

REPORT
BY
THE INTER-DEPARTMENTAL
TEAM
ON
ACCELERATED
DEVELOPMENT PROGRAMME
FOR
ANDAMAN AND NICOBAR
ISLANDS



GOVERNMENT OF INDIA
MINISTRY OF REHABILITATION
December 1965

REPORT
BY
THE INTER-DEPARTMENTAL TEAM
ON
ACCELERATED DEVELOPMENT
PROGRAMME
FOR
ANDAMAN AND NICOBAR ISLANDS

GOVERNMENT OF INDIA
MINISTRY OF REHABILITATION

CONTENTS

CHAPTER		PAGES
I	Introduction	1
II	Background Information	5
III	The Strategy of Development	13
IV	Agriculture (including Horticulture and Plantations)	36
V	Animal Husbandry	56
VI	Forests	63
VII	Industry	73
VIII	Fisheries	90
IX	Water --For Irrigation, Drinking & Power	98
X	Transport	103
XI	Health	109
XII	Colonisation	113
XIII	Manpower	119
XIV	Area Project—Little Andaman	123
XV	Summary of main conclusions	141
ANNEXURE		
I	Team's Itinerary	152
II	Mangrove Reclamation—A Project Outline	153

CHAPTER I

INTRODUCTION

Special Area Development Programme

At the time of its reconstitution in 1964, the Ministry of Rehabilitation was made responsible for development of "such special areas as may be indicated by the Prime Minister from time to time". The "special areas" referred to are those areas of the country where for climatic, geographical or other reasons, economic and social development has been retarded and which though sparsely populated are richly endowed with natural resources. As a natural consequence of a programme of accelerated development, the employment potential of these areas would expand and employment opportunities would be available, not only for the existing population but also for the new settlers.

2. The first "special area" to be notified is the Andaman and Nicobar Islands which are considered to be eminently suitable for integrated resource development, and for the rehabilitation of migrants from East Pakistan.

Setting up of an Inter-Departmental Team

3. An Inter-Departmental Team consisting of officers representing the Planning Commission and the Ministries concerned with the important facets of development was constituted by the Ministry of Rehabilitation. The team consists of :—

1. Shri L. J. Johnson, Convenor
Additional Secretary,
Ministry of Rehabilitation.
2. Shri P. P. I. Vaidyanathan,
Adviser (Programme Administration) and ex-officio Additional Secretary,
Planning Commission.
3. Shri A. D. Pande,
Joint Secretary,
Ministry of Home Affairs.
4. Shri D. J. Madan,
Joint Secretary,
Ministry of Finance.
5. Shri Hari Singh,
Inspector-General of Forests,
Department of Agriculture,
Ministry of Food & Agriculture.
6. Shri Baleshwer Nath,
Member (Minor Irrigation) COPP
Planning Commission.
7. Shri N. Sen,
Planning Officer,
Ministry of Transport (Roads Wing)

8. Shri D. L. Deshmukh,
Director (Development),
Ministry of Transport.
9. Shri J. S. Matharu,
Development Officer (Timber),
Directorate General of Technical Development,
Ministry of Industry & Supply.
10. Shri K. T. Jacob,
Director of Research,
Central Rubber Board,
Ministry of Commerce.
11. Dr. P. R. Dutt,
Asstt. Director General of Health Services,
Ministry of Health.
12. Shri G. N. Mitra,
Fisheries Development Adviser,
Ministry of Food & Agriculture.
13. Dr. A. K. Dutt,
Agriculture Adviser,
Ministry of Rehabilitation.
14. Shri K. N. Butani, Member-Secretary
Deputy Secretary,
Ministry of Rehabilitation.

Terms of Reference

4. The Team was asked :

- (i) To draw up an integrated resource development plan for the Islands particularly for the purpose of rehabilitating migrants from East Pakistan and, in the light thereof, to indicate the programme that may be undertaken to supplement the schemes included in the Fourth Plan in respect of Islands; and
- (ii) To assess and recommend immediate implementation of selected projects incorporated in the full development programme of the Islands.

The Programme of visit to the Islands

5. The Team held its first meeting on the 27th July, 1964, and studied whatever available information existed in regard to the natural resources of the Islands and their potential for development. At this meeting, the Chief Commissioner of the Andaman Islands was present. It was decided that the Team should visit the Islands and hold discussions with the local officers, and should, thereafter, prepare an out-line plan for the integrated resource development of the Islands. Between the 5th and the 20th February, 1965 the following members of the Team visited the Islands :

1. Shri L. J. Johnson,
Additional Secretary,
Ministry of Rehabilitation.

2. Shri P. P. I. Vaidyanathan,
Adviser (Programme Administration and ex-officio Additional Secretary,
Planning Commission.
3. Shri D. J. Madan,
Joint Secretary,
Ministry of Finance.
4. Shri N. Sen,
Planning Officer,
Ministry of Transport (Roads Wing).
5. Shri J. S. Matharu,
Development Officer (Timber),
Directorate General of Technical Development,
Ministry of Industry & Supply.
6. Dr. P. R. Dutt,
Asstt. Director-General of Health Services,
Ministry of Health.
7. Shri G. N. Mitra,
Fisheries Development Adviser,
Ministry of Food & Agriculture.
8. Dr. A. K. Dutt,
Agriculture Adviser,
Ministry of Rehabilitation.
9. Shri K. N. Butani,
Deputy Secretary,
Ministry of Rehabilitation.

6. All the others except Shri Hari Singh, had separately visited the Islands a short while earlier. Shri Hari Singh visited the Islands during the week following the conclusion of the Team's itinerary. Thus, all the members have visited the Islands and have acquainted themselves with the conditions obtaining there.

7. The Team visited the North Andaman, South Andaman, Middle Andaman, Little Andaman, Interview, Long, Havelock and Neil Islands in the Andaman group and Car Nicobar, Katchal, Camorta and Nancowrie in the Nicobar group of Islands. The details of the Team's itinerary are given in Annexure I.

8. The Team held discussions with the Chief Commissioner, with local officers, and with members of the Chief Commissioner's Advisory Committee. The expert members of the team also had individual discussions with their counterparts in the Andaman Administration. Based on personal observation, discussions with the local officers and a study of the available material, each member of the Team prepared a draft paper relating to his subject. These papers were discussed by the Team as a whole and form the basis of this report.

9. It must be explicitly stated that this report does not present a blue-print for the development programmes recommended for inclusion in the Special Area Development Programme for the Islands. The preparation of a blue-print would necessarily be the second stage in this exercise. What this report does attempt to present is a fairly detailed picture of the resource development potential of these

Islands and the programmes which can be planned to exploit this potential. On the basis of the material now available in the report it should be possible to prepare more detailed project reports in regard to specific items of development, and to bring the necessary administrative and technical machinery to implement the full programme of development. Further study will also be necessary to gauge the full extent of the expenditure involved in the programme.

10. The report also does not cover the programmes proposed by the Andaman Administration for inclusion in their Fourth Plan. These programmes are based on the normal pace of development which had been visualised for the Islands in the light of past performance. The programmes included in this report are intended to supplement those planned by the local Administration in their Fourth Plan, so as to ensure the accelerated exploitation of the rich resources of the Islands. In regard to detail it is possible that there may be some overlapping, mainly in those fields where the scale of development is more ambitious than what has been envisaged by the Andaman Administration for the Fourth Plan period.

11. The Team wishes to place on record its gratitude to the Chief Commissioner and his officers who assisted the Team in its work and who placed their knowledge and experience of the Islands at the disposal of the Team.

CHAPTER II

BACKGROUND INFORMATION

Latitude, Longitude

12. The Andaman and Nicobar Islands running North-South between 6° and 14° of North latitude and 92° to 94° East longitude, form the most isolated part of the Indian Union. The Islands lie in a long and narrow broken chain as part of a continuous ridge from cape Negrais in Burma through the Preparis and Coco islands to the Andamans and continue further south to the Nicobars and Sumatra. The dreaded 10° channel which is 90 miles wide and 400 fathoms deep separates the Andamans and Nicobars from each other.

13. The Andaman group has at the extreme north, Land Fall island followed by the three main islands—North Andaman, Middle Andaman and South Andaman—all of them being separated from each other by shallow seas. This area is known as Great Andaman. Further south, at a distance of 40 miles from South Andaman, lies Little Andaman. Besides these, here are numerous large and small islands making up a total of 204 islands in the group; many of them are very small in size and of no practical significance.

14. The Nicobar group extends from 6° to 10° North latitude. The northern-most island is Car Nicobar which lies 75 miles to the south of Little Andaman, and the southern-most island is Great Nicobar barely 91 miles from Sumatra. The Nicobar group comprises 19 islands of which 12 are inhabited, the more important of these being Great Nicobar, Little Nicobar, Car Nicobar, Chowra, Teresa, Nancowrie and Katchal.

15. The two groups of Islands abound in tropical forest and rich natural vegetation, and have a mild but humid climate. The Andamans are generally hilly but suffer from a shortage of water. The forests contain enormous quantities of commercial timber including the valuable Padauk and Garjan. Of the Nicobar islands, the smaller islands are largely flat or gently undulating while Great Nicobar is extremely hilly. The Nicobars are much better off for fresh-water than the Andamans and in these islands the economy depends on coconut and arecanut plantations. The aboriginal inhabitants of the Andamans are extremely primitive while the aboriginal inhabitants of the Nicobars are reasonably advanced and progressive.

Area

16. The total area of two groups of the islands is taken to be 3,215 sq. miles of which Andamans with 2,461 sq. miles account for 78% of the land area. The Andaman group stretches over 290 miles in length and has a maximum width of 32 miles, the average width being only 15 miles. The Nicobar Islands are 161 miles in length and 35.6 miles in width. In the Andaman group, the biggest island in terms of area is Middle Andaman covering 592.9 sq. miles. The smallest island is Ross covering only 0.3 sq. miles. In the Nicobar

group, the Great Nicobar has the largest area i.e. *403.3 sq. miles while the other islands cover less than 100 sq. miles. The smallest island in this group is Polu Millo covering only 0.5 sq. miles. The following table gives the area and population of the main islands in the two groups :—

Name of island	Area in sq. miles	Population
A. Andaman Group	2,416.0	48,985
1. North Andaman	531.3	6,797
2. Smith	9.5	119
3. Interview	51.5	183
4. Middle Andaman	592.9	10,227
5. Prolob	5.0	247
6. Long Island	6.9	562
7. South Andaman (including Viper & Chatham)	520.4	29,045
8. North Passage	8.5	46
9. Baratang	115.0	720
10. Havelock	44.0	879
11. Ross	0.3	20
12. Little Andaman	282.4	140
B. Nicobar Group	754.0	14,563
1. Car Nicobar	49.0	9,879
2. Chowra	3.2	1,233
3. Teressa	39.1	547
4. Bomboka	5.2	43
5. Katchal	67.3	904
6. Camorta	72.6	795
7. Trinkat	14.0	116
8. Nancowrie	25.8	539
9. Polu Millo	0.5	40
10. Little Nicobar	61.4	180
11. Kondul	1.8	82
12. Great Nicobar	403.3	203

Topography

17. The topography of the Andaman Islands is characterised by low ranges of hills enclosing narrow valleys, and leaving narrow coastal stretches. At places the hills go down to the water edge and indicate that the islands form part of a submerged mountain range. The general direction of the hills in the islands are north to south with ridges and spurs striking out in other directions. Generally speaking, the hills on the eastern side of the islands are somewhat higher than those on the west—the highest point being Saddle Peak, 2,400' above sea level. Except for Little Andaman and Interview Islands which are more or less flat, the other islands in the Andamans group have very little flat land.

18. The topography of the smaller islands in the Nicobar group is largely flat or gently undulating. However, the topography in

*This is the latest figure received by the Andamans Administration from the Surveyor-General. Earlier estimate was about 330 sq. miles.

Little Nicobar and Great Nicobar is akin to that of the Middle Andamans and these islands are characterised by steep ridges and valleys of varying width with more or less perennial streams and rivers.

Geology

19. In the Andamans the important rock formations are of sedimentary origin and are known as the Port Blair and the Archipelago series. With these are associated mesozoic basic and ultra basic igneous intrusions and volcanic rocks represented by basalts and serpentinites and minor occurrences of peridotite, dunite, and gabbro, etc. Red siliceous chert occurs as common inclusion in them. The Port Blair series consists principally of non-calcareous gray sandstones and embedded shales with occasional pockets of poor coal, conglomerates and pale-grey limestone. The Archipelago series consists mainly of limestones and calcareous sandstone. The Port Blair series is older than the Archipelago series.

20. The area around Mayabundar is underlain by strata of Port Blair series. The strata in this area consist generally of coarser materials than in the South Andaman Island. Cream-coloured porous limestones and calcareous sandstones are found to a large extent in Long Island. The North Andaman consist of cretaceous intrusions. In Interview Island, the principal rock formations are limestones. In Little Andaman the predominant rock formations are various types of limestones. Metamorphic and intrusive basic and ultrabasic rocks belonging to serpentine series—olivine, jasper and quartzite are also met with. Sandstones and shales of the Port Blair series are also come across.

21. The Nicobar Islands form part of the outer non-volcanic arc islands which extend from Sumatra to Araken. Car Nicobar is the northern-most island of the Nicobar group. The rocks which constitute the island are of tertiary and recent age. White, porous coral and shell limestone cover the greater part of the island. The sequence of the rocks in the island is as follows :—

Recent : Beach and Clay, swamp clay, and coral reefs.

Tertiary: White, porous coral and shell limestone.

Grey hard clay.

Shell limestone and massive and buff coloured sandstone.

Greenish grey limestone.

22. The principal rock of Noncowrie and Camorta is serpentine; other parts of the Island contain sandstone. The hills of Katchal are composed of calcareous sandstone and marble slate. The predominant rock formation of Little Nicobar is micaceous sandstone. In Great Nicobar soft micaceous sandstone is the principal rock. The recent deposits in and around the coasts of the Nicobar group of islands are white, porous coral and shell limestone.

Climate

23. The climate of these islands is of the tropical type. The islands are frequently disturbed by tropical storms and cyclones. The

islands have very little annual variation in temperature, the variation being 3° to 5° for mean minimum temperature and 4° to 7°F for mean maximum temperature. The annual maximum temperature varies from 85° to 87°F. Extremes of summer and winter are practically unknown as also frost. The relative humidity is also high, the average being 80%. The weather is always warm and very sultry, but is tempered to some extent by the pleasant sea breeze.

24. The islands receive rainfall from both the monsoons viz. south-west monsoon from May to October and north-east monsoon from November to January. The average rainfall is 120", but varies from place to place, decreasing as one goes towards the north. Both the south-west and the north-east monsoons blow with regularity from May to October and from November to January respectively. Stormy weather prevails at the beginning of the south-west monsoons and at the change of monsoons. Calm weather prevails in October and again from November to April.

25. The Nicobars have a more equable and uniform climate than the Andamans. The climate of Nicobars is said to resemble that of the Malaya Peninsula. The difference between wet and dry seasons is not very marked and the rainfall is better distributed.

26. In both the Andamans and the Nicobars, March and April are the driest months of the year and the wettest months are May to September.

Soils

27. Reports of soil survey are available on the areas colonised in Andaman Islands and also on some portions of Interview and Havelock Islands. Four distinct soil series have been identified, which have distinct morphological characteristics in the soil profiles, as described below:—

(i) **Haddo series**: include very deep well-drained soils occurring on hilly slopes under forest stands and have been derived from sedimentary rocks, mainly sandstone. The top soil is dark greyish-brown and loamy to clayey in texture. The sub-soil is yellowish brown and clayey characterised by the presence of grey mottlings.

(ii) **Ferrargung series**: include moderately deep to very well-drained soils on hill slopes under forest stands and have been derived from intrusive rocks such as serpentite. The top soil has a dark greyish-brown colour and is loamy in texture. The sub-soil is yellowish-red to reddish-brown in colour and possesses clayey loam to clay texture.

(iii) **Bajato series**: include moderately deep to deep and well drained soils on hill slopes of the forests, have been derived from argillaceous clay or clayey sandstone. The top soil is greyish-brown to brown in colour, loamy in texture and granular and friable. The sub-soil is dark greyish brown clay with yellowish and yellowish brown mottling.

(iv) **Havelock series**: include deep to very deep and well-drained soils on hill slopes and high table lands under forest stands and have usually derived from argillaceous or calcareous sandstone. The top soil is dark greyish-brown to black, clayey loam in

texture and granular. The sub-soil has a paleolive colour and is clayey in texture.

28. In the valleys there are some variations of the soil series. The soil profiles here have highly mottled sub-soil, due to the rising water table during monsoons, and the clay content increases with depth.

29. In the Middle and South Andaman the most predominant soil series is Haddo while in North Andaman Haddo-Bajato series are present in equal proportions.

30. No soil survey has been done of the Nicobar group of islands except part of Little Nicobar and Great Nicobar which was surveyed by Rajaram's team in 1960 to explore possibilities of colonisation by repatriates from Ceylon. However, the pedological factors operating in the Nicobar group of islands will be similar to those of the Andamans and the predominant influence on soil genesis will be of the climate and forests rather than of parent rocks. Hence soil series identified in Andamans are likely to be found in the Nicobar group of islands also.

31. Soils of mangrove forests are alluviums, highly fertile, and saline. The source of their salinity is due to their inundation by tidal flows.

32. Chemical analyses of the soils of virgin forests of the Andamans indicate that the soils are slightly to moderately acidic, fairly rich in organic matter and nitrogen, poor in available phosphoric acid and to some extent in potash. Because of high rainfall and heavy leaching, soils developed even from limestones have been found to be free from calcium carbonate throughout the horizons of leaching (alluvial horizon) and deposition (alluvial horizon). For the same reasons, there is absence of salts in the soil profiles and the content of soluble salt is within normal limits. High rainfall and temperature favour rapid mineralisation of organic matter and the carbon/nitrogen ratios under well-drained conditions are usually less than 10 : 1, indicating the ready availability of nitrogen to crops.

Population

33. There has been a steady growth in the population of the Andaman and Nicobar Islands except during the decade 1941—51 when for some years, the Islands were under Japanese occupation. Later, after the Government of India had re-occupied the Islands, the penal settlement there was abolished and many of the convicts were repatriated to the mainland. The population of the Islands, therefore, registered a fall. According to the 1961 census, the population was 63,548 indicating an increase of 105% over the figure for 1951. According to the latest population projections available, the present population would be about 75,000.

34. According to the 1961 census the Andaman group accounts for about 80% of the total population, of which 2/3rd is concentrated in South Andaman and the balance mostly in North and Middle Andamans. Little Andaman has a population of 140 only. The population in the Andaman group is rather heterogenous; aboriginals, ex-convicts with their local born children, officials and new

migrants from East Pakistan. The number of aboriginals is declining fast. The Onges who numbered 672 in 1901 were only 140 in 1961. They are the most friendly tribe and are living exclusively in Little Andaman. Jarawas and Sentineles are the two other notable tribes—both very hostile. Jarawas are confined to the Western parts of South and Middle Andamans. The Sentineles live in Sentinel island.

35. In the Nicobar group, the population of Car Nicobar alone accounts for 66%. Chowra, Katchal, Camorta, Teresa and Nancowrie have populations ranging from 500 to 1,200. Except for a few officials and traders, the rest of the population is Nicobarese in origin. The population can be said to have two broad divisions; the Nicobarese and the Shom-pens. The latter who are extremely primitive inhabit the high lands of Great Nicobar and their crude and primitive economy has remained virtually untouched on account of their complete isolation. There has been a rapid decline in their numbers, unlike the Nicobarese who have grown steadily in numbers.

36. The density of population taken as a whole is 22.5 per sq. mile. The distribution is, however, highly uneven. In the Andaman group, the concentration is in South Andaman, while in the Nicobar group the two small islands of Chowra and Car Nicobar account for 76%.

37. There is predominance of males in the population of the islands, there being 61.8% males as against 38.2% females. The male population has increased from 19,055 in 1951 to 39,304 in 1961, while the female population has increased from 11,916 in 1951 to 24,244 in 1961. The rate of increase in both male and female population is about the same i.e. 100%.

38. The total number of literates in these islands is 21,374 which is 33.6% as against 25.1% in 1951.

Working Force

39. The working force is 49.1% of the total population of which about 70% are males. Agriculture and allied activities absorb about 45% i.e. 14,000 of which half are cultivators and agricultural labour; the remaining half i.e. about 7,000 are engaged in forestry; fishery, hunting, plantation, livestock, mining and quarrying.

40. Other sectors such as industry, commerce, construction, transport and other services claim to employ about 55% i.e. 17,100 persons.

41. The following table gives the sector-wise break-up of the working force as per 1961 census:—

Category	Population			Percentage of total population
	Males	Females	Total	
(1)	(2)	(3)	(4)	(5)
Workers :				
1. Cultivators	5,228	1,227	6,455	10.2
2. Agricultural Labour	337	11	348	0.5

(1)	(2)	(3)	(4)	(5)
3. Mining, Quarrying, Livestock, Forestry, Fishery, Hunting & Plantations, Orchards and allied activities	6,986	307	7,293	11.5
4. Household Industry	2,047	2,612	4,659	7.3
5. Manufacturing other than household industry	1,145	59	1,204	1.9
6. Construction	5,426	16	5,442	8.7
7. Trade and Commerce	1,065	30	1,095	1.7
8. Transport, Storage and Communication	403	..	403	0.6
9. Other services	4,011	284	4,295	6.7
Total Workers	26,648	4,546	31,194	49.1
Non-Workers	12,656	19,698	32,354	50.9
Total Population	39,304	24,244	63,548	—

Agriculture

42. The greater part of the islands is under forests and it is only in the small areas of rural settlement that forests have been cleared for purposes of agriculture. Agriculture of any importance has developed only in South Andaman in the neighbourhood of Port Blair. Some areas in the North and Middle Andamans e.g. Diglipur and Rangat Valley have also been reclaimed and brought under cultivation. In the Nicobar group, there is no agricultural activity except some plantation of bananas, coconut and arecanut.

43. In South Andaman, the total area reported in 1962-63 is about 13,000 acres of which nearly 48% is under forests. About 20% of the area is still lying as culturable waste. About 30% is available for actual sowing. Area sown more than once is as little as 100 acres.

Forests

44. The Andaman Islands are one of the biggest source of high-grade woods in India. A large variety of timber is available for commercial exploitation. Padauk is the most important variety and is reckoned at par with high-grade teaks in the world market. It can be used for buildings and boats as well as for furniture. Garjan is next in importance and grows in all the forests of the islands. Other varieties which are grown in the islands include white-dhoop chuglam, papita, cane, mulberry and bamboo.

45. In the Nicobar group the important species of the Andaman forests, such as Padauk and Garjan are not found.

46. Mangrove forests along the coastal fringes cover about 230 sq. miles.

Fishery

47. There is not much scope for inland fishery in Andaman and Nicobar islands on account of the absence of perennial rivers, or canals, lakes and reservoirs.

48. The islands, however, abound in sea fish of varieties such as Tuna, Sea Perches, Sardines, Seer, Anchovies, Horse Mackerel, Prawns, Mullets, Lobsters, etc.

49. During 1963-64, 158 tons of fish were landed as against 42.7 tons during 1950-51. The total fish resources are, naturally far more than the present catch. It is estimated that if fishery in the seas around the islands is developed on scientific lines about 2,000 tons of fish can be landed per year in the near future.

Minerals and oil

50. Mineral investigations for sulphur, chromite, nickle, limestone, coal, gypsum and diatomaceous earth carried out by the Geological Survey of India during the last 4 years reveal that sulphur chromite, coal and gypsum do not occur in economically workable deposits. It is, however, believed that the islands may contain commercially exploitable deposits of the nickle group of metals and flux grade limestone.

51. Furthermore as the islands are known to belong to the same land formation group as Burma and Indonesia both of which are rich in oil, they hold out prospects of striking oil and natural gas.

Transport

52. **Sea :** At present there are two boats—MV Andaman and MV Nicobar—operating between the mainland and the islands. Inter-island transport is catered to by much smaller boats but recently Yerawa, a bigger boat has been introduced to meet the needs of all weather inter-island traffic.

53. **Air :** A weekly Dakota plane service between Calcutta and Port Blair *via* Rangoon operates for four to five winter months i.e. from November to March. Bad weather and inadequate landing facilities at Port Blair interrupt the air services even during these months.

54. **Road :** Roads have been developed in the South Andaman which with an area of 520.4 sq. miles has a road mileage of 138. The town of Port Blair has a very good pucca maccadam road system and two roads from the town run southwards. Feeder roads from different villages connect them with those roads. A trunk road between South Andaman and North Andaman is under construction. Some feeder roads taking off from this trunk road are also proposed to be constructed in the immediate future.

CHAPTER III

THE STRATEGY OF DEVELOPMENT

SECTION I—AREA DEVELOPMENT

55. A strategy of development implies the setting of long-term goals and the delineation of specific programmes as a means to achieve these goals. In respect of an Area Development Plan—such as the one with which we are concerned in Andaman & Nicobar Islands—the strategy will necessarily be different from that adopted in national plans. For one thing, it may not be feasible to set the long-term goals of an area plan in the same terms as national goals e.g. per capita consumption/income etc. Statistical information relevant to such goal setting at the area level is not easily available. For another, the constraints imposed by the necessity for balanced development need not operate at the area level where the emphasis may be on a specialised development necessitated by the specific physical resources of the area. Thirdly, the area development plan has to take note of the special conditions obtaining in the area. In the Andamans and Nicobars, for example, its insular location, and the large number of its constituent islands would dictate a much heavier share of investment in the transport sector. Also the division of the Islands into two distinct ethnic groups—the Andamans and the Nicobars—at different stages of social development may make it necessary for the strategy to be different in respect of these two groups of Islands. The strategic location of the Islands is another factor which adds an additional dimension to the development plan. It is thus necessary to plan long term developments with specific reference to the physical, economic and strategic characteristics of the area.

SECTION II—MANPOWER

56. Manpower can be taken as the starting point of all development. Economic and social development is or should be-motivated towards the betterment of the economic and social condition of man; and manpower in turn is indispensable as a factor—a vital factor—in the process of this development. It is manpower which brings the forces of material production into harmonious interplay to produce economic gains. In this respect it differs from other factors of production in the sense that it partakes of a dual character—one, as an indispensable element in the productive system, and the other, as the recipient of the fruits of production and, therefore, the focal point of all developmental activity.

57. At an area level—more especially for the Andaman and Nicobar Islands—the development of manpower may be taken as the starting point of the development programme. There is sufficient evidence to suggest that the process of social and economic development goes hand in hand with a process of upgrading of

certain characteristics of manpower. And so, alternatively, in areas where other sophisticated measures—economic or social—are not easy to obtain, these manpower characteristics may themselves be taken as objectives of development. It is not suggested that the upgrading of certain manpower characteristics will cause economic and social development. The reverse may well be argued that economic and social development will cause the development of manpower. Whatever the process, it is a fact that the two show a strong correlation.

58. These manpower characteristics, broadly stated could be:—

Numbers, in relation to area

Employment characteristics.

Educational levels.

59. Numbers: While on the mainland unutilised manpower is the nightmare of planners, in the Islands it is quite the reverse—the nightmare is the scarcity of manpower. Wherever, we turn in the Islands, we find projects having to slow down deliberately for lack of manpower. Even for un-skilled jobs manpower has to be imported from the mainland. Today, for example, the local PWD has on its rolls a force of 5,000 labourers which has been imported from the mainland.

60. The total population of the Islands, as of mid-1965, would be about 75,000. In an area of 3215 sq. miles this works out to density of about 22.5 per sq. mile. Against this the all-India average is 392. On the other hand the Islands lie in the same latitude as South India and get rain during both the South-West as well as the North-East monsoons. The annual rain-fall is 120 inches which is fairly evenly spread over the seven months from May to November. The climatic conditions, therefore, are very similar to those obtaining, for example, in Kerala where the density of population is 1,244 per sq. mile. In fact the rain-fall in the Islands is more favourable to agriculture than it is in Kerala. Because of these favourable climatic conditions thick tropical forests cover most of the Islands and it is apparent that the soil which can support such a growth should be satisfactory for agriculture. It is evident, therefore, that the land if properly and fully exploited can support a much larger population. As a first stage target, we may broadly visualise doubling the population in about 5 years—say by the end of the Fourth Plan. Thus by the end of 1971 the Islands should be able to support an additional population of about 75,000 bringing the total to 1.5 lakhs. And at the end of the Fifth Plan the population target may be 2.5 lakhs, representing an increase of 1.0 lakhs as against the increase of 0.75 lakhs targeted for the Fourth Plan. The development programme for the Islands will have to be so designed as to generate employment adequate to support this additional population.

61. Jobs: The existing ratio of workers to non-workers in the Islands is as high as 49:51. This high proportion is evidently due to the fact that, to meet the acute shortages, manpower has had to be imported from the mainland. Moreover, this manpower consists essentially of individual workers who have left their families behind

in the mainland. This has tended to increase the proportion of workers. The all-India participation rate for the labour force is about 43. For fresh injection of population into the economy of the Islands as visualised in para 60 above it will not be possible to maintain the present high ratio of workers to non-workers. This is because the growth of population envisaged in para 60 above is intended to be achieved by colonisation which will involve a certain amount of selectivity in the choice of persons to be moved to the Islands for settlement. As a general proposition, mostly families will be moved to the Islands and not individual workers. This is likely to make the percentage of workers in this additional 75,000 much less than the current percentage in the existing 75,000 persons. A part of the additional 75,000 will undoubtedly represent the natural increase in the population but the proportion of workers, for whom additional jobs will need to be created, will all the same be less than even the all-India average of about 43. In this report an estimate of this percentage at 33 $\frac{1}{3}$ is being adopted. This will mean that about 25,000 (1/3rd of 75,000) additional jobs will have to be generated during the period ending 1971. The number of additional jobs during the Fifth Plan period would similarly be about 33,000 (1/3rd of 1.0 lakhs).

62. Diversification : So much about numbers. But this would not be enough. The level of employment will need to be progressively raised to improve living standards. Underdevelopment is characterised by large employment, at no more than subsistence levels, in the primary sector of employment viz. agriculture, forestry, fishery etc. For productivity in this sector to increase, it is necessary for large numbers to be moved from agriculture and found employment in the secondary and tertiary sectors of the economy i.e. in industry, construction, etc. in the secondary sector and commerce, transport, social services, administration, etc. in the tertiary sector. This sets diversification of employment opportunities as another goal of development. At present the distribution of the working force in the Islands between these sectors is : primary 45%, secondary 36.5% and tertiary 18.5%. The corresponding all-India percentages are 72, 12 and 16. Comparatively speaking the Islands enjoy a much more favourable ratio of employment in the non-primary sectors. It may not be possible to maintain this balance because in the initial stages of an accelerated resource development programme for the Islands there will be strong forces operating to increase the share of employment in the primary sector. The present land-use pattern in the Islands and the direction of its future exploitation will tend to give a heavy bias to the opening up of virgin lands for colonisation in which agriculture, (including plantations, etc.) is bound to play a dominant role. Thus, the share of the primary sector in the additional employment will be much larger than the present proportion. A certain increase, therefore, in the overall share of the primary sector will have to be accepted as inevitable. What should be the targeted share of the employment in this sector? Having regard to the need for colonisation, the scope for reclamation of land for agriculture, and the scope for development of fisheries, an overall target of about 52.5% as the share of the primary sector as against

*The participation rate is not strictly comparable with the percentage of workers since it includes some unemployed also.

the present 45% may be possible to maintain. It will thus be necessary to ensure that at least 10,000 of the 25,000 new jobs that are to be created during the period ending 1971 are in the secondary and tertiary sectors i.e. industry, construction, transport, commerce, social services, administration, etc. The remaining 15,000 jobs will be in the primary sector i.e. agriculture (including plantations and horticulture), forestry, fishery, etc. Similar numbers for the Fifth Plan would be about 15,000 in the secondary and tertiary sectors and 18,000 in the primary sector.

63. Furthermore out of the 10,000 jobs in the non-primary sector, during the Fourth Plan period, about 50% viz. 5,000 will be in the tertiary sector and the remaining 5,000 will have to be found in the secondary sector—industry, construction, etc. Thus the percentage distribution of the working force between the three sectors at the end of the Fourth Plan period would be: Primary 52.5, Secondary 28.0 and Tertiary 19.5 as against the present distribution of Primary 45.0, Secondary 36.5 and Tertiary 18.5. The manpower implications of the various development programmes included in this report have been indicated in the corresponding chapters and these have been put together and examined in chapter XIII to ensure that the desired sectoral proportions will be achieved.

64. **Educational Characteristics:** Coming now to educational characteristics it is recognised that the progressive upgrading of employment characteristics, sectoral as well as occupational, will imply a progressive upgrading of skills and training. Educational levels can be broadly classified into four: literacy, elementary, secondary and higher level and it is necessary to aim at the optimum percentages for each of these levels. Attainment of full coverage for literacy and the elementary level is dictated by social considerations and has been enshrined in the Constitution. It also forms the basis for the attainment of higher levels. It is possible to introduce further sophistication in respect of the secondary and higher levels by further sub-dividing the former into general, vocational and the various grades of crafts-training and the latter into various categories of professional, scientific and technical manpower and by indicating broadly the targeted proportions of each. The present information in respect of the Islands however does not permit of this sophistication at this stage. Later, this may also become possible. For present purposes therefore, this goal may be accepted in qualitative terms except in so far as literacy and the elementary levels are concerned where complete coverage should be ensured. In respect of higher levels the manpower content of the programmes included in this report will be scrutinized to see that progressive upgrading of skill requirements does ensue.

SECTION III—LAND USE PATTERN—FORESTRY VS. AGRICULTURE (INCLUDING HORTICULTURE AND PLANTATIONS)

65. Land is the largest of the unexploited resources of the Islands. Adequate exploitation of land must occupy a dominant position in any accelerated resources development programme for the Islands. At present 77.8% of the area is covered with forests. On previous

occasions many surveys of the land resources of the Islands have been undertaken and conflicting recommendations have been made about a future land use pattern. One school of thought holds that the forests standing on the Islands should be the basis of all development. In its view the vegetation should not be tampered with and productive activity should be confined to the exploitation of the forest produce and its utilisation in a number of forest-based industries. The erosion of soil from lands cleared in the past has lent support to this view. It is feared that with the peculiar topography of the islands and the heavy rainfall they get, all the soil would be washed away into the sea if any more land is cleared of forests.

66. An altogether different view taken about the exploitation of land is that the forests should be cleared from all lands which are suitable for agriculture and plantations. In this view, the basis of development is the extension of agriculture, and the retention of forests would be necessary only where agriculture is not profitable. Soil erosion occurred in the past only because no measures to check this were taken. With proper and adequate soil conservation measures the hazards of soil erosion can be completely mitigated.

67. This apparent conflict between forestry and agriculture needs to be resolved and a definite policy on this issue evolved and built into the strategy of development.

68. It would appear to be unexceptionable that future land exploitation should be based on the proposition that it should produce the maximum income on a sustained basis and also enable the maximum number of persons to make a satisfactory living on the income thus generated. It is necessary to accept this and to keep these two basic objectives in view in designing the strategy of future land use.

69. A closer look at the area under forests shows that it comprises three distinct zones. First, there are the hilly regions with such gradients as would make forestry the best use of the land. Any tampering with forests here will lead to serious deterioration of the forests with adverse effects on the soil and the climate. These areas, which may form about 50 per cent of the area under forests, may be reserved for forestry.

70. Secondly, there are the large marshy stretches of mangrove forests which do not have much commercial value. From the forestry point of view there is no objection to clearing these lands and utilising them for other purposes, if it is technically and economically feasible to do so. Such areas form about 10 per cent of the area under forests.

71. Thirdly, there is the remaining 40 per cent of forests situated on lands which are either flat or gently undulating. No firm estimate of flat lands comprised in this category is available but some estimates in respect of some islands have been made on the basis of sample surveys. These lands have, generally speaking, good soil and can support both agriculture as well as valuable forests. It is really in respect of these areas that the apparent conflict between agriculture and forestry arises.

72. In one of the recent surveys it has been estimated that an elaborate forestry development programme for the islands with an

investment; of about Rs. 10 crores, though unremunerative to begin with, will yield a return varying from 10 to 20 per cent after 20 to 40 years of development. The employment immediately generated by this programme is of the order of 3000-4000 jobs. On the other hand utilisation of land for agriculture will generate income in a much shorter period of time and the employment generated from the same land would be about 40 to 50 times larger. In view of these two features of agriculture viz. much quicker returns and much larger scope for employment, there should be no hesitation in accepting that the future exploitation of these flat and undulating lands should be heavily biased towards agriculture (including plantations and horticulture).

73. It may well be asked why the land-rush witnessed in many parts of the mainland has not been repeated on the Islands. Why is it that land-hungry people have not scrambled for the land resources of the Islands? The reasons are obvious. First, people cannot reach these lands and their resources due to very inadequate transport facilities. Secondly, they cannot bring the lands quickly under cultivation because of the oppressive tropical growth which is able to defy isolated individual efforts. Thirdly, even where people are able to reclaim the land and settle down they do not like to stay because of numerous difficulties and inconveniences. In other words, the basic infra-structure—economic as well as social—necessary to support a proper development does not exist in the Islands except probably in the region around Port Blair. The infra-structure needs to be built up before the manpower needed for further development can become available. If this is done there is no reason why the pace of development should not be faster and why there should not be a land-rush as in other parts of the country.

74. Out of the flat or gently undulating forest lands mentioned in para 71, several areas are known to be fit for exploitation for other uses and can, therefore, be reclaimed. With all the land programmed for reclamation during the period ending with the Fifth Plan viz. 1976, the area under forest would still not fall below 70% from the present 77.8%.

75. It is not the suggestion that such reclaimed land should be used entirely for paddy cultivation as was done in previous reclamation schemes. Further, the exploitation of reclaimed land should be based on scientific land capability studies and only on this basis should land be apportioned between agriculture, horticulture and plantation crops. This general principle may, however, be subject to two provisos—First that sufficient land should be devoted to paddy cultivation to ensure self sufficiency of the Islands as a whole in respect of the staple food—rice. This is essential. The difficulties of population of the Islands, in the face of transport difficulties dictate such a calculated bias towards paddy cultivation. Later it should be possible, with the development of scientific agricultural practices to aim at an exportable surplus for consumption on the main-land. Secondly this principle of self-sufficiency may be extended even to larger islands such as Little Andaman, Great Nicobar, Katchal, etc. to reduce the strain on inter-Island transport. This can easily be

done, even when the best land use indicated by land capability studies is for plantation crops by following the Kerala practice of devoting small patches of the cultivable land to paddy, to the extent sufficient to produce food for local consumption. This pattern may have to give way to a more specified use of land at a later stage when inter-island transport facilities have been fully developed.

76. The following paragraphs describe briefly the areas available for reclamation.

77. **Great Andaman Group:** In the North, Middle and South Andamans, which constitute the Great Andaman Group of Islands flat or undulating land of the type described earlier is not available except some 3,000—4,000 acres in the Betapur catchment in the Middle Andaman where reclamation work has already commenced with the help of a fully mechanised unit of the Rehabilitation Reclamation Organisation. Other suitable areas in this group of islands are at present under lease for the exploitation of forest resources to a private agency—M/s P. C. Ray & Co. In these areas even exploitation of commercial forest produce has been held up on account of a long standing dispute with this firm. If this dispute is resolved larger areas would become available for exploitation. Among these areas the Interview Island deserves special mention. It comprises an area of about 51 square miles which is substantially flat and ideally suited for the development of agriculture and plantation crops. The Team had occasion to walk through some of this area and saw the highly successful efforts that had been made on a small patch of land by the Forest Department for the regeneration of timber species of great commercial value. However, further development of this Island is linked up with the resolution of the dispute with M/s. P. C. Ray & Co.

78. **Neil and Havelock Islands:** In Neil about 2,500 acres of almost totally flat land is available. The commercial timber exploitation rights have already been leased out to a private party and of the total area available about 700 acres were stated to have already been cleared. A proposal is already under consideration to utilise Neil for resettlement of ex-Servicemen. All colonisation programmes in these Islands are recommended to be co-ordinated by one agency—the Ministry of Rehabilitation—and as such the ultimate demarcation of areas for various groups of colonizers will need to be settled later. The best use of this land would appear to be for coconut and arecanut plantation. In Havelock the area reported to be available for clearance and utilisation for agricultural purposes is only a small patch of about 300 acres.

79. **Rutland Island:** This Island has been surveyed several times—in 1959 by Shri P. Mukandan Menon, in 1962 by M/s Cherian and Checko and very lately towards end of 1964 by a Rubber Board delegation led by Mr. K. T. Jacob, who is a member of the present Team. All of them reported that about 6,000 acres of land, mainly situated in the southern half of the Island are suitable for exploitation for rubber cultivation. Perennial sources of fresh water are reported to be available in the Island. A private contractor has already been awarded timber extraction rights in this Island.

80. **Little Andaman** : This is the southern-most Island of the Andaman Group. It covers a land area of about 280 square miles. The Team had occasion to walk into the forests over a distance of about 3 miles. The Island boasts of several perennial streams which with their tributaries are well distributed excluding some portions in the north. For assessment of forest resources, the Island was visited by Shri M.M. Srinivasan, former Chief Conservator of Forests and Shri J.C. Varmah, then Conservator of Forests and at present Chief Conservator of Forests, in 1960. Following this visit, a further forest survey was undertaken by a party led by Shri P. M. Sangal, Assistant Conservator of Forests early in 1962. This Island is reported to be generally flat. A net area of about 60,000 acres is recommended for clearance and utilisation for agriculture and plantation crops.

