

REPORT ON

DEVELOPMENT OF COASTAL AREA AFFECTED BY SALINITY

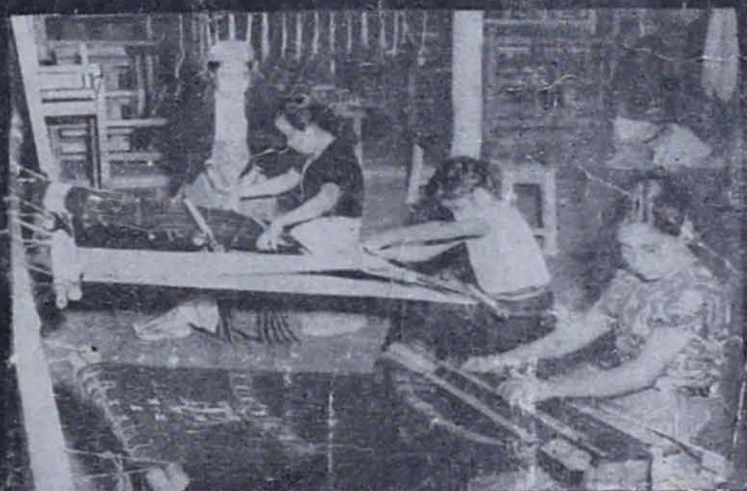
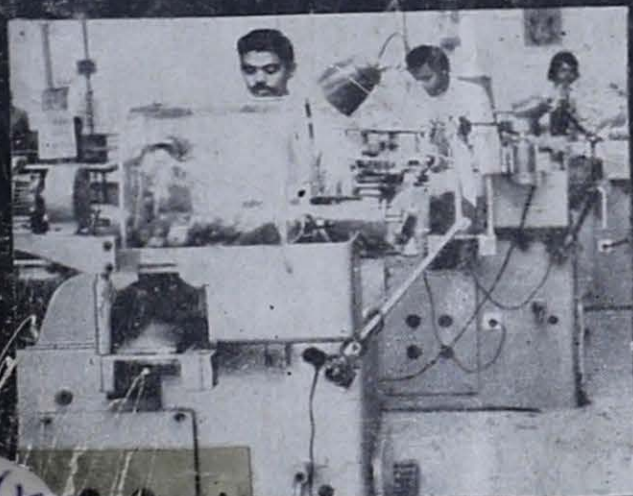


NATIONAL COMMITTEE
ON

THE DEVELOPMENT OF BACKWARD AREAS

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NOVEMBER, 1981



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PLANNING COMMISSION, GOVERNMENT OF INDIA



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ON
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BY SALINITY**

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NEW DELHI**

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SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

I INTRODUCTION

1. The National Committee on the Development of Backward Areas has identified different types of fundamental backwardnesses and is seeking remedies for rectifying the same. The coastal areas affected by salinity constitute one such category.

(Para 1.1)

2. The problem of salinity in coastal areas is a national problem and requires detailed studies in all the coastal states. The development of such areas requires special attention because they have remained neglected since long and the developmental efforts of the post-independence plan era have also not generally reached there for want of proper strategy, infrastructure and impediments due to backwardness.

(Para 1.6)

II STRATEGY OF DEVELOPMENT

3. The Committee is of the view that for special treatment as saline areas, coastal saline areas need to be identified as :—

- (a) Soil salinity areas where the top soil is saline;
- (b) Water salinity areas where either the water strata for great depths is saline, or even if top 30 ft. has fresh water where fresh water is entirely by rain-fall alone.

(Para 2.2)

4. With a view to providing the right type of development technology suiting of different conditions such areas may then be classified into :—

- (a) Saline soils;
- (b) Saline alkali soils;
- (c) non-saline alkali soils; and
- (d) degraded saline alkali soils.

(Para 2.5)

5. The entire area of Sundarban faces the problem of salinity, water logging and drainage. In the absence of upland water supply the area is exposed to tidal action making the water highly brackish. For the development of the Sunderban an integrated programme simultaneously covering crop production, fisheries, animal husbandry

and forestry and providing for improvement in infrastructural facilities including communication and supply of potable water will be necessary. For the protection and development of land and for increasing availability of fresh water for agricultural and drinking purposes, engineering and other measures as envisaged both in the Interim plan of development of the Sundarban and in the Sundarban Delta Project should be undertaken. Industrial development should be restricted to such agro-based industries as do not aggravate the problem of fresh water in view of its limited availability. As an integral part of the overall development of the region, river road and rail transport facilities should be considerably improved. Electrification should be extended to the area to support development.

