CHAPTER VII

SUMMARY AND CONCLUSION

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7.1 SUMMARY:

7.1.1 Introduction:

Landuse is a function of four variables - land, water, air and man. (Singh 1980 p.167). Each of them plays vital role, but the significance of man is supreme, as he is the only variable who assigns functions to land and enjoys the benefits of it. Land is that factor of production which plays dual role in human life - it provides the space for all his activities and provides the resources to meet his needs and fulfils his wants. It can be divided into two broad categories according to its use from an agricultural point of view: (a) Land not available for cultivation, and (b) land available for cultivation.

Present work is a study of both of these aspects of landuse in a segment of Jambusar Taluka in District Bharuch of the State of Gujarat.

It stretches between 21°.54'N and 22°.13'N latitudes, and 72°.30'E and 72°.50'E longitudes, covering an area of 577.59 km^2, shared presently by 46 villages. Its surface boundaries are constituted by the estuary of River Mahi in the north, Gulf of Khambhat in the west and River Dhadhar in the south. No natural boundary exists in the east. Perchance, however, the Bharuch-Kavi narrow gauge railway line serves as its eastern boundary. This railway line divides Jambusar Taluka into two segments - eastern and western. The eastern segment is locally known as "Haveli Tappa", and western, the area of present study, is called the "Bara Tappa".

Nearness to the Gulf, tidal ingress, existence of several backwater channels, flat topography, poor drainage, patches innundated by rain water, existence of vast areas of Kharland, the higher P.H. value of the soils, brackish sub-soil water, etc. are the physical elements of its personality.It, therefore, may be stated that the area lies almost under the clutches of environmental determinism.

The underground water is invariably brackish found at depths varying from 6 meters to 10 meters or more. The areas in the vicinity of the estuaries and the coast have bright prospects of rich reserves of mineral oil and gas.

Its structural history dates back to the beginning of the Quaternary period. Its terrain is monotonous flat, composed of the debris of the Cretaceous lava rocks standing on its opposite direction. Almost the entire area is composed of the black soils resting over the alluvium which goes to a depth of about 900 meters or more.

The varying properties of the black cotton soil have led to their classification into three groups:

A. Ankhi Haldar Series,

B. Degam Series, and

C. Balota Onjal-1 Series.

The villages nearer Jambusar town, on the eastern periphery of the study area, have the A type soils which are superior to the other two types. These soils are fertile and favour a variety of crops - mostly cereals and cotton.

The B type soils are overlain in the central part of the area though interspersed at places by the A type soils. They are slightly inferior to the A type, but favour cotton, cereals and oilseeds.

The C type soils are poor with higher pH value. They are distributed over the western part of the area. The Balota Onjal series are highly influenced by the marine conditions and tidal action. The interspersed soil patches belonging to the Degam and Ankhi Haldar series give better prospects for cropping activity, on a small area. The principal crop, however, is cotton followed by wheat.

These three soil types have enabled the division of the study area into three soil-based regions to facilitate regional study.

The climate is tropical monsoon type with seasonal variations. Temperatures hardly go above 36° celcius during the hot summers due to moderating influence of the Gulf waters. The lower limit of the range remains between 14° and 24° during the winters. Thus, the area experiences hot summers and mild winters. The rains are as erratic as elsewhere in India. The minimum recorded was 172 mm in 1948, and the maximum was 3060 mm in 1958. The average, therefore, comes to 650 mm. It is quite sufficient to provide a hopeful cropping season if this amount comes well distributed over the entire rainy season. But it hardly happens so, which causes crop failures. On the basis of the local experiences, it is said that the area invariably encounters partial famine conditions every alternate year. The rains are essential for both, food and drinking water; their erraticity not only causes concern for the crops but also for the drinking water. Absence of irrigation facilities made both of them dependant on the rains. The lack of irrigation prohibits from growing more than one crop (kharif), except when the retreating monsoon brings some amount of rain during the late October and early November. It helps sowing of 'rabi' crops. The significance of rains for the life and economic activities (mainly agriculture) of the area cannot be overemphasized. Thus, it may rightly be classed as the controller of all the catalysts of landuse changes in the area.