81. **Mangrove Forests** : The Islands abound in mangrove forests along their coastal fringes and creeks. The total area under such forests is reported to be about 230 square miles. As pointed out by Rehabilitation Ministry's Team in its report of 6th April, 1965, these areas hold out promise of reclamation and utilisation for paddy cultivation on the basis of similar achievements in the Sunderbans area in West Bengal. A beginning should be made with 7,000 acres during the period of the Fourth Plan which could be increased by 8,000 in the Fifth Plan period. An outline project of mangrove forest reclamation is given in Annexure II.

82. **Katchal** : This is a fairly large island in the Nicobar Group with an area of about 67 square miles. It is very sparsely populated by about 900 Nicobarese who live along the coastal fringes. About 10,000 acres of land suitable for agriculture and plantation crops are available in the centre of the Island. Clearance of timber from about 2,500 acres has already been contracted to a private party, the Hind Plantation Company which is not able to carry out the work on account of various difficulties, mainly relating to transport.

83. **Great Nicobar** : The opening up of this island needs to be taken up immediately. It is a large Island comprising an area of about 400 square miles and is the southern-most island of the Nicobar Group. Its geography adds another dimension to its development. So far nothing has been done to establish ourselves *de facto* on this Island. The Rajaram expedition of 1960 undertaken specifically to explore possibilities of colonisation and resettlement of repatriates from Ceylon recommended against colonisation on account of the costs which were then estimated as prohibitive. This party surveyed the western coast of the Great Nicobar and estimated that about 18,800 acres of land could be reclaimed. Out of this they estimated that only about 1,500 acres were fit for paddy cultivation and the rest for arecanut and coconut plantation. There are reasons which now necessitate the initiation of a development and colonisation programme in this Island. Accordingly, a phased programme of reclamation should be taken up immediately beginning with about 1,500 acres during the Fourth Plan and an additional 13,500 acres during the Fifth Plan. Any development work on this Islands as well as Little Andaman will, however, have to be preceded by the provision of landing facilities which at present do not exist.

84. The following table indicates briefly the extent of land at present known to be available for reclamation and the possible phas-

ing of the reclamation programme broadly over the Fourth and subsequent Plan periods:—

Name of the Island	Acreage to be reclaimed		
	Fourth Plan	Subsequent Plans	Total
<i>Andamans</i>			
1. Middle Andaman, Betapur Catchment	3,000	—	3,000
2. Little Andaman	18,000	42,000	60,000
3. Neil	2,500	—	2,500
4. Havelock	300	—	300
5. Rutland	2,500	3,500	6,000
6. Mangrove Forests	7,000	8,000	15,000
<i>Nicobar</i>			
7. Katchal	10,000	—	10,000
8. Great Nicobar	1,500	13,500	15,000
9. Nancowrie—Camorta-Trinket	500	14,500	15,000
	45,300	81,500	1,26,800

The phasing of this big reclamation programme have to be very carefully planned to take note of the targeted increases of population.

SECTION IV—COORDINATION OF TIMBER EXTRACTION WITH LAND CLEARANCE

85. Ordinarily, the programme of timber extraction from the areas proposed for clearance should be so organised that all commercial timber from a particular area is removed before the clearance operations commence. It may not be possible to accelerate the timber extraction operations to match the pace of land clearance which can be achieved with the existing resources of the Rehabilitation Reclamation Organisation without substantial mechanisation of timber extraction operations. This will involve foreign exchange which in the present context seems quite out of the question.

86. It is, therefore, felt that the land clearance operations may be carried on without necessarily matching these with timber extraction. The crux of the matter is in devising methods by which the timber extraction programme gets de-linked from the land clearance operations so that a lower rate of extraction of commercial timber does not necessarily slow down the pace of reclamation of land, and its utilisation for agriculture. In this connection, various alternatives have been considered, among them being the suggestion that, since in any case the method of bulk felling would not be feasible in the Andaman forests and individual felling has to be resorted to on a substantial scale, it may be possible to leave commercial trees standing in some areas. This could be achieved in two ways—either by leaving a portion of the number of commercial trees in all the areas or by leaving all commercial trees in some areas and clearing other areas completely. There are, however, some doubts about the feasibility of this procedure as the need to leave commercial trees untouched would

impose limitations on the movement and speed of tractors. However, in the opinion of the team even if the pace of reclamation is reduced a little by the adoption of this technique, and the cost thereby increases, it may still be the more profitable method to adopt, than either postponing the clearance operations till such time as the commercial timber can be extracted, or importing all the equipment needed to accelerate the timber extraction programme. It is, therefore, recommended that the proposed method should be tried out in Betapur during the current season, and that further decisions be taken in the light of results obtained. For the present, however, the reclamation programme, at least for the next two years, should not be framed on the assumption that such a suitable method would be evolved. Therefore, during the coming two years, the rate of extraction of timber with available indigenous equipment/vehicles and the utilisation of this timber should be accepted as the over-riding factor which would govern the pace of reclamation. Having regard to these considerations an island-wise programme for timber extraction, is suggested as under :—

NICOBAR GROUP

(i) **Great Nicobar** : The timber species in this island are not commercially exploitable, and no problem in regard to extraction need arise here. A small patch of land, as may be necessary for the establishment of a base camp around Campbel Bay—the area tentatively chosen for the first landing on this island—would be easy to clear manually.

(ii) **Nancowrie-Camorta-Trinket Group** : For similar reasons no problem of extraction of timber would arise here.

(iii) **Katchal** : Extraction of timber in this island need not be taken as a limiting factor, inasmuch as, if necessary, apart from limited local utilisation, the timber here could be either written off or left standing if it did not hamper utilisation of cleared land. The best land use in this area appears to be for plantations—particularly rubber. Commercial trees may, therefore, be left untouched, as rubber plantations would not necessitate clear felling of the area. Also, the pace of reclamation in this island would be much faster since even removal of stumps, etc. is not necessary if the land is to be put under rubber plantations.

ANDAMAN GROUP

(i) **Havelock** : The 300 acres available here would present no problem for reclamation. The local settlers have already volunteered to clear this area for their own requirements.

(ii) **Neil** : The 2,500 acres available here are being cleared of commercial timber by a private party M/s Kamal & Co. at the rate of 500 acres per year. About 600 acres have already been cleared and the balance is likely to be completed well within the Fourth Plan period. This area is suitable mainly for plantation/horticulture. Possibly this area could be taken up for clearance by the Rehabilitation Reclamation Organisation after Betapur has been completed. Another possibility lies in the direction of manual clearance of this area since uprooting and de-stumping will not be necessary if the land is to be put under plantations.

(iii) **Rutland**: The utilisation of timber from the 6,000 acres available here would also present no problem as the three existing industrial units in South and Middle Andamans would be able to consume it. It is understood that a proposal is already under consideration to allow the three units collectively to undertake the extraction of timber themselves.

(iv) **Middle Andaman (Betapur)**: The 3,000 acres here are under reclamation. The utilisation of commercial timber in this area would present no problem because it would feed the industrial units in Middle Andaman. To accelerate the timber extraction operations, some equipment/vehicles have been sanctioned. Some of these items are being transported to the area while others are still under order.

(v) **Little Andaman**: The total acreage visualised for clearance in this island is 60,000 of which about 18 thousand acres may be cleared during the period ending with the Fourth Plan. Leaving out the current and the next season, which would essentially be a period of preparatory action, this would mean an annual clearance rate of about 4,500 acres which would yield over 65,000 tons commercial timber. This is more than the total tonnage extracted yearly from the rest of the Islands at present. The timber to be extracted, is very valuable and, if extracted at the pace visualised, would pose the problem of utilization. Evidently, during the first two years, the proposed industrial complex on the island itself would not be fully established. The timber would, therefore, have to be utilised either by the existing industrial units in Middle and South Andamans or brought to the mainland. Both these alternatives present the problem of transporting the felled timber from Little Andaman until the proposed facilities are ready. Meanwhile the existing industrial units in Middle/South Andaman may be asked to indicate if they would be willing to lift timber from Little Andaman.

87. It is, therefore, felt that the preparatory phase visualised for the launching of the full-fledged reclamation programme in this island should cover two years. During this period, the Transport Ministry should ensure that the jetty and ancillary facilities for handling cargo are fully established. This period should also be fully utilised to complete all necessary surveys—land capability, road alignment, etc.—and to take appropriate health measures simultaneously with the establishment of a base camp. Thus, while the first year's clearance operations may be restricted to the needs of the base camp for all the agencies that would be concerned, Forest, Health, Public Works Department, Rehabilitation Reclamation Organisation, Project Administration, etc.—even the second year's operations should be on a somewhat restricted scale. It should be possible to maintain the pace of extraction from the third year onwards at about 4,500 acres per year for the remaining four years of the Fourth Plan, totalling about 18,000 acres.

SECTION V—COLONISATION

88. Past colonisation efforts were aimed essentially at the rehabilitation of migrants from East Pakistan. Some other families were also included but substantially it was migrant families who were

settled there—out of a total of 3,220/2,861 were migrant families. The pattern for future colonisation will need to be different on account of several considerations. First, the manpower needs of an accelerated development programme in sectors other than agriculture will not be met entirely from among migrants from East Pakistan. Their occupational background will not answer to the skill requirements of the non-primary sector; even in respect of the primary sector, the development of fishery and forestry will also require skills and vocational backgrounds different from those of migrants from East Pakistan. The Development of plantations—coconut, arecanut, rubber, coffee, etc.—will also need manpower of different occupational backgrounds. Repatriates from Ceylon would be a good source for plantation workers. Kerala could also provide plantation workers, and fishermen from Andhra and Kerala would be right source for off-shore fisheries. Secondly, from the security angle dictated by the peculiar location of the islands away from the mainland, it would be desirable to induct in future colonisation schemes, some sturdier stock of people from the mainland including a large proportion of ex-servicemen. Thirdly, from the national point of view it is necessary to develop settlements of people with diverse cultural backgrounds.

89. The above considerations would also imply that colonisation programmes in this area, whether they be for migrants from East Pakistan, repatriates from Ceylon or ex-servicemen, should be co-ordinated by one agency which, in the present context, must be the Ministry of Rehabilitation.

90. Colonisation in the Nicobar group of islands will encounter some problems of a special character which will have to be taken note of. The selection of people to be settled on the reclaimed land in this group of Islands and the programme of settlement will have to be very carefully and cautiously organised in view of the fact, that the Nicobarese are known to view any possible settlement by outsiders in Islands inhabited by them, as an unwelcome incursion into their domain. Any precipitate action to introduce alien ethnic elements in their social fabric may create awkward situations even at the political level. There is a view, held by some, that the Nicobarese, happy as they evidently are in their primitive social and economic environment, should be left alone to develop according to their own genius and should not be profaned by contact with modern civilisation. But this view apart, it would be very desirable to take note of the realities of the situation and to adopt a somewhat cautious approach in establishing new settlements in these areas, even in Katchal, which does offer scope for reclamation of a large area of land and is eminently suitable for resettlement. However even the local Administration holds the view that no colonisation by "outsiders" should take place in Katchal which should be left reserved for colonisation by the growing numbers of Nicobarese from Car Nicobar. It is readily conceded that there is need for making some such provision for the spill-over from Car Nicobar. Car Nicobar has a population of about 10,000 Nicobarese which works out to a density of about 200 per square mile on an area of about 50 square miles. The density of population is admittedly high, and exceedingly high when compared to the average of 22.5 for the Islands as a whole. Car Nicobarese do need "lebensraum" for their growing needs. But

it may be possible to provide this elsewhere. In this connection the island of Teressa readily comes to mind. It is a large island comprising an area of about 39 square miles and possesses all the favourable attributes of Katchal. It has an added advantage over Katchal in being much closer to Car Nicobar. It is about 60 miles from there as against 92 of Katchal.

91. Fortuitously the land available for reclamation in Katchal exists almost in the centre of the island. The use of the word 'colonisation' may have to be deliberately avoided in speaking of any resettlement programmes in this island. Since in any case the best land use indicated for this area appears to be for plantation crops, the resettlement in this area may begin not with migrants from East Pakistan but with others more suited for employment on plantations which will need to be organised as a public sector venture. The settlers could work as wage earners and in addition could be provided with a small patch of homestead land, say about an acre, on which they could develop, for private consumption or otherwise, fruits, vegetables and preferably paddy where possible.

SECTION VI— POLICY TOWARDS ABORIGINALS

The Andamans.

92. The aboriginal population of the Andamans consists of the Andamanese of South Andaman, the Onges of Little Andaman, the Jarawas of Middle Andaman and the Sentinelese of Sentinel Island. The main principle of Government's policy towards the aboriginal population has all along been to leave them alone and to interfere as little as possible with their way of life, so that their adjustment to the changing world might be very gradual. This policy has been completely passive in nature, and has utterly failed to achieve its purpose. If continued, it is likely to achieve the gradual extinction of these people. A drastic re-consideration of the policy may be necessary now.

93. The aboriginal Andamanese have practically become extinct, and it may perhaps be claimed that contact with the unsympathetic early colonists was responsible for this. The Onges, however, have been living in Little Andaman which is practically isolated from the rest of the population; and they are also rapidly becoming extinct. Their present number is supposed to be only about 140. In the course of the tour, the Team visited two Onge groups in little Andaman. It is difficult to conceive of a more primitive way of life than that of the Onges. They are quite naked except for a small fibre puff worn by the women and their habitation is a rough shelter rather than a hut. Their life is spent in hunting pigs, catching fish in primitive canoes and eating roots. They are said to be incapable of hard work, but are friendly, and we were told that some parties occasionally come to Port Blair. They are rapidly becoming inveterate beggars, which is the ultimate result of the policy adopted towards them. If some more active steps had been taken to give some preliminary education to the younger boys, to make them adopt a more settled form of life based even on primitive cultivation, we might have done better justice to the Onges. But it seems to be too late now.

94. The Sentinelese are confined to their island and have been uniformly hostile, so much so, that they have never been photographed. Since the island is small and far away from the existing colonies, it is possible to continue the present tribal policy of leaving them alone for another generation. They can be sheltered from contacts with the colonists.

95. But it is in the case of the Jarawas that our policy has been most disastrous. Even after so many years, we have not been able to establish any contact with them. The Jarawas have been uniformly hostile to all outsiders with the result that about half the Middle Andaman is treated as a Jarawa infested area where it is difficult for any outsider to venture. This hostility is the result of the skirmishes with the early colonists. The position was aggravated by the Japanese occupation, when the Japanese resorted to punitive bombing of a Jarawa village. With the present road construction and the colonisation of the forest fringes, friction has become more frequent, and no month passes without a case of attack by the Jarawas. However from all information available they are spirited people not lacking in human qualities and it will be a tragedy if they have to fight a rearguard action which would lead to their extinction in a few decades. An active policy of contacting them and establishing friendly relations with them and of trying to change their way of life has to be adopted and pursued. Similar situations on a larger scale have been faced by Brazil and Australia, and apparently this policy has met with considerable success. There is no reason why we should not be equally successful in tackling our much smaller problem.

The Nicobars

96. In the Nicobar Group only a few islands are populated, of which Car Nicobar and Chowra may be considered extreme examples. Chowra is over populated and has reached its present condition purely for historical reasons. It is a strange island in many respects. It has no drinking water, which has to be brought from elsewhere. It is on the other hand the headquarters of the native priests who also have the monopoly of the two main skills—manufacture of pottery and construction of boats. All the Nicobarese obtain their pots and boats from this island. However the island is rapidly losing its significance after the conversion of the Nicobarese to Christianity. It appears that this island which was the leader of the primitive Nicobarese culture is becoming its most backward spot, as a result of the contact with the changing world—a phenomenon not altogether uncommon in history.

97. On the other hand, Car Nicobar has the largest population and is the most progressive of the islands. It is 49 sq. miles in area and is round in shape and it is apparently an atoll which has been raised above the sea by volcanic action. At present this island is a vast coconut forest with some swamps in the interior. The population is about 10,000. The people have become Christians during the last two decades and their acknowledged leader is Bishop Richardson, a powerful personality, who provides intelligent, progressive, but moderate leadership. This island is divided into a number of villages and property is owned by families and not by individuals. Crime is

rare, and the people are amiable, but what is most striking about them is their attitude towards work, growth and economic development. Living in the midst of tropical bounty they feel that when nature provides their every need, their own energies need not be wasted in hard work or in the frantic search of wealth.

98. The economy is practically self-contained and all the needs of the island are found on the island itself. As a matter of fact, money itself has not made much of an appearance on the island. We were told that recently a headman of a village, who is called "Captain" in island terminology, made an offer of a thousand pigs and ten thousand coconuts for a jeep.

99. The economy of the island depends entirely on the coconut. The coconut is the main food of the people, of their pigs and of their poultry. It is supplemented by yams and a fruit called pandanus. It is significant that in recent years people are developing a taste for rice, but still the total quantity of rice consumed in a year by ten thousand people was only 800 bags, the entire quantity being imported. The Team was greatly surprised at first to see pigs eating coconuts on a large scale, and were told that on an average a pig eats about two nuts a day*. The pigs can dehusk the coconut and break it. It is estimated that about a third of the coconuts produced in the islands are eaten by pigs. Since local islanders quench their thirst by drinking coconut water, and use 2-3 coconuts per day per person, a very large percentage of the fruit is thus consumed. Estimates put the consumption at 1/3 of the total production. About one-third is left after meeting the needs of men and pigs and it is converted into *copra* and sold. The *copra* is brown and is of inferior variety.

100. The economy of the Nicobars cannot be understood without appreciating the part played by M/s Akoojee Jadwet & Co. Before the Japanese occupation, the islanders were mercilessly exploited by a number of petty merchants, but the Japanese occupation led to their extermination. Soon after the Japanese left M/s Akoojee Jadwet & Co. entered the field as the sole licensees for trade and established a number of *copra* purchasing centres combined with shops for consumer goods, locally known as "canteens". Akoojees also have a fleet of ships which enables them to maintain contact between the islands. The result was that they had a monopoly of the import of consumer goods and of the export of *copra*. On the whole their record is good, and their relations with the islanders are quite cordial and for this reason they have been able to maintain their activities with the consent of the people. Recently a firm called the Car Nicobar Trading Corporation has been set up to take over the functions of the company and the islanders have been given a half share in the undertaking, Akoojees retaining the other half. Of course accounts, etc. have to be maintained by the Akoojees' representatives because suitable local men are not forthcoming. Replacement of the Akoojees by the Government or by the State Trading Corporation has been talked about, but it is doubtful if either agency can undertake the task without considerable financial risk. The firm is efficient, because it owns its own shipping and the operation of transport is kept highly flexible, to conform to local needs.

*The price of a coconut in Port Blair is about 30 Paise.

101. Education of the modern kind made its appearance on the islands during the last two decades at the instance of early missionaries. Admittedly, during the last ten years, education has made considerable progress. Some of the elders we talked to were obviously concerned about the growth of education and asked: "If all go to schools, who will work in the coconut gardens?" Their concern was genuine, and indicates that, as elsewhere, in these islands also, the educated few are getting averse to manual work. There is one Higher Secondary School and a primary school in each of the villages in Car Nicobar. All the teachers have to be recruited from the mainland. Attending schools is quite popular, and in a few years most of the children in this island, will be attending school. They have also taken to Hindi with commendable success. The factors which inhibit the sending of children to schools in the mainland do not exist here. There is little work even for the adults and children are not needed for work at all and can be readily spared for the school.

102. There is a good hospital with 40 beds and it is quite popular. There is also a small hospital ship which visits the outlying islands regularly. The medical facilities available on the island are, therefore, better than in most parts of the country.

103. It is against this background that we have to consider the problem of development in the Nicobars. In Car Nicobar we convened a meeting of the elders including Bishop Richardson and some rather extraordinary views were expressed as their general consensus of opinion. Firstly, they did not want any special development scheme for their island, but preferred to be left alone. Secondly, they did not want any loans for any purpose. However, if the object suggested was worthwhile from their point of view, they would be quite prepared to take it up themselves. For example when it was suggested to them that a modern *copra* curing kiln would be useful, they wanted a model to be demonstrated and this is being done now. They said that if they were convinced of its utility, they were prepared with their own resources, to set up similar kilns in every village. This seems to be the only part of the country where people decline offers of assistance however generous.

104. However it cannot be forgotten that Car Nicobar is changing, and that the people will have to change under the compulsion of events beyond their control. Firstly, the medical facilities are being fully utilised and there has been a very sharp decline in the death rate. The increase in population will be certainly rapid in the coming years, and if the people continue in the old ways, there is a risk of their becoming poorer with the lapse of time. Secondly, education is becoming popular and there will soon be a fair number of matriculates on the island. These factors will undermine the strength of inhibiting tradition and custom. This is happening already with the result that the elders seem to be on the defensive in respect of new consumption habits which are developing among the younger people. Thirdly, people are developing a taste for consumer goods. The variety of goods displayed in Akoojees' shops is evidence of this and covered a wide range including sewing machines, cigarette lighters, lipsticks and tea. All these facts will suggest that a complete transformation of the economy in a decade or so is likely.

105. After a general discussion with the elders of the villagers it was generally agreed that the development of the island should be on the following lines :—

(i) The quality of education should be improved by appointing trained teachers in the schools and by the introduction of science on a large scale in the High School.

(ii) An attempt should be made to change the food habits of the pigs on the Island. On the higher land, maize should be grown on an experimental basis and some may be grown on the less inhabited islands of the Nicobars, e.g., on the Trinket-Nancowrie-Camorta group. If the pigs could be weaned from a coconut diet, the income of the Island can, almost immediately be doubled.

(iii) Improved methods of *copra* curing should be introduced in all the villages. The trial project seems to be successful, and if the villagers are convinced of its utility they will themselves put up the new type of kiln and thereby get a better price for their *copra*. At present, the inferior *copra* of Nicobars fetches a price of Rs. 40 a candy as against Rs. 75 obtained by the superior *copra* of Kerala.

(iv) The area under arecanut should be extended, since even now 50% of the export from the islands consists of arecanut. Also pigs do not eat arecanut.

(v) Improved methods of coconut cultivation including the use of potash may be demonstrated on the cultivators' fields on a large scale, since at present there is potash deficiency in the soil. The spacing of the coconut trees also seems to be far too dense to give the optimum yield. In both respects, there is plenty of scope for improvement.

(vi) Although the people are good fishermen; the catch is very small because of faulty technique. Some extension work to promote the use of nylon line will greatly increase the catch.

SECTION VII—FISHERIES

106. There is tremendous scope for the development of fisheries. At present the fishing activity is confined to a very inferior type of coastal fishing which more or less meets the local requirements. It is well known that there are vast potentialities for both off shore and deep sea fishing. The chief difficulties in the way of the exploitation of these resources are :—

- (i) Absence of an indigenous fishing population;
- (ii) Large capital investment necessary for boats and tackle;
- (iii) Lack of marketing facilities; and
- (iv) Lack of detailed knowledge of the fishing areas.

The pre-requisite to a big fishery development programme would consist in developing the necessary skills. Initially skilled fishermen will have to be brought to the island from the mainland. Progressively these skills could be imparted to the local people and to the younger people among the new colonisers. The process will

necessarily be gradual. In respect of marketing, the provision of cold storage, transport from Port Blair to Calcutta, the main area of prospective consumption, will need to be provided. The Team was told that in one of the two ships which were being purchased cold storage capacity of about 10 tons was being provided. This may be a good beginning in developing a taste in the Bengal market for sea fish.

107. A big fishery development programme has several other aspects. To begin with, there is the import substitution aspect if we can develop the taste for sea fish in Bengal. We were told that annual fish imports into Bengal from East Pakistan at present were about 6 crores of rupees. There is also the prospect of entering international markets for the export of Prawns and more spectacularly of Tuna for which this area is reported to be one of the richest in the world. Thirdly a large fishing fleet, appropriately manned, would combine economic with policing activities as a counter-measure against the widespread poaching by aliens that was reported to be going on in our territorial waters.

108. However, it needs to be remembered that nothing spectacular can be expected during the next few years either by way of commercial exploitation or in the form of employment. But there are good long term possibilities of development in which a beginning needs to be made right away.

SECTION VIII—INDUSTRIES

109. To achieve the target of diversification of employment, industries will have to be developed. Till such time as the prospecting for minerals and oil bears fruit, industrial development will be based essentially on the forest and agricultural produce of the Islands.

110. Forest based industries are not unknown to the Island—two veneer factories in the private sector and one large saw mill in the public sector already exist in the area and a third private sector plywood factory is coming up in the Middle Andaman. The additional forest produce that would become available as a result of the acceleration of forestry operations in the Great Andaman group of Islands could be utilised for the expansion of these three factories either in the shape of increased output or by the diversification of the products to embrace chip-board/particle-board, etc. It is possible that for the expansion of these industries, further capital would be invested by private entrepreneurs if timber is made available at an economic price and adequate transport facilities for the shipment of finished products are provided.

111. The opening up of hitherto inaccessible areas, as for example, in Little Andaman, will offer scope for setting up additional industrial units based on forest produce. The setting up of an integrated wood working complex based on the prospective working of the Little Andaman forests is visualised in the accelerated development programme. In such areas, colonisation, the exploitation of forest resources, and the setting up of industries will have to be

pursued in an integrated manner. The capacity of the industrial units and the working of the forests will have to be so matched as to enable the plants to maintain optimum production on a sustained basis. The surplus of commercial timber that may result initially from the accelerated land reclamation programme will also need to be subjected to some processing before being shipped to the mainland.

112. In respect of industries based on agricultural produce, a brief account appears in the report of 6th April, 1965 of the Team of officers of the Rehabilitation Ministry who visited the Islands during the last week of December, 1964. There is scope for the setting up of fruit processing unit(s), vegetable dehydration unit(s), etc. But to sustain such units, it is essential to increase the acreage under fruit and vegetables. The adequate development of horticulture and market gardening has been hampered by inadequate transport and marketing facilities. Therefore, developing the acreage under fruits and vegetables, the provision of adequate marketing and transport facilities will have to proceed side by side with the establishment of these units.

113. **Sugar factory.** Another clear possibility is the setting up of a big sugar factory sustained by an expanded production of sugarcane. The climatic conditions in the Islands are just right for the growth of sugarcane. The acreage under sugarcane, however, has not shown signs of increase for a long time. With the big land clearance programme in Little Andaman, it should be possible to earmark some 10,000—20,000 acres of land for growing sugarcane to sustain a sugar mill. The sugarcane plantation as well as the sugar factory would best be organised as public sector ventures.

114. **Village Industries.** In addition, a host of small and village industries such as oil extraction, shark leather processing, gur and khandsari making, coir products and match-making, etc. offer scope for development, and this scope should be fully exploited.

SECTION IX—AGENCY FOR DEVELOPMENT

Overall Development Agency

115. The accelerated development of the islands will involve a pace of investment much faster than has been achieved so far in the past. This will entail a tremendous organisational effort more specially as the bulk of the development programme may be concentrated in practically uninhabited areas such as Little Andaman, Great Nicobar, Katchal, etc. which are separated not only from each other but from Port Blair, the headquarters of the local administration, by large stretches of open sea. It was felt during the deliberations of the Team and in discussions with officers of the local Administration that for the accelerated development programme to make any headway, a sustained organisational effort will need to be made and the existing procedures of administrative and financial authorisations will have to be altered to make for a flexible approach and, as far as practicable, to curtail the exercise of remote control from Delhi. The officers of the Administration feel strongly that the Government machinery as it exists on the Islands at present

will be unable to undertake this accelerated development. They feel that an autonomous development corporation would be the most suitable agency for this programme. On the other hand those who have experience of the functioning of such corporations undertaking general development feel with equal conviction that a corporation which is not intimately integrated with the general administrative machinery will be ineffective and wasteful. There appears to be general agreement therefore that the agency which takes up this task should be very closely associated and integrated with the Administration and it should, at the same time, have the autonomy and flexibility which is generally found in the working of many corporations. The ultimate shape that this agency may take would be as a separate wing of the Administration directly under the Chief Commissioner who may be assisted, for this programme, by a senior officer. Possibly a Finance cell could be built into the organisational arrangement to make for speedier decision-making. It may also be desirable for a local Committee of Co-ordination consisting of representatives of concerned Departments and of the Ministry of Rehabilitation to assist the Chief Commissioner in the planning and execution of the development programme.

116. In respect of areas such as the Little Andaman, Great Nicobar, etc., it may be necessary to appoint Project Officers so that the various development projects in those areas are pursued in a co-ordinated manner and with vigour.

Agency for Specific Programmes

117. Because of the peculiar difficulties obtaining in the Islands, it is evident that the execution of most programmes/projects—at least the larger ones—will need to be undertaken in the public sector. For example, the programme of large scale reclamation of land has in any case to be carried out by the Rehabilitation Reclamation Organisation which has been engaged in reclamation work for a long time and has by now built up a substantial amount of expertise in this field.

118. It seems that even the extraction of timber from the forest areas may have to be substantially organised as a departmental venture. The Administration has always been aware of the immensity of the task to be undertaken but has on occasions displayed a misplaced faith in the ability of private enterprise to undertake the task. The result has been the failure of some private enterprises like P. C. Ray & Co., Hindustan Plantations, etc. These agencies evidently had only a vague idea of the magnitude of the difficulties to be faced in operating in the Islands, and as they got more and more involved they found themselves totally unable to perform even a fraction of what they undertook to do. The result has been that exploitation of the forest resources has been confined to small fringes where working is easy while the hard core has been left untouched. At the same time, however, the magnitude of the clearance operation visualised in the report will make it necessary to utilise all available agencies for this work as it may not otherwise be possible to undertake these operations in all the areas within the time visualised for their clearance. Thus, for example, difficult areas such as Little Andaman, Katchal, etc. may have to be handled

departmentally while in comparatively easier areas private enterprises may be tried.

119. The question of agencies assumes importance in respect of the cultivation of reclaimed land. Should the organisation be on the basis of individual cultivation or should it be in the form of a large-scale corporation or undertaking? This question has already cropped up in a number of places. Consistent with the orthodox policy, the Government have formed some co-operative societies for the cultivation of coconut. Some of these societies are already feeling the strain and the question has often been asked whether a group in the form of a co-operative would be more efficient than an individual, in this sort of undertaking. The colonists are of various kinds; some are very enterprising while others are indolent. In a pioneering work of this type, a uniform pace cannot be maintained by each individual in a group, and, therefore, it is felt that a group approach may not yield adequate results. In one society, a member who was quite enterprising has bought two or three hand-looms and has taken up the production of cloth as an additional occupation. The venture is thriving, and it was quite obvious that the full energies of this individual are devoted to this side industry rather than on the collective coconut plantation. Another member of the co-operative society has bought a *ghani* and is getting on fairly well as a local producer of oil. But he is also not likely to put his heart and soul into the coconut plantation. It looks as if the co-operative effort of the group is not likely to be particularly efficient, at any rate compared to the individual effort possible by each one of the members if he had been left alone.

120. The nature of the organisation for cultivation will depend very much on the crop itself. Paddy is at present grown on the basis of individual cultivation. This may be expected to yield the best results, but the land which is reclaimed cannot be handed over to the individual as it is; it has to be properly prepared by providing embankments, drainage and minor irrigation where such schemes are possible. In previous colonisation schemes each settler was given five acres of cleared land for paddy cultivation and five acres of uncleared hilly land for homestead horticulture. The paddy land was cleared by manual labour and the stumps of trees left in the land can still be seen. The results have however not been too satisfactory. Proper measures could not be undertaken by the new settlers with the result that soil erosion began to reduce the spectacular first year yields to the extent of causing an alarming situation in which further reclamation of land for the cultivation of paddy was not considered desirable. The settlers neither had the technical know-how nor the resources to organise soil conservation measures which are in any case not easy to undertake on an individual basis particularly in these completely virgin lands. The five acres of homestead land have also remained unattended to despite the prospects of harvesting rich horticultural crops. The settlers just do not have the capacity or, in some cases, the desire to clear the homestead areas of forest growth. This leads to the inevitable conclusion that, at least to begin with, even cultivation of paddy may have to be organised, as a group effort—State Farm, Group Farm, Co-operative—whatever be the name or the structure of the organisation. After some time, when adequate measures have been taken to stabi-

lise the soil and suitable cropping patterns have been evolved, the possibility of converting the State/Group Farm into a cooperative unit or to individual holdings may be considered.

121. So far as plantation crops are concerned, the investment envisaged is large and the yield is so delayed that it is doubtful if individual effort or even the effort of a small co-operative group can be really efficient. Plantations undertaken on large scale have always proved more successful than smaller units from the point of view of yield and efficiency. The difficulty, however, is that the colonists have to accept the status of wage earners, for a period though it would be possible to give them homestead land of about an acre or so on which they can expend their surplus energy. However it is clear that the nature of the organisation has to be kept flexible and one cannot be dogmatic. It may be relevant to mention in this connection that large scale plantations of rubber are being started in Madras through a wing of the Forest Department and in Kerala by a Plantation Corporation.

122. Similarly in respect of the big fishery development programme the public sector will have to play an important role particularly in deep sea fishing. Industries also, other than those in the small/village sector, particularly the few large forest-based industries which are contemplated for Little Andaman may have to be organised as public sector ventures since it is doubtful if any private entrepreneur will come forward to make large investments in such a difficult area as Little Andaman in the initial stages before development has taken place. However in this sector, private enterprise may not be completely ruled out particularly when they have already shown initiative in establishing several units in the Great Andaman group of islands which have been recommended for expansion, in this report.

SECTION IX—INCENTIVES TO PROMOTE ACCELERATED DEVELOPMENT

123. Unless a deliberate policy aimed at accelerated exploitation of the resources of "backward" areas is adopted, factors which have inhibited the growth process in such areas in the past, despite the abundance of natural resources, will continue to operate not only to perpetuate the state of "backwardness" but to accentuate the gap between the progress in such areas and the rest of the country. Such retarding factors usually are the absence of adequate economic and social infrastructure. The absence of transport facilities, for example, makes exploitation of natural resources an uneconomic proposition; at the same time the absence of economic activities of sufficient magnitude makes the undertaking of investments in transport an uneconomic proposition. Similar is the situation in regard to investments in power, manpower, training facilities, etc.

124. To accelerate the development process in such areas this vicious circle has to be broken. And it can only be broken by a deliberate policy which aims at providing a calculated bias towards investments in such areas. This is true for all "backward" areas; in respect of the Andamans and Nicobar Islands with which this Report is concerned, the need for this becomes greater on account

of various considerations which have necessitated the accelerated development of this area.

125. First, Government should make the needed investment in economic overheads—more particularly, in transport. This will cover mainland-island transport, inter-island transport, road transport within the islands and most of all, permanent landing facilities in the islands in which the bulk of the future developmental activities will be concentrated. Absence of such facilities has impeded the exploitation of the known resources of the islands. Investments by Government in this sector should be made, not on strictly economic considerations but as a prelude to the accelerated resource development of the islands.

126. Secondly, the economic criteria presently adopted in evaluating projects need to be tempered somewhat by a conscious and deliberate lowering of the economic expectations in terms of yield on investment in such "backward" areas and also by modifying the criteria now adopted in such a way as to include, explicitly, the additional social benefits derived from projects which are labour intensive, etc. As a matter of fact, the whole question of investment criteria needs to be thoroughly examined and overhauled with a view to evaluating projects by more rational criteria which take note of social as well as economic gains.

127. Thirdly, some positive incentives to channel private investments into the islands need to be provided. These may take the form of a tax holiday, subsidised supply of raw material or even subsidised rates of services such as transport, power, etc. Without these, private investment is not likely to be attracted to the islands. It is not as if efforts have not been made by private entrepreneurs in the past. But most of them have found the present incidence of economically worked out raw material prices, and transport charges somewhat crippling.

CHAPTER IV

AGRICULTURE (INCLUDING HORTICULTURE AND PLANTATIONS)

128. Considering the vast potential of the Islands the present state of development in the field of agriculture can hardly be considered to be adequate. If the major objectives which have been outlined in the preceding chapter are to be achieved, the improvement of agriculture will need a major effort on the part of the Government.

SECTION I—AGRICULTURAL STATISTICS

129. Statistics in regard to land utilisation in the Islands are incomplete. Whatever information is available relates mostly to South Andaman. This makes effective planning for the productive utilisation of the soil resources rather difficult. The paragraphs that follow indicate the information that is at present available.

130. In the Andaman group of islands paddy is the main crop and is raised under rain-fed conditions between June and January. Statistics of the region-wise distribution of paddy areas in 1963-64, show 5,258 acres in North Andaman, 4,999 acres in Middle Andaman and 7,227 acres in South Andaman. At present only one crop of paddy is raised. The average acre-yield of rice is 13 maunds (1963-64), i.e. 19.5 maunds of paddy. Internal production is not adequate to meet the demands of the local population and rice is imported from the mainland. Recently, the Nicobarese have also started consuming rice. Acreage and production of rice during 1960-61 to 1963-64 along with imports from the mainland are shown below :—

Year	Area	Production	Imports
	(acres)	(tonnes)	(tonnes)
1960-61			
1961-62	16378	6020	3559
1962-63	16685	6176	2011
1963-64	16724	6529	3110
	17484	8718	3554

Source : Director of Agriculture, Andaman and Nicobar Islands.

131. In the Nicobar group of Islands, cultivation of paddy has not yet been developed but some individual efforts have been made in Katchal notably by Rani Chenga.

Oilseeds and pulses

132. The "Statistical Outline" of the Andaman and Nicobar Islands shows the area under rape and mustard to be 10 acres in 1959-60, 2.5 acres in 1960-61 and 5 acres in 1961-62, but no acreage is indicated for pulses. Up-to-date information on the acreage of oilseed crops and pulses is not available. According to the information furnished by the Director of Agriculture, the present acreage

under pulses may be estimated to be 700. The pulses grown on the Islands are black gram, green gram and arhar, etc.

Vegetables

133. No information is available of the area under vegetables, although the internal production of Indian varieties of vegetables is quite large. Most of these vegetables are grown on homestead lands. Cucumbers, okra, brinjal, amaranthus, colocasia, lobia, chillies, etc. are among the Indian vegetables cultivated in the Islands. Tomatoes grow luxuriantly. Recently, cultivation of an early variety of cauliflower has been taken up and this crop is said to be grown largely in North Andaman from where the surplus production is exported to Port Blair.

Condiments and spices

134. No up-to-date information is available about the area under condiments and spices. The "Statistical Outline" of Andaman and Nicobar Islands shows the area under these crops to be 15 acres each in 1959-60 and 1960-61 and 34 acres in 1961-62. The area under turmeric is also quite small.

Sugarcane

135. According to the information furnished by the Director of Agriculture, the acreage and production of sugarcane during 1960-61 to 1963-64 are as shown below :—

Year	Area Estimated production of cane	
	(acres)	(tonnes)
1960-61	178	2670
1961-62	160	1800
1962-63	200	3000
1963-64	200	3000

Sugarcane requires plenty of fertilisers and manures to achieve high levels of production. The present production of cane, as is seen from the table above, works out to be about 15 tonnes per acre and indicates that the favourable climatic and soil conditions of the Islands are not being exploited to the best advantage by the use of fertilisers and manures to step up production. Sugar and molasses are imported from the mainland and statistics on imports for the first three years of the Third Five Year Plan are given below :—

Year	Sugar	Molasses—gur rab and jaggery
	(tonnes)	(tonnes)
1961-62	783	227
1962-63	940	275
1963-64	987	141

Coconut and arecanut

136. No statistics are available of the acreage of coconut and arecanut in the Nicobar group of islands. The same is true with regard to these crops in North and Middle Andamans. However, according to the information furnished by the Director of Agriculture, the up-to-date areas on the basis of number of seedling distributed since 1958-59 are estimated to be 7,400 acres under coconut and 600 acres under arecanut. This estimate does not take into account the percentage of mortality suffered by the seedlings after transplanting. Coconut and arecanut are important commercial crops of the Islands and are exported to the mainland. The Andaman group of islands export their produce in the form of husked coconuts and the numbers exported from Port Blair in 1961, 1962 and 1963 were 8.2, 7.8 and 6.9 lakhs respectively. The Nicobar group of islands export to the mainland their arecanut and surplus coconut in the form of smoke-cured copra. The Nicobar coconut is on an average much bigger in size and better in quality than the mainland or Andaman coconut. The copra cups are much larger than on the mainland and the kernel is also thicker. The quality of arecanut is adjudged to be equal to the Cochin variety and superior to the Calicut variety. Copra and arecanut exported to the mainland by the Nicobar group of islands in 1963-64 were 1,634 tonnes and 267 tonnes respectively.

Fruit crops

137. Correct figures regarding acreage and production of fruit crops are not available. The fruits which are found to grow remarkably well in the Islands are pineapple, citrus (orange, lime, pum-melo), banana, papaya, guava, sapota, etc. An up-to-date estimate made by the Director of Agriculture, on the basis of the number of plants and seedlings distributed since 1958-59 (mortality excluded) shows the area to be 40 acres under pineapple, 65 acres under guava, 35 acres under sapota and 100 acres under acid lime. Area of other citrus fruits has not been indicated. However, the "Statistical Outline" of Andaman and Nicobar Islands, 1963-64, shows about 183 acres under citrus fruits in 1961-62 in Andaman Islands. Acreage and production of banana and papaya from 1960-61 to 1962-63 are shown below :—

Year	Banana		Papaya	
	Area	Production	Area	Production
	(acres)	(tonnes)	(acres)	(tonnes)
1960-61	587	815	180	354
1961-62	604	831	169	363
1962-63	660	853	158	266

Source—Statistical Outline of Andaman and Nicobar Islands, 1963-64.