(Para 2.8)

6. On the east coast the principle of developing existing skill will lead to the obvious strategy of developing fisheries. The next important part of the economy will be agriculture in which some beginning of development can already be seen in these areas wherever fresh water is available. Development of village industries and tertiary sector growth will have to follow the primary growth in both fisheries and agriculture.

(Para 2.9)

7. In the West coast the entire economy will be based on fisheries except where agriculture be developed on the lines of Kuttanand. It will be found that such development on the West coast today would be a high cost development and may not give a competitive agricultural economy to the population.

(Para 2.9)

8. The Committee has generally been informed that there is no arrangement for any systematic soil surveys in most States particularly in the coastal areas. The Committee would urge that if a solution is to be found for the problem of the coastal areas affected by salinity, these areas can only be identified on the basis of a systematic soil survey. It is only then that it would be possible for the State Governments to identify areas of high, medium and low saline conditions and seek remedial measures.

(Para 2.10)

(iii)

9. It is important to undertake evaluation of the various measures taken by the State Governments to reduce the problem of salinity and how far these have been successful.

(Para 2.10)

10. The fishermen class in the coastal saline areas subsist mainly on marine fisheries. Optimal utilisation of the potential needs to be aimed at.

(Para 2.11)

11. The current controversy on the serious competition between traditional boats and mechanised boats needs to be resolved. Demarcation can be based on cost-benefit analysis and suitable rehabilitation of the displaced fishermen, if any, should be done. Possibilities of processing and marketing including export of frozen fish has to be worked out rationally and optimally.

(Para 2.11)

12. Brackish water fishery provides a sizeable potential for development. On account of large areas of brackish water, the reservation of the pursuits for the smaller people would help improve substantially the economics of these persons. Individual farms of smaller size are desirable but these need to be supported through areas development approach and also through the provision of appropriate supporting services including technical consultancy services.

(Para 2.12)

13. The transfer of technical knowledge to the fishermen is very vital and this responsibility should be shouldered by the State Governments by providing the technical consultancy free of charge. The systematic development of the fishermen class should be the focus of attention and would have to be intensified.

(Para 2.12)

14. Hectare for hectare brackish water fisheries which can develop prawns in addition to brackish water fish, give much greater income than the composite fish culture followed in inland fresh water fisheries. Fresh water being the most difficult ingredient in the coastal saline areas, its utilisation for culture fisheries whilst a more remunerative technology in brackish water is available, will not be warranted. The Committee, therefore, recommends that culture fisheries in the coastal saline areas should invariably be brackish water fisheries.

(Para 2.13)

15. With the higher rainfall on the east coast it should be possible to bring drainage waters from the land mass through controlled channels

to leach the top soil in the saline areas and also impregnate the sub-soil with fresh water pushing down the saline accifer. Proper fresh water use is, therefore, the main strategy for agriculture in these areas. Further, as fresh water will be scarce inspite of these attempts, the cropping system that will be developed has to be based on suitable cash crops whose water requirements will be low.

(Para 2.14)

16. Very little work has so far been done on finding suitable horticulture cultivators of various fruit trees suited to the area. The Agricultural Universities will have to rapidly survey available information about suitability of fruit trees for their coastal saline areas and in due course undertake development of the necessary cultivars for better production. Any how, coconut production would prime facie appear to be the most remunerative horticultural strategy.

(Para 2.15)

17. For the appropriate development of horticulture etc. and also for the protection of habitation, the shelter belt approach is very desirable. The Committee would like to commend the strategy of complete shelter belt for habitations.

(Para 2.16)

18. Animal husbandry will have to take a back seat for the time being, until the agricultural Universities check on the type of fodder that can be grown in the coastal areas and which will be suitable for animal rearing.

(Para 2.17)

19. Sundarban has developed a cheap road system which allows for utilising pedal trays to move the goods to the collecting markets. The strategy of road development will have to take note of these innovations.

(Para 2.18)

III BRACKISH WATER FISH CULTURE

20. A project profile for brackish water culture development by the West Bengal expects distinguishes three types of areas suitable for brackish water culture and they are :—

- (i) Zones of low saline and low tidal amplitude;
- (ii) Zone of moderately saline and moderate tidal amplitude; and
- (iii) Zone of high salinity and high tidal amplitude;

If the brackish water areas in the other coastal states are investigated, it will be found that these three types will be replicated all along the coast. Each of these zones require a different type of brackish water culture.

(Para 3.2)

21. The areas most favourably situated in the zone of high salinity and high tidal amplitude should be selected in each of the coastal saline states for brackish water culture during these two plans.

(Para 3.3)

22. For the low salinity and low tidal areas the bheri culture appears to be the most economic approach. It does not interfere with the paddy culture and, at the same time, gives a subsidiary income in fish culture. Such areas will have to be identified in all the coastal states and a programme of action developed.

