour of cultivation was that during the months of June, July, and August, almost all transport activity came to a stand-still because of heavy rains, and only unearthing of the iron-ore was carried on. This diverted the cultivator-mine labourers to cultivation, which being tenant-farming, also acted as a sort of compulsion, otherwise land-owners would have taken back the land from them. The relatively lower period of employment of women on mines during the rainy season also indicated their engagement, among other things, on the fields cultivated by their families. The harvesting operations started in the late September and early October, and during this period the cultivators would not work on mines. The almost complete absence in the rainy season of both male and female labour on mines from Cudnem was partly because of the availability of less strenuous work in cashew factory.

Table 14.3 : Average days of employment per nine worker in the mines, according to seasons

Village	No. of mine labourers per family		Average days of employment per labourer in							
			Rainy Season		Winter		Summer		Total	
			M	F	M	F	M	F	M	F
Bati	1.0	0.5	45.6	41.9	43.5	48.7	51.7	56.9	140.8	147.5
Sancordem	1.2	0.5	63.5	22.8	55.0	31.8	105.2	97.1	223.7	151.7
Cudnem	1.6	1.4	1.3	-	67.7	67.8	77.1	78.0	146.1	145.8
Cavarem-Mina	0.7	1.0	54.0	56.8	62.0	74.0	76.7	98.8	192.7	229.6
Pale	1.1	-	89.7	-	44.8	-	53.2	-	187.7	-
Total	1.2	0.7	38.0	13.6	58.0	57.2	78.3	78.6	174.3	149.4

M = Male F = Female

It probably indicated in addition, as also the absence of female labour from Pale, relatively more attention to cultivation in this area than in other mine areas. This point, however, could not be substantiated in the absence of relevant comparable data.

The villagewise data of employment on mines are presented for selected families in different groups of cultivated holding in table 14.4. The data showed, firstly, that among higher groups of cultivators both males and females worked on mines for comparatively fewer days. Secondly, it showed that women from higher groups of cultivators did not seem to have worked on mines as much as those from lower groups of cultivators have done. The participation rate of the females, i.e., the number of working females per 100 workers, was more than 37 among the cultivators cultivating upto 4 acres of land, while for cultivators cultivating more than 4 acres the participation rate went down to 33, and was almost nil for those who cultivated more than 5½ acres. This was because large cultivated holdings required relatively more attention, and this, to a certain extent, was reflected in fewer days of work on mines by male and female members of these families. Generally, the data showed that in different mining regions the availability of work on mines did not result in the complete neglect of cultivation on the part of those cultivators who worked on mines. There was, however, the possibility of inadequate attention being paid to particular operations of cultivation, also of leaving altogether marginal cultivation, by the cultivators engaged in mining labour. These points are discussed in paragraph 18.

Wage Rates :

The type of work on mines in which these workers were engaged consisted mainly of crushing the ore and carrying it to the trucks. Though the work was of the same type at different places, the wage rates received by these workers were different and depended mainly on the demand for and the supply of labour in the particular region. The statement below shows the average daily wages received by the male and female workers in mines as well as in agriculture, in and nearby the villages selected for study.

Village	Average wage rate per day (in Rs.)			
	Mine labour		Agricultural labour	
	Male	Female	Male	Female
Bati	2.64	2.00	2.25	1.50
Sancordem	3.10	2.12	2.50	1.75
Cudnem	3.00	1.75	3.00	1.75
Cavarem-Mina	3.18	1.83	N.A.	N.A.
Pale	3.37	N.A.	N.A.	N.A.

Relatively high wages seemed to be prevailing both for mine labour as well as for agricultural labour at Sancordem and Cudnem. Though relevant data of agricultural wages at Pale and Cavarem-Mina were not available it was understood reportedly that the agricultural wages at these places were also high. In fact, these villages represented the highly concentrated mining areas in Bicholim, Sanguem, and the north-eastern part

Table 14.4 : Average days of employment per mine-worker (Males and Females) according to the size of cultivated holding