Miscellaneous Crops

138. Tobacco, coffee and rubber occupy some area in the Andamans. The area under tobacco is very small; coffee is still in the experimental stage and occupied about 40 acres in 1963-64. The acreage

under rubber in 1963-64 was nearly 536 and the quantity of rubber exported to the mainland in 1963 was 8 tonnes against 22 tonnes in 1961. Rubber cultivation on a pilot scale is being taken up now by the Rubber Board in South Andaman.

Pests and diseases

139. No statistics are available of the incidence of pests and diseases of crops. According to the information furnished by the Directorate of Plant Protection, Ministry of Food and Agriculture, the pests to which paddy crops are subjected are stem borer, rice bug, grass hopper, leaf-eating caterpillar, swarming caterpillar, case worm, mealy bug, and rice hispa. Of these, the most serious ones are stem borer, rice bug, grass hopper, leaf-eating caterpillar and swarming caterpillar. The diseases affecting paddy crops are leaf spot (*helminthosporium*), leaf smut, root rot, and false smut, leaf spot being the most serious. The pests of vegetable crops are—leaf-eating beetle, stem borer, jassids, aphids, and cutworms, the most serious being the leaf-eating beetle and the stem borer. During our visit we observed the ravages of the leaf-eating beetle on standing crops of cauliflower and cabbage on government farms at Port Blair and Car Nicobar. Diseases affecting vegetable crops are collar rot, leaf spot and damping-off. The most serious pests of coconut is the rhinoceros beetle and diseases affecting this crop are grey leaf spot, stem-bleeding disease, root disease and die-back, etc. The disease affecting arecanut crop is bud rot.

Supplies

140. The Department of Agriculture distributes seedlings and plants of coconut, arecanut, vegetables, fruits and ornamentals, as well as seeds of paddy and vegetables, and fertilisers and pesticides, etc. Supplies made during the first three years of the Third Five-Year Plan were 60 tons of nitrogenous, 59 tons of phosphatic and 3 tons of potassic fertilisers; 12 tons of solid pesticides and 109 tons of pesticide-liquid; 120 tons of paddy seeds and 570 kgs. of vegetable seeds. Quantities of nitrogenous and phosphatic fertilisers distributed during the first three years of the Third Plan period at the rate of 20 lbs. of nitrogen and 32 lbs. of phosphoric acid per acre can cover only 1,200 acres by nitrogenous fertiliser and 590 acres by phosphatic fertiliser, although fertilisers at present are used more for plantation crops than for field crops and vegetables. This is too inadequate for the needs of the impoverished soils of the Islands to step up production. The same is true of pesticides in view of the great incidence of damage caused by insects and diseases.

SECTION II—A BRIEF REVIEW OF THE THREE FIVE YEAR PLANS

141. There was no proper integrated First Five Year Plan for the Islands though some development schemes were undertaken during this period. The main achievement was the reclamation of some 8,000 acres of forest lands for paddy cultivation under the Colonisation Scheme. In the Second Five Year Plan, a similar achievement under the Colonisation Scheme was made by reclaiming another 8,000 acres of forest lands. The increased area was put mostly under

paddy and coconut. During the Second Plan period the Agriculture Department was strengthened by the appointment of one Coconut Development Officer and a few Agricultural Inspectors and Demonstrations. A Director of Agriculture was appointed who assumed charge in December 1960.

142. During the Third Five-Year Plan the activities of the Department of Agriculture were directed towards multiplication and distribution of 'improved' seeds; supply of seeds, fertilisers, implements, pesticides and plant protection equipment; demonstration of intensive cultivation of paddy and horticultural crops, development of coconut, arecanut, pineapple and cashewnut cultivation; rejuvenation of old coconut plantations of South Andaman; establishment of Soil Conservation Demonstration Centres in North and Middle Andamans; conducted tours of selected Nicobarese to coconut plantations on the west coast of the mainland etc.

143. Under the 'Grow More Food' scheme, the Government of India have allowed, for these Islands, a 50% subsidy on distribution of improved seeds and agricultural implements and phosphatic fertilisers, 75% subsidy on pesticides and plant protection equipment and 25% subsidy on nitrogenous fertilisers, and have also waived inclusion in the sale price, of transport and incidental charges, on all the above-mentioned items from Calcutta—Madras Port to Port Blair and from Port Blair to internal centres of distribution.

144. Considering the varieties of paddy which are now grown in the Andaman Islands, the word 'improved' seeds is a misnomer. The varieties which occupy the largest area under paddy, have a maturity period varying from 5 to about 7 months. The name of the varieties with their period of maturity is given below :—

Name of Variety	Period of Maturity
	(days)
C-14-8	180-200
Masley	150-160
Agnisalai	140-150
GEB 24	160-180
ASD 8	100-110

Discussions were held with the Director of Agriculture about the need for finding more suitable and high-yielding varieties of paddy of short and medium duration, so that it would be possible to raise two crops of paddy on the same land under rain-fed conditions or paddy and a second field crop other than paddy, such as oilseeds, pulses, etc. on better residual soil moisture than is available now after the harvest of the late variety of paddy in December or January. The Economic Botanist, Andaman and Nicobar Islands, who joined towards the end of 1963, conducted last year some preliminary trials with 170 varieties of paddy brought from the mainland with different agro-climatic complexes, in order to isolate the more promising varieties. According to the information furnished by the Director of Agriculture, a few settlers have taken up the raising of two crops of paddy, but the details are not available. However, the Economic Botanist carried out last year a preliminary trial to raise two crops of paddy, an early variety followed by a late one, with adequate

doses of fertilisers and manures provided for both the crops, and the data are given below :—

Name of variety	Date of sowing in nursery	Date of transplanting	Date of harvest	Yield per acre (Kg.)
1. A.S.D. 8	16-5-64	5-6-64	21-8-64	1170
2. C. 14/8	25-7-64	26-8-64	21-1-65	1255

The choice to grow suitable and high-yielding varieties of paddy in double-cropping is restricted by the very few varieties now under cultivation.

145. No reliable and dependable recommendations on fertiliser use for paddy and other crops are available with the Department of Agriculture. In the demonstration of intensive cultivation of paddy and horticultural crops, as well as rejuvenation of old coconut plantations, improved seeds, fertilisers and pesticides are among the package of practices that contribute to increased production. The consumption of fertilisers and pesticides during the first three years of the Third Five-Year Plan has been quite negligible and one can hardly expect any substantial increase in production under such conditions.

146. The Soil Conservation Demonstration Centre at Rangat and the Soil Conservation Demonstration Centre at Diglipur were visited. Pineapple is the principal crop grown on the Soil Conservation Demonstration Centres on erosive slope and the soil conservation measures adopted to stabilise the slope are bench-terracing with a forward slope. In the absence of the records of run-off and soil loss and yield data under controlled and treated conditions, the effectiveness of the measures cannot be assessed. The Agricultural Farm near Sipighat was also visited where pineapple was planted on narrow bench terraces on the contour on similar slope and this would give greater stability to the soil against erosion than the terracing done at Rangat and Diglipur. The effective land use of soils with erosive slope under reference would be bench-terracing with backward slope, with provision to discharge excess run off to protected grass or forest outlets and to grow either plantation crops with a thick stand of legume cover crops or close-growing field crops.

147. The Department of Agriculture has been conducting adaptability trials with mainland varieties of mangoes, nutmeg, clove, cardamom, cinnamon, vanilla, wrapper tobacco, etc. Some of the trials have been in progress for more than a decade. Discussion with the officers in charge of these adaptability trials indicated that various technical problems have cropped up which they have not been able to diagnose and solve. Cultivation of coffee, cocoa and lac is also being tried in the Island.

SECTION III—DEVELOPMENT PROSPECTS

148. As already mentioned prospects for agricultural development are very bright both in the nature of intensive exploitation of existing lands by organising appropriate inputs as well as bringing fresh areas under cultivation by the clearance of forests. The need for clearing large areas of forests had already been discussed in

Chapter III. The extent of the clearance programme has also been indicated. It needs repeated emphasis, however, that soils must be put to the best use to produce maximum returns on a sustained basis, be it in forests or in agriculture.

Soil Conservation

149. The fear that forest clearance will result in heavy erosion is undoubtedly genuine based as it is on past experience in the Islands. But it may be repeated that in the previous colonisation scheme 5 acres of cleared land were handed over to the settlers who were left to rely on their own resources to adopt the appropriate soil conservation measures. This they were hardly in a position to do. In future reclamation scheme, soil conservation programmes will have to be organised by Government before putting the cleared land to agricultural use.

150. Factors affecting erosion hazards are soil and slope characteristics, total precipitation and intensity, nature and state of ground vegetation, management, etc. The total precipitation and intensity of rainfall, other factors remaining the same, are important factors that govern the erodibility of soils.

151. The Andaman and Nicobar Islands lie within 6° North and 14° North latitude. The high rainfall is characteristic not only of the Andamans and Nicobars but also of other islands situated in humid tropical regions and also of many parts on the mainland of India. Data of annual rainfall collected on other islands situated within 15° North or South latitude exhibit an annual rainfall of 87.7" to 174.3" for Borneo, Billiton, Celebes, Moluccas, Sarwak, Soembawa and Sumatra islands in Indonesia; 82.0" to 141.8" for Legaspi, Manila and Surigao in Philippine islands; and 91.8" to 93.1" for some parts of Ceylon. Rainfall as high as 103.0" to 214.6" in a year is known to occur in Burma. In the mainland, Assam experiences an average annual rainfall of 100"—150" and its Khasi and Jainti Hill regions receive 200" or so. In North Bengal, Jalpaiguri District gets an average annual rainfall of 155"; Darjeeling 121"; Kurseong 159" and Kalimpong 88". In the North Himalayas, the annual rainfall of Nainital town is 106" while in the West Coast of India, the average annual rainfall of Ratnagiri District, Coorg and Mercara area 130.1" 100.8" and 128.5" respectively.

152. The data on the maximum intensity of rainfall recorded at Port Blair and some of the stations in the mainland, based on records from 1948—1961, are given below and are self-explanatory :

Name of Station	Maximum intensity of rainfall (mm. per hour)
1. Port Blair	60.2
2. Agartala	65.5
3. Dibrugar	60.0
4. Gauhati	67.0
5. North Lakhimpur	71.1
6. Asansol	86.0
7. Durgapur	64.0
8. Kodaikanal	68.6

153. In Indonesia, Philippines and Ceylon as well as in Burma and the mainland of India where the rainfall is equal to or greater than that of Andaman and Nicobar Islands and where the topography of the country ranges from undulating to hilly or mountainous with native vegetation consisting primarily of dense stands of forests, the development of agriculture and horticulture has taken place through the clearance of forests and through the initiative and efforts of the native genius in the remote past. In those regions, measures have been evolved by the people to stabilise soils on undulating and steep slopes by bench terracing for agricultural and horticultural crops, and this kind of terracing is considered by modern science and technology today to be most effective on sloping lands which would be subject to severe erosion otherwise.

154. The fear that the clearance of forests for the development of agriculture and horticulture will carry the soil away into the sea, has arisen from the present land use prevalent among the old settlers. The land reclaimed from forests had been given to the settlers without adopting adequate and appropriate mechanical erosion—control measures such as bench terracing, diversion terrace, protected outlets for run-off, etc. It was too much to expect the settlers to adopt all these measures by themselves without technical guidance and the requisite financial assistance. Practically nothing has been done, even today, to apply these measures to the lands of the old settlers.

Land use capability classification

155. The present rational approach to judicious and productive use of soil resources is based on a land-use-capability classification, which treats a water-shed or a sub-water shed, as a unit of development. Lands are classified according to their ability to produce and are given treatment or measures according to their needs for maximising production on a sustained basis and by reducing erosion to the minimum. The colonisation of Andaman and Nicobar Islands through agriculture, horticulture and animal husbandry will have to follow the pattern of development based on a land-use-capability classification and this will stabilise the soils against erosion.

156. Rational land use on the basis of land capability classification does not envisage indiscriminate clearance of forests for the development of agriculture, horticulture and animal husbandry. In the interest of a prosperous and permanent agriculture and a sound soil and water conservation programme, forests will play a vital role in the Islands.

Pattern of Development

157. Patterns of agriculture to be developed in the Islands should take into consideration their remoteness from the mainland and the necessity of developing a self-supporting economy to the extent possible through the optimum utilisation of local resources. The production of food crops should be maximised at feasible levels through scientific agriculture to meet the requirements of the islands and to reduce imports from the mainland to the minimum. The commercial and plantation crops that may be selected for cultivation should be those which will give maximum yields at economic levels under the soil and climatic complexes of the islands, which will supply raw materials for the creation of an agro-industrial base,

enable the mainland to reduce or eliminate present imports of those agricultural commodities and their processed products and enter the mainland and world markets for exports.

Agriculture

158. To reverse the present position from insufficiency to self-sufficiency in food crops, and to develop horticultural and plantation crops on a large scale for a stable agro-industrial base and large exports, will require the improvement of present crop husbandry and the elimination of the present inhibiting factors of production.

Cereals, pulses, oil-seeds, spices, vegetables, potatoes and sugarcane

159. Paddy is practically the only cereal extensively cultivated in the Islands. At present only one crop of paddy is raised, although two crops can be readily grown under rain-fed conditions. In Assam and North Bengal with an annual rainfall of more than 100", two crops of paddy on a large scale are cultivated on the same land only with rains. Three crops of paddy may also be possible where better soil-moisture conditions or irrigation are available for the third crop which will be grown in summer. In Assam, West Bengal, Orissa and Bihar, a summer crop of paddy (boro paddy) is raised. Irrigation for the third crop is obtained in many parts of those States by a temporary bund or weir which is washed away by the rains and which is erected again after the monsoons. Maize is another cereal that can be grown successfully in the Islands. Wheat and barley will require trials for introduction.

160. No second field crop on a large scale is raised after the harvest of paddy. Pulses, oilseeds, spices, vegetables and potatoes can be grown as the second or third crop in rotation, depending on whether the preceding crops are single or double crops of paddy on the same land.

161. Pulses and oilseeds that can be grown successfully on residual soil moisture are black gram, green gram, French beans, cowpea, lobia, rape and mustard, sesame, groundnuts, etc. Cowpea and French beans are also grown for green pods as vegetables. Pulses and oilseeds which are legumes will improve soil fertility. Successful cultivation of new legume crops in the Islands will require the presence of specific *Rhizobium* strains in the soil. Where their absence is noted, inoculation of seeds or soils should be done once. The absence of nodules on French beans plants on Haddo Horticultural Station at Port Blair was observed. The growth of the crops was poor. One or two irrigations will undoubtedly increase the yield of these crops considerably if they are grown during the post-monsoon period and the efficiency of irrigation will depend on adequate soil fertility levels. Gram and lentils will require trials for introduction.

162. Increased production of paddy, pulses and oilseeds will open up the prospects of developing husking and oil mills in addition to their processing and extraction on a cottage industry basis. The bye-products rice bran, bhusa and oilcakes will be excellent feed for cattle, pigs and poultry.

163. No indications are available with regard to the prospects for the cultivation of spices on a large scale, although trials to grow cardamom, cinnamon, clove, nutmeg and vanilla beans have been in progress for a number of years. These islands like those in Indonesia are likely to prove important centres of production for such spices as well as for ginger, turmeric and many others. More serious efforts than have hitherto been made are required to cultivate these crops successfully. Ginger and turmeric will grow well in the Islands.

164. Indian vegetables are cultivated extensively on homestead lands. Tomatoes grow luxuriantly. Recently, an early variety of cauliflower has been cultivated in the Andamans. No systematic trials and experiments have been undertaken with regard to the growing of different kinds of English vegetables and potatoes. These vegetables are imported from the mainland and sold at exorbitant prices. The price of potatoes is more than a rupee per Kg. and it may be worthwhile to make a serious attempt to grow this crop in the valleys and at higher elevations on properly bench-terraced fields with facilities for irrigation. Even an acre-yield of 50 to 60 maunds of potatoes at the price level prevalent in the islands will be quite remunerative. India imports the Royal Kidney variety of potato from Rangoon because of the preference of the cultivators of some parts of the mainland for this variety against those grown on the mainland. The value of imports of potatoes from Rangoon to the mainland during 1963-64 and 1964-65 is shown below :—

Period	Quantity	Value
	(tons)	(Rupees)
1. April 1963 to March 1964	1,413	9,99,000
2. April 1964 to January 1965	1,321	8,96,000

Cultivation of potatoes at higher elevations may not conflict with forest interests, especially in situations where the forest stands may not be of much economic value. If the Royal Kidney variety of the Rangoon quality with freedom from disease can be grown, it will mean the saving of foreign exchange and will bring a substantial revenue to the islands.

Sugarcane

165. The tropics are the home of sugarcane. This crop is found to grow luxuriantly in the Islands but the acreage has not increased much since Independence. As the Islands have a tremendous scope for the development of horticulture the installation of any processing and canning unit for fruit crops will require sugar. The import of sugar from the mainland would be an expensive proposition. It will be in the best interests of the islands to encourage the expansion of the sugarcane acreage with the objective of eventually setting up a sugar factory. Meanwhile, the prospects of large-scale manufacture of gur and Khandsari sugar will brighten with the expanded acreage and production of sugarcane.

166. The data on the percentage recovery of sugar from the sugarcane grown in Andaman and Nicobar Islands are not available. However, according to the information furnished by the Secretary, Indian

Central Sugar Committee the following data—on the basis of sucrose percentage in juice, percentage purity and recovery percentage in Madras and Java—has been suggested.

Name of State	Sucrose percentage in juice	Percentage purity	Recovery percentage
Andaman	17.0—18.0	85—90	10.0
Madras	17.0—18.0	90	9.5—10.0
Java	18.5—19.0	90—95	11.49

According to the Director, Indian Institute of Sugarcane Research, Ministry of Food and Agriculture, a yield of 40 tons cane per acre can be expected in Andaman with a possible recovery between 9-10 per cent. The climate of Andaman is more akin to that of Java than to the climate of Madras. In Indonesia, the average yield from a 16-month crop of sugarcane is about 56 tons per acre. It is more probable that the data given for Indonesia for sucrose content, purity percentage and recovery percentage may hold good for Andamans and Nicobars also. The annual rainfall of the islands is more than adequate for the production of 50—70 tons of sugarcane per acre under good management and the cost of production will be much less than that on the mainland.

Fruit crops, coconut and arecanut

167. The fruit crops grown successfully in the Islands are pineapple, oranges (both mandarine and sweet orange) lime, guava, sapota, etc. The present acreage under these crops is small but the potentialities for expanded acreage and production are immense. The surplus production of fruits will be available for export, partly fresh and partly processed. Interview Island is ideal for the cultivation of all these crops on a large scale as it is for paddy and other field crops. The periods for harvesting of some of the fruits in the Islands are shown below :—

Name of fruit	Period of harvesting
1. Pineapple	March-May
2. Guava	August-October
3. Orange	December-February
4. Acid lime	December-February

The area of 10,000 to 12,000 acres of hilly lands given to the old settlers should be planted with these fruit crops and also with coconut and arecanut. Implementation may be done in a period of 5 years under the Fourth Five Year Plan. Facilities of subsidy and loan available to the cultivators in the mainland for the reclamation of forest lands and planting of orchards should be given to the settlers to accelerate the programme. Because of the peculiar conditions prevailing in the Islands with regard to manpower, the Administration may render some help in the clearance of forests as was done in the case of paddy lands, preferably on a matching basis, the Administration undertaking to clear an area equal to that cleared by the settlers themselves.

168. It is said that the Nicobars are the home of the coconut and the arecanut as these crops grow wild. Coconut and arecanut have been introduced into the Andamans. The proper exploitation of these crops is essential as at present we are importing them from abroad. The quantity and value of arecanuts imported by India from 1960-61 to 1963-64 are given below :*

Year	Quantity (Quintals)	Value (rupees)
1960-61	1,11,700	64,62,727
1961-62	1,00,408	45,32,009
1962-63	89,777	34,60,799
1963-64	28,102	13,86,584

*Source --Secretary, Indian Central Arecanut Committee, Kozhikode (Calicut).

Imports of copra and coconut oil from 1960-61 to 1963-64 are also shown below :*

Years	Imports of copra		Import of coconut oil	
	Quantity in Metric Tonnes	Value in (000) Rs.	Quantity in Metric Tonnes	Value in (000) Rs.
1960-61	97,975	115,238	Nil	Nil
1961-62	88,922	94,218	Nil	Nil
1962-63	94,492	99,667	4,340	6,030
1963-64	88,067	87,943	1,428	2,108

*Source --Secretary, Indian Central Coconut Committee, Ernakulam (S. India).

169. Copra made by the Nicobarese in primitive kilns is of inferior quality and fetches a somewhat lower price in the mainland markets. Drying in bright sun continuously for 5 to 7 days produces copra of good quality. But the high rainfall of the Nicobars does not make this method feasible. However, copra of fairly good quality can be made during the rainy season in properly designed kilns, and several improved types of kilns for making white copra perfectly free from blemishes of smoke have been patented. They need to be introduced in the Nicobars.

170. The production of oil from copra in the Andamans and Nicobars is very essential to the economy of the Islands. It will open up opportunities for the development of coconut oil-based industries and will also supply oilcakes as cattle and poultry feed. Moreover, one-third of the total production of coconut which now goes for the feeding of pigs in Car Nicobar may be available for oil extraction and the byproduct oilcakes will replace coconuts for feeding pigs.

Rubber plantation

171. This has been dealt with separately in section IV of this chapter.

Fibre crops

172. Both mesta and jute can be grown very well in the Islands. Jute is preferable to mesta since the former fetches more money. In

the cultivation of jute, the difficulty will be with regard to facilities for retting which are now lacking. The same difficulty was experienced in West Bengal when jute cultivation was intensified after the partition of the country. Jute retting tanks were provided to the cultivators and the acreage under jute increased considerably in a few years. Jute retting tanks need not be very big or deep. In monsoons shallow excavated tanks will hold enough non-brackish water and jute retting will be completed by July—September. Such tanks are possible in the Andamans and Nicobars. The scope for jute cultivation has to be investigated. It will not only become a cash crop to the cultivators but it will also provide raw materials for the development of industry. This crop will give excellent rotations with paddy, pulses, oilseeds, vegetables, etc. The jute crop will be sown in February-March and harvested by July-August.

Miscellaneous crops

173. The Department of Agriculture has been experimenting with the growing of crops like coffee, cocoa, cashewnuts, rubber, etc. Many crops of different varieties can be grown under the conditions prevailing in the Andamans and the Nicobars, but discrimination is necessary in the selection of crops which will be accepted by the cultivators and which will give maximum economic returns.

Improved seeds, optimum dates of sowing and transplanting, cultural practices, fertiliser and manuring schedule, plant protection, etc.

174. No specific recommendations are available with the Department of Agriculture, Andaman and Nicobar Islands, with regard to improved seeds of various crops, the optimum dates of sowing and transplanting, the fertiliser and manuring schedule, cultural practices and plant protection, etc. It is only last year that work on these lines has been started and it may take a few years before definite recommendations can be made to the settlers. In the absence of these recommendations, neither can extension be effective nor can the farmers be benefited. Under the climatic conditions of the Islands, some field crops may be grown throughout the year. Other factors being favourable, the optimum dates of sowing and transplanting will determine the maximum yields and the best rotations with other crops. Similarly, recommendations on cultural practices, fertiliser and manuring schedule, plant protection, etc. are required for maximising production.

Strengthening of the Agriculture Department

175. For the development visualised in this chapter it will be essential to strengthen the local Agriculture Department with adequate technical personnel of appropriate experience and calibre. Adequate laboratory facilities will have to be created and a strong extension wing established for effective follow up

SECTION IV—RUBBER PLANTATIONS

176. The climatic conditions in the islands are well suited to the development of rubber plantations. Some sporadic efforts in this direction were made in the past but without much success.

177. Late last year a delegation from the Rubber Board led by Dr. K. T. Jacob, Director, Rubber Research Institute a member of the Team—visited the Andamans to select a proper site for establishing a Pilot Project.

178. They visited the earlier plantations and observed, in respect of each, as under :

(i) The Manglutan Rubber Plantations—South Andaman.

179. This plantation covers about 60 acres and is owned by Shri Kamas Das. It has not yet been registered with the Board. The planting was done in 1960 and 1961 with Tjir I clonal seedlings. The seeds were perhaps obtained from Shaliacary Estate, Punalur. The trees are planted at a distance of 20'×10'. The rows in which they have been planted are not along the contours. The average girth of the tree in the 1960 area was found to be 17" to 37" height, which is considered very satisfactory. Indications of Phytophthora infection and other diseases were not noticed, although no control measures had been taken. However, a few young trees were found to be infected, probably by root disease, which needs further investigation. According to the statement of the person in charge, these were manured from the second year onward, mainly with nitrogenous fertiliser; yet, the crown and girthing factors were very satisfactory. However, a more pronounced tapering of the trunk was noticed; this needs further investigation. Signs of wind damage were also evident. On the whole, this plantation, though small and laid out without carrying out the normal manurial and cultural requirements, presented adequate evidence of the immense potentialities of growing rubber in that area.

(ii) Andaman Rubber Plantations—South Andaman.

180. This is an old estate which was raised about 45 years ago by the then Administration. It was later leased to private parties for extracting rubber and maintaining the estate. At present M/s. P. C. Ray are the lessees. The lease period has expired and the Administration is trying to get the area relinquished. The estate is situated in Wrighthmyo, Shoal Bay, Mannarghat and Kalatong Villages. The estate is registered with the Rubber Board, the registered area being 422 acres. The actual area under rubber is reported to be only 300 acres or so; the rest has been cleared and used for cultivation of other crops. The delegation could visit only the Mannarghat portion of the estate. The land here is hilly and undulating. Most of the top soil is eroded, leaving heavy yellowish clayey loam with only grass as the natural cover. The area is not fenced and is, therefore, open to cattle for grazing. The rubber trees in the area are small and stunted with bark on the main trunks badly tapped and malformed. The crowns are poorly formed. The trees are understood to be ravaged by abnormal leaf fall and die back diseases during the South West Monsoon every year. Earlier reports on the estate indicate that the soil conditions and tree growth are better in certain other parts of the estate situated in Shoal Bay and Kalatong. The trees, however, have far outlived their utility and are due for replanting.

(iii) M/s. Hindustan Plantations' Nursery—South Andaman.

181. Shri M. K. Ramkumar of M/s. Hindustan Plantations has raised a nursery of about 6,000 seedlings in Mannarghat near

Wimberlygunj. The seeds were sown in 1961. The plants are spindly and overgrown and are now not fit for transplanting. This nursery was raised for planting in Katchal island where forest clearance had been started in 1961. The project is now reported to have been abandoned.

182. The Delegation also visited some other areas and selected two sites on which the Pilot Project could be undertaken. The sites selected were:

(i) Forests in Bindraban, Ferrargunj Anikket, Caddlegunj, Ograbaraj, Namunagbar and Mithakhari Villages—South Andaman.

A compact block of unallotted revenue forest lands of over 3,500 acres in extent, composed of parts of the above villages was located. Commercial timber from these forests had been extracted during the pre-war period. At present the area supports thick secondary forests. The presence of commercial timber in these areas at present is only negligible. The flora is typical of the tropical forests of the Andaman Islands, being a mixture of evergreen, and deciduous species. The land is formed of a mass of low hills and ridges and their valleys. The highest hills according to the Survey of India sheet are 503 (Mt. Tuson) and 486' (near the Stone Quarry Road junction) above mean sea level. However, as is characteristic of the land formation in South Andaman, the contours are rather sharp. The soil, as in the other parts of South Andaman, is clayey loam, varying in colour from yellowish to reddish. The top soil is appeared to be soft, grey sandstone. During the perambulations made in the area, the delegation did not come across any large patch of shett rock at the surface. The depth of the soil is adequate for successful rubber cultivation. The hills give rise to a number of small streams. A number of these, were understood to be capable of giving perennial supply of fresh water. The delegation was satisfied that the area was eminently suited for locating in one compact block the proposed Pilot Project. The Chief Commissioner, however, thought it would be difficult to allot as large an area, as 1,000 or 1,500 acres from this locality for the Pilot Project because the settlers in the villages around were demanding allotment of additional lands to bring them on par with the recent allottees.

(ii) Forest land in Chiriya Tapu area—South Andaman.

These forests are connected to Port Blair by the Andaman Trunk Road. Suitable areas having easy accessibility from the road were, however, less than 100 acres in extent. Other areas on either side of the road are either already allotted to settlers or are too exposed to the sea to be suitable for rubber cultivation. A tall, steep and narrow ridge of about 1½ miles length and 500' height bars easy accessibility to areas lying farther beyond. Building of a bye-road to the areas behind the ridge is possible without great difficulty. Construction of such a road for a distance of 2 to 3 miles would bring within easy accessibility a further area of about 500 to 600 acres fit for rubber cultivation; the road would also open up the valley beyond, for other useful developments. Any large-scale development of these hinterlands would be possible only after such a road is opened. The soil conditions in the Chiriya Tapu area are more or less similar to those obtaining in the villages of Namunagbar, Bindraban, Ferrargunj,

etc. Perennial sources of fresh water supply are also understood to be present. The land is, however, much more hilly and rugged. Extraction of commercial timber in Chiriya Tapu has only been recently started and, therefore, the area available for immediate clear felling and planting is limited. In view of the non-availability of sufficient lands for locating the entire Pilot Project in Chiriya Tapu area, the Chief Commissioner has agreed to arrange allotment of 500 acres from out of the first plot inspected by the delegation and provide the balance requirement of forest land from Chiriya Tapu area. He also suggested that the Rubber Board may include in its Pilot Project 500 acres of land of the Andaman Rubber Plantations and its adjoining areas when that estate is ultimately resumed from its present lessees.

183. It was agreed that the Rubber Board would start work on the Pilot Project in the area provisionally selected in Bindraban—Ferrargunj—Namunaghar area. The Chief Commissioner agreed to allot 10 acres of land in this area for establishing the rubber nursery immediately and arrange a further allotment of an additional 500 acres.

Kyd, Neil and Rutland Islands

184. The Delegation also visited Rutland, Neil and Kyd islands. It recommended against development of any rubber plantation on Neil because it is badly exposed to both—the south-western and north-eastern gales. Coconut and arecanut cultivation would be a better alternative.

185. The delegation also rejected Kyd island because of its hilly topography. In respect of Rutland, however, the delegation confirmed an earlier report that about 6,000 acres of land mainly situated in the southern half of the island are suitable for rubber plantation. It was, however, felt that for any large-scale development of the islands jetty facilities would be indispensable.

Future Development

186. Rubber production can play a very important role in the future economy of the Andaman & Nicobar Islands. The ecological conditions obtaining in the various parts of the islands, though not ideal, are yet well suited for rubber cultivation. The resources available should be fully utilised in order to reduce the huge deficit in the production of this vital and strategic raw material in the country, and also for the quick development of the islands themselves. The following table shows the gap between the production and consumption of natural and synthetic rubber in India [during the various years] in the past. **Production and consumption of Natural & Synthetic Rubber in India.*

Year	(In metric tonnes)					
	Production			Consumption		
	Natural	Synthetic	Total	Natural	Synthetic	Total
1951-52	18,066		18,066	23,203		23,203
1961-62	27,446		27,446	48,410	10,186	58,596
1962-63	32,239		32,239	53,553	10,723	64,276
1963-64	37,487	8,075	45,562	61,155	11,959	73,114
1964-65	45,616	11,633	57,249	61,057	15,285	76,342

* Source —The Rubber Board, Kottayam-9, Kerala.

187. The country had spent about Rs. 5.2 crores on import of raw rubber during the last year. According to the estimates of the Sub-Group on Rubber of the Working Group on Plantation Crops of the Fourth Five Year Plan, the manufacturing industries in India would be consuming 1,89,000 tonnes of natural and synthetic rubber during 1970/71, while the production of natural rubber at the present pace of development would be only 72,000 tonnes.

188. The availability of suitable lands for further large scale extension of rubber cultivation on the mainland is limited. The area under rubber at present is concentrated on the south-west coast. Efforts are being made by the Rubber Board to locate suitable tracts in Tripura, Assam, Goa, Maharashtra, etc. However, Andaman & Nicobar Islands which enjoy identical climatic factors as the south-west coast of the mainland, remain the main hope for further expansion of the area under rubber.

Extent of land suitable for rubber cultivation in the islands

189. Experts from the Rubber Board have surveyed the islands from time to time. In 1956, the late K. N. Kaimal, the then Rubber Production commissioner, made a detailed study of the information available on the islands and reported that from the climatic angle the Nicobar Islands were the most suitable for rubber cultivation. The region comprising of Little Andaman, Rutland and South Andaman islands was considered to be the next best to Nicobars. The conditions were found to be less and less congenial as one proceeded northwards. During 1959-60, Shri P. Mukundan Menon, deputed by the Rubber Board, made an exploratory survey of the terrain and soil conditions of the various islands in the Nicobars. He reported Katchal as the only island having any sizable area suitable for opening large scale rubber plantations. The extent of land available in Katchal was estimated to be 10,000 acres.

190. Shri Menon has also reported the occurrence of small patches of 50 to 100 acres in extent in selected parts of Little and Great Nicobar Islands. He has, however, pointed out that the exploitation of such pieces of land for rubber cultivation would be feasible only when the islands are colonised or developed otherwise. In view of the present plans for the integrated development of these islands, it may be worthwhile to provide for rubber as a minor plantation crop to be taken up in 2,500 acres suitably selected.

191. In the Andaman Group, Rutland Island has been surveyed by Shri Mukundan Menon in 1959, by M/s Chacko A. Kallivayalil and P. P. Cherian in 1962 and lately by the Rubber Board Delegation led by Dr. K. T. Jacob, in 1964. The consensus of opinion is that 6,000 acres could be selected for rubber cultivation on the island.

192. The Rubber Board has already commenced work on the Pilot Project for rubber cultivation in 500 acres in Ferrargunj, Brindaban and Namunagarh villages of South Andaman. As already mentioned, the site for the project was selected by the Board's delegation in 1964 out of a compact block of unallotted revenue forest lands of over 3,500 acres in extent. The delegation was satisfied that the area was eminently suitable for the proposed Pilot Project. It has desired

that an area more extensive than the 500 acres now selected be made available for the project. M/s. Chacko & Cherian (1962) who had visited parts of South, Middle and North Andamans have expressed the view that land to a much larger extent than what had till then been reported would be available for rubber cultivation. The Rubber Board Delegation (1964) has also suggested that a detailed survey of the Andaman Group of islands will have to be carried out to assess the extent of suitable areas that may be available in those islands for rubber cultivation. Pending such a survey, it may be safe to assume that an area of at least 10,000 acres could be selected and set apart in the Andamans for rubber.

193. The total extent of land that will thus be available for rubber cultivation may be taken as :

Great Nicobar Island	2,500	acres
Katchal Island	10,000	"
Rutland Island	6,000	"
Rubber Board's Project (South Andaman)	1,500	"
Other areas in the Andaman Group	10,000	"
TOTAL	30,000	"

Programme for development

194. The Rubber Board's Pilot Project relates to the area around Port Blair. Here transport and other facilities are available and so it is a good area in which to make a beginning. When landing facilities are established, Katchal and Rutland could be taken up next.

195. The Rubber Board's Project envisages the planting of 500 acres in a phased programme spread over 3 years commencing from 1965-66 and the maintenance of the plantation until the entire plantation is in full production, which will be in 1974-75. Planting in Rutland and Katchal would be possible only from 1967-68. Timber extraction from the forest areas to be cleared for each year's planting would have to be undertaken in the years preceding the actual planting operation.

196. The Team considers that it is no longer necessary to organise any pilot plantations and that a full-fledged commercial plantation should now be started. The Rubber Board's Pilot Project should be considered as the first phase of such a venture. It should more appropriately be called a research-cum-development station which is an essential precursor to the larger scale commercial plantations. It will be able to raise a nursery and provide high yielding planting materials. The Rubber Board's project, thus processed, has already been sanctioned by Government.

197. The Plantation Corporation of Kerala had expressed interest in the development of rubber plantations in the islands; its Managing Director and the Director of Research, Rubber Board (a member of the Team) were asked to work out tentative estimates of the plantation programme covering about 6,000 acres.

198. The minimum period of time required for the commercial development of 30,000 acres of rubber will be about 15 to 20 years. The Plantation Corporation of Kerala has been planting up to 2,000 acres a year successfully. In the light of conditions in the Andamans, planting during the first five year period may not exceed 1,000 acres per annum. In subsequent years this target could be increased.

Financial Outlay

199. The Rubber Board Delegation has estimated the cost of clearing forests, planting of rubber and maintenance during the pre-bearing period at Rs. 3,000/- per acre. The expenditure to be incurred during each year is as follows:

	Rs.
1st year (pre-planting operations from October to March)	810·00
2nd year (year of planting)	550·00
3rd year (maintenance)	280·00
4th year (maintenance)	250·00
5th year (maintenance)	245·00
6th year (maintenance)	275·00
7th year (maintenance)	300·00
8th year (maintenance)	290·00
(Tapping can be commenced by about the middle of this year)	
TOTAL	3,000·00

200. The above costs do not include the overhead charges such as building, staff pay, office expenditure, insurance, amortisation, machinery, processing facilities and other capital items. For these purposes a sum of not less than Rs. 1000/- per acre has to be added. This will take the cost to Rs. 4000/- per acre. This does not include the cost of housing. Being on remote islands, a township and other minimum facilities connected with the establishment of a plantation have to be provided. In the mainland, labour and other housing is not required for all the employees. A fair percentage of them are local and come from their own houses for work. Here houses will have to be built for all. Schools, hospitals, transport, markets, entertainments and other facilities will have to be provided. These will, however, be included in the colonization scheme and should not be taken as a debit against rubber plantations.

201. The planting programme for the first five years will be as under:—

1st year	500 acres	(Possible to start this in 1967)
2nd year	800	..
3rd year	1200	..
4th year	1600	..
5th year	1900	..
TOTAL	6000	..

202. The total cost over 7 years for 6,000 acres will be approximately Rs. 2.4 crores in the Island. This will be spread over two plan periods, viz., the Fourth and Fifth, if the project is taken up for execution from 1967 onwards. An exercise in projection based upon an

yield of 1200 lbs. average per acre per year will show that this expenditure is well worthwhile and will be able to yield not less than a steady 6% return per year from the year 1980 after providing for amortisation, replanting reserves, further development reserves, etc. Actually the Rubber Board is confident that yields up to 1500 lbs. per acre will be realised here with the latest planting materials and proper care. But in working out a profitability exercise, it is prudent to take a lower figure of output per acre. In this exercise the price per lb. of rubber has been taken at the present rate of Rs. 1.50 per lb. (average), while the cost of production per lb. of rubber has been assumed at the level of Rs. 1.10 per lb. including taxation. These assumptions may need slight changes in the light of the actual conditions encountered in the islands during the period of development and operations.

203. Capital and operating costs of projects vary from time to time depending upon the general economic situation of the country in which the development is taking place. In this case, a special element of transport enters the picture. As these islands are remote from the mainland practically everything that we require has to be transported from the mainland or made there at a high cost. The costs for all items of development therefore have to be calculated at higher figures. Under the circumstances the above cost Rs. 6,000/- per acre cannot be regarded as high.

204. The development of the initial 6,000 acres will cost roughly Rs. 2.4 crores. The development of the rest may cost a little more, depending upon the price situation. A provision of 5% for rise in costs yearly would seem to be reasonable. This would be made up by a slight increase in the price of rubber. The Project would then continue to be attractive and productive.

Employment Potential

205. Rubber plantation is highly labour intensive. A plantation unit of 1000 acres can provide regular employment to not less than 300 labourers. When the plantation is in full production, the requirements of skilled rubber tappers alone for such a unit would be 250. A few months' training and practice can impart the necessary skill in tapping to unskilled labour.

CHAPTER V

ANIMAL HUSBANDRY

SECTION I—INTRODUCTION

206. The development of animal husbandry in the old colonisation areas has been spontaneous and shows promise of further expansion. Under the Colonisation Scheme the settlers were provided only with plough animals, and no milch cattle were supplied to them. Cows in milk according to the 1961 Livestock Census were 1,984 which is about 4 times the number of cows in milk in 1956 which was 538. The population of goats had increased from 3,663 in 1956 to 8,615 in 1961. According to the 1961 census, the population of poultry birds and ducks in colonised areas of North and Middle Andamans against those of South Andaman and Nicobar groups of islands is shown below in table 3:—

TABLE 3

Population* of poultry and ducks in Andamans and Nicobars

Name of Island	No. of poultry birds	No. of ducks	Total
1. South Andaman	31,087	2,179	33,266
2. Middle Andaman	9,473	1,891	11,364
3. North Andaman	13,248	2,985	16,233
4. Nicobar group of Islands	15,705	87	15,792
	69,513	7,142	76,655

*Source—Livestock Officer, Andaman and Nicobar Islands.

South Andaman has the oldest settlements of ex-convicts. Refugee families of East Pakistan were also settled on lands abandoned by some of the ex-convicts after Independence. Most of the animal husbandry work relating to cattle improvement and development of poultry is confined to South Andaman due to want of transport facilities and the lack of adequate and trained technical personnel for North and Middle Andamans. Nevertheless, in 1961, the population of poultry birds and ducks of indigenous variety in North and Middle Andamans was 27,597 against 31,087 in South Andaman. Although correct statistics are not available, it is reported that poultry birds and eggs are exported to Port Blair from the North and Middle Andamans.