(Para 3.5)

23. Large areas have to be embanked for culture fisheries. In agriculture, already there are very substantial land reforms laws which fix the rights of various parties on the land for agriculture. For culture fisheries at present there is no such law. It is suggested that the laws should provide compulsorily for common operations and for arbitration by governmental machinery. It should also define the rights of the owners of the land to the produce on a fair and equitable basis. The Committee recommends that the Fisheries Division in the Ministry of Agriculture should take up the development of a model law.

(Para 3.6)

24. In the zone of moderately saline and moderate tidal amplitude, where the designs can be suitably developed on the model applicable to the high salinity, it is desirable to follow a culture fisheries approach. In other areas where capital cost on culture fisheries is very substantial, immediate introduction of bheri culture of the controlled variety would benefit the people to a very large extent. The Committee would advise the classification of such lands in the coastal saline States and developing a suitably phased programmes.

(Para 3.7)

25. In areas where paddy-cum-prawn culture is now prevalent and in new areas where the technique can be introduced, it is necessary to improve the method. Introduction of water carrying mixed fry, both desirable and undesirable varieties, will have to be replaced by selective introduction of the better varieties which can give the best return out of the nutrition in the water.

(Para 3.8)

26. For a two crop routine which is more profitable method, fry of the right type has to be available at the right time. It should be possible generally by collecting the fry from the area where it is available to send it to the grower in the season when he wants it. The problem here is the transport of fry. While scientists should find out the best method to reduce transport mortality, obviously steps have to be taken to produce uniform batches of fry so that transport losses can be minimised.

(Para 3.11 & 3.12)

27. The Committee would recommend that the Ministry of agriculture, taking into consideration the various experiments that have been done and innovations introduced, should prepare a model for a production centre for prawn fry. The cost-benefit of the production and the price at which the fry has to be sold will also have to be established. The coastal States should have at least one pilot centre close to an area where culture prawn fisheries are now under development.

(Para 3.13)

28. The development of paddy-cum-prawn culture can probably be introduced quickly all over the coastal states provided areas are identified, extension work is done and necessary arrangements made for fry supply on demand. The Committee recommends that each coastal state should now do the basic investigations as has been done by West Bengal for Sundarban and identify suitable areas for development and lay on the expertise and extension and provide the necessary infrastructure including arrangements for fry supply.

(Para 3.14)

29. Culture prawn fisheries is a capital intensive industry. Whilst the fishermen class should be given every facility to enter into this new line and given reasonable help by way of loans, grants etc. the Committee feels that there is a limit beyond which the fishermen class as individuals will not be able to avail of this programme. A corporation idea on the lines of the Assam Plantation Corporation Act may be helpful. Various conditions will have to be imposed on the lease holder so that the programme is operated as a whole and individual vagaries do not spoil it. It may be worthwhile for the Ministry of Agriculture to set up a Working Group to study this problem and suggest a model project.

(Para 3.17)

30. It will be much easier to introduce controlled culture in small farmer's holdings under brackish water with holdings between 2—5 hectares. In effect, this will be small industry. The Committee recommends that these enterprises

should be treated on the same footing as small industries and all the benefits given to the small industries should be made available to such entrepreneurs in addition to such benefits as are given to small farmers.

(Para 3.18)

31. The Committee recommends that a few areas of 100 to 200 hectares may be given out to large entrepreneurs under very strict conditions including utilisation of local labour. One condition should be that they would put up a fry production centre and supply fry, on fair price, to the small farmed entrepreneurs round about. The Working Group dealing with the fishermen's programme can also look into the development of a model contract form for lease of these areas with large entrepreneurs.

(Para 3.19)

32. One of the major constraints to the development of aquaculture has been the paucity of trained personnel at various levels. Training of fishermen and others offering supporting services has to be carried out on a very large scale by each of the coastal states.

(Para 3.20)

IV MARINE FISHERIES

33. Any development of the coastal saline areas must stabilise the traditional economy of the non-mechanised boat sector who almost had monopoly in fishing in the coastal areas which are the most remunerative areas for fishing in the sea. At the same time, we have to support mechanised craft which can go far beyond the depths and distances which the traditional craft can handle and can exploit that vast fishery resources of the economic zone of the country. Where there is pressure and conflict between the mechanised and traditional crafts in certain highly fished areas, there are many areas along the coast where not much fishing is taking place because of lack of basic facilities like communications, fresh water and easy access to a fresh fish market.