Cultivated holding (Acres & Gunthas)	Bati		Sancordem		Cudnem	
	M	F	M	F	M	F
0.0 - 0.20	203.0	157.5	216.5	156.0	170.8	164.6
0.21- 1.00	131.7	160.0	228.5	142.5	148.6	150.2
1.01- 1.20	80.0	80.0	225.4	168.0	173.4	168.4
1.21- 2.00	35.0	200.0	247.4	172.0	180.2	179.6
2.01- 2.20	167.8	190.0	217.5	153.0	138.6	138.7
2.21- 3.00	130.0	160.0	237.7	155.7	138.7	156.0
3.01- 3.20	60.0	-	208.0	170.0	208.0	52.0
3.21- 4.00	160.0	-	139.0	102.0	69.3	78.0
4.01- 4.20	163.3	-	145.0	-	52.0	52.0
4.21- 5.00	-	-	-	-	52.0	52.0
5.01- 5.20	112.5	80.0	-	-	-	-
5.21- 6.00	74.0	-	-	-	-	-
Total	140.8	147.5	223.7	151.7	146.1	145.8

of Quepem talukas. This region, covering the talukas of Goa, Salcete, Marmugao, most of Quepem, Ponda, Bicholim, and parts of Bardez and Sanguem, with its development of mining and, as a consequence, of other secondary sectors like trade, transport, engineering, and communications, formed a high wage zone as compared to the remaining parts of Goa. The following statement on the next page illustrates this point further, to a certain extent. Broadly, it shows the level of wages received in agricultural labour at different centres which were selected for our socio-economic study. It could be seen that the villages where high wages prevailed, those in Salcete, Ponda, Marmugao, Bicholim and Quepem talukas, were marked by the availability of various alternative occupations, and hence a high demand for labour, whereas the villages in Satari and Cancona talukas, Nagargao and Gaodongre respectively, which showed relatively low wage levels, represented an underdeveloped, neglected, and interior region. These latter villages had more than 92 percent of their population engaged in cultivation/and/or agricultural labour, and alternative occupations like mining labour or fishing were not available to them.

Statement showing rates of agricultural wages at different selected Centres

Village(taluka)	Level of daily wages in agricultural labour labour (in Rs.)	
	Male	Female
Verem (Ponda)	2.50	1.50
Marcaim (Ponda)	2.75	2.00
Velim (Salcete)	3.00	2.50
Loutulim(Salcete)	2.75	1.50
Aroshim (Marmugao)	3.75	1.50
Cudnem(Bicholim)	3.00	1.75
Balli (Quepem)	3.50	1.50
Morgim (Pernem)	2.50	1.50
Sancordem(Sanguem)	2.50	1.75
Bati (Sanguem)	2.25	1.50
Nagargao(Satari)	2.00	N.A.
Gaodongre(Canacona)	1.75	1.00
Kalanhute(Bardez)	2.50	1.50

The impact of the development of mining industry could also be seen from the following statement of the simple index numbers of farmers' wages from 1957 to 1961 with 1933-34 as base :

Type of Work	1957	1958	1959	1960	1961
Ploughing	405	410	416	316	308
Digging and Sowing	428	431	397	319	308
Harvesting	386	386	381	303	303

(Source : Statistical Year Book of Goa, Daman and Diu, 1961)

Though earlier data were not available, it seemed that upto 1959 agricultural wage rates were almost at their peak level, and then began to come down. During this period, because of the large export demand, mining activity expanded very rapidly. In addition, migratory labour from India stopped as a result

of the complete blockade of the territory. Due to this, demand for labour in mining increased, thereby bringing pressure on agricultural labour, and consequent rise in agricultural wages. The fall in wage rates in 1960 and 1961 could not be explained fully in the absence of relevant data. But it might have been due to one or more of the following reasons. Some of the mines started mechanized or semi-mechanized operations, thereby releasing some labour, at least some of which, particularly the small cultivators, must have reverted to agricultural work. Similarly, as a result of blockade the prices of arecanut went down and cultivators found it uneconomic to pay enough attention to production. The exports of arecanut went down from about 2.0 lakh kgs. in 1954 to 0.9 lakh kgs. in 1955. Though they achieved the 1954 level during subsequent years, they never reached, except in 1956, the 1950 or 1951 level. This indicated, to a certain extent, lack of sufficient attention to production, due to fall in prices. Consequently, some labour must have been released from arecanut cultivation. Again, as a result of blockade the imports of rice from India were stopped and the former Govt. of Goa was required to import it from outside. These large imports brought down the price of rice, reportedly, to such a level that probably the cultivation of paddy with the existing wage level became almost uneconomical, consequently reducing the demand for labour and thereby wages. It seemed that since 1961 the agricultural wages have remained more or less at the same level, i.e., more than three times the pre-war level.