SECTION II—STATISTICS

207. Cattle and buffaloes in the Islands are non-descript. According to the 1955 and 1961 census the population of various kinds of livestock is as shown under :—

	1956	1961
1. <i>Cattle</i>	4,350	7,388
in milk	538	1,984
2. <i>Buffaloes</i>	6,105	8,357
in milk	800	679
3. <i>Sheep</i>	33	36
4. <i>Goats</i>	3,663	8,615
5. <i>Pigs</i>	14,449	14,416
6. <i>Poultry</i>	56,040*	69,513
7. <i>Ducks</i>		7,142

*Includes both poultry and ducks.

208. The average milk yield of a cow in the area is about 1.5 litres per day although selected cows yield 4 to 5 litres per day. There is an acute shortage of milk in the territory. The consumption of milk per capita in these islands is only 42 ml daily as against 139 ml on the mainland and 280 ml recommended by the Indian Council of Medical Research. Buffaloes in milk have registered a decline in the 1961 census. According to the information furnished by the Livestock Officer, Andaman and Nicobar Islands, the income derived from the Livestock products is more than Rs. 20 lakhs annually.

Poultry and ducks

209. The population of poultry birds and ducks in the Islands is about 20% more than the human population. The majority of the people in the Islands are non-vegetarian and they evince a keen interest in poultry keeping. The population of poultry birds and ducks in the Andaman and Nicobar groups of Islands according to 1961 census is 76,655. According to the information furnished by the Livestock Officer, Andaman & Nicobar Islands, the annual production of eggs is about 1.8 million. The egg production per person per year in the Islands is several times higher than that in the mainland. The annual value of eggs and poultry consumed in the Islands is more than Rs. 6 lakhs, 50% of the adult poultry birds and 40,000 chickens a year are utilised for table purpose. The entire poultry produce of the territory comes from backyard poultry kept by the settlers, labourers, etc.

Pigs

210. Almost the entire population of 14,000 odd pigs is confined to the Nicobar group of Islands. The concentration of pigs in proportion to human population is quite heavy. The Nicobarese depend largely on pigs for their food. Although pigs are prolific breeders, it has been observed that their population remained stationary between 1956 and 1961. The reasons are mainly want of scientific knowledge in the rearing of pigs, heavy losses in young stock, malnutrition and under-nutrition. The Nicobarese do not produce surplus pigs for sale. According to the information furnished by the

Livestock Officer, Andaman and Nicobar Islands, the annual consumption of pork by the Nicobarese may be worth Rs. 2 lakhs.

Sheep and goats

211. The population of sheep in 1955 was 33 and 36 in 1961. It has remained stationary. In the case of goats, the population has more than doubled in 1961 over a period of 5 years and the 1961 census figure shows, 8,615 goats in the Islands. Apart from pigs and poultry the goat is the only meat-producing animal in the territory. The demand for mutton is increasing day by day and the present cost is high. The Islands have to meet the entire requirements of mutton from goats only. According to the information furnished by the Livestock Officer, Andaman and Nicobar Administration, the annual income from goats in the form of milk, meat and hides would be more than Rs. 2 lakhs.

Feeds and feeding

212. The present position with regard to the development of feed and fodder resources in the Islands is not satisfactory. Concentrates for the cattle are imported from the mainland and the settlers do not grow fodder crops on their lands. The cattle graze on the monsoon growth of grass in the hilly areas of the settlers and in the forests. In the dry season, very little grazing is available. The total acreage of permanent pasture and grazing lands in 1960-61 was 10,567 acres for livestock population of 38,617 (1961 census), that is, about $\frac{1}{4}$ acre per head. This is inadequate. The Administration has a small grass farm of 10 acres in South Andaman. The distribution of perennial fodder grasses such as "napier" and "guinea" by the Department of Animal Husbandry started only during the Third Five-Year Plan and has been confined mainly to South Andaman and has not been in proportion to the increase in the cattle population. The department has recently imported 'giant napier grass' from the mainland for trial. This grass has been found on the mainland, to be superior to ordinary napier and guinea both in yield and in nutritive value. Poultry birds and ducks are maintained generally on natural food such as insects, snails and small fish which are found in plenty during the rains and in small creeks, throughout the year. During its tour the team found the birds to be healthy. Recently the Department has been using garden snails, which are a great menace to vegetables and field crops, as a nutritive and palatable feed for poultry after proper treatment. As mentioned earlier coconuts constitute the principal food of the pigs. In addition, the pigs devour roots in the forests, the grubs of the rhinoceros beetle in the coconut gardens, and also snails and crabs, etc. on the sea shore during low tide.

Diseases

213. The Islands are fortunate in having no cases of contagious diseases like rinderpest, black quarter, foot and mouth, anthrax, etc. The livestock which is imported from the mainland has under the rules to be quarantined for 14 days. It has been reported that M/s Jadwet Trading Co. have been recently importing goats from the mainland in their ships for their own consumption. It is not known whether these goats are quarantined or inspected by a veterinary authority. This practice is fraught with great danger and

may rob the Islands of the immunity they have been enjoying from contagious diseases. Ranikhet disease is prevalent in poultry. Instances of parasitic infestation were stated to be particularly high in the Island. 'Hampsores' is known to affect the Island cattle population. But information on different parasitic diseases affecting different kinds of livestock is not available.

SECTION III—BRIEF REVIEW OF THE THREE PLANS

Animal husbandry

214. One key village scheme was included in the Second Five-Year Plan but the actual work under this scheme started during the Third Five-Year Plan. Under this scheme there is one artificial insemination centre, and six key village units where the red Sindhi and Murrah bull of good pedigree have been stationed. The activities of the key village scheme are confined to the major part of South Andaman and are concerned with the upgrading of the local cattle population through artificial insemination and natural breeding, castration of scrub bulls, treatment of sterility cases, milk recording, distribution of fodder grasses, etc. For want of a Government cattle-breeding farm as a source of regular supply of good milch cattle and sturdy plough animals to the settlers, the transport of animals from the mainland has become a recurring feature. During the Second Five-Year Plan, 3,477 work animals were transported from the mainland for supply to the settlers against loans. But due to transport difficulties, the Administration had to organise 14 cattle markets in the past for the purchase of plough animals for the settlers and the number that could be purchased from such markets was 614. In the Third Five-Year Plan there was a provision to supply, through import from the mainland, 500 milch animals to the settlers at the rate of 100 animals per year. The scheme, however, did not materialise due to the non-availability of a cattle-carrier and also other difficulties.

215. There is a Government Poultry Farm at Port Blair. It has a strength of 1100 Leghorn and Rhode Island birds, out of which there are 250 layers. This farm acts as a demonstration centre, supplies birds and hatchable eggs to the settlers at concessional rates, and imparts training on scientific poultry keeping, etc. Most of the birds and hatchable eggs are distributed in South Andaman due to want of timely and ready transport facilities to North and Middle Andamans as well as to the Nicobar group of Islands. A small duck unit of the Khaki Campbell breed has just been started. During the Third Five-Year Plan, the farm produced about 70,000 eggs and distributed among the poultry keepers nearly 850 improved birds for breeding purposes and 3,000 eggs for hatching.

216. Four years back, the Administration distributed 12 white yorkshire boars and 6 sows among the Nicobarese for upgrading the local pigs. With the exception of one boar, all died. According to the Livestock Officer of the Island Administration, the principal cause of death was mal-nutrition and under-nutrition, since no provision was made nor precautions taken to ensure proper feeding of these

animals. During Team's tour to Nicobar Islands we found the progeny of the pedigree pigs, that had been supplied to the Nicobarese, thriving quite well under local conditions.

217. The Department had started a Goat Breeding-cum-Extension Centre a year ago with goats imported from Nellore, in Andhra Pradesh. These goats did not thrive in the Islands and eventually died. The Nellore breed of goats was obtained on the advice of an expert from the mainland.

218. The Island Administration has at present 4 veterinary dispensaries and 11 veterinary outposts. By the end of the current Plan, 1 more dispensary and 1 more outpost are likely to be established.

219. In South Andaman, 4 milk cooperative societies function in the rural areas and a milk cooperative union works at Port Blair. The societies and the union have been organised by the Cooperative Department and they market surplus milk to Port Blair. The total number of members is about 250 and the quantity of milk handled daily is nearly 300 litres. The producers are paid Re. 1 per litre and the milk is sold to the consumers at Rs. 1.16 P per litre. In the absence of co-operative societies, milk produced in North and Middle Andamans is sold by the settlers direct in the market. Poultry keepers in South Andaman are able to obtain a better price for their produce than those in the North and Middle Andamans. While in South Andaman, the poultry products can be brought direct to Port Blair for sale throughout the year, the settlers in North and Middle Andamans have to sell their produce at a lower price to the middlemen for marketing to Port Blair. There is no organised poultry cooperative society in the Islands.

220. There is no separate department of livestock at present. One Livestock Officer of Class II rank is in charge of livestock development work. He is also looking after the work of the Cottage Industries Officer since no incumbent has joined this post yet. The Administration has not been able to get suitable persons for appointment as Veterinary Assistant Surgeons on account of the low scale of pay and the absence of allowances for specialised posts such as those in key village scheme, poultry farming, etc. Such allowances are normally provided for similar posts on the mainland. Also, there are no posts in the selection grade and the chances of promotion to higher posts are, therefore, remote. The pay scale of Veterinary Assistant Surgeons is Rs. 150—380 with a starting salary at Rs. 210/- for Veterinary Graduates which is even lower than the pay scales prescribed for Extension Officers and Agriculture Inspectors in the Islands.

SECTION IV—DEVELOPMENT PROSPECTS

221. The scope for the development of animal husbandry, poultry and duckery in Andamans and Nicobars is quite considerable, but it has to be planned in a systematic manner. No provision has been made in the Fourth Five Year Plan for intensive development of fodder crops. No productive and stable livestock industry can develop if cattle are maintained on roughage from forests and crop stubble and concentrates are to be obtained from the mainland. Supply of fodder crops in adequate quantity and concentrates at cheap costs has to be ensured. This is possible only if the production

of fodder crops and oil-cakes is taken up in the Islands. The climate of the Islands is very favourable to the growing of fodder crops which can give yields, under rain-fed conditions, much higher than those obtained on the mainland under similar conditions. Giant napier grass which is perennial can give 2,000 maunds or more of green fodder per acre in a year and this can support about 8 to 10 milch animals. Cowpea and lucerne are legume fodder crops which can be raised in the Andamans and Nicobars. Cowpea can be raised throughout the year and can give 6 to 8 cuttings or more per acre. Kudzu is another legume which merits consideration for planting in eroded and wastelands. It is perennial and supplies feeds of nutritive value equal to that of lucerne.

222. The Islands provide enough natural food for poultry and ducks. Fish meal is one of the concentrates for poultry feed and is now quite expensive on the mainland. Exploitation of the fishery resources of the Islands will make it possible to produce locally cheap fish meal conducive to the large-scale development of poultry, dairy and piggery. Production of oil-cakes in the Islands will also supply cheap concentrates to the birds.

223. The pigs of the Nicobarese are mainly fed on coconuts. It is estimated that nearly one-third of the annual production of coconuts goes for feed for the Nicobarese, one-third for export and the remaining one-third for feeding pigs. The ideal nutritive ratio of feeds for growing and fattening pigs varies from 1:6 to 1:10. The approximate composition of kernels of green and ripe coconut, copra and coconut oil-cakes is given in the table below:

Approximate Composition of Coconut and Coconut Oil-cakes

Head of analysis	Kernel of green coconut	Kernel of ripe coconut	Copra	Coconut oil-cake		
				Mill	Expeller	Chekku (ghanni)
Moisture	75.92	36.30	6.80	11.00	10.00	13.30
Ash (minerals)	0.98	1.00	2.00	5.70	5.30	4.00
Ether Extractives	6.43	41.70	63.70	6.00	10.00	28.70
Proteins	9.41	4.50	7.60	19.80	19.10	14.30
Fibre	2.50	3.60	3.80	12.20	11.80	8.90
Carbo-hydrates.	4.76	13.00	16.10	45.30	43.80	32.80
Calories per 100 gm	123.92	448.90	675.70	334.20	360.70	443.00
Nutritive ratio	1 : 2.04	1 : 23.69	1 : 20.95	1 : 2.97	1 : 3.47	1 : 6.55

*The Coconut Palm, Indian Central Coconut Committee, 1957.

224. The present system of feeding pigs on copra and kernels of ripe coconut is wasteful and calls for additional protein supplements because of a wider nutritive ratio. Coconut oil-cake, on the other hand, has a narrow nutritive ratio and is rich proteins. It contains essential amino acids necessary for growth and maintenance and can readily replace the present system of feeding pigs on copra or kernels of ripe coconut. This will also result in saving of a large

quantity of coconut oil for other purposes. Of coconut oil-cakes produced by different methods of oil extraction, 'ghanni' oil-cake has the ideal nutritive ratio for growing and fattening pigs. Coconut is a poor source of minerals and vitamins. To record rapid and profitable gains, pigs must receive well-balanced rations that provide a sufficient amount of good quality protein. They should also be given minerals and vitamins. This will have very important bearing on the success of any pig improvement programme that may be undertaken for the benefit of the Nicobarese.

225. The schemes proposed under the Fourth Plan, reflect the long-felt needs in the field of animal husbandry. It may, however, be desirable to consider whether the proposed composite Livestock-Breeding Farm for cattle, buffaloes and goats should be established at Port Blair or in the Islands of Camorta and Trinket which have extensive areas of grasslands. The implementation of the scheme will ensure timely and regular supply of animals to the settlers at a cost perhaps cheaper than that paid on the mainland.

CHAPTER VI

FORESTS

SECTION I—GENERAL

226. The Andaman and Nicobar Islands are a unique territory. They abound in forests which as mentioned earlier, cover 77.8 per cent of the total area. Forests offer, indisputably, the major basis for economic development. However, as indicated earlier in Chapter III, there is need for a balanced apportionment of land between various competing uses e.g. paddy, horticulture, plantation and, of course, forestry. This is dictated not only by the targeted increase in population but also by economic considerations such as the best use of land indicated by land capability studies.

227. While the Andaman forest has been worked for the last 75 years, much of it is still virgin, especially, along the West Coast (aboriginal reserve), North Andaman Island (under lease). forests on many smaller islands in the Andaman group including those of Ritchie's Archipelago and in the interior, away from the accessible seas and creeks, from which extraction of timber is difficult due to the lack of roads.

228. The forests of the Nicobar group of islands have received no attention except for an exploratory survey a few years ago, and very recently the start of clear-felling operations in Katchal Island over an area of 2,500 acres, for plantation purpose.

229. To appreciate better the value of forests of these islands it is necessary to understand the topographical and edaphic conditions obtaining there. The islands consist mainly of a chain of mountain peaks submerged in the sea. The ground for the most part is therefore hilly, the higher ridges being to the eastern side of the main islands some of them going upto nearly 3,000 feet elevation. Locally, some areas are undulating with small patches of level ground, particularly along rivers and creeks some of which penetrate almost from coast to coast. Some of the islands, namely, Neil, Interview, Little Andaman, Car Nicobar, Katchal, etc., are also more or less level.

230. The geology of the Andaman group of islands consists mainly of sandstones, and conglomerates, with outcrops of igneous rocks of the serpentine series. In South Andaman Island there are patches of clays interspersed with the sandstones. In Ritchies Archipelago and on some of the islands near the East Coast the geological formation is quite different. In addition to the sandstones and patches of clay, may be found limestone formations, rendering the soil calcereous. As a result of this geological formation, the soils are very porous except where there are clays and limestones, despite the heavy rainfall which averages from 100" to 170" per annum.

231. With the gradually increasing demand for land for colonization, grazing, etc. despite the fact that all land is government.

owned, it is necessary that the legal status of the forest areas should be accurately defined as early as possible and 'reserved' and 'protected' forests should be demarcated on the ground, particularly in the islands where land has already been transferred for colonization.

SECTION II—FOREST TYPES

232. The Forest vegetation may be differentiated into four broad and distinct types viz. :

(i) *The mangrove Forests* : These are evergreen and are confined to belts subject to tidal action along the coasts and along the creeks, on saline low-lying land, the sub-soil of which is usually alluvial. The belts vary in depth from a few yards to sometimes 8 to 10 chains. These forests fulfil the important function of preventing tidal erosion but are otherwise not economically valuable. There is a local demand for poles, but the cost of extraction is high, because of the swampy nature of these areas.

(i) *The Littoral or Beach Forests* : These forests also form a narrow belt of varying depth just above high tide level on "Detritus brought down by streams and sands banked up by wind and wave". The soil is generally alluvial. The forests of this type contain some valuable hardwoods species like *Mimusons littoralis* (bellet-wood) *Tetrameles nudiflora* (Thitpok) *Calopyllum inoplyllum*, *Terminala catappa*, etc.

(iii) *The Deciduous Forests*: This type of forest occurs on undulations and gentle slopes up to about 300' in height and covers about 45% of the total area of the Andaman group of islands. The soil is generally poor or physiologically less moist as the underlying rock is sandstone or conglomerate. These are amongst the most valuable forests of the islands and contain padauk, white chuglam, black chuglam, Pynma, white dhup, chooi, marbelwood, etc. which are in great demand for match splints, plywood and ornamental timbers.

(iv) *Evergreen Forests*: This type constitutes most luxuriant type of forests in these islands. The soil is generally well-drained and fertile. The forests are equally valuable as a source of timber and industrial wood, as the deciduous type. While the highly prized padauk is rarely found here, the most important species are the Dipterocarps which grow to very large sizes and form the predominant commercially valuable species of these islands. In addition, other valuable match and plywood species like papita, badam, red bombwe, didu, lalchini, lambanapatti, bakota, thingah, etc. occur in this type of forests.

233. *Bamboos and canes*: A variety of bamboos and canes are also found in these islands interspersed in pockets with the main, types mentioned above. These bamboos and canes are commercially important for local use; canes are also exported to the market in Calcutta.

234. While the mangrove belts are distinctly separable, the other types tend to merge into or are freely interspersed amidst each other, particularly, the deciduous and evergreen forests.

235. The forests of the Nicobar group of islands are mainly of the evergreen type with coastal fringes of mangroves. A most striking and important feature is, however, the absence of the two most valuable commercial species, padauk and gurjan, from these islands. This is one of the reasons which has made the exploitation of the forest wealth of this group of islands an uneconomic venture at present.

SECTION III—PRESENT UTILISATION

236. Of the large number of species of trees which go to make-up the forest complex of the Andaman and Nicobar Islands, in general, only a few of them (about 26) have been found commercially useful. This, together with the selective requirements of the market with regard to size and shape have resulted in a system of selective fellings where only the useful species above a certain girth limit are removed, while the non-commercial species are either left to rot in the forest or are burnt in regeneration operations. This results in colossal waste as the useful species represent together barely 25-30% of the standing crop. It is expected, however, that the utilization of these non-commercial species will progressively improve with advances in wood technology and in the use of mixed miscellaneous hardwoods as suggested in the Chapter on Industries.

237. *Protection of the forests*: The protection of these valuable forests has not posed any problem as yet. Due to the high rainfall there is no appreciable danger from forest fires. The requirements of the small local population for timber and other forest products are met to the desired extent with the result that there is no problem of illicit fellings. The only source of damage which is causing concern is that by deer (cheetal) particularly in plantations and newly regenerated areas, it is interesting to note that of all the deer species introduced into these islands, the cheetal has flourished and spread to all the islands within swimmable distance from the main islands.

Present System of Working

238. The main preoccupation of the Forest Department of this territory is the extraction of timber from the accessible forests to feed the timber market at Calcutta, and to a less extent that at Madras.

239. There is no approved Working Plan in force for the forests of these islands though five plans have been prepared from time to time. Work at present is being done according to the prescriptions laid down in Changappa's Plan (1951) as modified, where necessary, by those in Vermah's Plan (1960).

240. The areas to be felled are chosen mainly for their accessibility rather than on the condition of the forest crop. Thus the areas which are within easy reach of the creeks and water-ways have been worked. The method of regeneration is mainly natural, that is from seed shed by the trees which have not been felled. In selected areas, however, plantations of teak are being raised. These plantations are doing fairly well. Plantations of other valuable species like padauk have also been raised in the past but these are not being continued, because the young seedlings are very susceptible to damage by deer.

241. The extraction of timber from the forests of these islands presents considerable difficulty. It involves the combined use of elephants, tractors, locomotives on tram-lines, rafting and touring by motor boats in the creeks and transport by steam launches and L.C.T.S. in the open sea. Transport to the mainland is by ocean-going ships. Thus, a number of stages involving the loading and unloading of timber, are involved. This increases extraction costs. More complicated, however, is the rafting of the timber, since some species are heavy (sinkers) and others light (floaters). To facilitate the extraction of the heavier logs, rafts have to be made of a judicious combination of floaters and sinkers. Sometimes these rafts have to be kept tied together till they are loaded on ships otherwise the heavy logs would sink. This delay often results in the deterioration of the light logs which are used for match splints. The absence of good jetties which could be utilised for loading timber on the ships also makes it necessary to keep the logs tied together, as rafts for long durations so that they could be towed to the ships anchorage for loading.

Wastage

242. As the market requires logs of 48"-and-above midgirth for plywood, and of 36"-and-above midgirth for matchlogs, logs of these girths of commercial species, only are extracted. This results in considerable wastage of timber, particularly in the deciduous forests where only a few seed trees are retained after felling. Greater utilization of undersized logs as well as of non-commercial species has to be brought about as early as possible.

243. Now that there are a few roads on these islands, road transport is being increasingly used, namely, near Port Blair in the South Andaman Division and in Yerrata in Middle Andaman Division.

244. Exploitation is done mainly by the Forest Department except in the North Andaman Division which has been leased to M/s. P. C. Roy & Co. (India) Private Limited, for a period of 25 years from 1951. All the operations in this Division are carried out by the licencees themselves. However, at present work is almost at a stand-still and the licencees are not extracting any timber at all.

245. In recent years, extraction by private agencies is also being resorted to, namely in Neil Island, Nayasheher (South Andaman), Katchal Island, etc.

246. No forest operations are being carried on in the aboriginal reserve in the South and Middle Andaman Islands. This reserve which is meant for the hostile Jarawas covers an area of approximately 300 square miles. Similarly, there are no forest operations on Little Andaman island. In the Nicobar group forest operations are restricted to a 2,500 acre lease on Katchal Island. This area is being clear-felled for plantations but it is reported that the leasee is finding it very difficult to extract the timber because of the very poor anchorage facilities.

247. Till recent years, most of the timber extraction was sent to Calcutta and Madras, to feed the wood-based industries there, particularly at Calcutta. Small quantities of timber were also being

exported to international markets but because of the internal demand this was stopped. With the establishment of two veneer factories, M/s. Andaman Timber Industries at Bamboo flats, South Andaman, and M/s. Albion Plywood at Long Island, together with the older match splint factory in Port Blair, about 500-600 tons of plylogs and about 300 tons of match logs are being utilised by these factories. A third veneer factory is being established at Bakultala near Rangat Bay, Middle Andaman. These factories are expected to expand to utilise approximately 800 tons of plylogs per month each. Similarly, the match splint factory at Port Blair is also likely to expand. The local demand for timber is also gradually increasing, particularly with the large colonization and development programmes. The use of small dimensioned secondary species should be encouraged to meet this demand to allow the more valuable species to be utilised by the wood-based industries.

248. The existing staff of the Forest Department is far too meagre for the needs of the territory with the result that very often important silvicultural works tend to be neglected. The staffing pattern is itself irrational with too few Range Officers and Forest Guards. With the accelerated development programme visualised in this report, the staff would have to be augmented considerably.

SECTION IV—PROPOSALS FOR THE FUTURE

Working Plans

249. The first and most important step in the scientific exploitation and development of the forests of the Andaman and Nicobar Islands is the preparation of Working Plans on modern scientific lines based on statistically collected and analysed data from field sample surveys. The use of aerial photography and photo interpretation in conjunction with sample ground surveys, would accelerate the work of preparation of such Working Plans which are essential, not only for a sound policy of forest management, but also for an accurate estimation of the forest resources and thereby for the rational planning of wood-based industries.

250. The Working Plan prepared by Changappa in 1951 was not implemented since it coincided with a rush of colonisation work as a result of political disturbances on the mainland as well as with a slump in the timber market. A revised Working Plan was prepared by Vermah in 1960, based on the information and data available in Changappa's Working Plan but this Plan was not approved by Government. The position today is that there is no Working Plan in force in this territory. However, the regeneration techniques as prescribed in Changappa's Plan with necessary modification where required, are in force.

251. A post of a Working Plan Officer was created under the Third Plan and preliminary work started, but this post has been lying vacant for some years and, therefore, no work has been done.

252. To expedite the preparation of these Working Plans, it is necessary that a Working Plan-cum-Research Circle under the charge of a Conservator of Forests is created immediately. Under this Conservator there should be two Working Plan officers (Deputy

Conservators of Forests) one in the existing vacant post and the other in an additional post, also to be created immediately.

Silviculture

253. Greater attention has to be given to silvicultural operations and the regeneration of forests which have been felled. Regenerated areas have to be tended carefully so that the future crop does not suffer from neglect—weeding, climber cuttings and thinnings are essential for a healthy well-formed crop. Research into the best regeneration techniques, thinning regimes and to determine the rate of growth of different species, has to be conducted. A separate post of a full-time silviculturist with his ancillary staff, to work under the Working Plans-cum-research Conservator, mentioned in the previous paragraph is very necessary.

Plantations

254. During the Third Plan, about 6,000 acres of teak plantations were to be raised. This programme could be stepped up substantially in the Fourth Plan as the technique of planting teak is well known and the plantations have proved successful. Plantations of padauk, a very valuable indigenous species, have been raised on a small scale in the past and have proved successful. Plantations of this species should now be raised on a large-scale and be adequately protected from deer damage. Experimental plantations of other valuable species should also be started.

255. The mangrove forests present peculiarly difficult conditions of working because of the soft soil, tidal conditions and the impenetrable development of still and aerial roots. As a group, mangrove species are used mainly as firewood and to some extent as transmission posts. But their economic utilization will be possible only when methods of extraction are developed that would serve in the peculiar ground conditions prevailing in this type of forests. When there is an abundance of larger sized and better quality timber, it is hardly conceivable that these mangrove forests would be exploited commercially in the near future, except for some local use.

256. Canes are found in appreciable quantities in both the Andaman and Nicobar group of islands. At present they are being exploited for trying rafts of timber as well as for the market at Calcutta. In accessible areas this exploitation tends to be indiscriminate. Selected varieties of canes should be cultivated to cater to the furniture industry both on the islands as well as for the Calcutta market. Since Malayan canes are in demand in the Indian market, there is good reason for this species to be introduced.

Timber Extraction

257. As already mentioned, logging—which includes felling of trees and extraction of timber is based on the existing mode of transportation by tram-way, by creeks and by sea and logging has progressed inland only to the extent that areas could be readily tapped. Exploitation areas are not selected on the maturity and condition of the crop. Fellings are restricted to marketable species or species required as 'floaters' for rafting. Of these species, only

trees above exploitable girth—48" in the case of ply-logs and 36" in the case of match logs—are felled. This as mentioned earlier results in considerable waste of timber and high extraction costs.

258. A well-planned system of roads would lead to a reduction in transportation costs since movement of timber would be more rapid, resulting in less deterioration in transit; would avoid the necessity for handling the timber at various stages of transport now in vogue; would obviate the necessity for a balanced extraction of "floaters" and "sinkers" and would allow for the working of areas away from the creeks and bays where there may be larger sized mature trees. Even now, the short stretches of roads completed by the P.W.D. are being used by the Forest Department for timber transport by road, particularly, in South Andaman (Beach-dera area). The completion of the proposed Great Andaman Trunk Road would go a long way to help in the extraction of forest products. It would be necessary for the Forest Department to construct feeder roads and extraction tracks to link this main road with the forest areas being worked. The planning of this network of roads would depend on the sequence of worked suggested in the proposed Working Plans mentioned earlier. Feeder roads should preferably be all-weather roads with permanent stream crossings. The extraction tracks would be temporary as they would link the individual working areas with feeder and main roads. The construction of such roads is best done by the Forest Department (as is the case on the mainland) which not only has the necessary know-how but would also do it more economically. Where possible, the construction of feeder roads can be mechanised to accelerate the work.

259. Even as the road system is developed the existing land-cum-water transport can be gradually curtailed, particularly, the tramways which serve only a limited purpose. Water transport would, however, continue to be necessary over the larger part of the territory but could be minimised. Transportation of timber in L.C.T's to minimise floating would have to be increasingly resorted to in the future, provided such craft are available. This would enable the transport of match and plylogs independent of each other, with less deterioration. As the wood-based industries in the Islands expand, transportation of timber in the log form to the mainland will gradually diminish and shipping of only the processed material will be required. This would be easier in that it would result in economy of space and reduce wastage as a result of deterioration.

Mechanization

260. Various experts in the past have suggested mechanisation of forest operations because of labour shortage and to reduce costs. As the road system develops it would be increasingly possible to mechanize forest extraction but the major bottleneck in this would be the difficulty in obtaining suitable mechanical equipment and spare parts which would have to be imported and would, therefore, involve foreign exchange. It may be mentioned that more than 50% of the mechanical extraction equipment with the Department is lying idle for want of spare parts. In these islands due to climatic conditions, wear and tear is heavier involving more frequent replacement of parts. Furthermore, with the targeted increase in

population it would be wise to adopt a more labour intensive technique of extraction to provide for larger employment opportunities, thus a judicious combination of mechanical and manual operations would seem to be the best answer.

261. Felling technique in these islands result in considerable wastage of valuable timber. There is, therefore, a need for the introduction of modern logging tools, particularly, modern power chain-saws as well as hand-saws.

Forest Industries

262. As mentioned earlier there is a match splint factory (W.I.M. Co.) at Port Blair which utilises 300-400 tons of match logs or 'softwoods' per month. This factory would gradually expand but at present it is found difficult to meet its requirements because of the bottleneck in transportation, which also results in the deterioration of the 'softwoods' required by the factory. The factory could, however, meet its requirements from other areas which would be worked as a result of the accelerated development of these islands.

263. At present there are two veneer factories in operation—one at Bamboo flats in South Andaman Division and the other, established in 1963, at Long Island. These two units consume approximately 200-300 tons of plylogs per month, each, but plan to expand to a capacity of 800 tons/month each in the near future. A third unit is being set up at Bakultala in Middle Andaman Division and is to go into operation soon. These three units are expected to consume about 28,000-30,000 tons of timber per annum eventually, which on present estimates, is more than the production of the South and Middle Andaman Divisions. These factories are also planning to set up glueing and drying plants for the manufacture of plywood from the veneers. This is a welcome step.

264. As mentioned in the Chapter on Industries there is considerable scope for the establishment of chipboard units in these islands. These units would utilize the wastage from the veneer units as well as the non-commercial and under-girth commercial logs which are at present not being utilised.

265. The paradoxical scarcity of sweet water despite the heavy rainfall in these islands precludes the establishment of pulp and paper units at least for the present.

266. The establishment of further industrial units visualised for these islands should be preceded by a resources survey particularly of some of the islands now not included in the scheme of working, such as Little Andaman Island and islands of the Nicobar Group.

267. The Forest Department runs a large saw-mill at Chatham which utilizes undergirth logs and those rejected for plywood. These logs are sawn into various sizes to feed the market on the mainland at Calcutta and Madras and to a smaller extent, the local demands particularly at Port Blair. This saw mill has a seasoning and preservation plant which is not being used to its full capacity. With an expansion in the development programme of the islands, the demand for sawn timber particularly seasoned and preserved timber

would increase. The mill could conveniently utilize non-commercial species and popularize their use after treatment for local requirements, particularly of Government departments. The efficiency of the mill could be increased by better equipment and a good saw doctor to ensure the proper maintenance of saws.

268. There is another saw mill at Betapur in the Middle Andaman Division which works as a scavenger unit in converting the non-saleable logs into sawn timber for local use in the colonization schemes, as well as for departmental use. Scope for its expansion has been indicated in the Chapter on Industries.

North Andaman Agreement

269. The forests of North Andaman Division which includes a part of Middle Andaman Islands as well as the whole of North Andaman Island together with some of the adjoining islands (708 square miles) has been leased out to a private concern M/s. P.C. Ray and Co. (Private) Ltd., for 25 years from 1951. This area is approximately equal to the total exploitable area of South and Middle Andaman Islands and the licensee is expected to extract 75,000 tons of timber per annum. Unfortunately, work for the past year is at a complete stand-still with the result that the mature and over-mature forest stands are facing decadence and are as a consequence failing to put on adequate increment. The necessity for exploiting these forests cannot be too strongly emphasised in view of the acute timber shortage on the mainland. Most of the stocks of padauk are now mainly to be found in this leased area. The agreement with the firm is now under arbitration at Calcutta.

Agency of Working

270. At present the extraction of timber is done almost entirely by the Forest Department and most of the staff is engaged on this. It is recognised that this may have been necessary due to the peculiar problems in territory among which were the lack of private operators who could undertake this work, the large capital investment involved and the difficulty in getting labour. These conditions are changing gradually. Since 1947, a few small scale operators have started timber extraction in the Port Blair area; 2,500 acres on Neil Island are being worked by a private operator and a similar area on Katchal in the Nicobars. A lease in the Manglutan—Nayasheher area of South Andaman Island, has been sanctioned to the Andaman Timber Industries.

271. It is, however, doubtful if the conditions are ripe for a large scale exploitation of forest wealth by private entrepreneurs. Experience with M/s. P. C. Roy is a pointed reminder of this; even the Hind Plantations, Ltd., are having trouble in Katchal. In view of difficulties pointed out in Chapter III, it is certain that the exploitation of forest resources in areas such as Little Andaman, Great Nicobar, Katchal, etc. will have to be undertaken in the public sector. Whether this should be done departmentally by the Forest Department or be taken up by an autonomous corporation is the only question to settle. If an autonomous corporation takes over the commercial side of forest management, it may enable the forest

department to devote their attention to other important duty of conservation, management and forest development.

Strengthening of the Forest Department

272. As mentioned earlier, the accelerated exploitation of the forest resources of the Islands will throw heavy burdens on the Forest Department. The Department is under-staffed even for its existing tasks. If the extraction of timber continues to be the responsibility of the Department, a separate wing of the Department may have to be set up for that purpose so that the scientific and development side of forestry received adequate attention.

273. In the expansion of the Department, the need for trained personnel needs to be emphasised. A training school is being established in the Islands. Training courses for Foresters and Forest Guards may alternate in this school—a course of one year's duration for Foresters followed by two courses of six months' duration each for Forest Guards. The training facilities available in Forest Colleges on the mainland should also be made use of and advance action taken to recruit personnel and put them through the required training.

Forestry Vs Agriculture

274. As discussed in Chapter III, there need be no conflict between forestry and agriculture. The future exploitation of land should be based essentially on the principle of the most economic land use dictated by land capability studies. Forestry will have its due share in the economy of the islands and will continue to play a dominant role in its future development. Thus, for example, Interview Island, where past efforts of regeneration of Commercial Forest Species have been successful, the land utilization, may be substantially oriented towards Forestry even though the land is eminently suitable for agriculture.

275. Another island which merits specific mention is Little Andaman. Here about 100 square miles would be cleared of forests to yield a net area of about 60,000 acres proposed for development of agriculture (including plantations and horticulture). About 50 square miles may, to begin with, be maintained as an Onge reserve and left untouched. The balance of 130 square miles of forests should be covered by a Working Plan for the exploitation of commercially usable forest produce.

CHAPTER VII

INDUSTRY

PART A—FOREST-BASED INDUSTRIES

SECTION I—INTRODUCTION

276. As mentioned in Chapter III, industrial development in the islands will have to be forest and agro-based for quite some time to come. The rich forest resources of the Islands will necessarily dictate a pattern of industrial development heavily biased towards the utilisation of these resources. Therefore with the exception of sugar all the big industrial units will be forest-based. The importance of forest based industries even as at present is reflected in the fact that more than 60% of the workers employed in manufacturing industries in the islands are accounted for by wood based industries such as saw milling, veneer and match stick manufacture.

SECTION II—FOREST RESOURCES AND THEIR PRESENT UTILISATION

Resources

277. As already mentioned, forests cover about 2,500 sq. miles of the area of the Islands; this is about 77.8% of the total of 3,215 sq. miles. The forests boast of a wide variation of types, mainly inter-mixed and a super-abundance of several species of hardwoods, varying widely in their economic and industrial importance. The main forest types are :

- (i) The Mangrove forests.
- (ii) Beach forests.
- (iii) The Moist Deciduous forests.
- (iv) The Low level wet ever-green forests.
- (v) The High level wet ever-green forests.

278. From the economic and industrial point of view the Moist Deciduous and the Low Level Wet Ever Green Forests are of the highest importance; most of the important hardwood species suitable for saw milling, plywood and match manufacture are found in these forests. Garjan, the most important plylog species forms roughly 30 to 50% of the total timber extracted from the ever-green forests. No proper stock mapping has yet been done, but it is estimated that about two-thirds of the forest area of Andaman Islands, excluding the area under Mangrove and Beach forests, is covered with wet ever-green forests and the remaining one-third by Moist Deciduous forests.

Present Extraction

279. Out of the total forest area of about 2,500 sq. miles, about 1,381 sq. miles are being worked according to the prescription of a

working plan. Of this latter area only the near and easily accessible forests have been worked during the last 50 years and most of the area is still covered with virgin forests.

280. Under the present arrangements for working the forests the annual yield for South and Middle Andamans forest division has been assessed at 55,000 tons; about half for each division. The yield from the area leased to M/s. P. C. Ray in North Andaman forest division has been fixed at 75,000 tons per annum but the lessees have not been able to fulfil their contractual obligations with the result that this area remains almost unexploited.

Agency for forest working

281. The forest area covered under the working plan in Middle- and South Andamans is being worked departmentally. Recently some areas, such as in Rutland Island and in Neil Island have been leased out to private parties. Some coups on the main Islands have also been given to local industry for the felling of over-mature trees. Discussions with the firms who are working these coups indicated that the actual yield of commercial timber from the coups worked by them would be about 18 to 20 tons per acre, and not 12 tons per acre as estimated by the forest department. It would, therefore, be seen that the annual yields prescribed in the working plan by the Forest Department are very much on the conservative side and it may be possible to extract larger quantities of timber per annum from the areas covered under the working plan, if the forests are worked intensively on modern lines. This appears all the more feasible in view of the fact that many of the non-commercial species of timber in these forests which have not been taken into account by the Forest Department for yield purposes have been found to be suitable for plywood manufacture.

282. The past yields of logs from these areas are indicated below :—

Year	Middle and South Andamans		North Andaman
	All Hard-woods	Garjan	All Hard-woods
	(tons)		
1951-52	45,933	N.A.	29,437
1952-53	37,647	13,066	
1953-54	43,486	11,000	
1954-55	58,044	23,000	23,991
1955-56	55,701	21,000	26,395
1956-57	56,465	18,000	34,229
1957-58	49,729	14,386	17,932
1958-59	47,706	14,067	14,559
1959-60	50,799	18,272	16,018

Reasons for present slow utilization

283. Some of the important factors which have stood in the way of faster economic utilisation of the forest wealth of the territory are :

- (i) Comparative isolation of the territory from the mainland resulting from poor transport facilities.
- (ii) Manpower shortage—both skilled and unskilled.
- (iii) Almost non-existent financial resources of the local private sector.
- (iv) Inadequate infra-structure to sustain the growth of an industrial economy.
- (v) Lack of incentives to attract capital from the mainland

SECTION III—EXISTING FOREST—BASED INDUSTRIES

Milling Industry

284. **Chatham Saw Mill** : The public sector has played a pioneering role in the development of forest-based industries and the Chatham Saw Mill, which is the largest industrial undertaking in the Islands, has played a significant role in the economic development of the area. The mill is equipped to saw about 100 tons of logs per day and employs about 1,200 workers. Even though the plant and equipment is rather old, the degree of mechanisation available in the saw mill is of a high order even by mainland standards. The quantity of logs sawn from 1956-57 onwards is given below :—

Year	Intake of saw logs	Sawn timber produced
	(tons)	(ton)
1956-57	26,615	13,545
1957-58	22,207	12,350
1958-59	20,763	11,303
1959-60	21,032	12,293
1960-61	17,625	9,644
1961-62	20,517	10,982
1962-63	20,256	10,846
1963-64	20,799	11,431

285. **Betapur Saw Mill** : Another State owned saw mill, though on a much smaller scale, is situated at Betapur in Middle Andaman.

286. **Private Saw Mill** : The outturn of six privately owned saw mills is insignificant as compared to the State owned saw mills. By and large, the privately owned saw mills are not doing well; surprisingly the main reason for this state of affairs is an acute shortage of saw log supplies to these mills. The privately owned small saw mills can play a significant role in the economy of Islands if

- (i) Saw logs can be made available to them at reasonable prices and the prices fixed by the forest department are not changed often;
- (ii) Saw mills can be given small coups for direct working on royalty basis;

- (iii) The major demand for sawn timber within the Island is left to be catered by these small saw mills and the State owned saw mill is worked from the export sawn timber to the mainland and abroad. Sawn timber for export can only be manufactured in the well equipped state owned saw mill which also has adequate facilities for seasoning and preservation of sawn timber
- (iv) The saw mills are encouraged to set up small seasoning kilns and wood preservation plants. Availability of wood preservation facilities in small saw mills spread all over the Islands would lead to a wider utilisation of treated secondary species of timber in building construction in place of well-known naturally durable species of timber which are in short supply; and
- (v) The Public Works Department in the Island can give preference to the use of treated secondary species of timber in its building programmes.