(Para 4.13)

34. Where there are large concentrations of catamarans and dinghis it can be examined by pilot schemes whether a mechanised boat can be engaged to pull them out to the fishing areas in numbers. The Committee would suggest that pilot schemes of this nature should be started and the cost benefit worked out and demonstrated so that a methodology can be developed applicable to the various coastal states.

(Para 4.16)

35. It is possible to introduce labour intensive mother vessel fishing to enable traditional fishermen to go out far into the sea.

(Para 4.17)

36. The most important diversification that can be done with the present technological knowledge is introduction of purse-seining for catching pelagic fish in the coast.

(Para 4.20)

37. The Committee would seriously recommend that the ground level statistics of rempaniusers and mechanised boat users in all those areas where conflict has arisen should be done and, if possible, an introduction of the joint interest method followed in Karnataka may be a solution.

(Para 4.21)

38. The allegation that the purse-seiners are interfering with the coastal movement of the pelagic fish in season may not at all be scientifically tenable. It is desirable that the fishery research and oceanic research look into this problem so that unnecessary conflict by lack of proper knowledge may not continue.

(Para 4.22)

39. Now that a reasonable amount of survey of fishery resources mainly pelagic has been done on both the coasts, areas where long lines and pole and line fishing by improved means can be introduced should be demarcated.

(Para 4.23)

40. Mechanised boats require jettis for landing. A programme for construction of fishing jettis round the coasts at such locations where jettis can be constructed and where the available potential is not being exploited close to the coast by traditional fishermen and in the distance by mechanised boats can be identified and jettis constructed. This will help in diversifying mechanised boats from highly fished areas to the new areas. This planned deployment should be attempted.

(Para 4.24)

41. The question of subsidising the price of diesel for mechanised boats or reducing the excise is a problem continuously under examination. Some concrete steps in this direction would greatly improve the economics of mechanised boat fishing.

(Para 4.25)

42. There is over exploitation of juveniles of prawns in certain back waters of the country. In the interest of both the traditional fishermen and the mechanised boats, regulations to conserve the juveniles and allow for the breeding cycle to go through without serious interference is an immediate necessity.

(Para 4.26)

43. Much of the cat fish caught are the incubating males. Hence operation of high efficiency gear has to be regulated in terms of number, area of operation, period of operation, mesh size etc. as unbridled introduction of modern craft and gear can have a devastating influence on the fishery.

(Para 4.27)

44. Deep sea fishing will not greatly add to direct employment opportunities for the fishermen class in the coastal areas. At the same time, without deep sea fishing the country will not be able to exploit the vast potential within the economic zone which at present is being peached upon by fishing crafts of various countries. The Committee has not been able to examine the problems of deep sea fishing in any great depth and, therefore, can only say that in the interest of all concerned, it is desirable to increase the fishing vessels force for deep sea fishing and also attend to the infrastructure to make the fishing economics

(Para 4.30)

45. The Committee would seriously recommend that the Ministry of Agriculture must take up a comprehensive marketing programme for fish by supporting pilot projects of innovating marketing. Linkages will have to be established between the coastal States and interior States who can be the consumers. The Committee would recommend that the Ministry of Agriculture should carry out a survey all along the coast finding out the seasons when there are large catches in particular pockets of the coast leading to a sharp fall in prices and, at the same time, identify markets in the country where such fish can be sold at economic prices allowing for the transport charges.

(Para 4.33 & 4.34)

V CROP PLANNING AND ALLIED PROGRAMMES

46. Soil and water salinity and the lack of irrigation are the principal constraints affecting crop planning in saline coastal areas.

(Para 5.1)

47. If efforts are made to evolve and introduce a scientific crop planning in the coastal saline areas, it should be possible to increase crop productivity substantially. For this purpose, it is necessary to make more intensive efforts for evolving suitable crop patterns for different salinity conditions and soil characteristics. The long duration nature of kharif crop is recognised as a constraint for increasing the land use intensity in such areas. Therefore, measures have to be considered how far long duration kharif paddy can be replaced by short duration paddy and suitable rabi crop, viz; barely, sugarbeet, sunflower, cotton etc. which can be grown after harvesting of the kharif crop.

(Para 5.7)

48. Cropping intensity in coastal saline areas provides tremendous scope for improvement. This can mainly be done by providing irrigation facilities and also introducing dry farming techniques in these areas. All the sweet water reserves, surface as well as underground, need to be exploited and put to more judicious use for improving productivity. As much of fresh water as possible needs to be conserved for raising rabi and summer crops. As irrigation water is likely to be scarce, advantage of the moisture present in the soil at the time of kharif harvest would have to be taken for raising early short duration and rabi crops.