Summary

The discussion so far has indicated the following points:

(i) That more than 60 percent of the cultivator families in the villages around the areas where mining activity was concentrated were engaged in mine labour either as main or subsidiary family occupation;

(ii) That on an average two persons out of every family of five members worked on mines;

(iii) That in spite of higher wages on mines, almost all cultivator-mine labourers have worked on their fields during the agricultural season.

(iv) That the mining industry, with the development of its associated activities like trade, transport, communications, and engineering, affected the wage levels in the areas excluding the talukas of Pernem, Canacona, and parts of Satari, Sanguem and Quepem which have remained undeveloped, and neglected; and

(v) That the rapid expansion of mining industry affected agriculture, in that by offering higher wages it exerted considerable pull on agricultural labour in the surrounding areas, thereby causing a steep rise in the agricultural wages which, probably made it difficult for cultivators to properly cultivate their fields.

Effects of mining activity on agriculture

It has been stated above that most of the cultivator-mine labourers worked on their fields during the agricultural season. But a complaint was persistently made that as a result of mining activity many cultivators have abandoned cultivation. This referred mainly to three types of cases: (i) cultivation

being stopped as a result of overburdens being directly dumped on cultivated land; (ii) cultivated land being abandoned because earth from overburdens, which contained a small amount of iron ore, was carried to the low-lying fields during rainy season, thereby making the land slowly uncultivable; and (iii) cultivation being abandoned because of persistent shortage, and high wages, of agricultural labour.

Damage to cultivated land

During our investigation we tried to obtain information on these points. The data collected showed that out of 169 families only 2 families reported that because of overburdens being dumped on the fields they had to stop cultivation. Both of them were tenant cultivators, and the land which they cultivated was purchased by the mining companies from the owners of the land. The land lost in this way amounted to not more than 2 percent of the total cultivated area. It would, however, be highly misleading to conclude that only a very small portion of the cultivated land was affected in this way, because the incidence of such cases depended mainly on the distance between the mine and the cultivated land. The nearest lands were first lost to this purpose. It was, therefore, quite likely that in some areas which we were not able to cover, the incidence of such cases might be heavy. For example, in Pale area the cultivated lands were so near the mining area that, in addition to polluted water damaging the fields, very often some of the fields got covered with small stones containing iron ore as a result of constant blasting operations. However, in the absence of sufficient detailed data, the number of cultivators and the extent of area affected in this way could not be estimated.

The mine owners, whenever they wanted to purchase any land for utilization in the industry, settled its price with the owners and paid it. Realising that such a transaction deprived the land owners of their permanent asset, though they received full compensation in the form of cash, some of the mine owners advised them about the avenues of profitable investment and helped them to establish themselves on a sort of permanent basis. About land owners, therefore, the situation did not present any difficult problems. It was with respect to the cultivators and the actual land lost that the problem assumed importance. Since almost 70 percent of the land was leased out for cultivation, the transaction of sale and purchase of land between the land owner and the mine owner affected, in the majority of the cases, the cultivator who was almost invariably a tenant. After the sale of the land, the tenant who cultivated it was automatically displaced. Under these circumstances he had noway out except to work as a labourer, preferably on mines. Till the enactment of the Goa, Daman and Diu Agricultural Tenancy Act, 1964, the tenants had no rights at all. They could be evicted at the pleasure of the landlord. However, the situation has changed, to a certain extent, since December 1964, when the Act came into force. Now, before such a transaction is entered into, the landlord is required to resume the land for himself. Regarding the actual land lost in this process the authorities had to see that wherever possible, such land should not go under overburdens, taking, however, into account the possibilities of the best utilization of such lands as between agriculture and mining industry.

In our investigations we came across cases where the respondents reported that due to the earth from overburdens, which contained a small amount of iron ore, being carried to

their fields during rainy season, the productivity of land was going down slowly but perceptibly. It was reported that the iron ore contained in the earth made the soils progressively less and less fertile. Government were aware of this situation and measures were being taken to divert such water, which brought down the overburdens, away from the cultivated land, and also to compensate the cultivator for any loss suffered by him because of this. The diversion of such polluted water away from the cultivated land was easier than the determination of the loss suffered by the cultivator due to this and the compensation to be paid to him. The Government were contemplating to raise a fund through levy on mine owners out of which such losses could be made good. The difficulty, however, was that of such cases coming to the notice of the Government in time so that suitable action could be taken to stop the deterioration of cultivated land. Cultivators were unaware of the Government efforts and were reluctant to push forward their claims. In one village we came across twelve cases of this type, but only one of them had, reportedly approached to the authorities for redress. The proper action in this respect would be an initiative on the part of the authorities to estimate the damage caused in this way and to take necessary action in time.