Plywood and Veneer Industry

287. Two units in the private sector have been set up during the Third Plan for manufacture of peeled veneers by two large plywood factories in Calcutta; one in Long Islands (Middle Andaman), and the other at Bamboo-flat near Port Blair, (South Andaman). Both these units are licensed under the Industries (Development and Regulation) Act and their future expansion programmes include the manufacture of plywood. At present both the units ship peeled veneers to their mother plywood factories at Calcutta for conversion into plywood. A sum of Rs. 50 lakhs has so far been invested in both these units and they employ a total of about 600 workers. The employment potential is likely to rise to about 800 workers as soon as the expansion programme of one of the units which is now under way, is completed. The third unit for manufacture of peeled veneers is at present under installation at Bakultala (Middle Andaman) and is likely to go into production by the third quarter of 1965. The installation of the third unit and the expansion programme of the other two units will raise the total investment in the existing veneer and plywood industry to about Rs. 90 lakhs. The veneer and plywood industry has made a good beginning in the Islands and it is expected to play a significant role in the industrial economy of the Islands in the coming Five Year Plans. Surprisingly, here also the economic growth of the units has been hampered by the shortage of plylogs and the unfavourable price. Recently, however, the supply position of plylogs has shown a slight improvement as a result of the policy of the administration to allot areas by open tender for direct working by the local factories. The plywood and veneer factories at present consume 5,000 tons of plylogs per annum.

Match Splint Industry

288. The largest group which manufactures about 60% of the safety matches in the mainland (Wimcos) has set up a match splint factory at Port Blair. The match splints made here are shipped to the match factories on the mainland. The factory employs about 150 workers and consumes about 3,500 tons of match logs per annum.

Here also the factory has not been able to increase its production over the last few years due to shortage of match logs.

Problems facing the existing industries

289. The difficulties and handicaps that beset the existing industries are formidable. Among others that are more or less inherent in the underdeveloped and isolated nature of the Island's economy, the following deserve special mention.

- (i) The supplies of timber to these industries are not adequate; The Forest Department shall consider opening up new areas to meet the rising demand from existing and new industries.
- (ii) The prices of logs charged from the existing industries are not economically favourable at present for various reasons.
- (iii) The availability of shipping for transport of manufactured products to the mainland is extremely inadequate and uncertain.
- (iv) The rates of sea freight from Port Blair to the mainland are disproportionately high as compared to sea freights prevailing in the rest of world for similar distances.
- (v) The extraction cost of timber extracted by the Forest Department is comparatively high. The high cost of departmental extraction adds to the price for the industries.

SECTION IV—DIRECTIONS OF FUTURE DEVELOPMENT

290. There is a growing tendency in the world to integrate the manufacture of fibre board and particle board with the manufacture of primary forest products viz. plywood and sawn timber. In the integrated operations, the residue from one part of the undertaking e.g. saw mill or plywood plant, furnishes the raw material for the board plant. Such integration conserves forest resources and leads to their intensive utilisation at a higher economic level. Wood-waste residues which would otherwise be wasted or at best used as fuel become useful raw material for board industries. Under certain conditions, the successful working of board plants can give considerable economic support to the manufacture of primary wood products like plywood, veneer and sawn timber. The problem of integration is essentially one of transport and involves an estimation of economic area of operation depending on the total market potential of the products to be manufactured in the home and the export market.

291. Apart from wood-waste residues from factories, utilisation of forest management wastes, non-commercial species of timber, lops and tops of trees, branch wood and fuel wood resources of the area can be improved with the help of an integrated project. In certain areas of the world, board manufacture has been successfully used as a means to improve the forest economy of the area by using the species that have little or no economic value and over-mature trees that cannot be converted into other products like sawn timber or plywood. It is well-known that the forests of Andamans have a large

number of species which are classified as non-commercial by the Forest Department. A number of these have already been found suitable by the plywood, saw-mill and packing case industry. Others which cannot be used by any of these industries would become the raw materials for the proposed integrated board plant. The forest land so freed by clear felling of the so-called non-commercial species can be utilised for raising species of timber of higher economic value for the industrial development of the area. Some of the area can also be ear-marked for raising plantations of fast growing species of timber so that higher yields of industrial timber suitable for board manufacture, over small rotation cycle can be obtained per annum.

292. It is also well known that the Andaman forests contain an unusually large number of overmature trees because the forests have not been worked extensively during the last 100 years. Many of these over-mature trees cannot be converted into sawn timber and plywood, as more often than not the timber obtained from these trees is defective. Many of the over-mature trees, including those of high economic value species like Gurjan, are found on being felled to have heavy incidence of heart-rot. The utilisation of such trees can be improved by setting up integrated forest based projects.

293. The availability of well-designed mobile chippers which can be taken into the forests beyond the economic areas of exploitation for conversion of forest wastes into chips, has opened up another avenue for improving the economics of the tropical forests. The immediate possibility of using such chippers will, however, depend, solely on the relative cost of wood raw-materials at site. In the next 20 years, however, the use of portable chippers is likely to gain added importance.

294. Another problem in tropical forest like those of the Andamans, is the super-abundance of species of hard-wood only a few of which are the preferred species (Gurjan for example). The disposal of other non-preferred species which in many areas may constitute more than 50%, is a serious problem. Fibre board and particle board manufacture can make an important contribution towards the utilisation of these species. Sometimes, as is likely in the Andaman forests, the quantity of such raw material is so vast that fibre board and particle board industries cannot alone utilise all the available quantities. In such cases it would be necessary to examine the possibility of using the trees of non-preferred species for the manufacture of plywood and for sawn timber. The integrated development of these industries can, therefore, make an important contribution to the forest and industrial economy of the Islands. It is, therefore, desirable that as far as possible the forest based industries in the Islands should be developed on the basis of the integrated utilisation of the forest resources of selected areas.

SECTION V—ECONOMICS OF FOREST-BASED INDUSTRIES

295. Forests produce a renewable source of raw material for a very wide range of industries. Many of these industries have acquired great importance in industrially advanced countries. Forests in less developed or under-developed countries are very often neglected or exploited only as a source of raw material for export. Wood removed from the forests can be used either as fuel wood or as industrial wood.

The use of wood as fuel wood is, no doubt, of great importance in underdeveloped areas but it is by far the lowest economic use to which wood can be put. Industrial wood can be utilized mainly in two ways :

- (i) In uses where wood retains its chemical and physical structure intact, even though it passes through a number of unit operations of diverse nature—sawn timber, veneers and plywood.
- (ii) In uses where wood is used as a raw material in a chemical process where it loses its individuality e.g. wood-pulp and paper. Fibre-board and particle-board also fall under this group though not to the same extent as pulp and paper, because the end use of these two products is similar to those of the first group.

296. Among forest based industries the most capital intensive industry is pulp and paper; next comes board products and the last is ply-wood and saw milling. Another important difference between the board industries and saw mill and plywood industry is that board industries use mainly small-dimensioned wood and not high value timber, which are essentially required by the saw mill and plywood industries. Board industries, in fact; have become in recent years the major consumers of wood waste residues, both from other forest based industries and from forest management operations. This is an important point in favour of board industries *vis-a-vis* plywood and veneer industry.

297. In the sawmilling industry the economies of scale are not very significant and the mill size can be determined in the context of the availability of raw material, the extent of the market and the transport link between the mill and market. Roughly 50—70% of the cost of the production in a saw-mill is accounted for by the cost of the saw logs. Combined with this, a sawmill has to carry large stocks of saw logs and sawn timber to ensure continuous operation and to meet the requirements of the market. The working capital needs are, therefore, comparatively high; sometimes as high as the total fixed investment. Manpower needs vary widely depending upon the type of material sawn, the degree of mechanisation and the efficiency of the mill. The degree of mechanisation possible depends upon the nature of the saw logs. The possibility of mechanisation increases with a more homogeneous quality of log intake. An appreciable percentage of saw logs entering a saw-mill emerges as waste wood residues in the shape of slabs, edgings and saw dust. On an average this amounts to not less than 40%. Till recently these residues were either going waste or were, at best, used as fuelwood as is the case in the Chatham Saw mill. With the development of fibre-board, and particle board industries, it has now become possible to use the slabs and edging as raw material for these industries. The utilisation of these waste wood residues from a saw-mill can favourably modify the economics of a sawmill to a considerable extent.

298. The most important factor in the location of a plywood factory is the availability of large and medium diameter ply-logs suitable for

peeling or slicing. The transformation co-efficient in plywood manufacture is fairly low; less than half a cubic foot of plywood is obtained from a cubic foot ply-log. The cost of plylogs represent about 30—50% of the cost of production. The second important raw material is adhesive resin, mainly Urea and Phenol Formaldehyde resin, which accounts for about 15-20% of the cost of production. Investment costs are higher than sawmilling. Labour requirements vary widely depending on the degree of mechanization available but the industry is comparatively labour intensive. Power requirements are modest. There is a growing trend to integrate the production of plywood with particle board to the economic advantage of both. Independent veneer plants, making green or dried veneer for local or overseas factories require much less investment. As shipment of veneer saves transport costs, such factories have grown in importance in recent years.

299. The economies of scale in fibreboard manufacture are highly significant. Investment costs are very much higher as compared to plywood and sawmilling. Wood costs may account for 20—40% of the production cost depending on the scale of production. In integrated units where cheap wood waste residues are available the incidence of cost of wood may even fall below 20%. Fibreboard production can be based on a wide range of raw materials, including suitable blended mixtures of hard woods. Water needs are quite high in the wet process and for this technology adequate resources of fresh water are essential. The manufacture of fibre board by the dry process has gained importance in recent times because investment per ton is lower as compared to the wet process and large supplies of fresh water are not needed. Labour requirements are on a modest scale as the process of manufacture is quite automatic. Power requirements are quite high.

300. The economies of scale in the particle board industry are less significant as compared to fibreboard and relatively small mills can be economic under certain conditions. Investment on a particle board mill of Intermediate size represents roughly half that on a fibre board mill of comparable tonnage. Water is not required. Power requirements are modest. The most important consideration is the availability of adequate quantities of resin at fair prices as the incidence of resin cost in total production cost can vary from 15-40% depending on the cost of resin. In fact under Indian conditions, the cost of resin in total cost is likely to be more than that of wood.

SECTION VI—DEVELOPMENT OF ADDITIONAL INDUSTRIES

301. The following industries have considerable scope for further development in the Islands:

- (i) Veneers and plywood Industry.
- (ii) Particle Board Industry.
- (iii) Fibre Board Industry.
- (iv) Match Industry.
- (v) Saw milling and manufacture of packing cases.
- (vi) Pencil slats Industry.
- (vii) Manufacture of roofing shingles.

Plywood Industry—Expansion of existing units

302. As already mentioned earlier, three veneer and plywood factories have already been licensed in the Middle and South Andamans. It is felt that these factories will be sufficient for the full utilisation of the plywood resources of Middle and South Andamans. It is, therefore, suggested that the plywood resources of Middle and South Andaman Islands should be ear-marked for the expansion of these units, so that in another 10 years each of these factories can increase its production to a minimum of 20 million sq. feet of plywood per annum. Production of 60 million sq. feet of plywood would require about 35,000 to 40,000 tons of plylogs annually, and it is reasonable to assume that this quantity of plylogs would be ultimately available from South and Middle Andamans on a sustained yield basis. It needs to be mentioned here that the plywood industry would be able to consume the so-called non-commercial species of timber in these forests which have not been taken into account for the purpose of determining the annual yield of the forests from these two areas under the present working plan. In fact one of the major gains to the Forest Department as a result of the setting up of plywood factories in the Islands has been that a number of so called non-commercial species of timber have become saleable, thereby yielding additional revenues to the Forest Department. The plywood factories are at present engaged in a systematic study of the utilisation of these non-commercial species of timber and many of these have already been found quite suitable.

303. About 4000 acres of forest land near Betapur (Middle Andaman) are being cleared for the settlement of migrants from East Pakistan. The timber obtained from this area by clear felling should also go to the two existing veneer factories and to the third factory under erection at Bakultala. Plylogs not suitable for plywood manufacture should be supplied to the Government saw-mill at Betapur. The clear felling of the forest areas for resettlement of migrants in Middle and South Andamans can be carried out on a systematic and planned basis without fear of deterioration of logs extracted from these areas, because of the existence of the three plywood factories in this area. As a result of the increasing availability of plylogs to these factories, it would be possible for them to offer employment to some of the displaced persons brought to these areas for resettlement.

Particle Board Industry—expansion of existing ply-wood/saw mill units

304. Particle board industry has great scope for development in South, Middle and North Andamans. Enormous quantities of waste-wood residues of the types listed below are available for conversion into board products.

- (i) Logging and forest management residues, lops and tops of trees, branch wood left in the forests on logging.
- (ii) Non-commercial species of timber having no or low economic value at present.
- (iii) Wood waste residues from saw mills, plywood and veneer factories.

305. It is, therefore, suggested that the three plywood factories in the Islands should be encouraged to set up particle board plants in the next phase of their development. An economic size of the plant would have a capacity of 20 to 30 tons per day. As, however, the price of indigenous Urea Formaldehyde Resin is very high as compared to the international price, it would be necessary to make available the forest management wastes listed above at a nominal price to the plywood factories to make the production of particle board attractive and economic in the Islands.

306. In the public sector the setting up of a Particle Board plant as an adjunct to the saw mill at Betapur should be examined in view of the likely availability of large quantities of wood waste residues from the areas to be clear felled for refugee rehabilitation. In case, however, the wood waste residue from clear felling of areas near Betapur for refugee rehabilitation can be used for Particle Board manufacture by the newly plywood factory at Bakultala, the idea of setting up a Particle Board plant with the saw mill need not be taken up at this stage. The saw mill waste available from the Chatham saw mill is being fed into boilers in the power house (about 30 tons of waste wood is used per day) and as no alternative fuel, at economic price is likely to be available for replacing fuel wood for many years to come, it is not considered practicable to set up an integrated particle board plant at Chatham. Apart from this, there is no space for further expansion at Chatham Island. There is however no doubt that the setting up of a particle board plant as an integral unit with the Chatham saw mill will go a long way to improve the economic viability of the Chatham saw mill which is at present running at a loss.

307. The economies of scale are not very significant in the case of particle board manufacture. It is, therefore, suggested that a particle board plant with the capacity of 7500 tons per annum with a provision for further expansion to 15,000 tons per annum should be set up at Betapur. This would require an investment of about Rs. 50 to Rs. 75 lakhs depending on the technology employed. As water is not required in any substantial amount for particle board manufacture, the availability of water is not likely to present any problem. The power required for the project would have to be generated at site and about 800 KW of power would be needed for the project. After wastewood, the second major raw material required for particle board manufacture is Urea Formaldehyde Resin adhesive which is now available from two sources on the mainland, Calcutta and Madras. There should, therefore, be no difficulty about supplies of resins.

308. The Particle Board industry is essentially a post-war development and over the decade (1950-60) the world production of particle board grew from 15,000 tons to two million tons. While the current growth rate may not be sustained, continued expansion is certain. The future of the particle board industry depends primarily on two factors,

- (i) The price trend in relation to alternative materials; and
- (ii) The success achieved in the search for new uses and developments.

In view of the large estimated shortage of sawn timber in this country during the next 20 years the rapid development of the particle board industry in the mainland is inescapable. The Andaman Islands have a definite contribution to make towards the larger and easier availability of this versatile board-material during the next 20 years.

309. The production of particle board in the mainland increased from nil to 6,000 tons by 1964 during the Third Plan. By the end of the Third Plan, the production is expected to touch the 15,000 tons mark. The total installed capacity of the 5 plants in the mainland is 23,000 tons, all the 5 plants except one are integrated with the manufacture of fibre board or plywood. It is tentatively planned to achieve a production target of 100,000 tons by 1970-71.

Fibre Board Industry—new unit

310. Fibre board manufacture can be based on the same set of ligno-cellulosic raw materials as listed under the particle board industry. The use of mixed species of hard-woods for fibre board manufacture is already well-established in the two wet-process plants on the mainland. The third plant based on the semi-dry process is also planned on the use of mixed hardwood species. From the technical point of view, therefore, there should be no difficulty in setting up a large dry process fibre board plant in Andamans. It would not be, however, possible to adopt the technology of the more well established wet process due to the lack of known resources of fresh water in Andamans. From a purely technical point of view, the wet process is to be preferred for fibre board manufacture in underdeveloped areas because it is based on a well proven technology and more than 90% of the fibre board plants in the world are based on the wet process. The dry or semi-dry process is a recent development which has definite advantages in areas where water resources are lacking or are inadequate. Before taking a final decision on the technology to be adopted, it would therefore be desirable to explore water resources of the area selected for locating the plant and if the investigations indicate more than average availability of fresh water, it would be desirable to adopt the wet process. Effluent disposal from the wet process is not likely to pose any serious problem as the sea is not far away from Betapur, Mayabunder or Bamboo flat, the suggested sites for locating that fibre board plant. On the basis of our present knowledge of the water resources of the Islands, it is however, possible to plan for a plant based on the dry process only.

311. The essential difference between the aid felting (dry process) and wet felting process is that air suspension of fibres is used rather than a water suspension. The dry process also requires the use of phenolic resins which may vary from 0.5% to 3% depending upon the quality of the board desired. The additional cost of phenolic resin required for dry process is likely to be offset by the shorter press cycle required in the dry process as compared to the wet process.

312. Fibre Board is a well-established board material and its production rose from about 3 million sq. feet (100 tons) to about 40 million sq. feet (13,000 tons) during the first 4 years of the Third Plan. Production is likely to touch 80 million sq. feet by 1965-66. It is tentatively proposed to achieve a production of about 250 million

sq. feet by 1970-71 and the development of fibre board industry in Andamans during the Fourth Plan is expected to contribute handsomely towards the achievement of the Fourth Plan production target.

313. It is, therefore, suggested that a fibre board plant with a capacity of 5,000 tons per annum to 6,000 tons per annum. Now that Betapur-Rangat area in Middle Andaman or at Bamboo-flat near Port Blair in South Andaman. Mayabunder is also an excellent site but in view of the M/s. P. C. Ray Stalemate it may not perhaps be possible to locate the plant there. The economies of scale are quite significant in fibre board production and fixed investment per daily ton can vary from Rs. 1.5 lakhs to Rs. 5.0 lakhs with an annual capacity of 5,000 tons per annum to 6,000 tons per annum. Now that the fibre board industry has been successfully established in the mainland and the board material has become quite well-known in the home market, it is desirable to take advantage of the scale economies while planning for a fibre board plant in the Andamans where other fixed costs such as power generation and housing are likely to be much higher as compared to the mainland. The power required for the project would be about 6,000 KW and will have to be generated at site. The setting up of a plant with an annual capacity of 50,000 tons per annum would require an investment of about Rs. 3.5. crores.

Match Industry

314. The Andaman forests are very rich in species of timber suitable for match manufacture. At present about 12,000 tons of match logs are shipped to the mainland for use by the large match manufacturing units. Surplus match wood resources for starting a match factory with a capacity of 1.5 to 2 million gross boxes per annum available in the Islands. It is, therefore, recommended that the possibility of setting up a large match factory in the main Andamans should be examined in detail. The investment required for a match factory of this scale would be of the order of Rs. 90 to 100 lakhs. Before taking a final decision in the matter it would, however, be necessary to obtain expert advice, as it is claimed in some quarters that due to the high prevailing humidity in the Islands, it may perhaps not be possible to manufacture matches. The concerned technical member of the Team is, however, of the opinion that this is not an insurmountable difficulty and can be overcome if the climatic conditions are made known to the suppliers of the plant in advance.

315. As the setting up of such a large factory may take some time in view of the foreign exchange needed for the import of plant and machinery, it is suggested that steps may be taken to install a semi-mechanised match factory with a capacity of 500 gross match boxes per day or 150,000 gross boxes per annum. The plant and machinery required for such a match factory is readily available from indigenous sources. Medium scale semi-mechanised manufacture of matches would also provide employment to a large number of settlers. Similar factories are already working quite successfully in the State of Madras and account for about 35 to 40% of the total matches produced in the country. The investment required for a small scale match factory would be about Rs. 5 lakhs.

316. The match factory would not only be able to meet the local

demand for matches in the Andaman Islands but will have surplus production for sale on the mainland. In view of the recent shortage of matches in the country this surplus production would help to ease the supply position of matches on the mainland. It may however be mentioned that since the population of the Islands is targeted to be doubled by 1970-71, the local demand for matches would also rise steeply during the Fourth Plan. The incidence of shipping freight from Port Blair to mainland ports is very high, as already mentioned, and something would have to be done on this account if match boxes manufactured in the Islands are to sell in competition with the match boxes made in the mainland. It is suggested that the small scale match factory should be set up near Betapur to dovetail with the resettlement programme as it would be possible for the factory to draw workers from the migrants. It would, however, be necessary for ensuring the success of this project, to induct some experienced workers from the Sivakesi and Sattur areas in Madras State.

Saw Milling Industry—Improvement in existing units

317. It is suggested that the State-owned Chatham saw mill should work mainly for the export of high class sawn timber to the mainland and abroad and the internal market for sawn timber of secondary species be left entirely for small privately owned saw mills already set up at various points in the Islands. Such a policy will not only improve the earning capacity of the Chatham Saw Mill but would also enable the smaller saw mills to work to full capacity. The small saw mills should be encouraged to put up facilities for seasoning and preservation of sawn timber of secondary species. The ready availability of seasoned and treated timbers from a number of mills in the Islands will lead to the utilisation of treated secondary species of timber for house building. Timber is the most popular house-construction material in the Island. Seasoning Kilns of small, medium and large capacities with corresponding equipment for wood preservation with chemical preservations is available from indigenous sources.

318. Some of these saw mills should also be encouraged to manufacture packing cases required in large number by the industries in the mainland. Many of the so-called non-commercial species of timber which have no economic value at present could be utilised for the manufacture of packing cases. The manufacture of packing cases by small saw mills will lead to a better utilisation of the logs made available to these mills. There is a large unsatisfied demand for packing cases in Calcutta and Madras and it should be possible for these units to ship their total production to these two cities provided shipping space at reasonable rates is made available to them.

Pencil Slat Industry—New Unit

319. It is suggested that a pencil slat plant with a capacity of 5 lakh gross pencil slats per annum may be set up in the Islands. Plant and machinery required for this project is readily available from Czechoslovakia on a rupee payment basis and would cost about Rs. 5 lakhs. About 50% of the pencil manufacturing capacity on the mainland is concentrated in the cities of Calcutta and Madras and it would be possible for the Andaman plant to meet the total demand for pencil slats of these two areas. It is, however, necessary to examine

most of the secondary species of timber in Andaman and the so-called non-commercial species of timber for their suitability for manufacture of pencil slats. This work should be taken in hand immediately by the Forest Development with the cooperation of the Forest Research Institute Dehra Dun and the large pencil manufacturers in Madras and Calcutta. The team was told by Chief Conservator of Forests that some species have already been found to be quite suitable, for this purpose. Pencil slats required by the pencil industry in the mainland are imported at present from United States and Africa at a cost of about Rs. 40 lakhs in foreign exchange per annum. In view of the important import substitution nature of the industry it is desirable to give high priority to this project.

Manufacture of Roofing Shingles—New Unit

320. Most of the houses built in Andaman Islands during the pre-1947 period have shingle roofs. At that time, Padauk, the most durable species of the Island was available in large quantities and the shingles were made out of Padauk. It is not possible now to use Padauk for this purpose because timber is in short supply and it would not be economical to manufacture roofing shingles out of Padauk. It is, however, quite possible to manufacture roofing shingles from some of the secondary species of timber if these are properly treated with preservatives. It may be mentioned here that even in United States where hundred of types of roofing materials are available, roofing shingles are still being manufactured in fairly large quantities. At present all the roofing material required by the building industry in the Islands is brought from the mainland. It is, therefore, suggested that the possibility of setting up a shingle factory at Port Blair may be investigated. It may be necessary, to import the shingle making machines for the factory from U.S.A. The cost of two machines would be about Rs. 15 lakhs and the total investment in the project would be less than Rs. 5.0 lakhs.

SECTION VII—INDUSTRIES IN LITTLE ANDAMAN

321. It is proposed to clear about 60,000 acres of forest land in Little Andaman. This Island is not covered under the working plan for the Andaman forests. A preliminary survey of the forest resources of this island has, however, been made by the Forest Department. On the basis of this survey, it is estimated that about 15 to 20 tons of commercial timber per acre, of all species, would be available in these forests. The clear felling of 60,000 acres of forest land would, therefore, yield a minimum of $60,000 \times 15 = 9,00,000$ tons of timber over a number of years. As it is proposed to clear after the preparatory phase about 4500 acres of forest land per annum, about 67,500 tons of logs of all species would become available per annum in Little Andaman over the next 10—15 years. There would be scope for the setting up of (i) a plywood factory with a capacity of about 20 million sq. ft. per annum with a surplus veneer making capacity for an additional 60 million sq. ft. peeled veneer, (ii) a saw mill with a capacity of 10,000 tons per annum with corresponding facilities for seasoning and preservation of timber, (iii) a particle board plant with a capacity of about 15,000 tons per annum should form an integrated scheme.

322. The industrial programme should be planned and executed by an agency which will have to be in the public sector. It has already been emphasised that the building of an adequate infrastructure will be indispensable to the development of colonisation and to individual programmes in the Islands in general, and in Little Andaman in particular. The construction of jetties, the building of roads, the provision of transport facilities for incoming as well as outgoing traffic, etc. will have to go hand in hand with the colonisation and industrial programmes indicated in this report.

323. Even after the clear felling of 60,000 acres of forest in Little Andaman a very substantial area under natural forests would still be available for meeting the wood requirements of the integrated project on a sustained yield basis without any difficulty. It must, however, be emphasised that the capacities of the various units indicated in this section would need to be carefully matched with the availability of forest produce on a sustained basis during the economic life-time of the plants. There need, however, be no fear on this count as any forest produce, in excess of the sustained consumption needs of the proposed industrial units can, with little processing on the Island, be fed into local/individual market. As a matter of fact, entire orientation to industry in this Island should be towards international markets.

324. The industrial programme in Little Andaman should be as under:—

(i) *First Phase:* In the first phase facilities for manufacture of veneer should be created. The veneers manufactured should be used for conversion into plywood in a factory to be set up at Madras or Visakhapatnam as a subsidiary of the main project or preferably the veneers should be exported to Japan or U.S.A. Export of large quantities of veneers of species like Gurjan will not present any difficulties at all. Export possibilities of other species of veneer will, however, have to be investigated. The first phase of the project will also cover the setting up of a saw mill so that the sawn timber required for use in construction of residential and non-residential buildings for the project can be met. It will also be necessary for the agency to acquire ships for transporting finished products from the Islands. This would involve an investment of about Rs. 1.5 crores.

(ii) *Second Phase:* In the second phase, depending upon the experience gained, manufacturing facilities for conversion of veneer into plywood should be installed in the Island itself. Surplus veneer making capacity should, however, continue to be utilised for feeding the plywood factory at Madras, or at Visakhapatnam. Export of veneers from the project should be replaced by export of finished plywood. There would be no difficulty in the export of Gurjan plywood. Export possibilities of plywood made from species other than Gurjan will, however, have to be investigated. It would be necessary to create facilities for manufacture of particle board also during the second phase. The total investment on the industrial complex in the second phase would be of the order of Rs. 100 lakhs.

**SECTION VIII—TOTAL INVESTMENT AND EMPLOYMENT
POTENTIAL—AN ABSTRACT**

325. a.—Investment.

Industry	Total investment	Foreign exchange component (in Rs.)
1. Expansion of 3 existing plywood factories	50,00,000	10,00,000
2. Setting up of Particle Board Plants in integration with 3 plywood factories	1,00,00,000	60,00,000
3. Fibre Board Plant	3,50,00,000	50,00,000
4. Match Factory (large scale)	90,00,000	15,00,000
5. Miscellaneous industries	15,00,000	5,00,000
6. Little Andaman Project	2,00,00,000	1,00,00,000
TOTAL	8,05,00,000	3,40,00,000

b.—Employment Potential

Industry	Managerial & supervisory	Skilled	Unskilled	Total
1. Existing 3 plywood factories on expansion to full capacity and integrated with particle board manufacture	40	360	1,600	2,000*
2. Fibre Board Plant Betapur	50	100	350	500
3. Match Factory	5	25	270	300
4. Pencil Slat Factory	4	16	30	50
5. Roofing Shingles	5	10	35	50
6. Little Andaman Projects	100	400	1,500	2,000
TOTAL	204	911	3,785	4,900**

*Note.—Additional employment for 1,200 men, 800 men are already employed in the 3 existing factories.

**Considerable unskilled labour would find employment in the forest operations connected with these industries.

PART B—OTHER INDUSTRIES

326. **Sugar:** There is scope for the establishment of a large sugar factory sustained on the expanded production of sugarcane for which the Islands boast of ideal conditions. The capacity of the proposed factory sustained on the expanded production of sugarcane for which Planning Commission, to make for economies of scale with an eye on the export market. To sustain a large unit about 20,000 acres will have to be earmarked for sugarcane plantation. This acreage

would be easily available in Little Andaman where a large land reclamation programme has been recommended.

327. A sugar plant of capacity of 60—70 thousand tons of sugar would require investment of Rs. 5-6 Crores with Rs. 50 Lakh as foreign exchange component. The plant would provide employment to nearly 2,000 persons of which 80% would be unskilled and 20% in the skilled category.

Fruit and Vegetable Preservation Units

328. The development of agriculture (including horticulture) will sustain a number of such units. In addition there would be scope for smaller units sustained by the accelerated resource exploitation as described in this report. Some of these are :

- (i) A small fish de-hydration plant: The dried fish would have a good market in Ceylon.
- (ii) A fish canning Plant: eventually directed to developing an export market.
- (iii) A shark liver oil plant : catering mainly to local needs.
- (iv) A small fish-meal plant : linked with the by-product of the Shark liver-oil plant directed mainly to producing feed for poultry and cattle.
- (v) An ice plant : catering to the needs of the fishery industry.
- (vi) An oil extraction unit : based on copra and other oil seeds.
- (vii) Drying kilns—for copra.

329. Further-more there is scope for development of the following on village/cottage industry basis:—

- (i) Shark leather
- (ii) Gur and Khandsari making
- (iii) Paddy husking
- (iv) Oil extraction
- (v) Copra drying
- (vi) Cane basket and furniture
- (vii) Coir products from Coconut husk
- (viii) Match-making.

CHAPTER VIII

FISHERIES

SECTION I—EXISTING RESOURCES

330. The Andaman waters are known to possess over 40 species of fish but the common commercial varieties are about 15 in number. The most common commercial varieties are: Sea Perches, Sardines, Mackerel, Mullet, Anchovies Barracuda, Silver belly, etc.

331. The islands have a coastline of approximately 1200 miles and provide excellent fishing grounds. The sea abounds in fish. This fact is indirectly borne out by the occasional discovery of foreign fishing boats in these waters. Some of these were captured with fishing gear and with fish in their holds. Evidently it is considered economically worthwhile to come all the way from Singapore, etc. to catch fish in these waters.

Fishermen

332. There is no traditional fishermen's community in the Islands. Since 1947, a number of fishermen have come over to the islands from the mainland and have settled permanently. In addition, there are a number of migratory fishermen—mostly from Andhra Pradesh—who come for one or two years at a stretch, to earn extra money by preparing dry fish and exporting the same to the mainland.

Fishing Methods

333. The indigenous fishing methods employed in the islands are hook and line, shore seine, anchor net, cast net, gill net, stake net, etc., etc. Of these methods, the hook and line method is the most common, while shore-seine is the most effective. Almost all the methods land fish throughout the year. The relative landings and the efficiency of the gear may be seen from the following table:

	No. of Units	Landing	Per gear in a year	Material
			KG	
Hook and line	61	58,871	1000	Cotton Plastic
Shore Seine	7	40,267	6000	Cotton
Anchor (Trawl) Net	5	20,161	4000	Cotton
Cast Net	34	13,004	300	Cotton
Gill Net	27	16,811	600	Nylon
Stake Net	1	2,238	2000	Cotton

334. The fishing method usually employed by the foreign boats is 'pole and line'. In some cases, it has been suspected that they used dynamite sticks to stun the fish and collected them by means of scoop nets.

Quantity and value of fish landed in South Andaman

335. Earlier, the fish catch was meant to satisfy only the demand in the limited local market. Barely 44 metric tons of fish valued at Rs. 5 lakhs were landed in South Andaman in 1950. In 1960, the total catch was 129 metric tons worth Rs. 136 lakhs, which rose to 159 metric tons in 1963, the value of which was Rs. 239 lakhs. A part of the catch is now dried, salted and brought to the mainland. Monthly occurrence of different varieties has been studied for a year (in 1963). It brought out the interesting fact that most of the species including mackerel and sardines occur throughout the year. This is explained by the peculiar location of the Islands and the effect of two monsoons. It has also been found that almost all the methods have succeeded throughout the year.

Mechanised Fishing

336. An attempt was made in the Second Plan to introduce mechanised boats and three pablo type boats 24'—7" in length were constructed. One of them was operated with different types of gear. The following table indicates the relative efficiency of different types of fishing gear operated from Pablo boats from April, 1961 to March, 1963 :—

Type of Gear	No. of days of fishing	First quality Fish	Second quality Fish	Third quality Fish	Total in (Kgs.)
Stake Net	232	581	361	394	1336
Gill Net	325	855	596	553	2004
Hook and Line	425	..	..	..	4021
Anchor Net Seine	442	610	253	N.A.	..

337. The experiments so far made by the Fisheries Department of the Andaman Administration, as also by individual experts from the mainland clearly indicate that the fishing efforts in the Islands can be increased immediately on commercial lines and that the success of these efforts will depend only on the limitations of manpower and money.

SECTION II—FISHERIES AND THE FIVE YEAR PLANS

338. The main emphasis has so far been on the resettlement of fishermen partial success has been achieved by the Andaman Administration in this. The supply of fishery requisites by the Administration has led to an increase in production to 160 tons in South Andaman, which meets the local demand satisfactorily. A five ton ice factory and a small cold storage are under construction at Aberdeen Jetty. It is likely that the local fishermen with a full complement of crafts and gear will increase their production sufficiently to meet the increased local needs in the near future.

SECTION III— APPROACH TO THE FUTURE DEVELOPMENT OF FISHERIES

339. The fish resources of the islands are immense. As stated earlier, the present landing in South Andaman is reported to be

about 160 tons a year which is providing fish for the local population at a rate varying between 75 Ps. to Rs. 1.50 per kg. Fish is available throughout the year, except for a few days when the weather is very inclement. The local fishermen are inadequately equipped and are not producing to their full capacity. The accelerated development programme for the Islands visualises a 100% increase in population over the Fourth Plan period indicating the need for at least a corresponding increase in the tonnage of fish caught for local consumption. This additional requirement is, however, negligible compared to the vast potential. For this reason, the development of fisheries in the islands has to be essentially export-oriented.

Development of dry fish

340. The export trade in dry fish to a very limited extent may be said to have already developed. Fishermen from Andhra Pradesh and Madras go to the islands for one or two years at a stretch. They dry all their catch of fish with salt and export it to the mainland. This industry could be carried on in any fishing cove with a sand beach and a supply of fresh water. The fishermen need only be given equipment, salt and a hut. It will be a great advantage if the fish could be lifted by Government from the site and marketed directly; otherwise, it is apprehended, that the middle man will take away the lion's share of the profits. In the alternative a regulated market at Port Blair may establish a direct link between the producer and the export market.

341. It may be mentioned that it is not likely that fishermen from East Bengal will find an economic living in the dry-fish industry. They are not accustomed to this type of fishing and would find it difficult to adapt themselves to sea fishing which entails long hours in rough sea or in salt water. There is a possibility, however, of fishermen who are accustomed to salt water fishing in the estuarine areas of Pakistan or in riverine fishing where conditions are somewhat similar, taking to sea fishing and to the salt-curing of fish. Even then, these people may need one to two acres of land to occupy themselves with during the rainy season. It is suggested that an experimental unit with 10 to 25 persons may be attempted in the first instance. Government may provide a fish curing yard and a drying kiln for the rainy season and arrange marketing facilities for the dried fish.

Expansion Programme

(a) Immediate

342. Considering the potentiality of the area it is proposed to raise the level of production from the present 200 tons or so (including dry fish) by 2000 tons, which can easily be caught from the sea given proper manpower and equipment. The principal means of production will be the following:

- (1) Indigenous production will be encouraged by the issue of boats and nets, subsidised salt, carrier boats for marketing and provision for a fish drying kiln for the rainy season. Each dinghi or country boat with fishing gear is

at present producing approximately 2 tons of fish. One hundred additional dinghies with gear can be introduced for use by the local fishermen, who may come over from the mainland under the Colonization Plan. The cost of boats, gear, etc., will be about Rs. 1,50,000/-.

- (2) One hundred and sixty power boats may be introduced and utilised for fishing within a range of 20—30 miles from the islands. These boats can operate from creeks with water 5'—7' deep. They can get their supply of salt and ice from Port Blair. Each such boat can be expected to land about 30 tons of fish a year. The cost of the boats with gear, etc. will be about Rs. 56 lakhs. The boats can be constructed in the existing marine dockyard in Port Blair. The marine engines can be obtained partly from indigenous and partly from foreign sources.

Training

343. The fishermen to operate the mechanized boats will need training. For this purpose, a main training centre may be established at Port Blair with subsidiary training centres in Havelock, Rangat, Mayabunder, and Diglipur. The training centres may, in addition to utilising the boats available with the Fisheries Department at Port Blair, have three large boats of 50'—60' length equipped for gill netting and trolling. Stipends may be paid to the trainees for one year after which they may be provided with mechanised boats complete with gear either on hire-purchase or on fish-sharing basis. The main training centre will have a qualified officer on gear technology with an instructor each on navigation and engine driving. Each sub-centre may have an engine driver and master fisherman per boat. Suitable leave reserves may be provided. The cost of the scheme would be about Rs. 16 lakhs.

Marketing

344. Marketing facilities, will be the biggest single factor in encouraging production. The department may take up marketing and run a carrier boat service between the Ice Factory at Aberdeen Jetty and the mechanised fishing centres ending in Diglipur. It may also have a vehicle for internal transport in Port Blair. The carrier boat may have an insulated hold and may be 55' in length so that it could go out in rough waters. The marketing scheme would need a suitable working capital which may be Rs. 1 lakh. The cost of this scheme would be Rs. 16 lakhs, including the provision of a freezer, frozen fish storage, ice storage at fishing bases, and a transport van.

(b) Long term.

Deep Sea Fishing

345. It has been already stated that marketing facilities will have to be organised. Marketing has indeed been the limiting factor in fish production in the Islands all these years. The nearest market is Calcutta which is approximately 2 days' journey from Port Blair. Considering the abundance of the fish population it is necessary to have immediately two medium sized fishing-cum-processing Vessels (factory ships) which could be based on Port Blair.

Each Vessel may have a displacement of 800—900 tons with approximately 800 horse power and a freezing capacity of 10 tons a day. In addition to trawling, these vessels should be able to do troll fishing, hook and lining, gill netting, and, if possible, processing. They will also be equipped for survey and hydrography. A beginning could be made with one such vessel.

346. These vessels will capture the fish, process the quality fish on board and deliver the same to the Calcutta market in a frozen condition. Although the Calcutta market has not developed a consumers' preference towards sea fish, it is expected that in the course of two or three years, subsidized sale of the sea fish may induce acceptance there, and create a steady demand. In addition, exportable fish like frozen shrimp or tuna can be sold to the United States or Japan. The advantage in having factory ships will be that there will be no delay in production on account of the lack of shore installations in Port Blair, and the expansion of the harbour there, which must naturally take time. From the current price trends, it would appear that the price of each vessel complete with fishing gear and processing equipment will range between Rs. 35 to 45 lakhs. The vessels can be obtained from France, Poland or Germany either on deferred payment terms lasting over 5 to 10 years or by credit arrangements with these Governments. The ship-builders will be expected to train Indian staff for at least six months in the use of the vessels and the fishing gear. The delivery period may be 2 years. Each vessel is likely to land 1000 tons of fish a year. One advantage of vessels of this type will be the long range of their operation and the possibility of their being utilised elsewhere in time of emergency.

Harbour Facilities

347. Present berthing capacity at Port Blair will be insufficient for the large number of fishing boats visualised in the accelerated development programme. It would be necessary to build a fishing harbour at a suitable site in Port Blair. A good marine workshop and a dry dock already existing in Port Blair and, with appropriate expansion if necessary, would be able to provide repair facilities to fishing vessels. It would also be necessary to provide an ice factory and a cold storage of adequate capacity at the very same site as the fishing harbour.

Organization

348. The implementation of the scheme and preliminary work would need a whole-time senior officer (Director) who will work out the scheme in detail in consultation with the Fisheries Development Adviser. Each fishing base may be in charge of a Survey Assistant (who may be designated Assistant Director) who will take up power fishing-cum-training, extraction of shark liver oil, preparation of dry fish, training in mechanised fishing and local fishing methods, maintaining statistics of catches, etc. He will have adequate staff for the work in hand.