(Para 5.9)

49. The Central Soil and Salinity Research Institute at its Canning and Research Station has succeeded in identifying a few useful rice varieties and other salt tolerant crops. Development of period bound varieties is desirable so that harvest can be controlled. The newly developed varieties should be tried on the cultivators field before introducing on a large scale.

(Para 5.10 & 5.11)

50. Due to high saline soil and poor water quality, no crop other than kharif rice is generally possible under commercial cultivation. It is essential to introduce a suitable second crop (rabi) which can tolerate salinity effectively and can grow better than others in moisture stress conditions.

(Para 5.13)

51. Possibilities of introducing inter-cropping should be fully explored. For instance, possibility of prawn culture along with coconut, development has been proved. Similar experimentation are desired for making optimum use of natural resources.

(Para 5.17)

52. Trial-cum-demonstration farms need to be established in affected areas which should operate under the guidance of technical hands. The introduction of new rabi crops e.g. vegetables will require the establishment of new marketing, input supply and credit arrangements. Hence measures to introduce new rabi crops in the area must be accompanied by steps to establish an appropriate credit, input supply and marketing infrastructure in these crops. Sundarban has established that, given the necessary support, vegetables can be an important crop in some of these areas.

(Para 5.18)

53. Canning experimentation is an heavy black soil. In other areas the situation is different. As such location specific research whould be desirable.

(Para 5.19)

54. There is plenty of scope to develop horticulture in coastal saline areas by introducing technology capable of giving good monetary returns to the growers. The obvious strategy would, therefore, be to select and propagate right type of fruit crops suited to local topographic and salinity conditions. Further, improved varieties of fruits with a view to raising their yields and resistivity to salinity and water logging conditions which are common in these areas, would have to be evolved through field research conducted at different centres set up for the purpose.

(Para 5.21)

55. The most successful horticulture plant is coconut which has immense potential for plantation in coastal areas. Coconut plantations with suitable inter-cropping can be an important employment and income generation measure in these areas. The gross return per tree is quite profitable. Moreover there could be substantial opportunities for non-agricultural employment in processing units e.g. coir.

(Para 5.22 & 5.23)

56. Cashew can be cultivated quite successfully in sand dunes which at present are unutilised and often encroach on adjoining farm lands year after year. Cashew trees once established stabilise the soil. An integrated pattern of coastal horticulture involving coconut, cashew and causarina holds great promise.

(Para 5.24)

57. Amongst fruit trees sapota and Guava have potential for development in all areas. In many areas having temporary water stagnation, Jamun could be planted. If salinity is brought down through reclamation measures, many other fruit crops can also be grown.

(Para 5.25)

58. Area-wise approach has to be made for selecting suitable fruit crops for different ecological conditions and research support would be necessary to develop special species of different fruits so that good crop yields are achieved and horticulture becomes more remunerative to the people. The essential requirements for these purposes are (a) the availability of suitable planting material, (b) enough sweet water to sustain the plant in the early stages of growth, (c) arrangements for credit during the long gestation period; and (d) arrangements for marketing.

(Para 5.27)

59. Multipurpose afforestation of coastal areas is the need of the hour. On the eastern coast, shelter belt plantation requires to be taken up along the entire coast. This could be achieved only if the participating farmers are ensured of economic returns from such plantations and also their requirements of fuel and timber are met from such farm forestry. There is very good scope for forestry development on west coast also. Salinity resistant trees for meeting the local requirement of fuel and wood may be raised all along the coast which would also check the menace of felling of trees in the adjoining forest areas.

(Para 5.29, 5.30 & 5.35)

60. For any meaningful enhancement of livestock production work in the coastal saline areas, the main problems are provision of drinking water, feed and fodder, marketing facilities and logistics. In addition, there is at present dearth of infrastructure for supply of foundation and production stock of cattle, pigs and poultry including ducks.

(Para 5.40)

61. As a basic approach, a balance between cows and buffaloes and other animals on the basis of ecological conditions in different regions has to be struck and seasonal adjustment made.

(Para 5.41)

62. For improving different breeds of animals, artificial insemination programme would have to be extended to these areas in a phased manner. Breed improvement programme should have the dual purpose of increasing the livestock products as well as the drought quality of farm animals. Veterinary dispensaries and live stock Aid Centres need to be set up at convenient places to cover such areas. Mobile veterinary dispensaries may have to be organised for meeting the requirements of difficult areas.

(Para 5.41)

63. Supply of drinking water for animals may be made from tanks and ponds which have embankment protection from ingress of saline water. Small tanks protected by ring bunds can also store fresh water for use of animals. In some regions, drinking water supply to the animals may be made by sinking of shallow/deep tubewells depending upon the ground water aquifers of the area.