Shortage of labour :

Elsewhere it has been stated that consequent to the availability of jobs in mining industry at higher wages the agricultural wages also rose, and the cultivators found it difficult to obtain labour for agricultural operations. This shortage of labour, however, did not result in cultivators altogether leaving cultivation in favour of mining labour. The possibility was that of inadequate attention being paid to particular essential operations of cultivation, and also that of marginal cultivation being altogether abandoned. As regards former we had no relevant data of operationwise inputs of labour by these families and resultant production before and after they started working on mines. It was only in our discussions that cultivators and knowledgeable persons reported that due to shortage of labour they could not execute the various operations efficiently, and that this was definitely affecting production. As regards the latter possibility, however, a few cases came to our notice in our investigation where the cultivators had reduced cultivation specifically because of shortage of labour. Three cultivators in Sancordem, all tenant cultivators, reduced their cultivated land by 9 acres, because labour could not be obtained for carrying out certain operations. Similarly, one cultivator in Sancordem and eleven in Bati reduced their Kumri or shifting cultivation. But this was more because of the attraction of higher wages in mining than because of the non-availability of labour.

Pattern of Expenditure :

On an average every cultivator-mine labour family received an annual income of about Rs.900 from labour in mines. This formed about 71 percent of their total income, indicating a substantial annual addition to their earnings since the mining industry began operating. It was expected that in addition to the regular family expenditure, like food, clothing, education, etc., a part of these earnings would be utilized for capital formation, especially in agriculture since these families were initially cultivators. Data were collected regarding their expenditure on some important items, and these are presented in table 14.5. However, considering the response obtained to the

Table 14.5 : Expenditure pattern of selected mine-labour families on some items other than food

Village	Clothes		Education		Durable goods		Marriage and other ceremonies		Travelling		Purchase of Ornaments		Purchase of Livestock	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Bati	31	85.16	10	11.50	-	-	-	-	-	-	-	-	-	-
Sancordem	41	140.49	7	300.00	10	247.50	15	599.67	-	-	2	265.00	8	234.37
Cudnem	51	107.39	-	-	-	-	-	-	-	-	-	-	-	-
Cavarem-Mina	16	129.06	2	40.00	9	55.56	5	700.00	8	90.62	8	88.25	-	-
Pale	21	107.62	-	-	-	-	4	575.00	-	-	6	650.00	-	-
Total	160	113.69	19	120.79	19	156.68	24	528.86	8	90.62	16	320.00	8	234.37

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(continued)

Table 14.5 (continued)

Village	Repairs carried on to								Construction of new houses	Repayment of debt		
	Residential houses		Cattlesheds		Wells		Bunds					
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)				(1)
Bati	-	-	-	-	-	-	-	-	3	583.30	-	-
Sancordem	18	263.89	1	75.00	2	65.00	2	100.00	-	-	-	-
Cudnem	-	-	-	-	-	-	-	-	-	-	-	-
Cavarem-Mina	20	38.25	-	-	-	-	4	51.25	-	-	2	107.50
Pale	11	163.64	-	-	-	-	-	-	-	-	-	-
Total	49	186.45	1	75.00	2	65.00	6	67.50	3	583.30	2	107.50

Note: (1) Number of reporting families; (2) Expenditure per reporting family in rupees.