Research

349. The present knowledge on the Tuna resources in the Indian Ocean is limited. A research station should, therefore, be establish-

ed at Port Blair where facilities of harbour and an ice factory are available. The research work would consist of:

- (1) Exploratory fishing in the sea.
- (2) Marine biological observations on the fish and fisheries.
- (3) Technological work on different types of processing.

Accommodation is not now available in Port Blair, but the Chief Commissioner may be able to provide land on a suitable water front. The establishment of a Research Station in Port Blair is recommended. In view of the large investment involved in the programme of fishery development visualised in the preceding paragraph it is necessary that a firm estimate of fish resources based on proper studies be available before the programme is actually launched upon.

Manpower

350. Manpower requirements of the programme detailed above are indicated below :

	Marine engine driver-cum-skipper	Deck Hands/Fishermen	Captain	Marine Engineer	Radio Engineer	Total
Addition of 100 dinghies . . . . .	..	100	..	..	..	100
160 Small Fishing-Boats	160	640	..	..	..	800
2 Deep Sea Vessels,	2	70	2	2	2	78
Others . . . . .	..	..	..	..	..	200
TOTAL				Or Say,		1178 1200

For every person in the dinghy two additional persons will be needed for ancillary occupations in drying yards, etc;

Finances

351. The financial implications of the above programme are indicated below :—

S. No.	Items	(Rs. in lakhs)	
		Total Expenditure	Foreign Exchange component
(1)	(2)	(3)	(3)
(i)	Provision of additional 100 dinghies, fishing gear and other facilities.	1.50	..
(ii)	<i>Power Boats</i>	48.00	9.00
	160 with fishing equipment Operational Costs	8.00	..
	Total power fishing boats	56.00	9.00

(iii) Training Scheme		
Trg. vessels & equipment	10.00	2.00
Operational Costs	6.00	..
Total Training	16.00	2.00
(iv) Marketing		
Freezer, storage and Equipment	12.00	2.00
Operational Costs	4.00	..
Total Marketing	16.00	2.00
(v) Deep Sea Fishing		
Vessels and Equipment	100.00	100.00
Operational Costs	25.00	5.00
Total	125.00	105.00
(vi) Working expenses of cooperatives boats	4.00	..
(vii) Direction Cost .	14.00	..
Total	18.00	..
GRAND TOTAL	232.50	118.00

352. The phasing of this programme over the next six years is indicated below.

(Rupees in lakhs)

	Third Plan		Fourth Plan					Total
	V Year	I	II	III	IV	V		
(i) Country Dinghies and gear, etc. . .	0.20	0.30	0.30	0.30	0.30	0.30	1.50	
(ii) Power boats . . .	6.00	8.75	10.50	12.25	12.25	12.25	56.00	
Operational Costs . . .	..	1.00	2.00	1.00	..	..	4.00
(iii) Deep sea vessels . . .	..	40.00	60.00	..	..	..	100.00
Operational Costs . . .	..	..	..	8.00	8.00	9.00	25.00
(iv) Training vessels and Equipment . . .	4.00	4.00	6.00	..	..	..	10.00
Operational Costs of vessels, staff etc. . .	..	0.40	0.80	1.40	1.60	1.80	6.00
(v) Marketing Equipment . . .	..	5.00	2.00	5.00	..	..	12.00
Operational Costs . . .	..	1.00	..	3.00	..	..	4.00
(vi) Direction . . .	0.50	2.00	3.00	3.00	3.00	3.00	14.00	
TOTAL . . .	10.70	62.45	84.60	33.95	25.15	26.35	232.50	

353. An annual return of Rs. 20.6 lakhs is expected from the power boats and deep sea fishing projects as the following statement will show :—

Programme	Capital Rs. in lakhs	Annual opera- tional cost Rs. in lakhs	Produc- tion in metric lakhs	Gross sale price Rs. in lakhs	Deprecia- tion and interest Rs. in lakhs @15% of capital	Net return Rs. in lakhs
(f) Small power boat fishing- 160 boats	56.00	19.20	9,000	36.00	7.2	9.6
(H) Deep Sea fishing	100.00	6.00	8,000	32.00	15.0	11.0
TOTAL	156.00	25.20	17,000	68.00	22.2	20.6

354. It is not possible at this stage to indicate similar details in respect of the programme visualised for the Fifth Plan. However, it is visualised that the production level should be raised by another 8,000 tons. This may involve an outlay of about Rs. 2.5 crores.

CHAPTER IX

WATER FOR IRRIGATION, DRINKING AND POWER

SECTION I—IRRIGATION

355. A conspicuous feature of the first three Five Year Plans for the Andaman and Nicobar Islands is the absence of any provision for irrigation. This may seem justified because in these tropical islands with rainfall averaging about 123.33 inches per year, spread over a period of almost 7 months, agriculture had largely been dependent on rainfall.

356. The land at present under the plough is about 12,140 acres in South Andaman and over 22,230 acres in the whole area. With the accelerated development programme comprising as it does the large scale reclamation of land for agricultural purposes, the need for irrigation would arise. Besides, it would be desirable to have more than one crop in these areas where possibilities exist for multiple cropping.

Type of irrigation works

357. Irrigation has therefore, to be provided for two reasons *viz* :

- (i) to supplement supplies from rainfall whenever there is a break in the monsoons, so that crops do not suffer and that they mature properly; and
- (ii) to extend the agricultural operations into the post monsoon period thus promoting double and triple cropping wherever possible.

358. The topography of the territory more particularly in the Andamans is of a rolling nature. The possibilities of providing irrigation arise from :—

- (i) diversion weirs, wherever there is perennial flow available in the streams and where the post-monsoon flow extends at least up to the month of February or so.
- (ii) by putting small or medium size dams across streams which have possibilities of storage on their upstreams and to lead off contour canals therefrom to command areas on the downstream side.

359. These irrigation works have to be small because at present the farm-lands are in small patches and exist along the coast line.

Temporary weirs

360. Provision of diversion weirs across the streams on a permanent basis will require investigation, which may take sometime. It would, therefore, appear prudent to start at suitable sites more particularly in the Wimberlygunj area with temporary diversion weirs of the kind which are constructed in the State of Kerala and in the

South Kanara district of Mysore. These weirs are built out of local materials and are put across streams towards the close of the rainy season. Thus any post-monsoon flow in the stream can be diverted to agricultural lands through suitably aligned irrigation channels. Four or five months after the monsoon starts these temporary structures, which are made of brushwood and boulders are automatically washed away. The advantage of irrigation is thus secured with the help of such weirs as necessary year after year. Their cost is low and no big construction is needed to start with.

361. A provision of a few thousand rupees should be made forthwith, say in the budget for the year 1965-66 so that a number of such temporary weirs could be put up at suitable sites on a trial basis. This will show if the cultivators are keen to make use of the water so provided and it will prepare them for utilising irrigation water when it is eventually given on a permanent basis. When some of these weirs have proved their utility in two or three seasons, proposals could be formulated for providing pucca anicuts or diversion weirs across these streams on a permanent basis.

Small dams

362. With regard to small reservoirs and dams detailed investigation will be necessary to determine the water holding capacity of the impoundments created, as also the foundation conditions on which these small dams will have to be constructed. Since the soils in the hilly reach are mostly of an immature nature care will have to be taken to guard against possible leakages from these impoundments and also through fissures or faults which may exist in the rocky beds. For example, a small water reservoir built for domestic water supply at Mayabunder is reported to be losing water through its beds. Apparently the bed soils are porous. An effective remedy to minimise this leakage may be sought through a buried membrane lining given to the bed of the reservoir. This remedy has been tried in many such cases and has proved effective.

363. One such material is Polyvinylehloride, which is available in plastic sheets. This material is plastic, about one hundred of an inch thick and is laid in sheets with one foot overlays. For installation a few inches of earth are removed from the surface to be treated. Plastic is laid and then a blanket of earth is placed over the plastic. The ends of the membrane can be anchored into trenches dug at the periphery of the water-spread of the tank. This forms a buried type of plastic membrane lining and has proved effective in many cases. An indigenous product alkathene may be tried as membrane lining. A gauge may be fixed on the reservoir and observations may be taken to compare the losses now and those occurring if any after treating the bed of the tank with Alkathene lining.

Land distribution—colony areas

364. Where, however, new areas have to be opened up and colonisation has to be done, it is essential that lands are developed in suitable blocks and that haphazard division of lands is avoided. Wherever farm lands exist they should be divided, in rectangular blocks keeping in view the drainage lines so that well formed fields

are made with straight water-supply channels. This will also give the landscape a planned look and will eventually lead to better farm management.

Demonstration farms

365. Talking to the cultivators in the Guptapara and Wimberlygunj areas it appeared that the cultivators are not very keen to make use of irrigation water. This is natural because they have not yet had the experience of the benefits of irrigation. These have to be demonstrated to them, so that they can be persuaded to realise the value of irrigation. For this purpose some demonstration plots may have to be organised along with the first irrigation schemes, which should be widely publicised. It was also gathered that the paddy crops suffer considerable damage on account of lodging caused by high velocity winds. It will seem advantageous if paddy varieties with sturdy stems introduced in this area which will not suffer from lodging.

Investigation unit

366. While it would seem prudent to make a start forthwith with the proposed temporary seasonal diversion weirs, it will be necessary to have a regular investigation unit posted in the territory to make detailed surveys of possible sites, to formulate proposals and to work out estimates both for diversion weirs and for storage schemes.

367. For this purpose an Officer with some experience of the field and of investigation will be necessary. A division with an Executive Engineer may be formed to undertake this investigation, for detailed surveys, and for the formulation of plans and estimates. Areas to be irrigated will also have to be marked and the possible crop patterns to be followed will have to be determined in consultation with the Agriculture and Revenue Department.

Water supply and irrigation together

368. Since water supply schemes in this territory will also draw upon the resources which also will be tapped for irrigation purposes, it would be better for the investigation division for irrigation projects to deal with the water supply schemes. This will enable water resources to be studied and exploited on a comprehensive basis and will lead to better planning for the utilization of the sweet water resources of the islands. Possibly in some cases minor irrigation requirements could be met from the water supply resources whenever surplus water is available.

SECTION II—DRINKING WATER

369. In the recent past some scattered investigations of the ground water in the Andaman and Nicobar Islands were carried out by the Geological Survey of India. These surveys revealed that there are good sources of water for drinking purposes in the various islands of the Andaman group. Surface wells in Mayabundar area if dug at a distance from the swamps and marine creeks, preferably at the foot of hills or around the margins of the valley lands—should be capable of meeting moderate local requirements.

370. Even in the old settlement areas of South Andaman, there are good water sources which can be developed. Sona Nali which flows over the Ferrarganj-Tusonabad plain has quite a good discharge and is fresh as far as Manpur. Dhani Khari Nala, and Wright Myo Nala are also good sources of potable water. Almost all the nalas flowing from the Mt. Harriet range flow over the cultivated lands in the settlement areas and have a good discharge. Weirs at suitable places in these nalas can store and supply copious quantities of drinking water. Havelock Island where the water position becomes critical in the summer months may also have ground water of potable quality in the deeper tertiary sand-stones.

371. The position of drinking water supply is better in the Nicobars than in the Andamans. Ground water development in the Car Nicobar Islands, according to the recommendations made by the Geological Survey of India, should be done through large open wells, and the well now in use at the Air Force Station can serve as a model for such wells. According to the observation made by Shri B. S. Chengapa (Conservator of Forests, Andaman Administration) in 1952, water supply is very good in Great Nicobar, Little Nicobar, Katchal, Nancowrie and Camorata islands. In the first two islands there is a large number of perennial fresh water streams which have sparkling and crystal clear water for drinking purposes. Potable water is available in shallow wells near the coastline, and at almost any place along the coastline, an inexhaustible supply of good drinking water is obtained.

372. The source of drinking water in reclaimed mangrove forest lands will be groundwater and also springs and rivers wherever available. A groundwater survey of the type which was carried on in the Sunderban areas will be necessary in any areas of mangrove forests which may be selected for reclamation.

373. At the instance of the Ministry of Rehabilitation, the Exploratory Tube-Well Organisation deputed a team to undertake pilot drillings. The report of the team is not yet available.

SECTION III—HYDRO-ELECTRIC POTENTIAL

374. The sites of two falls, one on the Dhanikhari stream near Humphreyganj, and the other on the Vasumdhara stream near Wimberleyganj, were visited by a member of the team. These falls are reported to be perennial. At the time of the visit on January 28, 1965, the approximate discharge was about 3 cusecs on the Dhanikhari and about 8 cusecs on the Vasumdhara. It was gathered that there are small basin formations on the upstream of these falls. While the foundation conditions can be judged only by close geological examination of the rocks, the falls apparently provide possibilities for the generation of hydro-electricity.

375. On a rough assessment, 40-50 K.W. can be had dependably on the minimum discharge available. Nothing more than a possibility can be indicated at this stage. The question, however, needs to be looked into and the proposed investigation division can make out a tentative plan after examining the site more closely.

376. Even if dams are not possible, balancing tanks created above these falls can help to utilise the run off of the river for hydro-electric generation for at least nine months in the year. This will lead to considerable savings in the conventional fuels now being consumed for the generation of electricity in Port Blair and Wimberleyganj areas.

377. In the meantime, it will be advisable for both flanks of the falls to be cleared of forest growth so that closer inspection can be made of the nature of rocks on the flanks. A plain-table survey could thereafter be conducted on the upstream of the falls, which will, in fact, indicate the extent of possible storage.

Micro-Hydel Grid

378. Small hydro-electric generation units with a blending with existing thermal units may provide operationally efficient composite power plants. In the Himalayan region of Uttar Pradesh a number of such micro-hydel units are being installed and a micro-hydel grid is being established in the Kumaon area. Indian made hydro-electric generation plants are being used for the purpose.

379. The site at Dhanikhari near Humphreygunj may also provide water for a water supply scheme at Port Blair. The exact nature of the project, however, can be indicated only after more detailed investigations have been made. Water, which will be a by-product in these cases can be used for irrigation purposes in the farm lands lower down.

CHAPTER X

TRANSPORT

SECTION I—INTRODUCTION

380. Lack of adequate transport facilities constitutes a serious bottleneck in the development of the islands. At present the islands are virtually isolated from the mainland and so are many of the islands from each other—particularly during the monsoons. The accelerated development of the islands visualised in this report will necessitate a considerable expansion of transport facilities all round—sea, air and road. As mentioned in Chapter III, the share of investment in transport will have to be large in view of the geography of the islands.

SECTION II—SEA TRANSPORT

Mainland-Island

381. At present two ships viz, the M. V. Andaman and M. V. Nicobar ply twice a month between the mainland and the islands; the former from Calcutta and the latter from Madras. The M. V. Andaman has a passenger capacity of about 600 and a cargo capacity of about 1,250 tons. The passenger carrying capacity of M. V. Nicobar is about 250 and its cargo capacity about 750 tons. This capacity is inadequate even for the existing volume of goods and passenger traffic. This situation gets worse when one of the ships goes for its annual survey or repairs. In the perspective of the future development visualised for these islands the existing service between the mainland and the islands needs to be immediately improved. The Third Five-Year Plan had provided for the commissioning of two more ships to ease the situation. It has not been possible to procure these ships but urgent steps are now being taken by the Transport Ministry in this direction.

382. The commissioning of these two ships may also not prove adequate in view of the targeted increase of population by the end of the Fourth Plan as well as the large reclamation and industrial development programmes which will generate a large amount of passenger as well as cargo traffic, particularly of timber and its products. It has not been possible for the team to make a precise estimate of the traffic load that would be generated. It is recommended that this be done as soon as the content of the accelerated development has been finally settled.

Inter-Island transport

383. The inter-island ferry service has also been far from satisfactory. With the recent commissioning of the ship 'Yerawa' the situation has eased somewhat, but the targeted increase in population and the opening up of islands such as Little Andaman, Katchal, Great Nicobar, etc., will generate a large amount of inter-island passenger as well as goods traffic. To cope with this it would be necessary

to plan ahead for the strengthening of the existing inter-island service.

Landing facilities—Jetty construction

384. A prerequisite for the opening up of some of the islands such as Little Andaman, Katchal, Great Nicobar and improvement of inter-island transport, is the construction of jetties to provide landing facilities. Even before the team could visit the Islands, an expert of the Transport Ministry, who is also a member of the team, was sent by the Rehabilitation Ministry to make a reconnaissance of the possible sites at which jetties could be constructed in Little Andaman and Katchal. Having regard to the necessity of providing sheltered anchorage during both the monsoons, two sites in Little Andaman—Jackson Creek and Hut Bay, and two sites in Katchal—West Bay and East Bay have been recommended. A brief account of the merits of the proposed sites follows.

385. Little Andaman: (i) Jackson Creek Bay—Inside the Creek there is a natural bay which is about 8' to 9' deep and 500' to 600' wide. The banks of the bay are well defined. There is no sign of rocks or the presence of strong tidal currents. A safe anchorage for deeper draught ships could be available within a short distance from the mouth of the creek. The site on the whole is very favourable for providing harbour facilities. The construction cost of the jetty would be approximately Rs. 10 lakhs.

(ii) Hut Bay: This is a wide bay extending from South to North. This site seems more suitable from the point of view of operation and approachability and extraction of timber. There is a perennial stream nearby. The depth of water appears to be very favourable. There is no possibility of any tidal wave currents and the shore line is protected from the ocean swell. The jetty would afford a depth of 12' and 4' to 6' additional depth could be easily obtained by adding a pontoon. The construction of a jetty would cost about Rs. 8 lakhs; in addition about Rs. 2 lakhs would be needed for dredging.

386. Katchal Island—(i) East Bay: This bay is quite long and has practically no breakers. At about 700' from the shore a depth of 4 ft. water is available. The bay on the southern side has a fairly well defined approach. It is protected by islands of the Nancowrie group. A jetty here could provide for a depth of 12' alongside at an approximate cost of about Rs. 9 lakhs.

(ii) West Bay: This is a natural bay with an entrance channel leading to the deep sea. The entrance channel is comparatively wide and a depth of 20 ft. could be located. The bay is being connected with the East Bay by a peripheral road about 15 miles long. The cost of construction of a jetty providing 10' draught, would be about Rs. 5 lakhs.

Lines of further action

387. Before the designing and construction of jetties can commence it would be necessary to carry out a detailed hydrographic survey and soil investigation at proposed sites. Proper account of soundings, direction and strength of tidal currents, and round-the-year observations of sea conditions are also necessary. The hydro-

graphic survey of Jackson Creek in Little Andaman has already been completed. A similar survey in respect of other areas needs to be accorded the highest priority in the next working season.

388. Lately, the opening up of Great Nicobar has also assumed urgent importance. A hydrographic survey of possible location of jetties on the east as well as the west coast of the Great Nicobar will also have to be given high priority. A team of experts of the Transport Ministry and the Naval Headquarters headed by the Port Development Adviser in the Transport Ministry has lately paid a visit to, amongst other islands, Great Nicobar and has suggested Campbell Bay on the east coast as a possible site for the location of a jetty. This team could not visit the west coast on account of bad weather.

389. This team has also indicated that pending the hydrographic survey and the designing and construction of jetties, some improvisation can be made to afford temporary landing facilities. They have recommended the construction of pontoon in Great Nicobar (Campbell Bay), Little Andaman (Hut Bay) and Katchal.

390. The Ministry of Transport has already taken charge of the designing, technical supervision and execution of the jetties/pontoon construction programme in the islands. A Construction Circle under a Principal Engineer (Marine) has already been set up and the pontoons are expected to be in position by April, 1966.

391. It is felt that ultimately it would be essential to provide 2 jetties in Little Andaman, 2 in Katchal, 2 in Great Nicobar and at least one each in Rutland, Neil and Havelock.

SECTION III—AIR TRANSPORT

392. At present a fair weather weekly Dakota service operates from Calcutta to Port Blair. For want of refuelling facilities at Port Blair, the flight has to operate *via* Rangoon. This reduces the passenger and cargo capacity and also adds to the flying time. The existing air strip at Port Blair needs to be enlarged to provide landing facilities for bigger planes.

393. Car Nicobar also has an air field which is at present used by the Air Force. It should be possible as the pace of development gathers momentum, to provide more air strips on some of the large islands, particularly Little Andaman and Great Nicobar.

Heli-pads

394. As an immediate measure the possibility of constructing helipads in the islands such as Great Nicobar, Little Andaman and Katchal to facilitate inter-island communication needs to be explored.

P.O.L. Storage Facilities

395. At present there are no facilities at Port Blair for the storage of P.O.L. items. This strains the already inadequate transport system in this that both the planes as well as the ships have to carry fuel for return journeys. The provision of adequate storage facilities is an

absolute necessity. This matter has been taken up with the I.O.C. and needs to be pursued vigorously.

SECTION IV—ROAD TRANSPORT

396. The value of roads in the islands has already been demonstrated with beginnings made on the Great Andaman Trunk Road and the circular road in Great Nicobar. The Great Andaman Trunk Road is an ambitious project which will connect the southern-most tip of South Andaman—Chiria tapu, with the northern-most tip of North Andaman—Diglipur. The programme envisages the construction of bridges over creeks, etc. Out of a total mileage of about 200 miles, about 50 miles have been taken up. There are possibilities of accelerating the construction of this road to step up the development activity which will follow in its wake and at the same time generate scope for larger employment. Some road rollers and trucks desired by the Principal Engineer to accelerate the road works between the Betapur and Mayabunder section have already been provided by the Rehabilitation Ministry.

Mechanisation

397. In the past, the pace of construction of new roads has been in the neighbourhood of 15 to 16 miles per annum. It will be desirable to step up this pace, if need be, by introducing some degree of mechanisation e.g. road rollers, bull-dozers, motor graders, stone-crushers and granulators, etc. In addition, the single-pass stabilizer, mention of which is made below in connection with a new technique of road construction suitable for the islands, could also be introduced. Of these items, only stone-crushers and granulators are likely to affect appreciably the labour input in road works. But the labour input in road construction is, in any case so high, that a balance could be achieved between mechanised road works and manually constructed road works so as not to impair to any considerable extent the labour intensive character of such works. With mechanisation, the pace of construction would be accelerated with the result that in the immediate future, employment opportunities would be augmented. This has relevance to the need for finding 5,000 additional jobs in the secondary sector, mention of which has been made in chapter III.

Additional outlays for road works

398. For road works a provision of Rs. 388 lakhs was asked for during the Third Five Year Plan. The allocation actually made was about Rs. 238 lakhs but it is estimated that about Rs. 295 lakhs will have been spent on this programme by the end of the Third Plan. The provision included in the draft papers for the Fourth Plan stands at Rs. 580 lakhs and even if about Rs. 400 lakhs are actually allocated to this programme it will mean an increase in the investment in road works of about Rs. 100 lakhs.

399. In addition intensification of development activity in the Little Andaman, Great Nicobar and Katchal would give an added fillip to road works. The two jetty points in Little Andaman will neces-

sarily have to be connected by what may be called the Little Andaman Trunk Road. This, on an estimate, will run an approximate length of about 25 miles. The work on the peripheral road in Katchal will need to be accelerated and the road works undertaken in Great Nicobar. Katchal and Great Nicobar will account for another 40 miles or thereabout. The road works in these three islands alone would mean an additional outlay of about Rs. 1.3 crores.

Direction of Future Development

400. The roads expert member of the Team has indicated possibilities of substituting the conventional water bound macadam method of road construction with the soil-aggregate method. This will have two advantages; it will be better in quality, having regard to local conditions, as well as cheaper than the conventional method.

401. Road building material available in the islands is generally soft. The water-bound macadam method of road construction which is the commonest form of road construction in India is not suitable in this area, as that type of road depends for its strength primarily on grain inter-locking and, consequently, on the angularity of the stone aggregate. The road metal available in the area, being soft, will lose its angularity very soon under the load of traffic. On the other hand a soil-aggregate road, which depends for its strength on internal friction of the soil aggregate mix, inherent in its denseness, and also cohesion of the soil fines, would be the most suitable type of road for this area. Sand, which is plentiful in this area and which cannot be made much use of in water bound macadam construction, could be used in large quantities in soil-aggregate roads. The West Bengal Public Works Department is using sand clay mix in the soling course in the reconstruction of National Highway No. 6. The cost of sand-clay carriageway in Andamans calculated on the basis of the rates obtaining in West Bengal plus suitable premium for conditions in Andamans would work out to Rs. 30,600/- per mile of 12 ft. width and 18 inches thickness as against Rs. 67,500/- for the conventional water-bound macadam road construction of the same width and equivalent thickness. Where sufficiently coarse sand or gravel is not available in adequate quantities soft road metal manufactured from coral stone or rock could be used in the mix along with sand and local clay. The cost of manufactured road metal being high, it would raise the unit cost to about Rs. 46,900/- per mile.

402. For surface dressing also, having regard to the volume of traffic expected on the roads in the area, an application of road tar No. RT-2 covered with light coating of coarse sand could serve the purpose. By replacing the use of costly chips with locally available sand, the cost of surfacing could also be reduced from Rs. 26,000 per mile of 12 ft. carriageway to about Rs. 9,000.

403. Thus, the average cost per mile of 24 ft. wide road with 12 ft. wide bituminous surface could be reduced from the present about Rs. 2.0 lakhs to about Rs. 1.6 lakhs.

404. The Soil aggregate road construction technique would require special equipment—the single-pass stabilizers. One such stabilizer at present in use in West Bengal, costs about Rs. 3.77 lakhs all of it in foreign exchange, since the equipment has to be imported. In

view of the economies it offers and the improvement in the quality of the road construction that would result by the use of this technique, it would be desirable to introduce this technique at least on a pilot basis. To begin with, one such unit may be utilised; its use on pilot basis would enable local experience to be built up in this comparatively new field of road construction.

405. One single-pass stabiliser would complete about 15 miles of 12 ft. wide carriageway in a year in Andamans. The road construction programme should be planned in such a way that earth work is completed in about 20 miles a year. Collection of road materials should also proceed ahead of the construction work. The labour strength would, therefore, need to be planned in such a way that for one unit of construction force having one single-pass stabiliser there should be sufficient labour for completing about 20 miles of road in a year. On this basis the labour strength required per unit has been estimated to be 60 skilled and 2,600 unskilled.

Testing Laboratories

406. In the construction of roads in general and soil aggregate roads in particular, the testing of soil is very essential. It will be necessary to set up a testing laboratory at Port Blair. In addition, field laboratories will also be needed at the work sites for exercising quality control. In this connection for every ten miles of road construction one field laboratory will be needed. There are a number of research stations in India and it should not be difficult to recruit the required personnel in charge of direction for the central laboratory. Difficulty may be experienced in recruiting laboratory assistants. In this connection it will be necessary to arrange training of persons having minimum educational qualification as matriculate in the existing material testing laboratories in the country. The types of tests that are needed in the construction of soil aggregate roads are quite simple e.g. determination of Liquid Limit, Plastic Limit, natural moisture content, grain size distribution, degree of compaction, etc. It may be mentioned that the first three types of tests would be useful for soil survey studies in connection with agricultural development also. Possibly a laboratory set up for road works may also work for Agricultural Department in the beginning.

Mechanical Workshop

407. There is need for the setting up of a mechanical workshop to attend to the repairs and servicing of the fleet of transport at present in use in the islands which is bound to increase substantially with the accelerated development visualised in this report. At present, both the Principal Engineer and the Chief Conservator of Forests, complained that quite a bit of their equipment and transport units were lying idle for want of such facilities.

CHAPTER XI

HEALTH

SECTION I—INTRODUCTION

408. In view of the isolation of the Islands from the mainland, the provision of adequate health measures assumes great importance. While cholera and small-pox, the two major communicable diseases of the mainland are not prevalent in the Islands, necessitating the existing strict compliance with international health regulations for visitors to the Islands, the present vaccination status of people in the Nicobar group of islands leaves much to be desired. Should an outbreak of an epidemic of the type of the poliomyelitis epidemic of 1957 recur, there would be a real danger of large numbers of the population being decimated.

409. The targeted increase of the population of the Islands adds quite another dimension to the future health programmes in the Islands—particularly to virgin areas of proposed new settlements e.g. Little Andaman, Katchal, Great Nicobar, etc.

SECTION II—THE PRESENT SITUATION

Existing Disease Pattern

410. The prevalent diseases in the islands are:—

(i) Gastro-intestinal diseases: Dysentery, diarrhoea, and enteric fever form the major groups of gastro-intestinal diseases.

(ii) Soil-transmitted helminthis: It is believed that infestation is present in fair measure.

(iii) Poliomyelitis: Since the last epidemic in 1957, there had not been any major outbreak.

(iv) Leprosy: Most of the cases are among the people coming from the mainland.

(v) Tuberculosis: 127 cases have been treated in 1964 as against 119 in 1963.

(vi) Weil's disease: appears to be prevalent (3 per 1,000 population). 229 cases were treated in 1964 as against 215 in 1963.

(vii) Filaria: Since the last survey carried out in 1958 by the Malaria Institute of India now known as the National Institute for Communicable Diseases, New Delhi, it is believed that the position has worsened in Port Blair.

(viii) Trachoma: It is prevalent in the Nicobar Islands (Car Nicobar, Katchal and Nancowrie) found mostly in persons above 6 years of age.

(ix) Malaria: is on the wane.

Medical Facilities

411. Medical and health care is provided entirely by Government through the Medical Department. There is no private or municipal

medical care. In-patient and dispensary services are provided through 8 general hospitals, 1 tuberculosis hospital and 36 dispensaries, with a total bed strength of 400. In addition to these, there are two mobile dispensaries; one on sea and the other on land.

412. A typical dispensary is run by a compounder and a ward-boy under the overall supervision of the medical officer of the nearby hospital, who periodically visits the dispensary.

Public Health Activities

413. Public health activities have not kept pace with the curative services. Laboratory services need improvement. Among the national health programmes, malaria eradication, small-pox eradication, B.C.G. and leprosy programmes are in operation.

Water Supply

414. Much has been done to increase the quantity and to improve the quality of water in Port Blair. But much remains to be done, particularly in respect of the filtration and chlorination of water.

SECTION III—FUTURE PROGRAMME—SALIENT FEATURES

Training

415. To augment the availability of medical personnel, particularly at the middle level, training facilities should be provided in Port Blair for auxiliary nurse midwives, junior male nurses, compounders, dais, nursing and other auxiliary staff as far as possible. Compounders in independent charge of dispensaries should be replaced gradually by the auxiliary health workers, now known as health assistants.

Provision of Isolation Hospitals and Beds

416. Isolation hospitals and isolation beds in existing hospitals need augmentation. There is also need for the provision of a convalescent ward of about 30 beds at Port Blair as nearly one-third of the population consists of labour from the mainland, most of whom are without families and, therefore, when ill, need be hospitalised sooner than would otherwise be the case and kept on until fit enough to resume their duties.

Provision of ambulance services at Rangat, Diglipur and Car Nicobar

417. An ambulance car will expedite not only the transport of cases requiring hospitalization but would also facilitate the supervision of dispensaries by medical officers of the nearby hospital.

Laboratory Services, X-Ray Facilities, etc.

418. The following additional facilities/improvements in existing facilities will need to be made:—

- (i) Improvement of laboratory services in hospitals at Car Nicobar, Rangat, Diglipur and Long Island.
- (ii) Provision of X-ray facilities at Diglipur and Mayabunder hospitals.

- (iii) Provision of Public Health Laboratory (food, drinks) strengthening of existing laboratory services (public health and clinical) and strengthening of technical staff (including a pathologist).

National Trachoma Control Programme

419. The Trachoma control programme on a modified staffing pattern should be undertaken, particularly, at Car Nicobar, Nancowrie and Katchal.

National Malaria Eradication Programme

420. This will have to be continued and a maintenance programme started. In respect of hitherto unopened areas like Little Andaman, Great Nicobar and even other islands such as Rutland, etc. the malaria eradication programme will have to be initiated.

Filaria Control

421. An "A" type filarial unit should be established at Port Blair.

Drinking Water Facilities

422. In view of the acute shortage of drinking water in the Islands, particularly during the months of March, April and May the possibility of deep tube wells should be explored for groups of villages and particularly in islands likely to be colonised—Little Andaman, Great Nicobar, Katchal, Havelock and Neil islands, etc.

Reorganization of Medical Department

423. The 'Medical Department' should be redesignated as Health Department and the 'Senior Medical Officer' as 'Director of Health Services'. He should also be the Surgeon-Superintendent of the Civil Hospital, Port Blair and the Secretary for Health to the Chief Commissioner. The Department should be appropriately strengthened at lower levels.

424. The public health activities should include :—

- Local health services;
- Port Health;
- Laboratory and epidemiology and control of communicable diseases;
- Maternity and child health and family planning;
- School health work;
- Nutrition;
- Health education; and
- Statistics.

425. Local health services should include hospitals, primary health centres and dispensaries in outlying islands. Because of the peculiar situation existing in the islands, owing to difficult communications and transportation all hospitals should provide both preventive and curative services and all public health activities including the national programmes should be made a part of the responsibility of the medical officers of hospitals and all future primary health centres.

SECTION IV—SPECIAL HEALTH MEASURES FOR LITTLE ANDAMAN AND GREAT NICOBAR

426. Development activity will be concentrated to a substantial extent, at least in so far as land reclamation and its exploitation for agriculture (including plantation and horticulture), in Little Andaman. The opening up of Great Nicobar is also assuming importance for various reasons already indicated in this report. The opening up of these two large islands will necessitate the organisation of health measures on a large scale against malaria as well as against sand flies and ticks which are known to constitute a health menace at least on the Little Andaman. A public health party should be amongst the first to land in Little Andaman and Great Nicobar when the first improvised landing facilities are provided, so as to control the potential danger from mosquitoes and sand flies.

CHAPTER XII

COLONISATION

SECTION I—PATTERN

427. The targeted increase of population mentioned in Chapter III will involve a big settlement programme over the next ten years. By the end of the Fourth Plan alone the increase in population visualised is 75,000. Of this a part will represent the natural growth of local population which may be estimated at about 15,000.* The balance of 60,000 people will have to be moved from the mainland and resettled in the islands. This chapter is concerned with the resettlement programme during the period ending with the Fourth Plan.

428. It has been indicated in Chapter III that for the absorption of the increased population in the economy of the islands, about 25,000 jobs will need to be created during the Fourth Plan period. About 15,000 of these will be in the primary sector and 5,000 each in the secondary and tertiary sectors.

429. As mentioned in Chapter III, in future colonisation programmes, it would be essential to develop settlements of a mixed character not restricted to people of one particular cultural background. This will provide a stronger base for the economy and security of the islands. It has already been mentioned that the skill requirements of specific programmes would necessitate the induction of special groups of people from the mainland e.g. fishermen from Andhra and Kerala, plantation workers from Kerala, repatriates from Ceylon, etc. Similarly it would be necessary to induct some sturdier people into the new settlements. Ex-servicemen could provide a good nucleus. These are illustrative examples; the idea is to get the right type of people for the specific programmes that are visualised in the accelerated development of the islands and also generally to aim at mixed communities.

430. In view of the vocational background of migrants from East Pakistan, it would be necessary to give them the first priority for resettlement on paddy lands. Such of them as are accustomed to salt-water fishing in the estuarine areas of Pakistan may also be accorded the first priority in coastal fishing programmes.

431. The priorities in the matter of reclamation and opening up of new areas for settlements should be :—

- (i) Betapur in Middle Andaman where work has already commenced;
- (ii) Little Andaman where the largest area is available;

*The latest Official population estimates indicate a 3.46 annual rate of natural increase of population which has therefore been considered to be too high. The 15,000 increase is based on somewhat lower rate of growth.

- (iii) Great Nicobar which needs to be opened up immediately for various considerations already set out in this report;
- (iv) Katchal where a large area of 10,000 acres is available;
- (v) Rutland where 6,000 acres suitable for rubber are reported to be available.
- (vi) Nancowrie- Camorta-Trinket group
- (vii) Neil and Havelock.

The above priorities should not be taken as inflexible. For example, it will not be possible even to commence work in Little Andaman and Great Nicobar before the visualised landing facilities are ready. Also work on the reclamation of mangrove swamps can proceed simultaneously with work in other areas as the operations in these swamps will be substantially manual and would not necessitate the use of a fully mechanised tractor unit. Similarly, work already commenced in Rutland, Neil and Havelock can proceed at the present pace which could be accelerated later after the pressure on the use of the mechanised units eases somewhat. On the other hand, Rutland may receive a higher priority because of its comparatively easier accessibility and close proximity to Port Blair, if the rubber plantation programme can be pursued with vigour. Similarly the Nancowrie-Trinket-Camorta group may need to be taken up simultaneously because of easier accessibility and the need to develop animal husbandry.

SECTION II—FINANCIAL IMPLICATIONS

Maintenance

432. Broadly stated, the resettlement programmes will involve essentially the same ingredients in respect of all the three sectors of the economy. The settlers will have to be provided with the where-withal to live till they are able to stand on their own legs. This may take the shape of an assured wage before they are absorbed in industry or organised agriculture (including plantation and horticulture); a subsistence allowance for a longer period if they are individually settled on agriculture. Provision for this will be necessary only in respect of the 60,000 people—(involving the creation of 20,000 jobs)—proposed to be moved from the mainland; the remaining 15,000 will be local people from settled homes.

433. As already mentioned the 45,000* acres proposed for reclamation during the period ending with the Fourth Plan will be utilised for paddy, plantation, crops, horticulture, etc. in accordance with the best land-use pattern indicated by land capability studies. Past experience has shown that about 5 acres of paddy land provide an adequate unit for the sustenance of one earner. Plantation crops such as rubber, tea, coconut, etc. however are able to support, comparatively, a larger number of 'earners'. The manpower requirements for rubber, for example, work out to about 1 for every 2 acres. To

*While the figure indicated in Chapter III is 45,300 for operational purposes, the figure of 45,000 is being adopted.

Thus the basis of calculating the figure of Rs. 150 lakhs should not be taken as being linked to any particular form of organisation or any particular pattern of land utilisation. This figure is a very tentative estimate and may well increase substantially if farming is organised mechanically even to a limited extent.

Business loans

435. Those who will be absorbed in small trades, or professions would need to be given the facilities of a business loan. This number may be estimated to be about 2,000. The 12,000 earners on the 45,000 acres of new settlements would need, on the basis of previous experience in Dandakaranya and elsewhere at least 1,200 (10%) small trades, services, etc. In addition, there will be multifarious activities in these new settlements relating to road building, forestry, etc. so that the estimate of 2,000 is fairly reasonable. With Rs. 1,000 as the average business loan, this will mean, a total expenditure of Rs. 20 lakhs.

Housing

436. Housing facilities in the shape of house building loans or built-up structures will need to be provided and these would similarly be restricted to the 20,000 earners moved from the mainland. If some of the local people are also absorbed in new settlements in virgin areas, such Little Andaman, Great Nicobar, etc., they may also be justifiably entitled to some housing facilities. Attempts should, however, be made to absorb the local people in activities near about the areas where they are at present settled so that expenditure involved in their transport to, and resettlement in, new areas can be avoided.

437. With an average house building loan of about Rs. 1,250 per unit for those settled on land and Rs. 2,000 for others, the total expenditure on this would come to Rs. 310 lakhs.

438. In addition to this, these 20,000 earners will need to be provided with homestead land on which to build their homes. The size of the homestead plot will vary from about half an acre for those absorbed in the service sector or industry to about one acre for those absorbed in agriculture, fishery or forestry. On an average thus, about 16,000 acres will be needed. This will, of course, not be flat land and will, therefore, not go to reduce the land cleared for agricultural purposes. But to enable this land to be used for the cultivation of vegetables or fruits, of which there would be plentiful scope, it will have to be cleared of forest growth because experience of past colonisation efforts has shown that the settlers who were given 5 acres of uncleared homestead land have not been able to clear it with the result that all of it remains unexploited. Costs involved in this will be indicated under land reclamation costs.

Social Services

439. The provision for community services like schools, water, dispensaries, etc. may, however, have to take note of the full targeted increase of population, since in new settlements it will not be possible or advisable to distinguish between local people and others. On the assumption, however, that the natural growth of the local population

will have been covered in the normal Fourth Plan provision of the Andaman Administration, the present provision may be calculated on the basis of 20,000 earner units and not the full 25,000 units.

440. Experience in Dandakaranya has shown that on an average these services cost about Rs. 800 per family unit. The outlay on this will, therefore, involve about Rs. 160 lakhs.

Land Reclamation

441. The investment needed to create the required number of jobs in programmes other than agriculture have been indicated in the appropriate chapter. Provision for reclamation of land and its exploitation is included here.

442. On an average the reclamation cost per acre of land cleared would be Rs. 400 including contour bunding, etc. This includes Rs. 100, the proportionate depreciation on the heavy equipment that would be used. But for the purpose of estimating the volume of investment required for the colonisation programme the element of cost attributable to depreciation is being excluded here, since it is relevant only for estimating unit cost purposes, and instead the total cost of the four fully mechanised tractor units that would be needed, included. The reclamation cost of 45,000 acres will come to Rs. 135 lakhs.

443. The reclamation of mangrove swamps will cost more—roughly about Rs. 800 per acre as it will involve the building of dykes, etc. This will mean an additional expenditure of Rs. 500 per acre of mangrove forest and since it is proposed to clear 7,000 acres of mangrove forests during this period, the total additional cost would be about Rs. 35 lakhs.

444. The 16,000 acres required for homestead plots may not be cleared as complete as the land meant to be used for agricultural purposes; also the method employed for clearance need not be wholly mechanised. All the same, the cost of clearance per acre will hardly fall below Rs. 200. Excluding Rs. 100 attributable to depreciation this will involve an additional sum of Rs. 16 lakhs.