(Para 5.42)

64. As the biggest single constraint in the livestock farming relates to the proper nutrition of the animals, improved fodder cultivation is of urgent necessity. Suitable varieties of fodder, fodder trees and shrubs should be propagated in these areas. It would be advisable to establish experimental fodder farms for trial of various types of salinity resistance fodder plants. Fodder seeds and cuttings of successful varieties should be distributed to the farmers under a fodder development programme. Arrangements for supply of feeds in promising areas may also be taken up by these farms.

(Para 5.43)

65. Duck farming should be encouraged in coastal saline areas on an intensive scale provided it does not, in any way hamper with the progress of brackish water fishery development in these areas.

(Para 5.44)

66. Poultry development also needs to be intensified for supplementing the incomes of the people in these areas. Economical poultry rearing in Kerala is done due to the large availability of cheap protein from fish waste and other sea products. This must be studied so that similar system can be developed elsewhere.

(Para 5.45)

VI IRRIGATION, DRAINAGE AND SALINITY CONTROL

67. Persistence of high water table with poor quality of ground water calls for a good sub-surface drainage system in coastal saline areas. Due to marine origin and the impeded surface and sub-surface drainage the soils have become highly saline and present unfavourable characteristics for crop growth. So far not much work has been done on the sub-surface drainage of these soils.

(Para 6.22)

68. The age old method for controlling the salinity in coastal areas has been the construction of embankments as a protective measure to stop ingress of sea water to these lands. There is also

need to protect rest of the areas by constructing saline embankments along the sea coast in between the area demarcated by creeks and streams.

(Para 6.25)

69. A suitable shelter with trees or grasses has to be developed around bunds, so as to check the wave action. Provision of shelter belts will protect drifting of saline sands into the inland areas thereby protecting the land from salinity.

(Para 6.26)

70. The dykes/embankments have to be provided with one way sluice gates so that the ingress of sea water into the land is prevented during high tides and the inland excess water is drained out to the sea during the low tides.

(Para 6.27)

71. In some areas, flushing the saline fields with sweet water followed by fresh water irrigation to leach the salts down the soil profile is a practical method adopted by the farmer.

(Para 6.28)

72. One of the curative measures which has been found useful in improving the saline soils is the use of chemical amendments such as gypsum, sulphur, iron sulphates etc. But they are costly and their use require close technical supervision for deciding the dose and the particular kind of chemical to be used.

(Para 6.29)

73. Various studies carried out at Canning indicated that :—

- (i) Surface soil mulching with rice husk helps in improving the soil physical conditions.
- (ii) Mixing rice husk with surface soil by ploughing during fallow winter period after the harvest of kharif rice significantly increases the rice yield during following monsoon.
- (iii) Manipulation of the surface 15 cm. of moderately heavy textured soil either through addition of sand or rice husk improves the leachability of the soil.

(Para 6.30)

74. Where there is inundation of sea water, stagnant surface water ditches turn saline. Treatment of the water with powdered charcoal reduces salinity to some extent.

(Para 6.32)

(x)

75. While natural depressions, creeks, channels etc. having saline water may gainfully be utilised through development of brackish water fishery, sweet water resources have to be protected from the ingress of saline waters and utilised for irrigation and drinking purposes. Surface water flow during the rainy season has to be regulated through a well planned system of drainage works for controlling the salinity in the top soil. Embankments and bunds are to be erected for protecting sweet water from the ingress of sea water and other saline waters.

(Para 6.33)

76. The present groundwater development in coastal tract is very limited but when the ground water withdrawals are to be increased, the existing saline and fresh water disposition may be disturbed and the process of ingress of saline water may be accelerated. Hence scientific management at the vital ground water resource will require critical evaluation of the changes, brought about consequent to withdrawals and must so regulate the draft as to prevent the ingress of saline water in fresh water bodies.

(Para 6.46)

77. Due to the peculiar and complex hydro-geologic set up in the coastal belt set with salinity hazards, the following precautions are required to be taken for proper development and management of ground water :—

- (i) Geophysical investigation must precede tubewell designs so that the strainers are located against fresh water aquifers.
- (ii) The shrouding materials between the fresh water aquifers and saline water aquifer are required to be sealed by a quick setting cement to avoid contamination.
- (iii) Gravel shroud materials should be carefully selected to avoid sand fillings in tubewells.
- (iv) Indiscriminate pumping from tubewells should be discouraged.
- (v) In the coastal areas of Gujarat there is said to be salinity ingress from the sea. In such areas exploitation should be controlled and induced recharge of fresh water coming from the upper hinterland should be prevented escaping straight into the sea by means of small dams etc. so that percolation of fresh water underground might increase.