questions in this respect, these data give only a broad picture of the pattern of expenditure on specific items. The most important item of expenditure reported by almost all the families was clothing, with an expenditure of about Rs.114 per reporting family. Next in order were items like repairs to residential houses, marriage and other ceremonies, education, durable goods like bicycles and furniture, and purchase of ornaments. Capital formation as such which included all types of new construction with reference to agricultural and non-agricultural occupations, was almost nil. The only item which could be included under capital formation was construction of new residential houses which was reported by only 3 families in Bati, with an average expenditure of about Rs.583. A few families in Sancordem used part of their savings for purchase of livestock, and repairs to cattle-sheds, wells and bunds. But excluding the purchase of livestock, the number of such families and the amount spent by them was very small. Livestock was purchased by about 18 percent of the cultivator-mine labour families in this village, with an average expenditure of about Rs.234 per family. The data showed that it was only in Sancordem that these cultivator-mine labourers have utilized their savings, though to a very small extent, for the purpose of agricultural development. Such a tendency was not observed either in Bati or in Cudnem. This might be because the number of cultivators who cultivated their owned land was proportionately more in Sancordem, about 43 percent of the total number of cultivators, than in Bati, about 15 percent, or in Cudnem, less than 3 percent. Naturally, the owner cultivators, being the owners of the land, had relatively more incentive than the tenant cultivators to spend on improvements. In Cavarem-Mina also some cultivator-mine labourers used some of their savings for repairs to bunds. But since the sample in Cavarem-Mina and Pale did not represent the cultivator-mine labourers of the villages, nothing definite could be said about the utilization of their savings for the purpose of improving their cultivation. Broadly, however, it could be stated that the cultivator-mine labourers utilized their savings more for purchase of clothes, durable goods, and ornaments, on education, marriage and other ceremonies, and on repairs to residential houses, than on regular capital formation, in the sense of new construction in agricultural and non-agricultural occupations, and residential houses.

Summary and Conclusion :

To summarize briefly, in the areas where concentrated mining activity was being carried on, agriculture was affected in two ways. Firstly, cultivated land was being damaged due to (i) overburdens being directly dumped on it, and (ii) overburdens containing iron ore being carried by rain water to low-lying lands, thereby making them slowly, but progressively uncultivable. Secondly, the high wages in mining exerted a considerable pull on labour in the surrounding areas, thereby affecting agricultural wages, as a result of which (i) some tenant cultivators had to reduce cultivation, and (ii) majority of the cultivator-mine labourers, it was reported, had to carry out agricultural operations without the help of hired labour, which affected the efficiency of operations and hence production. However, our data were not enough to estimate the actual land and the number of cultivators affected in this way, as also to judge broadly the extent to which the production had gone down. It was also reported, on the other hand, that cultivators did not neglect cultivation, nor the efficiency of the agricultural operations was affected by the shortage of labour.

In a predominantly agricultural economy, the operation and the rapid expansion of large scale mining activity was bound to raise wage levels and divert part of population engaged in agriculture to mining. On the one hand, this would reduce pressure on agriculture, but on the other hand, would create problems which, if not considered and attended to in time, might lead to serious maladjustments in the economy. In Goa, so far as agriculture was concerned, this rapid expansion of mining activity since 1954, created problems of adjustment in respect of individual cultivators, as also in respect of the total development of the territory. So far as individual cultivators were concerned, we have seen that majority of those affected by mining operations, such as dumping of overburdens, were tenants, and fell within the group of medium and small cultivators. The solution to their problems would have to be thought on the lines of proper land reforms and suitable organizations for efficient production. The former Government of Goa did not pay any attention to their problems. It was only after liberation that serious thought was given to them. With the enactment of the Goa, Daman and Diu Agricultural Tenancy Act, 1964, some beginning was made in this direction, but much would depend on its efficient execution. The organizational aspect of small and medium cultivators, however, has not received attention so far. The pressure of mining activity on labour would go on increasing, and shortage of labour in agriculture would be more and more acute. If the cultivators in the affected areas could be brought together so that they could use labour saving methods efficiently, the maladjustments would be definitely minimized. In respect of the total development of the territory, it seemed that as a result of the establishment of mining industry considerable impetus was received for the development of secondary activities like trade, transport, communications, and engineering. And since the movement of the product was towards the coast, all these activities developed between the coast and the mining areas, thus covering the talukas of Goa, Salcete, Bardez, Ponda, Marmugoa, Bicholim and parts of Satari, Sanguem, and Quepem. This rapid spurt in the mining and other allied activities in these talukas has affected the sectoral as also the regional development. Sectoral, because even in these talukas only the mining and associated activities developed, whereas agriculture, animal husbandry, fishing, and forestry have relatively lagged behind. Regional, because the talukas which lie outside the influence of mining activity i.e., the talukas of Pernem, Canacona, and large parts of Satari and Sanguem have remained undeveloped in respect of almost all the sectors of development. The situation, therefore, indicated, prima facie, the existence of a dual economy, and hence, during the plan periods, the lagging sectors and regions would have to be given more attention, if this lop-sided development was to be arrested and corrected.