445. In addition, an area of about 6,000 acres would be needed for the industrial complex proposed for Little Andaman. This will need to be completely cleared and the cost involved, at the average rate of Rs. 300 (exclusive of depreciation) per acre would be about Rs. 18 lakhs.

446. Thus the total cost involved in the reclamation of land would be about Rs. 204 lakhs.

447. The capital costs involved in the purchase of fully mechanised units for the reclamation of land have still to be estimated. Out of the 45,000 acres proposed for clearance during the six years ending with the Fourth Plan period, 7,000 acres are of mangrove forests which will need a different technique of clearance. But this will be made up by the additional 6,000 acres needed for the industrial complex in Little Andaman. Thus the rate of clearance will have to be maintained at about 7 to 8 thousand acres a year. This would require at least 4 fully mechanised units, which at an average of about Rs. 65 lakhs per unit would cost about Rs. 260 lakhs of which

about Rs. 180 lakhs would be in foreign exchange. If the rate of clearance in the initial one or two years is less it may become to press one more unit into service later.

Roads

448. The new settlements on the 45,000 acres will involve the construction of a net work of link roads. On an average this would involve an outlay of about Rs. 12 lakhs per 10,000 acres. The total for 54,000 acres would, therefore, be about Rs. 54 lakhs.

Transport

449. The programme involves the movement of 60,000 persons from the mainland to the islands. This will involve movement by rail to the nearest port and thereafter by boat. These 60,000 persons will include children also but even if the average cost per person comes to about Rs. 50, the total cost involved would be about Rs. 30 lakhs. This excludes the cost involved in the transport of vehicles and heavy units of the fully mechanised reclamation units.

450. Thus the total cost would be :

	Rs. in lakhs
(i) Maintenance grants	57
(ii) Loans to agriculturists	150
(iii) Business loans	20
(iv) Housing	310
(v) Social services (Schools, dispensaries, water supply, etc.)	160
(vi) Land Reclamation	204
(vii) Feeder roads	54
(viii) Transport	30
(ix) Capital costs—4 tractor units	260
TOTAL	1,245

451. It needs to be remembered that these are very broad and tentative estimates of cost. They also do not include all the expenditure which may be considered as relating to the colonisation programme. For example the cost of construction of jetties—2 in Little Andaman, 2 in Katchal 2 in Great Nicobar and at least one each in Rutland, Havelock and Neil—which may well work upto about Rs. 100 lakhs or more has not been included in this chapter. Similarly the cost of the health measures that will need to be taken in respect of virgin areas like Little Andaman, Great Nicobar and to some extent even in Katchal and Rutland has not been estimated and included. These will need to be worked into the detailed programmes that are drawn up in respect of each large area where resettlement is undertaken.

CHAPTER XIII

MANPOWER

SECTION I—INTRODUCTION

452. It was mentioned in chapter III that a definite target for the accelerated development programme in the Islands should be the doubling of the present population by the end of the Fourth Plan period. Thus the present population of about 75,000 will be raised to 1.5 lakhs by the end of the Fourth Plan. The target for the increase during the Fifth Plan period is 1.0 lakh so that the population of the islands at the end of the Fifth Plan is expected to be 2.5 lakhs. It was also mentioned that to sustain an increase of 75,000 people, the economy of the islands would need to generate 25,000 jobs during the period ending with the Fourth Plan and an additional 33,000 during the Fifth Plan. In this chapter an attempt is made to integrate the manpower implications of the various programmes included in this report and to see if the employment visualised will meet the requirement during the period ending with the Fourth Plan.

453. It was mentioned in chapter III that out of the 25,000 jobs created during the period ending with the Fourth Plan, 15,000 will need to be in the primary sector (agriculture, fishery, forestry, etc.) and the remaining 10,000 in the secondary (industry, construction, etc.) and the tertiary (social and administrative services, trade; commerce, etc.) sectors. It is generally accepted that out of the total employment created in the secondary and tertiary sectors, the tertiary sector accounts for about 50 per cent. This would be, even more so in respect of the Andaman and Nicobar Islands where the accelerated development will necessitate a substantial expansion in the social and administrative services to cope with the increasing task involved in the accelerated development.

SECTION II—AGRICULTURE, FISHERY AND FORESTRY

Agriculture

454. As discussed in the chapter on Colonisation, settlement on about 45,000 acres of land, no matter what the form of the organisation or the technique employed in exploitation, will support about 12,000 "earners".

Fishery

455. The fishery development programme will generate employment opportunities for about 1,200 persons of which the occupational break-up is indicated in the chapter on Fisheries.

Forestry

456. Forestry will easily generate the remaining 1,800 jobs. As mentioned in the chapter on Forestry, about 180 square miles would

be covered by a forest working plan in Little Andaman alone. Even on the basis of a 100 year rotation cycle, this would mean about 1.8 square mile per year. This, it is estimated, will generate employment for about 1,000 persons. In addition, the accelerated clearance programme involves the clearance between 7 to 10 thousand acres a year for about 10 to 15 years and the extraction of commercial timber. The extraction operations in these areas may have to be speeded up by employing machines, yet the employment potential on a sustained basis will hardly be less than the required balance of 800 jobs. As a matter of fact a much larger temporary labour force may have to be deployed on these operations. It must also be remembered that this does not take note of the labour involved in the land clearance operations in which a judicious combination of manual and mechanical operations will have to be resorted to in the peculiar conditions of reclamation work on the islands. Trials during the past working season indicated that mechanical operations alone are not likely to be the most efficient method, in view of the heavy growth of creepers, etc. which will have to be cleared manually. An appropriate working combination has already been agreed upon by the Chief Conservator of Forests and the Director of the Rehabilitation Reclamation Organisation. Such manpower requirements will be met from amongst the 12,000 persons who are ultimately proposed to be settled on the reclaimed land.

SECTION III—INDUSTRY, CONSTRUCTION, ETC.

Industry

457. The chapter on Industries indicates the employment potential of the forest based industrial programmes to be about 4,000. In addition, the big sugar factory of 60-70 thousand tons capacity would generate employment of about 2,000. The industrial programme will be phased over the Fourth and the Fifth Plan periods. The end of the Fourth Plan should see the completion of the expansion of the three existing veneer plants including the integrated particle board plant, the particle board plant at Betapur, the match factory, the pencil slat and roofing shingles factory and the first phase of the Little Andaman industrial complex. The big sugar factory involving as it does, the clearance of 20,000 acres of land in Little Andaman, the cultivation of sugarcane on the cleared land, etc. may go into full production late in the Fourth Plan or possibly early during the Fifth Plan period. Its full employment impact may not be felt during the period ending with the Fourth Plan. Thus, out of the total employment of about 6000, about 2500 is estimated to relate to the Fourth Plan period, leaving a balance of about 3,500 jobs for the Fifth Plan.

458. The smaller and medium industries listed in the chapter on Industries may provide another 700 jobs or thereabout; the total would thus be about 3,200.

Construction

459. On the construction side, one programme alone—roads is likely to generate a substantial part of the balance of requirements in this sector. In the chapter on Transport it has been mentioned

that even the normal roads programme of the Administration during the Fourth Plan is likely to involve an outlay which is about Rs. 100 lakhs more than the corresponding expenditure during the Third Plan. This will, of course, cover both maintenance, improvement and construction of new roads, but its equivalent in terms of new roads will be about 50 miles or about 10 miles per year. The Transport member of the Team has estimated that on an average, one mile of road construction in the islands, would employ 130 unskilled and 3 skilled persons*. Thus the phasing at 10 miles per year would mean an additional employment of about 1300 unskilled and 30 skilled persons.

460. This does not take note of the recommendation made in this report that the construction of the Great Andaman Trunk Road should be speeded up. It does not take into account the large network of feeder roads that would be needed in the colonisation programme on the 45,000 acres of land proposed for clearance during the period ending with the Fourth Plan. On these feeder roads, some of the 12,000 persons who are to be ultimately settled on land could also be employed. It also does not take into account the new road construction programme that will have to be undertaken in islands such as Little Andaman, Katchal, Great Nicobar. In Little Andaman alone, where the bulk of the colonisation effort may be concentrated, there would be need to connect the two proposed jetty sites at Jackson Creek and Hut Bay what may be called the Little Andaman Trunk Road. An estimate of the probable length of this road has been made at about 25 miles. This alone, at the rate of about 5 miles a year would provide employment to about 650 unskilled and 15 skilled workers, taking the figure indicated in para 9, to 1950 unskilled and 45 skilled—more than the balance of 1800 jobs required in the secondary sector.

SECTION IV—SERVICES

461. In the tertiary sector, small trade and professions will account for at least 2,000 mostly self-employed persons in the new settlements on the 45,000 acres, as explained in the chapter on Colonisation. It is not the practice to estimate separately, the requirements of each of the activities that are comprised in this sector. As already mentioned, of the total employment provided by Industry, Construction and Services, the latter generally constitutes 50%. The multifarious activities included in this sector, which will receive an expansion push by the targeted increase of population and the accelerated tempo of development may, if anything, generate larger than estimated at present.

SECTION V—CONCLUSION

Nature of the estimates

462. It is necessary to state that the presentation of an integrated manpower picture in this chapter is not intended to be a tally of

*This estimate is based on the use of the single pass stabiliser in soil-aggregate road construction, but it is not likely to be materially different in the orthodox method.

the total requirements with the corresponding job opportunities visualised in the accelerated development programme. It merely takes an empirical and operational view of the manpower situation to ensure that the economic needs of the targeted increase of 100 per cent in the present population would be adequately met from the employment opportunities created by the accelerated development of the islands. The picture as it now emerges makes it clear that the opportunities if anything, are likely to be more, if one takes into account, not only the programmes which have not been covered in these estimates, but also substantial parts of the normal developmental activity included in the Fourth Plan of the Island.

Organised recruitment

463. It has already been pointed* out by the small team of officers of the Rehabilitation Ministry that the present manpower situation in the islands is difficult—unskilled labour in large numbers has to be imported from the mainland, key positions in government remain unfilled because of the non-availability of persons or the reluctance of mainlanders to accept posts in the Islands, etc. The situation is likely to worsen with the acceleration of the developmental activity unless some organised efforts are made to meet these shortages.

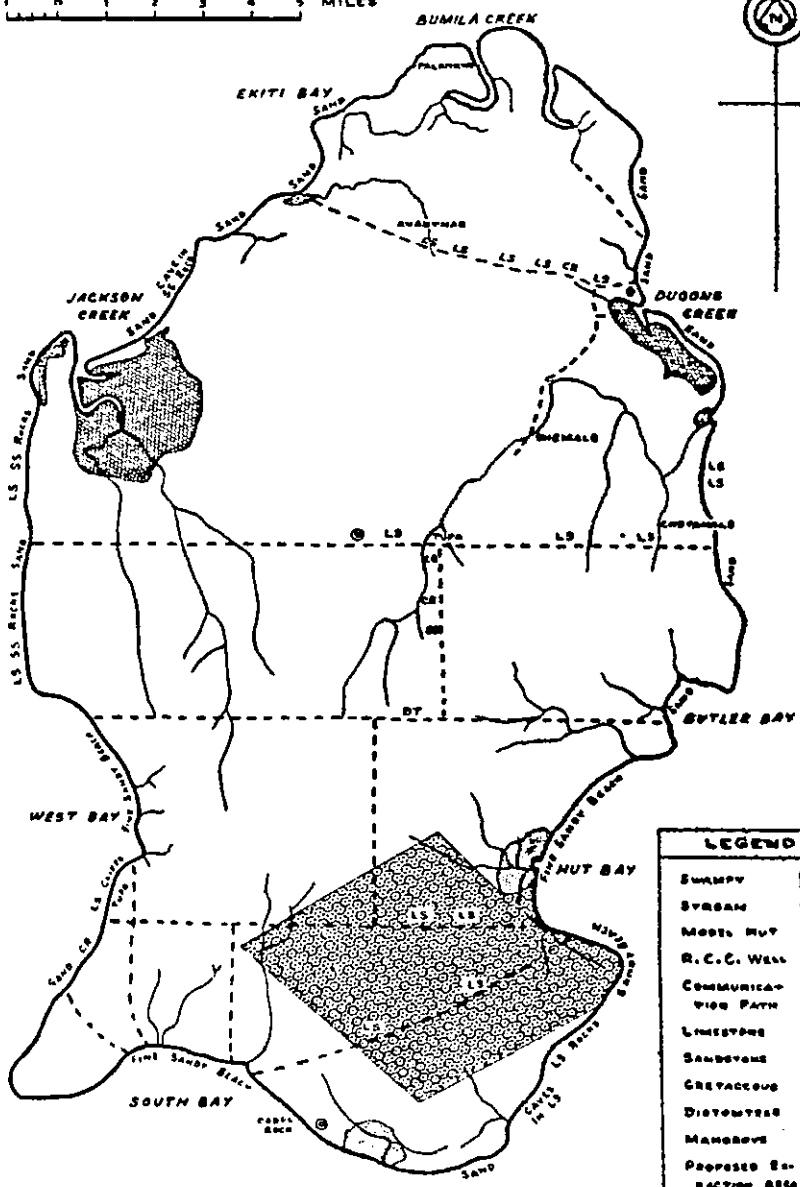
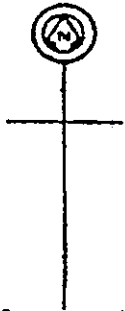
464. The requirements of unskilled labour can be met to a large extent by the Rashtriya Vikas Dal, if necessary by expanding it to more than double its present strength.

465. In respect of some categories of semi-skilled and skilled categories it may be necessary to resort to a similar Organised Recruitment from the mainland. The scheme of the Rashtriya Vikas Dal also provides for the recruitment of semi-skilled and skilled personnel so that this recruitment can be organised through this Dal or possibly even separately, if the recruitment is not restricted to migrants. This will meet immediate requirements; but for a sustained supply of labour, these skills will have to be developed locally by establishing adequate training facilities.

466. The question of the shortage of profession and administrative personnel may best be solved by the inclusion of such posts in corresponding cadres on the mainland.

* Paras 64 and 65 of the report by K. N. Butani (April, '65)

LITTLE ANDAMAN ISLAND



LEGEND	
SWAMPY	
STREAM	
MODEL HUT	
R.C.C. WELL	
COMMUNICATION PATH	
LIMESTONE	LS
SANDSTONE	SS
GNEISS	GS
DIORITE	DT
MANGROVE	M
PROPOSED EXTRACTION AREA	

1° 15' N DEGREE CHANNEL

CHAPTER XIV
AREA PROJECT—LITTLE ANDAMAN
SECTION I—INTRODUCTION

467. The bulk of the developmental activity should be concentrated in Little Andaman with Great Nicobar and Katchal as close seconds. It would be necessary to draw up an integrated picture in respect of each of such island. In this chapter, an attempt has been made, to present such a picture in respect of Little Andaman only. It needs to be emphasised that at this stage, this picture can, at best, be taken as indicative of the scale of operations and investments involved. It is, therefore, very tentative and provisional.

468. It is recommended that similar island projects should be prepared for other islands and spelt out in greater detail at the appropriate time, with full fledged Project Reports.

SECTION II—MAIN TARGETS TO BE ACHIEVED

469. The main targets to be achieved in the development of this island are:—

- (i) Clearance of 60,000 acres of forest land;
- (ii) Settlement of 12,000 families on agriculture (including plantation, horticulture, etc.);
- (iii) Establishment of an integrated industrial complex based on timber resources of the island;
- (iv) Establishment of a sugar factory with an annual capacity of 60-70 thousand tons; etc.

SECTION III—PHASING OF THE PROJECTS

470. The paragraphs that follow indicate the phasing of the programme, in physical as well as financial terms over :

- (i) The two years ending March, 1967.
- (ii) The next two years ending March, 1969;
- (iii) Subsequent two years ending March, 1971 (End of the Fourth Plan),
- (iv) The two years ending March, 1973,
- (v) And the remaining three years ending March, 1976 (End of the Fifth Plan)

SECTION IV—FIRST PHASE—TWO YEARS ENDING, MARCH, 1967

Item I: Landing Facilities: Estimated Expenditure: Rs. 38.5 lakhs.

471. Two pontoons to provide temporary landing facilities at Hut Bay are scheduled to be in position by March, 1966. This will facilitate the movement of men and material for a substantial part of the year. The pontoons are expected to cost about Rs. 75,000 each, totalling to about Rs. 1.5 lakhs. A hydrographic survey around Jackson Creek, one of the two points at which permanent jetties are proposed to be constructed, has already been completed. The hydrographic survey around the second point—Hut Bay has been accorded

a high priority in the current year's programme. A Marine Construction Circle under a Principal Engineer (Marine) has been set up, and it is expected that the preliminary investigations, the designing of the jetties, procurement of equipment and a substantial part of the construction will have been completed by end of this two year period. The equipment cost is estimated at about Rs. 36 lakhs and preliminary expenditure and expenditure on surveys at about Rs. 14.5 lakhs for the jetty construction programme for three islands—Little Andaman, Katchal and Great Nicobar. On a rough estimate one third of this expenditure may be attributed to the jetty construction programme in Little Andaman. This would be about Rs. 17 lakhs. The construction of two jetties would cost about Rs. 20 lakhs per jetty. This would mean another 40 lakhs but on the assumption that a part of the construction work may spill over to the next phase a sum of Rs. 20 lakhs may be included here.

Item II : Trunk Road : Estimated Expenditure : Rs. 10 lakhs.

472. The key to the development of this Island will be the Little Andaman Trunk Road connecting the two jetty points—Hut bay and Jackson Creek. To speed up road construction it will need to be mechanised, at least, partly. The equipment needed can be landed without waiting for the permanent jetties to be in position, as was actually done last year near Betapur. During these two years, therefore, the survey for the alignment of the road will have to be completed and a beginning made on the construction of the road possibly from both the ends at the same time. It should be possible to complete at least five miles of the road during this period. Excluding the cost of the survey which, comparatively, will be nominal, the cost of 5 miles of road will be about Rs. 10 lakhs.

Item III : Land Clearance : Estimated Expenditure : Rs. 130.6 lakhs.

473. The land targeted for clearance by the end of the Fourth Plan period is 18,000 acres. On an average this would mean a little over 3,000 acres a year for the six years ending 1971. As it will not be possible to maintain this average in the first few years, it will be essential to press at least two fully mechanised units of the type now used by the Rehabilitation Reclamation Organisation to achieve this target over the 6 year period. The optimum clearance rate for one unit on the mainland, working two shifts, is about 4,000—5,000 acres a year. In view of the special nature of the Andaman forests and the much shorter working season, an average expectation of about 2,250 acres would be realistic. Absence of permanent landing facilities will be no obstacle to the landing of the fully mechanised units even in the very first year since they will in any case have to be reached. The limiting factor will be the speed with which the preliminaries are completed. Such preliminaries would be: the construction of sheds for the equipment and houses for the operators, the land survey precedent to the commencement of clearance operation, the establishment of a nucleous settlement etc. and above all the extraction of commercial timber from the areas to be cleared. Extraction of timber will indeed set the pace for the reclamation of land. In an earlier chapter have been indicated the difficulties in the way of a large-scale extraction programme in a place like Little Andaman. It will, therefore, be necessary to go slow during the first

phase and gear up machinery for full scale operations commencing with the second phase. Thus, while the first two years may see only the clearance of about 100 acres or thereabout each year by manual operations for setting up the base camp, etc., it would be possible to commence full-fledged clearance operations with the help of both the fully mechanised units during the second phase, i.e., from the third year of operations onwards. The costs involved during the first phase would, therefore, be : capital cost of two fully mechanised units viz. Rs. 130 lakhs and the cost of reclamation of 200 acres at the rate of Rs. 300 per acre (exclusive of depreciation) viz Rs. 60 thousand.

Item IV : Forest Operations : Estimated Expenditure : Rs. 45.50 lakhs.

474. To begin with, forest operations will cover extraction of commercial timber from the 60,000 acres proposed for clearance. It is only after all this has been cleared that the remaining 180 sq. miles of forest would be worked under a regular Working Plan. The preparation of the Working Plan, however, can and should be commenced in the very first phase. The cost involved in the preparation of the Working Plan has been estimated at about Rs. 1,00,000. Later, towards the end of the second or the beginning of the third phase, it may be possible to undertake trial plantations of desirable timber species. No separate provision for this need, however, be made as such trials would, in the initial stages, be restricted to an acre or so at a time, and will involve nominal costs.

475. Some expenditure will have to be incurred on the purchase of machinery and equipment for timber extraction operations which will be in full swing during the next phase. An expenditure of Rs. 45 lakhs is estimated on this account. Since the expenditure on timber extraction in the other phases has been worked out on the basis of Rs. 150 per ton (inclusive of depreciation), this expenditure will be adjusted by corresponding short provision in the second phase.

Item V : Temporary Housing for Staff, Equipment Stores : Estimated Expenditure : Rs. 25 lakhs.

476. A fully-mechanised tractor unit was moved to Betapur in March, 1965 from the mainland for reclamation operations in Middle Andaman. A sum of about Rs. 4.85 lakhs was spent on the construction of tractor sheds and temporary houses for the operators and the supervisory staff. An estimate for the similar structures in Little Andaman, comparatively much more difficult area, Rs. 5.00 lakhs per unit would be reasonable. Accordingly, the housing of two units and their staff would cost about Rs. 10 lakhs.

477. There will also be the expenditure on the construction of temporary housing for the office and staff of the Forest Department, the Public Works Department, the Project Administration, etc. excluding labour which is being provided for under the item—"colonisation". A very tentative estimate of another Rs. 10 lakhs. is being made.

478. In addition, there will be need to provide storage facilities for stores of daily consumption that will have to be carried to the island in the earlier phases, for the equipment of the Forest and Public Works Departments, and for the construction materials, etc. An ad hoc estimate of expenditure on this account may be placed at about Rs. 5.00 lakhs.

Item VI: Colonisation: Estimated Expenditure: Rs. 27.62 lakhs.

479. At the end of the first phase about 600 'earners' would be engaged in Little Andaman mostly on reclamation road building house construction, and other allied activities. The road works indicated under Item II, would need about 500 persons on a sustained basis, at least for the duration of the first, second and third phases. Small trade and profession (50) and later for initial operations may account for another 100 bringing the total to 600.

(a) Transport: Estimated Expenditure: Rs. 1.00 lakh.

480. According to the percentage indicated in the chapter on Strategy of Development, these 600 persons will involve the movement to Little Andaman of a total number of about 2,000 persons. At the average cost of about Rs. 50 per person, transport charges will account for about Rs. 1 lakh.

(b) Maintenance: Estimated Expenditure: Rs. 1.08 lakhs

481. As mentioned in the chapter on Colonization, maintenance grants will have to be given to the settlers. At an average rate of about Rs. 60 per month for 3 months, the total maintenance grant payable to these 600 settlers would amount to Rs. 1.08 lakhs.

(c) Loans: Estimated Expenditure: Rs. 1.00 lakh.

482. During the first phase, very little, if any, land will be available for agricultural operations as the land proposed to be cleared during the period will barely suffice for the setting up of a base camp, etc. No expenditure will, therefore, be incurred on agricultural loans. To those in small trades and professions, a business loan at the rate of about Rs. 2,000 per earner would have to be given as visualised in the chapter on Colonization, involving an expenditure of Rs. 1 lakh.

(d) Housing: Estimated Expenditure: Rs. 12.00 lakhs.

483. On the basis of figures indicated in the chapter on Colonisation, the house building expenditure at the rate of Rs. 2,000 for the 600 earners would amount to Rs. 12 lakhs. The estimates for road works, timber extraction and industry on which these earners will be engaged, do not provide for housing for labour.

(e) Social Services: Estimated Expenditure: Rs. 4.8 lakhs.

484. The provision for community services like schools, water, dispensaries, etc. may be made, as indicated in the chapter on Colonisation, on the basis of about Rs. 800 per family. This, for 600

families, would come to Rs. 4.8 lakhs, if necessary this may have to be postponed to the second phase.

(f) Internal Road System : Estimated Expenditure : Rs. 0.24 lakh.

485. The forest roads needed in connection with timber extraction operations will be provided out of the estimates on timber extraction. The net work of link roads needed for a settlement on about 200 acres will involve, on an average estimate of about 12 lakhs per 10,000 acres, about Rs. 0.24 lakh.

(g) Provision of Essential Supplies e.g. rice, kerosene, sugar, pulses, oil, etc. : Estimated Expenditure : Rs. 5 lakhs.

486. The arrangements for this will have to be made by the Project Administration. The estimate of Rs. 5 lakhs has been made on an ad hoc basis. The amount will be recovered in due course by the sale of stores to the settlers, etc. It may form the revolving capital for a fair-price Co-operative/Government Store that would need to be set up.

(h) Administrative Overheads : Estimated Expenditure : Rs. 2.5 lakhs.

487. It is not easy to make firm estimates of administrative costs involved in the programme in this phase. Such costs will relate generally to the Project Administration, Forest, Health, P.W.D. R.R.O, etc. A very tentative estimate of this at about Rs. 2.5 lakhs may be made. It is presumed that other administrative services such as police post, etc. would be provided from the resources of the local administration.

Item VII : Agriculture : Estimated Expenditure : Rs. 0.5 lakh.

488. The cropping pattern on the reclaimed land will be settled on the basis of land capability studies. As a first step, therefore, a soil survey will have to be organised. This is in any case one of the preliminaries which must be completed before land is earmarked for clearance and, therefore, for timber extraction operations. The total acreage to be surveyed would far exceed the net area of 60,000 acres. The survey work should be so organised as to be completed during the first 5-6 years. It has been estimated that survey of about 1 lakh acres would cost about Rs. 2.5 lakhs. A provision of about Rs. 50,000 in this phase and Rs. 1 lakh during each of the two following phases would, therefore, need to be made.

Item VIII : Industry : Saw Mill : Estimated Expenditure : Rs. 5.5 lakhs.

489. This phase would see the establishment of a service saw-milling unit to meet the requirements of sawn timber for construction activities, etc. This is estimated to cost about Rs. 3 lakhs. In addition, there would be need for a small preservation-cum-searoning-cum-carpentry shop for which a provision of about Rs. 2 lakhs would be necessary. Preparatory action for the setting up of a veneer manufacturing unit would also need to be undertaken for which a small provision of Rs. 50,000 may be made. The total provision under this item will, therefore, need to be Rs. 5.5 lakhs.

490. The manpower needs under this item during this phase would be about 50 persons.

Total Expenditure During the First Phase

	(Rs. in lakhs)
Item (I) Landing Facilities	38.50
Item (II) Trunk Road	10.00
Item (III) Land Clearance	130.60
Item (IV) Forest Operations	45.50
Item (V) Temporary housing for staff, Equipment and stores	25.00
Item (VI) Colonisation	27.62
Item (VII) Agriculture	0.50
Item (VIII) Industry	5.50
	283.22

SECTION V—SECOND PHASE—TWO YEARS ENDING MARCH, 1969

Item I: Landing Facilities: Estimated Expenditure: Rs. 20 lakhs

491. As mentioned under this Item in the estimates relating to the first phase, the spill over of construction work during the phase would account for about Rs. 20 lakhs.

Item II: Trunk Road: Estimated Expenditure: Rs. 20 lakhs

492. A rate of about 5 miles per year will need to be maintained for this Trunk Road. During this phase, therefore, 10 miles would be constructed which will cost about Rs. 20 lakhs.

493. The manpower requirements for an average 5 miles per annum would be the same as in the first phase. Bulk of the construction on the 5 miles scheduled for completion during the first phase will have been concentrated in one year viz the second year, and the annual rate of construction during the second phase is the same. No additional manpower will, therefore, be needed for this programme.

Item III: Land Clearance: Estimated Expenditure: Rs. 27 lakhs

494. The land targeted for clearance during the two years of this phase is 9,000 acres. During this phase no capital costs on the purchase of any more tractor units would need to be incurred. The operating costs at the rate of 300 per acre (exclusive of depreciation) would, therefore, be Rs. 27 lakhs.

Item IV : Forest Operations : Estimated Expenditure : Rs. 157.50 lakhs

495. Timber will be extracted from the 9,000 acres targeted for clearance during this phase. It is estimated that 1,35,000 tons of timber will become available at the rate of 15 tons per acre. The

extraction costs are estimated at Rs. 150 per ton (inclusive of depreciation on equipment and transport vehicles). Thus an expenditure of Rs. 202.50 lakhs will be incurred. Allowing for a provision of Rs. 45 lakhs made in the 1st phase for purchase of machinery, etc. the balance expenditure will be Rs. 157.50 lakhs. (The revenue from the 1,35,000 tons would amount to about Rs. 540 lakhs).

496. The extraction operations from 4,500 acres per year would, at the rate of one person for 4 acres, need about 1100 persons. These will be brought to the island during this phase.

Item V : Temporary Housing for Staff, Equipment, Stores, etc : Estimated Expenditure : Rs. 20 lakhs.

497. Other than housing for the tractor units and the reclamation staff, the provision under this item in the first phase was Rs. 15 lakhs. On the estimate that the project staff would considerably increase during this phase, this estimate is being raised by another Rs. 5 lakhs.

Item VI : Colonization : Estimated Expenditure : Rs. 148.82 lakhs.

498. As at the end of the second phase about 2,800 'earners' would be settled on the 9,000 acres targeted for clearance during this phase. Out of these 9,000 acres, about 3,000 acres may be put under sugarcane and about a thousand acres each under arecanut, coconut and horticultural crops, leaving the balance of 3,000 acres for paddy.

499. As already mentioned under Item IV, timber extraction operations from these 4,500 acres per year will in all need about 1,100 persons, all of whom will need to be moved during this phase.

500. The 500 persons utilised for the road construction programme during the previous phase would continue to work on the road works during this phase and no additional manpower would be required on this account.

501. During this phase, industry may need about 530 persons. Small trade and professions will account for another 250 persons, bringing the total additional requirements to 3,680 'earners'.

(a) Transport : Estimated Expenditure : Rs. 5.52 lakhs.

502. These 3,680 'earners' will involve the movement to Little Andaman of a total number of about 11,050 persons. At the average cost of Rs. 50 per person, transport charges would account for about Rs. 5.52 lakhs.

(b) Maintenance : Estimated Expenditure : Rs. 9.86 lakhs.

503. Allowing for a maintenance expenditure of Rs. 60 p.m. for six months for each family settled on land and for a similar expenditure for 3 months on each family otherwise settled, an expenditure of Rs. 9.86 lakhs will be incurred during this phase on maintenance grants.

(c) Loans : Estimated Expenditure : Rs. 27.50 lakhs.

504. As stated in the Chapter on Colonization, an estimate of expenditure on agricultural operations can be made on the basis of Rs. 1250 per 'earner' settled on land. For 1800 'earners' to be settled on land during this phase, an expenditure of Rs. 22.50 lakhs will be involved. Similarly, an expenditure of Rs. 5 lakhs would be incurred on grant of loans @ Rs. 2000 each to 250 persons to be settled in business and small trade. Those engaged on timber extraction, road works, or as industrial labour will not need any loans.

(d) Housing : Estimated Expenditure : Rs. 60.10 lakhs.

505. Housing facilities will be provided to 1800 settlers families on land @ Rs. 1250 per family unit and to 1880 others @ Rs. 2000 per unit. The total cost will be Rs. 60.10 lakhs.

(e) Social Services : Estimated Expenditure : Rs. 31.04 lakhs.

506. For 3880 additional families, an expenditure of Rs. 31.04 lakhs will be incurred on provision of social services like schools, dispensaries, etc. on the basis of Rs. 800 per family.

(f) Internal Roads : Estimated Expenditure : Rs. 10.80 lakhs.

507. The link roads needed for a settlement on 9,000 acres to be cleared during this phase will involve an expenditure of Rs. 10.80 lakhs on the basis of the estimates of expenditure indicated in the chapter on Colonization.

(g) Administrative Overheads : Estimated Expenditure : Rs. 4 lakhs.

508. The administrative set-up constituted for the Island will need to be augmented to take note of the additional expanded activities in this island. In the first phase, an *ad hoc* provision of Rs. 2.50 lakhs was made. In the second phase, the expenditure may be placed at Rs. 4 lakhs.

Item VII : Agriculture : Estimated Expenditure : Rs. 1.00 lakh.

509. As explained in the corresponding item relating to the first phase, an expenditure of Rs. 1 lakh will be incurred during this phase on soil surveys.

Item VIII : Industry : Estimated Expenditure : Rs. 145 lakhs.

510. During this phase the veneer unit in Little Andaman and the plywood factory at Madras or Vishakhapatnam will come up. The latter will use veneers manufactured in Little Andaman and convert them into plywood. An expenditure of Rs. 25 lakhs on the plywood factory, Rs. 20 lakhs on the veneer unit and Rs. 100 lakhs on the sugar factory is proposed. Additional employment facilities for 530 persons are expected to become available in Little Andaman.

Total Expenditure During Second Phase

(Rs. in lakhs)

Landing Facilities (Item I)	20.00
Trunk Road (Item II)	20.00
Land Clearance (Item III)	27.00
Forest Operations (Item IV)	157.00
Temporary Housing for staff, equipment and stores (Item V)	20.00
Colonization (Item VI)	148.78
(a) Transport	3.52
(b) Maintenance	9.82
(c) Loans	27.50
(d) Housing	60.10
(e) Social Services	31.04
(f) Internal Roads	10.80
(g) Administrative Overheads	4.00
	<u>148.78</u>
Agriculture (Item VII)	1.0
Industry (Item VIII)	145.00
	<u>538.78</u>

SECTION VI—THIRD PHASE—TWO YEARS ENDING MARCH, 1971

Item I : Landing Facilities : Estimated Cost : Rs. 2 lakhs.

511. As explained earlier, the two jetties in Jackson Creek and Hut Bay would come up during the first two phases. During the 3rd phase, expenditure would have to be incurred mainly on maintenance facilities. These may be estimated at Rs. 2 lakhs.

Item II : Trunk Road : Estimated Cost : Rs. 20 lakhs.

512. As in the second phase, 10 more miles of trunk road will be laid during this phase costing Rs. 20 lakhs. This phase would see the completion of the trunk road from Jackson Creek to Hut Bay. No additional employment will be generated, as the labour already engaged on these works will continue to do this work.

Item III : Land Clearance : Estimated Cost : Rs. 92 lakhs.

513. The programme during this phase will be on the same scale as during the last phase, viz., reclamation of 9,000 acres of forest. The expenditure would be Rs. 27 lakhs. Towards the end of this phase, an additional tractor unit will be obtained to quicken the pace of reclamation during the next phase. An expenditure of Rs. 65 lakhs on the purchase of one more unit will, therefore, be incurred, bringing the total expenditure to Rs. 92 lakhs.

514. For settlement on 9,000 additional acres that would become available, 1,800 earners would be brought over from the mainland. As was done during the last phase, 3,000 acres out of the land reclaimed during this phase will be put under sugarcane, 3,000 acres under paddy and the remaining 3,000 acres under other crops/plantations.

Item IV : Forest Operations : Estimated Cost : Rs. 202.50 lakhs.

515. As in the second phase, an expenditure of Rs. 202.50 lakhs will be incurred on extraction of 1,35,000 tons commercial timber from 9,000 acres of land to be cleared during this phase. (This timber is expected to sell for Rs. 540 lakhs). No additional employment potential will be generated, and the 1100 workers already engaged on these works will continue to be employed.

Item V : Temporary Housing for Staff, Equipment, Etc. : Estimated Cost : Rs. 15 lakhs.

516. Arrangements for housing of operators and machinery of the additional tractor unit that would be ordered during this phase, will have to be made. As explained in the corresponding item in Phase I, an expenditure of Rs. 5 lakhs will be incurred on this account.

517. Some additional public buildings may have to be raised. An *ad hoc* provision of Rs. 10 lakhs will be necessary on this account.

Item VI : Colonization : Estimated Expenditure : Rs. 135.40 lakhs.

518. By the end of the Third Phase, 1,800 more earners would be settled on land that would be cleared during this phase. No additional manpower will be engaged on road works or forestry, but about 1,300 more persons may be expected to find employment in the industrial activities and about 100 persons in business and trade activities. Thus, during this phase, 1,800 additional 'earners' will be settled on land and 1400 otherwise.

(a) Transport : Estimated Cost : Rs. 5 lakhs.

519. For the transport of 3,200 earners and their families, an expenditure of Rs. 5 lakhs will be incurred on the basis indicated earlier.

(b) Maintenance : Estimated Cost : Rs. 9 lakhs.

520. For the maintenance of 1,800 'earners' settled on land and 1,400 otherwise, an expenditure of Rs. 9.00 lakhs will be incurred on the basis adopted in this behalf.

(c) Loans : Estimated Cost : Rs. 24.50 lakhs.

521. Those settled on land will need assistance by way of loans amounting to Rs. 22.50 lakhs (Rs. 1250/- \times 1,800 earners). The 100

'earners' engaged in business/trade will require loans amounting to Rs. 2 lakhs, bringing the total requirement under 'loans' to Rs. 24.50 lakhs.

(d) Housing : Estimated Cost : Rs. 50.50 lakhs.

522. For provision of housing to the 3,200 additional settlers during this phase, housing assistance amounting to Rs. 50.50 lakhs will be necessary. This amount is made up as follows:—

	Rs. lakhs
Houses for 1,800 settlers on land @ Rs. 1,250 each	22.50
Houses for 1,400 other settlers @ Rs. 2,000 each	28.00
	<hr/>
	50.50
	<hr/>

(e) Social Services : Estimated Cost : Rs. 25.60 lakhs.

523. The provision of social services for the additional 3200 families will cost about Rs. 25.60 lakhs.

(i) Internal Roads : Estimated Cost : Rs. 10.80 lakhs.

524. The construction of link roads in the freshly reclaimed area of 9,000 acres will cost about Rs. 10.80 lakhs.

(g) Provision of Essential Supplies, etc. : Estimated Cost : Rs. 5 lakhs.

525. In the 1st phase, a provision of Rs. 5 lakhs was included to serve as a 'revolving capital' for the departmental store to be run by the Project Administration. This capital may need augmentation during this phase since the activities would have greatly increased. A further sum of Rs. 5 lakhs may have to be provided during this phase.

(h) Administrative Overheads : Estimated Cost : Rs. 5 lakhs.

526. A provision of Rs. 5 lakhs during this phase is proposed.

Item VI : Agriculture : Estimated Cost : Rs. 1 lakh.

527. An expenditure of Rs. 1 lakh would be incurred on soil survey. This work will be completed during this phase.

Item VII : Industry : Estimated Cost : Rs. 365 lakhs.

528. The plywood factory in Madras/Vishakhapatnam will be completed during this phase. The setting up of the sugar factory will make further progress and a provision of Rs. 300 lakhs is suggested for this purpose. A further expenditure of Rs. 30 lakhs is proposed on the wood-based industrial complex, bringing the total to Rs. 365 lakhs. The additional employment potential in the Island will be about 1,300.

Total Expenditure During the Third Phase

(Rs. in lakhs)

Landing Facilities (Item I)		2.00
Trunk Road (Item II)		20.00
Land Clearance (Item III)		92.00
Forest Operations (Item IV)		205.50
Temporary Housing for staff, Equipment, etc. (Item V)		15.00
Colonization (Item VI)		
(a) Transport		5.00
(b) Maintenance		9.00
(c) Loans		24.50
(d) Housing		50.50
(e) Social Services		25.60
(f) Internal Roads		10.80
(g) Provision of Essential Supplies, etc.		5.00
(h) Administrative Overheads		5.00
	135.40	135.40
Agriculture (Item VII)		1.00
Industry (Item VIII)		365.00
		832.90

SECTION VII—FOURTH PHASE—TWO YEARS ENDING MARCH, 1973

Item I : Landing Facilities : Estimated Cost : Rs. 12 lakhs.

529. A provision of Rs. 2 lakhs may be made for maintenance of landing facilities, etc. It is not unlikely that an additional jetty may be required to cope with the increased volume of goods and passenger traffic. Alternatively, it might become necessary to make the existing jetties bigger in size. A provision of Rs. 10 lakhs may, however, be included for this purpose.

Item II : Trunk Road : Estimated Cost : Rs.

530. No provision on this account will be necessary as the trunk road would have been completed by the end of the Third Phase. Five hundred workers engaged on this activity will be diverted to forestry as explained subsequently in this chapter.

Item III : Land Clearance : Estimated Cost : Rs. 40.50 lakhs.

531. With three mechanised units functioning in the area, it is expected that 13,500 acres of land will be cleared during this phase.

The expenditure thereon will be Rs. 40.50 lakhs, on the basis of Rs. 300 per acre. For settlement on 13,500 additional acres of land that would become available, 2,700 earners would be brought over from the mainland. Out of the reclaimed land, 4,500 acres will be put under sugarcane, an equivalent area under paddy, and the balance under other plantations/crops.

Item IV : Forest Operations : Estimated Cost : Rs. 303.75 lakhs.

532. During this Phase, 2,02,500 tons of commercial timber would be extracted. On this an expenditure of Rs. 303.75 lakhs will be incurred. (The timber extracted would be worth about Rs. 810 lakhs). The extraction operations will require about 1,700 workers. As explained earlier, 1,100 workers would already be available. Of the additional 600 workers required, 500 will be diverted from trunk road construction works which would have been completed by the end of the 3rd Phase. Thus 100 additional workers will be brought from the mainland.

Item V : Temporary Housing for Staff, Equipment, etc. : Estimated Cost : Rs. 10 lakhs.

533. Some additional public buildings may have to be raised for which an *ad hoc* provision of Rs. 10 lakhs may be made.

Item VI : Colonization : Estimated Cost : Rs. 170.07 lakhs.