(Para 6.59)

78. The Committee would like to emphasise that there is considerable scope for exploitation of ground water in the coastal areas and would, therefore, recommend :—

- (a) In the alluvial plains deep tubewells for irrigation are now taken up as a stage programme in aquifers as deep as 400 ft. Keeping to the cost benefit acceptable generally such wells should be taken up in the coastal areas, even if they are deeper.
- (b) In particularly difficult areas where both top and sub-soil water is saline and salinity persists to great depths, if alternative sources of fresh water for better agriculture is lacking, it may be necessary to stretch a point and allow for deep tubewells for irrigation even if it is a little more costlier than levels so far accepted.
- (c) Even if the economics of deep tubewell water is generally adverse for agriculture, as a drinking water amenity and for industrial purposes like cleaning and processing of fish, it is necessary to provide deep tubewell systems wherever possible. This is a basic amenity which the Committee will recommend as necessary.

(Para 6.60)

79. For good agriculture, the first essential is to ensure that saline intrusion is reduced as much as possible and whatever saline intrusion does take place, it is leached out by suitable introduction of fresh water during the rainy season wherever possible.

(Para 6.61)

80. Where saline intrusion in summer is now taking place, the areas should be investigated on a watershed basis and low ridges provided on the ridges of the watershed. The investment in these structures will not be very much and the Committee would recommend that priority selection of such areas and urgent steps to see that this is done may be taken up.

(Para 6.62)

81. The fresh water drainage from the hinterland will have to be suitably guided and directed towards the watershed, where the salinity has to be leached. At the same time, steps should be taken to see that such introduction does not lead to heavy water logging in the lower reaches of the watershed as has happened in the Sundarban.

(Para 6.63)

82. In many of the delta areas of the country, there are irrigation systems which extend towards deltas. These irrigation systems are themselves the cause of heavy water logging in the coastal areas which together with admixture of saline water makes these areas unfit for agriculture. The normal irrigation practice is to leave tail ends of the canals open. In these areas where water logging is a serious problem, canal control is essential. If canals have to be drained, there should be definite drainage structures leading them away from the low lands. Further, the fresh-water available in such canals can also be utilised in the off-season for flushing out the salinity in the coastal agricultural areas. This planned development of the lower reaches of irrigation system must be done in each state on a priority basis.

(Para 6.65)

VII DEVELOPMENT OF SAURASHTRA AND KUTCH AREAS OF GUJARAT

83. While recognising the sea ingress problem to be the prime problem of the Saurashtra area, the National Committee would like to stress that the control measures would have to find the most economic engineering solution. It feels that tidal regulators may be a high cost technology and would sound a note of warning towards its adoption without judiciously weighing the pros and cons. The Committee feels that recharge technique would be much more economic and reasonable for adoption. The Committee has observed effective use of one way regulation, in mini creeks and run-off in the Sundarban region of West Bengal and would recommend for its adoption after careful detailed study. The Committee has also noticed difficulties in controlling large creeks and here again would recommend the adoption of techniques tried successfully in Sundarban.

(Para 7.8)

84. The suggested device of a static barrier or impermeable cut-off wall for the salinity control measure, beside being quite costly, cannot prevent upward movement of salt water which already underlies the overdrawn extraction area. The Committee would recommend an earnest-pilot research to establish whether the methods could alleviate the problem.

(Para 7.9)

85. At present, hardly any measures for checking of surface flow are there and as such a large portion of the monsoon precipitation goes over to sea. One way of tackling that would be through control of river flows in the upper reaches and measures to induce water retention in upper reaches. Further, down the course of rivers, check dams, percolation tanks and recharge wells in

hard area locations are the possibilities open for adoption. The possibilities can be studied through a detailed investigation of the area on a comprehensive watershed approach, be adopted.

(Para 7.18)

86. A single line of gates, can regulate the manageable parts of any flood throughout the monsoon season. The Committee would urge the adoption and optimum utilisation of such measure and introduction of any design modifications, if called for.

(Para 7.19)

87. On the problem of afforestation, the Committee would like to reiterate the suggestion that the tree selection should be the one which benefits the water balance and not prove counter productive in terms of recharge.

(Para 7.21)

88. The broad conclusion of earlier Commissions etc. had been that the Kutch area can be agriculturally improved if part of the Narmada flows could be diverted to this area. Such a measure would not only substantially mitigate the acute problem of drinking water but also create conditions for reclaiming substantial area of the Rann for agricultural purposes. In this context the feasibility of bringing water to the Little Rann to control salinity for brackish water fish culture could also be considered.

(Para 7.27)

89. The developmental efforts in the Kutch areas have obviously to be directed toward aquaculture development.

(Para 7.28)

90. The Committee feels that in the Rann of Kutch very large areas are suitable for development of brackish water fisheries. The Committee would urge that the proper assessment of these areas should be done through a detailed survey with basic parameters. The two vital aspects needing special attention are checking of tidal ingress and the supply of fry. Measure for tidal ingress have already been dealt with at length. With regard to the supply of fry, the Committee visualise two practical ways, to catch the fry where it is and put the same in these areas, or to breed the fry elsewhere and then bring to these areas. The Committee is confident with effective tackling of the problems and with suitable provisions for nutrition in the water and design development, brackish water fish culture can become a major base for the economics of Saurashtra and Kutch area of Gujarat.

(Para 7.37)

91. The pattern of water use in Kutch areas is likely to undergo a change after the completion of and the operation of the Sardar Sarovar Dam. In such a situation brackish water fisheries may not provide the answer for optimum utilisation of the resources of the area. For that purpose a fresh look at the problems would be desirable to evolve suitable development strategies for the areas with a balance between fresh brackish water culture. Pilot schemes and sufficient research effort should be carried out to take full advantage of the changed conditions when they occur.

Para 7.38)

VIII DEVELOPMENT OF SUNDARBAN AREA IN WEST BENGAL

92. Considering the physical and other characteristics of the Sundarban area and keeping in view the constraints pointed out above, the strategy for development in this area has necessarily to be as follows :—

- (i) Extending irrigation by utilisation of excess rain water, construction of sluices and network of drainage, channels to remove drainage congestion;
- (ii) Once irrigation becomes available, an attempt should be made to convert the present non-cropped area into two-cropped area to the maximum extent possible. Whatever little has so far been attempted has clearly established that given the irrigation, the yield in rabi can be very much higher and the crop production can also be diversified;
- (iii) Land-use should be made more intensive in order to raise production status, particularly, of small and marginal farmers;
- (iv) There is a lot of potential for the development of fisheries and there is already a ready market in the Calcutta city. Next to agriculture, fisheries would appear to be the most important programme of development in this area;
- (v) There is also good scope for taking up horticulture, animal husbandry, fishery, poultry, piggery, dairy etc. which would create new avenues of productive employment.
- (vi) Natural resources and local skills must be utilised for development of cottage and small industries;
- (vii) Infrastructural facilities including extension support, input supply, credit

facilities, marketing/processing arrangements, communication etc. would have to be provided ; and

- (viii) The last but the most important point is that the organisation structure would have to be so streamlined that not only there is adequate delegation of financial and administrative powers to the development authority, but it has the necessary powers to coordinate, supervise and monitor the execution of programmes.

(Para 8.29)

93. The Committee found that the works in the Growth Centres on the Sundaraban are being executed by the board and that there is no support at all to the programme from the Agricultural or Animal Husbandry Departments. The Committee feels that this sort of truncated approach will not do. If these Growth Centres have to succeed, the sub-plan strategy of Tribal Welfare Programme would appear to be extremely relevant.

(Para 8.37)

94. The Committee would like to stress the development of a comprehensive plan of irrigation through drainage and optimum utilisation of tank development. The economics of tank development are favourable and hence need to be encouraged. If energetic steps are taken for appropriate development of tanks to store rain water, there are immense possibilities of increasing the second crop acreage and also raising the yields of the crops grown therein.

(Para 8.43 & 8.45)

95. Coconut cultivation can go up substantially and the field enquiries show an awareness. But there is no arrangement to supply good quality seedlings either for 'Dab' or 'Hardnut'. The Sundarban Development Board should consider temporary hiring of services of out side expertise on development of high-yielding varieties of coconuts.

(Para 8.47 & 8.48)

96. Bee keeping is one of the fields which holds bright prospects for enhancing the production of honey in the area.

(Para 8.52)

97. Inland water transport being the main mode of transport, the development of boats is the natural solution. The Committee would suggest

(xiii)

that either loans should be advanced to individuals who want to adopt plying of boats on commercial basis or to Cooperative Societies for owning and renting the services of the boats.

(Para 8.53)

98. The Committee would strongly urge that the concept of delegation of powers, both financial and administrative, as recommended by it in its report on "Organisation of Administrative and Financial Structures for Backward Areas Development" should be fully implemented if the organisation has to be effective. Also, it would be

necessary that proper linkages are established with the State level Technical Departments so that expert advice and technical guidance at a higher level is available to the personnel working in the Sundarban organisation.

(Para 8.56)

99. It is essential that as many of the project personnel as possible stay in the project areas and do not have the tendency to stay in nearby Greater Metropolitan Calcutta and come for work to the project.

(Para 8.57)