534. During the Fourth Phase, about 13,500 acres of reclaimed land will become available on which 2,700 earners will be settled. As explained above, an additional 100 persons will be required on forest works. In addition, about 200 persons will be engaged in trades or business or may be otherwise self-employed. In the Industrial sector about 1,170 more persons will be expected to get employment bringing the total number of additional earners to 4,170.

(a) Transport : Estimated Cost : Rs. 6.25 lakhs.

For the transport of 4,170 earners and their families, provision will have to be made for transporting about 12,500 persons. The expenditure involved will be Rs. 6.25 lakhs.

(b) Maintenance : Estimated Expenditure : Rs. 12.36 lakhs.

For the maintenance of 2,700 'earners' settled on land and 1,470 'earners' settled otherwise, an expenditure of Rs. 12.36 lakhs will be incurred on the basis of six months' maintenance grant to those settled on land and three months' maintenance to those settled otherwise.

(c) Loans : Estimated Expenditure : Rs. 37.75 lakhs.

Two thousand and seven hundred earners settled on land will be given loan amounting to Rs. 33.75 lakhs @ Rs. 1,250 each. The 200 earners engaged in business/trades will be given loans amounting to Rs. 4 lakhs @ Rs. 2,000 each. The total expenditure will thus be Rs. 37.75 lakhs.

(d) Housing : Estimated Expenditure : Rs. 58.15 lakhs.

An expenditure of Rs. 58.15 lakhs will be incurred on the provision of houses for 4,170 earners on the basis of Rs. 1,250 each for those settled on land and Rs. 2,000 for those settled otherwise.

(e) Social Services : Estimated Expenditure : Rs. 33.36 lakhs.

The provision for social services for the additional 4,170 families of settlers will be Rs. 33.36 lakhs.

(f) Internal Roads : Estimated Expenditure : Rs. 16.20 lakhs.

The construction of link roads in the area reclaimed during the Fourth Phase will cost Rs. 16.20 lakhs on the basis already indicated earlier.

(g) Administrative Overheads : Estimated Cost : Rs. 6 lakhs.

A provision of Rs. 6 lakhs during this Phase is suggested.

Item VII : Agriculture : Estimated Expenditure : Rs.

535. No expenditure on this account is likely to be incurred during this Phase.

Item VIII : Industry : Estimated Expenditure : Rs. 250 lakhs.

536. The sugar mill will be completed during this phase. A provision of Rs. 2 crores for the sugar mill and Rs. 50 lakhs for the wood-based industrial units may be made. 1,170 additional workers will gain employment in these industries.

Total Expenditure During the Fourth Phase

(Rs. in lakhs)

Landing facilities (Item I)	12.00
Trunk Roads (Item II)	..
Land Clearance (Item III)	40.50
Forest Operations (Item IV)	303.75
Temporary Housing for staff, Equipment, etc. (Item V)	10.00
Colonization (Item VI)	170.07
(a) Transport	6.25
(b) Maintenance	12.36
(c) Loans	37.75
(d) Housing	58.15
(e) Social Services	33.36
(f) Internal Roads	16.20
(g) Administrative Overheads	6.00
	<u>170.07</u>
Agriculture (Item VII)	
Industry (Item VIII)	250.00
	<u>786.32</u>

SECTION IX—FIFTH PHASE—THREE YEARS ENDING MARCH, 1976

Item I : Landing Facilities : Estimated Cost : Rs. 3 lakhs.

537. A provision of Rs. 3 lakhs maintenance of the landing facilities, etc. is suggested.

Item II : Trunk Road : Estimated Cost : Rs.

538. No provision on this account will be necessary as the trunk road would have been completed by the end of the Third Phase.

Item III : Land Clearance : Estimated Cost : Rs. 60.75 lakhs.

539. With three mechanised units functioning in the area, it is expected that 20,250 acres of land will be cleared during this phase. The expenditure thereon will be Rs. 60.75 lakhs.

540. For settlement on 20,250 additional acres of land that would become available, 4,050 'earners' would be brought over from the mainland. Out of the reclaimed land, 6,750 acres would be put under sugarcane, an equivalent area under paddy and the balance under plantations/crops. Thus, by the end of the 5th Plan, the area under sugarcane would be 17,250 acres. The sugar mill will require some more cane and the shortfall will be made good by putting an additional 2,500 acres under cane during 1976-77.

Item IV : Forest Operations : Estimated Cost : Rs. 455.62 lakhs.

541. During this phase 3,03,750 tons of commercial timber would be extracted (20,250 acres × 15 tons per acre). On this, an expenditure of Rs. 455.62 lakhs will be incurred. (The timber extracted would be worth about Rs. 1,215 lakhs). Since the yearly output of work will remain un-changed, no additional forest labour will be required during this phase.

Item V : Temporary Housing for Staff, Equipment, Etc : Estimated Cost : Rs. 10 lakhs.

542. An *ad hoc* provision of Rs. 10 lakhs for this purpose is suggested.

Item VI : Colonization : Estimated Expenditure : Rs. 214.49 lakhs.

543. As stated earlier, 20,250 acres of reclaimed land will become available during this phase. On this land 4,050 'earners' will be settled. In addition, about 300 persons will be engaged in trades/business or may be otherwise self-employed. In the industrial sector, about 350 more persons will be expected to be absorbed bringing the total number of additional earners during this phase to 4,700.

(a) Transport : Estimated Cost : Rs. 7.00 lakhs.

For the transport of 4,650 'earners' and their families, provision will have to be made for transporting about 14,000 persons. The expenditure involved will be Rs. 7.00 lakhs.

(b) Maintenance : Estimated Expenditure : Rs. 15.75 lakhs.

For the maintenance of 4,050 'earners' settled on land and 650 'earners' settled otherwise, an expenditure of Rs. 15.75 lakhs will be incurred on the basis explained in the preceding phases.

(c) Loans : Estimated Expenditure : Rs. 56.62 lakhs.

The 4,050 'earners' settled on land will be given loans amounting to Rs. 50.62 lakhs, @ Rs. 1,250 each. The 300 'earners' engaged in business/trades will be given loans amounting to Rs. 6 lakhs (@ Rs. 2,000 each). The total expenditure will thus be Rs. 56.62 lakhs.

(d) Housing : Estimated Expenditure : Rs. 63.62 lakhs.

An expenditure of Rs. 63.62 lakhs will be incurred on the provision of houses for 4,650 earners on the basis of Rs. 1,250 each for those settled on land, and Rs. 2,000 for those settled otherwise.

(e) Social Services : Estimated Expenditure : Rs. 37.20 lakhs.

The provision for social services for the additional 4,650 families of settlers will be Rs. 37.20 lakhs.

(f) Internal Roads : Estimated Expenditure : Rs. 25.30 lakhs.

The construction of link roads in the area reclaimed during the fifth phase will cost Rs. 24.30 lakhs on the basis already indicated earlier.

(g) Administrative Overheads : Estimated Cost : Rs. 10 lakhs.

A provision of Rs. 10 lakhs during this phase is suggested.

Item VII : Agriculture : Estimated Expenditure : Rs.

544. No expenditure on this account is likely to be incurred during this phase.

Item VIII : Industry : Estimated Expenditure : Rs. 34.50 lakhs.

545. As would be seen from the relevant chapter of Report, Rs. 8 crores have been provided for the setting up of a sugar mill and wood based industrial complex in Little Andaman. Provision for an expenditure of Rs. 765.50 lakhs has been made in the preceding four phases on this account and the balance of Rs. 34.50 lakhs is, therefore, suggested in this phase. These industries will provide additional employment for 350 persons.

Total Expenditure During the Fifth Phase

	(Rs. in lakhs)
Landing Facilities (Item I)	3.00
Trunk Roads (Item II)	..
Land Clearance (Item III)	60.75
Forest Operations (Item IV)	455.62
Temporary Housing for staff, Equipment, etc. (Item V)	10.00

Colonization		214.49
(Item VI)		
(a) Transport		7.00
(b) Maintenance		15.75
(c) Loans		56.62
(d) Housing		63.62
(e) Social Services		37.20
(f) Internal Roads		24.30
(g) Administrative Overheads		10.00
		<u>214.49</u>

Agriculture

(Item VII)

Industry

(Item VIII)	34.50
	<u>778.36</u>

Break-up of the Provisions Suggested for Expenditure During the Five Phases

(Rs. in lakhs)

(1) First Phase		
(Two Years Ending March, 1967)		283.22
(2) Second Phase		
(Two Years Ending March, 1969)		538.78
(3) Third Phase		
(Two Years Ending March, 1971)		832.90
A. Total Expenditure up to the end of Fourth Five Year Plan		1654.90
(4) Fourth Phase		
(Two Years Ending March, 1973)		786.32
(5) Fifth Phase		
(Three Years Ending March, 1976)		778.36
B. Total Expenditure during Fifth Five-Year Plan Period		1564.68
C. Total expenditure up to the end of Fifth Five-Year Plan		<u>3219.58</u>

546. From the preceding paragraphs of this chapter, it would be seen that the Little Andaman Project phased over the period ending with the Fifth Plan (i.e. March, 1976) will involve an outlay of little over Rs. 32 crores. Of this amount, the relative shares of agriculture, industry, colonization and economic and social overheads would be 47%, 25%, 22% and 6% respectively. The following

table gives the break up of the total outlay under various heads over the five phases :—

(Rs. in lakhs)

Item of Programme	Phases					Grand Total
	I March 1967	II March 1969	III March 1971	IV March 1973	V March 1976	
I. Economic & Social Overheads						
(a) Landing Facilities	38.50	20.00	2.00	12.00	3.00	75.50
(b) Roads	10.00	20.00	20.00	—	—	50.00
(c) Housing, Equipments, Stores, etc.	25.00	20.00	15.00	10.00	10.00	80.00
Total	73.50	60.00	37.00	22.00	13.00	205.50
II. Agriculture						
(a) Land Clearance	130.60	27.00	92.00	40.50	60.75	350.85
(b) Forest Operations	45.60	157.00	202.50	303.75	455.62	1164.37
(c) Soil survey etc.	0.50	1.00	1.00	—	—	2.50
Total	176.60	185.00	295.50	344.25	515.37	1517.72
III. Industry	5.50	145.00	365.00	250.00	34.50	800.00
IV. Colonization	27.62	148.78	135.40	170.07	214.49	696.36

547. Nearly 52,000 acres would be reclaimed over this period and 16,000 families settled in various sectors of the expanded economy of the Island. The following table gives the break up of these achievements over the five phases :—

Item of Programme	Phases					Grand Total
	I	II	III	IV	V	
I. (a) Agriculture & Forestry	—	2,900	1,800	2,800	4,050	11,550
(b) Industry & Construction	500	530	1,300	1,170	350	3,850
(c) Small trades, etc.	100	250	100	200	300	1,950
Total	600	3,680	3,200	4,170	4,700	16,350
II. Land reclaimed (in acres)	200	9,000	9,000	13,500	20,250	51,750

CHAPTER XV

SUMMARY OF MAIN CONCLUSIONS

Strategy of Development

The strategy of development for Andaman and Nicobar Islands will imply the consideration to the physical, economic and strategic characteristics of the area. (Para 55)

2. Doubling of present population (75,000) by end of the 4th Plan and its further increase by one lakh by end of the 5th Plan may be visualised. (Para 60)

3. About 25,000 additional jobs by end of 4th Plan and about 33,000 additional jobs during the 5th Plan will have to be created. Of the former, about 10,000 will be in the secondary and tertiary sector and about 15,000 in the primary sector. Corresponding numbers for the 5th Plan would be 15,000 and 18,000 respectively. (Paras 61 & 62).

4. Attainment of full coverage for literacy and elementary education level may be visualised as the target for the present. In order to meet the higher level manpower requirements, upgrading of skills will have to be ensured. (Para 64)

5. The apparent conflict between forestry and agriculture as the basis of the development programme for the islands needs to be resolved, and a definite policy on this issue evolved and built into the strategy of development. (Para 67)

6. The future land use should take into account the two basic objectives of maximum income on sustained basis and maximum number of persons to make a satisfactory living on the income thus generated. (Para 68)

7. Areas available for reclamation are in Middle Andaman, Little Andaman, Neil, Havelock, Rutland, Katchal, Great Nicobar, Noncowrie, Kamorata, and Trinket. Areas under mangrove forests are also available for reclamation. (Paras 77—84)

8. Land clearance operations may be carried on without necessarily matching these with timber extraction so that a lower rate of extraction of commercial timber does not slow down the pace of reclamation of land and its utilisation for agriculture. (Para 86)

9. Timber extraction will pose no problem in most of the islands, mentioned above because the forests there are not valuable. The problem will, however, arise in Little Andaman where the timber is very valuable. In that island, first year's clearance operations may be restricted to the needs of the base camp for all the agencies that would be concerned with Forest, Health, Public Works Department, Rehabilitation Reclamation Organisation, Project Administration, etc. Even the second year's operations should be on a somewhat restricted scale. From the 3rd year onwards, it should be possible

to maintain the pace of extraction at about 4,500 acres per year. During the last four years of the Fourth Plan, therefore, about 18,000 acres will be reclaimed. (Para 87)

10. The future colonization programme will aim at settlement of not only migrants from East Pakistan but also from other sources such as repatriates from Ceylon, plantation workers of Kerala, fishermen of Andhra and Kerala, sturdy ex-servicemen, etc. (Para 88)

11. All colonization programmes in these islands should be co-ordinated by the Ministry of Rehabilitation. (Para 89)

12. An active policy of developing contacts with aboriginals and establishing friendly relations with them and of trying to change their ways of life has to be adopted and pursued. (Para 95)

13. There are good long-term possibilities of fisheries development in which a beginning needs to be made right away. (Para 108)

14. For quite some time industrial development will be based essentially on the forest and agricultural produce of the Islands. (Para 109)

15. The setting up of an integrated wood working complex based on prospective working of the Little Andaman forests may be visualised. (Para 111)

16. Agency for the accelerated development should be very closely associated and integrated with the Andamans Administration and it should at the same time, have the autonomy & flexibility generally found in the working of many Corporations. (Para 115)

17. In respect of areas such as Little Andaman, Great Nicobar, etc. it may be necessary to appoint Project Officers so that the various development projects in these areas are pursued in a co-ordinated manner and with vigour. (Para 116)

18. Execution of most of the programmes/projects at least the larger ones—will need to be undertaken in the public sector. (Paras 117—122)

19. Incentives to promote accelerated development should be provided in the shape of (i) Government making the needed investment in economic overheads—more particularly in transport, (ii) modifying the investment criteria, and (iii) by providing tax holiday, subsidized supply of raw material or even subsidized rates of services to channel private investment. (Paras 124—127)

Agriculture

20. Prospects for agricultural development are very bright both in the nature of intensive cultivation of existing lands by organising appropriate inputs as well as bringing fresh areas under cultivation by the clearance of forests. (Para 148)

21. In future, soil conservation programmes should be organised by Government before putting the cleared land to agricultural use. (Para 149)

22. The future pattern of development of agriculture should aim at self-sufficiency in food crops and development of horticulture and plantation crops on a large scale for a stable agro-industrial base and large exports. (Para 157)

23. Two to three crops of paddy can be raised. Maize can also be grown successfully; wheat, barley and gram will require trials for introduction. Pulses, oilseeds, spices, vegetables and potatoes can also be grown. (Paras 159-160)

24. More serious efforts are required to cultivate cardamom, cinnaman, clove, nutmeg and vanilla beans, ginger, turmeric, English vegetables and potatoes. (Paras 163-164)

25. Attempts should be made to increase the acreage under sugarcane. (Para 165)

26. The area of 10,000 to 12,000 acres of hilly lands given to old settlers should be planted with the fruit crops, such as pineapple, oranges, lime, guava, sapota, etc. and coconut and arecanut. Interview island is ideal for the cultivation of all these fruit crops. (Para 167)

27. The scope for the cultivation of Jute has to be investigated. (Para 172)

28. It would be essential to strengthen the local Agricultural Department with adequate technical personnel of appropriate experience and calibre. (Para 175)

29. The climatic condition in the islands are well suited to the development of rubber plantations. (Para 176)

30. The total extent of land available for rubber cultivation may be taken as about 30,000 acres. (Para 193)

31. It is no longer necessary to organise any pilot rubber plantation and a full-fledged commercial plantation should be started. (Para 196)

Animal Husbandry

32. Animal husbandry, poultry and duckery shows promise of further development in the islands and should therefore, be planned in a systematic manner. (Para 221)

33. Fish meal, a concentrate for poultry feed, can be locally produced by exploiting fish resources of the islands. (Para 222)

34. The present system of feeding pigs on Copra and kernels of ripe coconut is wasteful. 'Ghani' coconut oil cake has ideal nutritive ratio for growing and fattening pigs and can readily replace the present system of feeding pigs. (Paras 223-24)

35. It is desirable to examine whether the composite Livestock Breeding Farm for cattle, buffaloes and goats proposed under the Fourth Plan should be set up at Port Blair or in the Islands of Camorta and Trinket which have extensive areas of grass land. (Para 225)

Forest

36. Working Plans on modern scientific lines based on statistically collected and analysed data should be prepared. Aerial photography and photo interpretation with sample ground surveys may be used in preparation of working plans. (Para 249)

37. It is necessary to set up a Working Plan-cum-Research Circle under the charge of a Conservator of Forests assisted by two Working Plan Officers. (Para 252)

38. A separate post of full time silviculturist with his ancillary staff is very necessary for paying greater attention to silvicultural operations and the regeneration of forests. (Para 253)

39. Plantation of teak and padauk should be raised on a large scale. Adequate protection against deer menace should be ensured. Experimental plantation of other valuable species should also be started. (Para 254)

40. In the near future, commercial exploitation of mangrove forests is hardly conceivable except for some local use. (Para 255)

41. Selected varieties of cane should be cultivated to cater to the furniture industry both for the islands and Calcutta market. Malayan canes are in demand in the Indian market, therefore, there is good reason for this species to be introduced. (Para 256)

42. For timber extraction it would be necessary for the forest Department to construct feeder roads (preferably all-weather roads) and extraction tracks to link the Great Andaman Trunk Road with the forest areas being worked. Where possible the construction of feeder roads can be mechanised to accelerate the work. In regard to the method of timber extraction a judicious combination of mechanical and manual operations is the best answer. (Paras 258-259-260)

43. To avoid wastage in case of valuable timber there is a need for introduction of modern logging tools particularly modern power chain saws and hand saws. (Para 261)

44. Match splint factory (WIMCO) at Port Blair would gradually expand. The increased needs of the factory for the soft woods will be met from areas which would be worked as a result of the accelerated development of these islands. (Para 262)

45. The two existing veneer factories would expand to a capacity of 800 tons per month each in the near future. A third unit at Bakultala is to go into operation soon. These three units will consume 28,000 to 30,000 tons of timber per annum. This is more than the present production. Manufacture of plywood from veneers is also visualised. All this would help in utilizing the timber that would be available from the accelerated clearance programme. (Para 263)

46. There is considerable scope for the establishment of Chip Board units to utilise the wastage from the veneers and the non-commercial and under-girth commercial logs not being utilised at present. (Para 264)

47. The paradoxical scarcity of sweet water despite the heavy rainfall in these islands precludes the establishment of pulp and paper units at least for the present. (Para 265)
48. The establishment of further industrial units visualised for these islands should be preceded by a resource survey particularly in Little Andaman and the islands of Nicobar group. (Para 266)
49. The saw mill at Chatham could conveniently utilise non-commercial species and popularise their use. The efficiency of the mill could be increased by better equipment and a good saw doctor to ensure the proper maintenance of saws. (Para 267)
50. Suitable steps should be taken to expand the Betapur Saw Mill. (Para 268)
51. Exploitation of forest resources in areas such as Little Andaman, Great Nicobar, Katchal, etc. will have to be undertaken generally in public sector i.e. by the Forest Department or by some autonomous corporation. (Para 271)
52. The Forest Department should be adequately staffed and a separate scientific and development wing may be set up. (Para 272)
53. Training of Foresters and Forest guards in the training scheme of the islands should be co-ordinated. The training facilities available in the forest colleges on the mainland should also be made use of. (Para 273)
54. In Little Andaman about 100 sq. miles (about 60,000 acres) of forest land would be cleared for agriculture, about 50 sq. miles left as Onge Reserve and the balance of 130 sq. miles be covered by a working plan for the exploitation of commercially usable forest produce. (Para 275)

Industry

55. With the exception of sugar, all the big industrial units will be forest-based. (Para 276)
56. Inadequate supply of timber, unfavourable prices charged for logs, uncertain and inadequate shipping services, disproportionately high freight rates and comparatively high cost of timber extraction, have been the main difficulties for the new industries to come up. (Para 289)
57. The future development of forest based industries in the islands should aim at the integrated utilisation of forest resources of selected areas. (Para 294)
58. The following industries have considerable scope for further development in the islands. (Paras 301—320)
- (i) *Veneer and Plywood*.—The existing two factories and the third factory under installation can attain a target of 60 million sq. ft. of plywood in the next 10 years. Nearly 35,000 to 40,000 tons of ply logs would be required by these factories which will be supplied by the forests of Middle and South Andamans.

(ii) *Particle Board*.—The three plywood factories in the islands should set up particle board plants in the next phase of their development. A unit with the capacity of 7,500 tons per annum with a provision of further expansion to 15,000 tons should be set up at Betapur.

(iii) *Fibre Industry*.—A plant with a capacity of 50,000 tons per annum should be set up either in the Betapur Rangat area in Middle Andaman or at Bamboo-flat near Port Blair in South Andaman.

(iv) *Match Industry*.—Setting up of a large match factory may take some time in view of the foreign exchange needed for the import of plant and machinery, meanwhile a semi-mechanised match factory with a capacity of 500 gross match boxes per day may be installed.

(v) *Saw Milling—Improvement in the existing units*.—The State owned Chatham Saw Mill should work mainly for the export of high class sawn timber to the mainland and abroad and internal market for sawn timber of secondary species be left entirely for privately owned saw mills. Some of these saw mills should also be encouraged to manufacture packing cases required in large numbers by the industries in the mainland.

(vi) *Pencil Slats—New Unit*.—In view of the important import substitution nature of this industry it is desirable to give high priority to setting up a plant with the capacity of 5 lakh gross pencil slats per annum.

(vii) *Roofing Shingles—New Unit*.—It is possible to manufacture roofing shingles from some of the secondary species of timber in Andamans. The possibility of setting up a shingle factory at Port Blair may therefore be investigated.

59. In Little Andaman there could be scope for the setting up of (i) a plywood factory with a capacity of about 20 million sq. ft. per annum with a surplus veneer making capacity for an additional 60 million sq. ft. of peeled veneer, (ii) a saw mill with a capacity of 10,000 tons per annum with corresponding facilities for seasoning and preservation of timber, (iii) a particle board plant with a capacity of about 15,000 tons per annum. This programme of industrial development will be spread over two phases. (Paras 321—324).

60. A large sugar factory with a capacity of 60—70 thousand tons of sugar, fruit and vegetable preservation units, industries connected with fisheries development and a number of cottage/village industries such as shark leather, Gur & Khandsari making, paddy husking, oil extraction, copra drying, cane basket & furniture, coir products from coconut husk, match making, etc. have great scope. (Paras 326—329)

Fishery

61. The islands have a coastline of approximately 1,200 miles and provide excellent fishing grounds. The experiments so far made indicate that the fishing in the island can be increased immediately on commercial lines. (Para 331)

62. In view of the limited local demand the development of fisheries has to be essentially export-oriented. (Para 339)

63. The present fish catch of 200 tons may be increased to 2,000 tons per annum. As an immediate step, additional 100 dinghies with fishing gear (each producing approximately 2 tons of fish) and 160 power boats may be induced. (Para 342)

64. A main training centre may be established at Port Blair with subsidiary training centres in Havelock, Rangat, Mayabunder and Diglipur. (Para 343)

65. The department may take up marketing and run a carrier boat service between the ice factory at Aberdeen Jetty and the mechanised fishing centres ending in Diglipur. It may also have a vehicle for internal transport in Port Blair. (Para 344)

66. On long term basis, it is necessary to have two medium sized fishing-cum-processing vessels (Factory ships) each having a displacement of 800—900 tons and a freezing capacity of 10 tons a day. A beginning could be made with one such vessel. (Para 345)

67. It would be necessary to build a fishing harbour in Port Blair, and set up ice factory and cold storage of adequate capacity at the very same site as the fishing harbour. (Para 347)

68. The implementation of the scheme and preliminary work would need a whole time senior officer (Director) who will work out the schemes in detail in consultation with Fisheries Development Adviser. Each fishing base may be in the charge of a Survey Assistant having adequate staff for the work in hand. (Para 348)

68. A fishery research station at Port Blair may be set up. (Para 349)

70. The manpower requirements of the programme would be about 1,200 persons. (Para 350)

71. The total cost of the programme is estimated to be about Rs. 232.50 lakh while the annual return would be about Rs. 20.6 lakh. (Paras 351-352)

72. During the Fifth Plan it is visualised that the production level of fish should be raised by 8,000 tons. (Para 354)

Water—for irrigation, drinking & power

73. With large scale reclamation of land for agricultural and for multi-cropping, the need for irrigation facilities would rise. (Para 356)

74. Irrigation works have to be small because the farm lands are in small patches and exist along the coast line. (Para 359)

75. Provision of diversion weirs across the streams on a permanent basis will require investigation, which may take some time. It would therefore, be advisable to start at suitable sites more particularly in Wimberlygunj area with temporary diversion weirs of the

kind which are constructed in the State of Kerala and in the South Kanara district of Mysore. (Para 360)

76. Investigations to determine the water holding capacity of the impoundments and the foundation conditions of sites should precede the construction of dams and small reservoirs. (Para 362)

77. More land to be opened and colonised should be developed in suitable blocks keeping in view the drainage lines and water supply channels. (Para 364)

78. To publicise the need for irrigation some demonstration plots may be organised alongwith the first irrigation schemes. (Para 365)

79. A regular investigation unit may be set up to formulate plans and estimates for irrigation projects and also to deal with the water supply schemes. (Paras 366—368)

80. There are good sources of drinking water in the various islands of Andaman group. Surface wells in Mayabunder if dug at a distance from swamp marine creeks should be capable of meeting moderate local needs. (Para 369)

81. In the old settlement areas of South Andaman, Sona Nali, Dhani Khari Nala, Wright Myo Nala are also good sources of potable water. Weirs at suitable places in these nalas can store and supply copious quantities of drinking water. (Para 370)

82. Position of drinking water supply is better in Nicobar. Ground water development in the Car Nicobar island, according to the recommendation made by the Geological Survey of India, should be done through large open wells, and the well now in use at the Air Force Station can serve us a model for such wells. (Para 371)

83. A ground water survey as done in Sunderban areas is needed in reclaimed mangrove forest lands to locate the sources of drinking water. (Para 372)

84. The sites of two falls, one on the Dhanikhari and the other on the Vasumdhra apparently provide possibilities for generation of hydro-electricity. Proper investigation of the sites to make out a tentative plan and estimates may be undertaken. (Para 374)

85. Small hydro generation units with a blending with existing thermal units may provide operationally efficient composite power plants. (Para 378)

86. The site at Dhanikhari may also provide water for a water supply scheme at Port Blair. (Para 379)

Transport

87. The accelerated development of the islands visualised in this report will necessitate a considerable expansion of transport facilities all round—sea, air and road. (Para 380)

88. The existing service between the mainland and the island needs to be immediately improved. Precise estimates of traffic load should be made as soon as contents of the accelerated development programmes are finalised. (Paras 381-382)

89. To cope with the volume of traffic released by the targeted increase in population and the opening up of new islands such as Little Andaman, Katchal, Great Nicobar, it would be necessary to plan in advance for the improvement of the inter-island transport. (Para 383)

90. Construction of Jetties at Jackson Creek (Rs. 10 lakhs) and at Hut Bay (Rs. 10 lakhs) in Little Andaman; and East Bay (Rs. 9 lakhs) and West Bay (Rs. 5 lakhs) in Katchal is recommended. Before the designing and construction of Jetties hydrographic surveys and soil investigation of proposed sites would be necessary. (Paras 384—86)

91. Pending the hydrographic survey and the construction of Jetties, some improvisation can be made to afford temporary landing facilities. Construction of one pontoon each in Great Nicobar, Little Andaman and Katchal is recommended. (Para 389)

92. Ultimately it would be essential to provide 2 Jetties in Little Andaman, 2 in Katchal, 2 in Great Nicobar and at least one each in Rutland, Neil and Havelock. (Para 391)

93. The existing air strip at Port Blair needs to be enlarged to provide landing facilities for bigger planes. (Para 392)

94. It would be possible, as the pace of development gathers momentum, to provide more air strips on some of the larger islands particularly in Little Andaman and Great Nicobar. (Para 393)

95. As an immediate measure, the possibility of constructing helipads in the islands such as Great Nicobar, Little Andaman and Katchal to facilitate inter-island communication needs to be explored. (Para 394)

96. Provision of adequate P.O.L. storage facilities at Port Blair is absolutely necessary. The matter needs to be pursued vigorously with I.O.C. (Para 395)

97. There are possibilities of accelerating the construction of Great Andaman Trunk Road to step up the development activity which will follow in its wake and at the same time offer scope for large employment. (Para 396)

98. It will be desirable to step up the pace of construction of new roads by introducing some degree of mechanisation. (Para 397)

99. The two Jetty points in Little Andaman will necessarily have to be connected by Little Andaman Trunk Road (about 25 miles). The work on peripheral road in Katchal and the road works in Great Nicobar will need to be accelerated. (Para 399)

100. The soil aggregate method of road construction will be better in quality and would be cheaper than the conventional water-bound macadem method. (Paras 400-401)

101. The soil aggregate road construction technique would require special equipment—the single pass stabilizers. In view of economies and improvement in quality offered by this technique, it would be desirable to introduce it on pilot basis. This would enable local

experience to be built up in this comparatively new field of road construction. (Paras 404—405)

102. In the construction of roads in general, and soil aggregate roads in particular the testing of soil is very essential. It would be necessary to set up a testing Laboratory at Port Blair. In addition, field laboratories will also be needed at work sites for exercising quality control. Possibly, a laboratory set up for road works may also work for agricultural Department in the beginning. (Para 406)

103. There is need for the setting up of a mechanical workshop to attend to the repairs and servicing of the fleet of transport. (Para 407)

Health

104. In view of the isolation of the islands and the targetted increase of population, it would be necessary to give greater attention to the future health programmes in the islands. (Paras 408-409)

105. To augment the availability of middle level medical personnel, training facilities should be provided at Port Blair for auxiliary nurse midwives, junior male nurses, compounders, dais, etc. (Para 415)

106. Isolation hospitals and isolation beds in existing hospitals need augmentation. There is also need for the provision of a convalescent ward of about 30 beds at Port Blair. (Para 416)

107. Ambulance services at Rangat, Diglipur and Car Nicobar should be provided. (Para 417)

108. Laboratory services in hospitals at Car Nicobar, Rangat, Diglipur and long island should be improved. X-Ray facilities in hospitals at Diglipur and Mayabunder should be provided. (Para 418)

109. National Trachoma Control Programme on a modified staffing pattern should be undertaken at Car Nicobar and Katchal. (Para 419)

110. In un-opened areas like Little Andaman, Great Nicobar and even other islands such as Rutland, etc. the malaria eradication programme should be initiated. (Para 420)

111. An 'A' type filarial unit should be established at Port Blair. (Para 421)

112. In view of the acute shortage of drinking water in the islands, the possibility of deep tubewells should be explored for groups of villages and particularly in islands likely to be colonized—Little Andaman, Great Nicobar, Katchal, Havelock, Neil islands, etc. (Para 422)

113. The medical department should be re-designated as Health Department with expanded preventive and curative services and the Senior Medical Officer designated as Director of Health Services. (Paras 423—425)

114. A public health party should be amongst the first to land in Little Andaman and Great Nicobar when the first improvised landing facilities are provided, so as to control the potential danger from mosquitos and sand flies. (Para 426)

Colonisation

115. By the end of the Fourth Plan the increase in population visualised is 75,000. Of this 15,000 would be natural growth and 60,000 will have to be moved from the mainland. (Para 427)

116. For the absorption of the increased population in the economy, about 25,000 jobs would need to be created. Of these, 15,000 would be in the primary sector and 5,000 each in the secondary and tertiary sectors. (Para 428)

117. In order to provide a stronger base for the economy and ensure security of the islands, the future colonization programme would aim at settlement of a mixed character and not restricted to people of one cultural background. (Para 429)

118. In view of the vocational background of migrants from East Pakistan, it would be necessary to give them the first priority for resettlement on paddy land. (Para 430)

119. The priorities in the matter of reclamation and opening up of new areas for settlements should be Betapur, Little Andaman, Great Nicobar, Katchal, Rutland, Noncowrie, Kamorta-Trinket group and Neil and Havelock respectively. (Para 431)

120. The colonization programme in the Islands would involve expenditure on maintenance grants, loans to agriculturists, business loans, housing loans, social services like opening of schools, dispensaries, water supply, land reclamation, construction of feeder roads and other transport amenities, other capital costs, etc. etc. The tentatively estimated total cost on such a colonization scheme during the 4th Five Year Plan would be in the neighbourhood of Rs. 13 crores. (Paras 432—451)

Manpower

121. The economy of the Islands, geared by the accelerated development programme would need to generate 25,000 jobs during the Fourth Plan and an additional 33,000 during the Fifth Plan. Of the 25,000 jobs to be created during the Fourth Plan period, 15,000 will need to be in primary sector and the remaining 10,000 in the secondary and the tertiary sectors. (Paras 452-453)

122. The accelerated development programme in the Islands will generate employment opportunities for 12,000 persons in agriculture, 1,200 persons in fishery, 1,800 persons in forestry, 3,200 persons in industries (in addition the big sugar factory of 60.70 tons capacity would create jobs for another 2,000 persons), 1,800 persons in construction, 2,000 persons in small trades and professions and 3,000 persons in other activities of the tertiary sector. Employment opportunities are likely to be more due to the programmes not covered in these estimates and the development activities included in the Fourth Plan of the Islands. (Paras 454—462)

123. The requirement of unskilled labour can be met by the enlarged Rashtriya Vikas Dal while organised recruitment has to be made for skilled and semi-skilled workers from the mainland. The shortage of professional and administrative personnel will be solved by the inclusion of such posts in corresponding cadres on the mainland. (Paras 463—466)

ANNEXURE I
TEAM'S ITINERARY

Places visited	Dates	
	Arrived	Left
Port Blair	5-2-65	7-2-65
Car Nicobar	8-2-65	8-2-65
Katchal	9-2-65	9-2-65
Nancowrie	9-2-65	10-2-65
Kapenga	10-2-65	10-2-65
Port Blair	11-2-65	13-2-65
Little Andaman	14-2-65	14-2-65
Port Blair	14-2-65	15-2-65
Rangat Bay	15-2-65	15-2-65
Long Island	15-2-65	16-2-65
Interview Island	16-2-65	16-2-65
Mayabunder	16-2-65	17-2-65
Diglipur	17-2-65	17-2-65
Smith Island	17-2-65	17-2-65
Havelock	18-2-65	18-2-65
Neil Island	18-2-65	18-2-65
Port Blair	18-2-65	20-2-65

ANNEXURE II

MANGROVE RECLAMATION—A PROJECT OUTLINE

1. Introduction

In Andamans there are about 230 square miles of forest belts of varying width. These forests are subject to inundation by the tidal flows and contain very rich soils. Density of mangrove forests is quite thin in the Islands have stilt roots. There is not much economic use of mangroves except for fuel and to some extent for transmission poles. Mangrove forest lands in the Sunderbans in West Bengal have been reclaimed in the last 200 years for the cultivation of paddy through private efforts. Sunderbans mangrove forests are very thick and the characteristic stilt roots of mangroves in the Andamans are wanting in them. Area reclaimed in the Sunderbans will run to several lakh acres and about two-thirds of these lands lie in East Pakistan. Field crop grown on these lands is mainly one crop of paddy.

2. Principles of reclamation

The general principles employed in the reclamation of mangrove forests for cultivation are :

- (i) Clearance of mangrove trees by manual labour and removal of stumps. Before clearance, a belt of mangroves of appropriate width (*buffer strip*) from the outermost perimeter of the forests is to be left to break up the surge of tidal waves.
- (ii) From the innermost perimeter of the buffer strip, an earthen embankment of appropriate height with 3 ft 'free board' (3 ft above the high tide level) is to be constructed around the outer perimeter of the cleared belt subject to inundation by tidal flow. This embankment will cut off the entry of brackish water into the lands.
- (iii) The construction of automatic sluice gates in adequate number and capacity to drain out the water and leached-out salts from the fields protected by the embankment to outside during low tide.
- (iv) Contour survey of the area and lay out of fields for levelling and bunding.
- (v) Leaching out of soluble salts by rains to safe limits for the normal growth of crops.

Because of the slushy nature of mangrove soils, the construction of the embankment has to be done by manual labour. Once the lands are embanked and provided with sluice gates for drainage, the land will become dry and the operations of levelling and contour and field bundings can be done by either machines or manual labour. Even clearing of mangroves from within the lands meant for reclamation (except the belt along which the earthen embankment is to be built) may be done by machines once the embankment and sluice gates are constructed.

3. Period required for leaching out of soluble salts

The period required to leach out the soluble salts from the fields protected by the embankment will depend upon the rainfall, soil characteristic and land shaping (levelling) etc. In the Sunderbans it takes 3 to 4 years to achieve this. The annual rainfall of Sunderbans ranges from 1508 mm to 1802 mm. and most of it is received during south-west monsoon. In the Andamans the annual rainfall ranges from 2769 mm. to 3124 mm. and it is fairly well distributed over south-west and north-east monsoons. This higher rainfall of Andaman Islands and the longer period over which it is received will hasten the process.

of leaching of soluble salts much faster than is possible in the Sunderbans. Moreover, the mangrove belts form continuous land masses with the Islands in which they are located and they receive sweet water from the run-off which flows from the adjoining land masses above. This will accelerate further the process of leaching of soluble salts. Hence it is expected that the reclaimed mangrove forest lands of the Andamans will be free from soluble salts in one to two years and raise normal crops. Moreover, the creeks within the embanked area will carry eventually sweet water which will permit the cultivation of fresh-water fish.

4. Possible cropping patterns

The high annual rainfall of Andamans and the longer period of its distribution over south-west and north-east monsoons will make it possible to grow 2 to 3 crops in a year. With suitable varieties of paddy and sound soil management, fertiliser and plant protection programmes, it will be possible to raise two crops of paddy with an average yield of 40 maunds per acre per crop. Jute can come in the rotation with paddy. A third crop may be paddy, other cereals, pulses, oilseeds or vegetables, etc. If irrigation is required, it may be for the third crop. Otherwise, the annual rainfall will be sufficient for raising two crops. Coconut, arecanut, banana, pineapples and other tropical and sub-tropical fruit crops can be raised on the home stead lands and coconut especially can be grown also on the field bunds.

5. Cost of reclamation

The cost of cultivation under Herobhanga Scheme No. I under which mangrove forest lands in the Sunderbans were reclaimed within the past decade for the settlement of East Pakistan refugees, is available. This scheme was executed by the Relief and Rehabilitation Department,* Government of India. According to the information furnished by the Government of West Bengal, the cost of clearing mangrove forest lands came to Rs. 156 per acre in 1957, including 10 per cent departmental charges. About 50 man-days were required to clear one acre. The cost of reclamation including deforestation and for the construction of dyke, sluices, cross bunds, culverts, drainage channels and the closing of the khals and creeks came to Rs. 417 per acre on the basis of tender rates prevailing in 1957 and included 10 per cent departmental charges. From a recent tour undertaken by a team of officers of the Ministry of Rehabilitation to Herobhanga Scheme No. I in the Sunderbans, it appeared that the job of reclamation including levelling, provision of sluice gates in adequate number and capacity etc. was not done satisfactorily. However, it may be safe to estimate an expenditure of Rs. 800 per acre for the reclamation of mangrove forest lands in the Andamans, taking into account the present market rates of wages in the Islands, transport cost from the mainland to the Islands for construction materials and the thorough job of levelling and provision of sluice gates in adequate number and capacity etc. Even a sum of Rs. 1,000 as the cost of reclamation per acre can be justified if one considers that the cost of providing irrigation comes to Rs. 400—600/ per acre while in this case the natural rainfall itself will be adequate to raise two crops with good yields.

6. Phased programme of reclamation

Against the background of development of mangrove forest lands effected in Sunderbans for agriculture settlements, the potentialities of development of mangroves in the Andamans can be readily visualised. In view of the isolated location of the Islands from the mainland and the dependence of the Islands on the mainland for man and materials, the rate of progress of reclamation in Andamans is likely to be relatively slow as compared to Sunderbans. The total area of 230 square miles of mangroves in Andamans

needs to be surveyed in order to locate compact workable blocks, to determine their suitability for agricultural purposes, and to develop specific cropping and soil management practices for maximum production. This soil survey should be completed during the Fourth Plan period. A phased programme of soil survey and reclamation along with expenditure estimates is tentatively given below :

Plan Period	Target for reclamation (in '000 acres)	Cost in Rs.
<i>Soil Survey</i>		
Fourth Plan		2 lakhs
<i>Reclamation</i>		
Fourth Plan	7	56 lakhs
Fifth Plan	8	64 lakhs

*Government of West Bengal, with the financial assistance from the Ministry of Rehabilitation, Government of India.