7.2 OBJECTIVE:

The objectives of the present study in the selected area with the above stated characteristics has been,

(1) To find out the levels of change which have taken place in the general, and cropland use of the area between the chosen points of time 1959-60 and 1979-80.

(2) To investigate the catalysts of change for both general and cropland use over the period of two decades.

(3) To trace out constraints to the healthy change, and to suggest measures for a rational landuse and cropping pattern to aid the developmental processes in the area.

7.3 METHODOLOGY AND DATA BASE:

The area is divided into three soil based regions for the sake of finding the regional disparity, in both general and cropland use. Area level as well as village level observations have also been made wherever necessary.

Data for general and cropland use for the two points of time have been procured from office of the Mamlatdar and Taluka Development Officer - (T.D.O.) at Taluka headquarter, Jambusar and the Talatis (village officers) of the individual or group of villages.

Excepting a few aspects of the study viz. crop combination, crop diversification, the total volume of change etc. in which the prescribed methodology has been used, the rest of the work is mostly based on percentages. However, the percentages are worked out according to need i.e. with the total area, the total area of the regions, and the village areas. The topographic sheets both old (1" sheet) and new (1:50,000) have been used at various stages of the study.

The nature of study being spatio-temporal, two points of time are purposefully selected. 1959-60 is the base year. It is selected with the intention to know the landuse situations on the eve of the formation of the separate State of Gujarat (May 1960). 1979-80 was selected for being the year for which the latest land use data were available at the time of starting the work.

The main focus of study being the dynamics of landuse, the percentage difference of the two points of time have been used to set the levels of change at village and regional levels. The landuse data have been analysed employing available traditional methods and plotted on maps which provide a visual impression of the spatial dimension of change.

7.4 FINDINGS:

The dynamic aspect of the landuses in this area is the focal purpose of this study. The rural landuse types are grouped into two broad categories (1) non-productive, and (2) productive. The first category covers all those uses which fulfil the socio-cultural needs of the rural folk. The second category, however, is meant to ensure food and other needs. The first is the general landuse and the second is the cropland use.

The General Land Use includes two types of land:

(i) Land available for cultivation;

(ii) Land not available for cultivation.

7.5 LAND AVAILABLE FOR CULTIVATION:

5.1.1 The N.S.A.

Of the total area of 57759.30 ha. the major share of 59.70 and 61.39 per cent have respectively gone to N.S.A. at first and second points of time. The N.S.A. thus, registered a slight increase of 1.69 per cent. This increase has been accompanied with decrease in a variety of wastelands including parts of the kharlands which have been reclaimed. Among the villages, it is seen that of the 46 villages, 34 showed positive change between 0.01 and 9.44 per cent. Only 12 villages experienced negative change between 0.01 and 1.39 per cent in their N.S.A. Such villages have shown increase in fallow land by the second point of time.

7.5.2 The fallow land:

(a) The current fallow: It increased by 11.66 ha. (0.02%). Though it is not a significant increase, it indicates that the practice of fallowing due to various reasons is on an increase. One of the significant reasons for the marginal and small farmers keeping current fallow is their financial constraint which prohibits the requisite timely inputs.

(b) The "other fallows" dropped from 4.80 per cent to 4.19 per cent. This is natural fall due to the need to increase the N.S.A. in view of the increasing population. The intention to increase the extent of area for the cash crop, cotton, may also be taken as a significant reason.

c) The culturable waste: Similar was the fate of the culturable waste that dipped from 0.29 per cent to 0.11 per cent in the wake of increasing net sown area.

Thus, two of the four sub-categories of the category A - N.S.A. and the current fallow - have shown positive change, while the other two - other fallow and the culturable waste - have shown negative change over the two decades, though the changes have been quite meagre.

7.6 LAND NOT AVAILABLE FOR CULTIVATION:

It comprises seven types of uses of land:

7.6.1 The Grazing Land:

It shows an overall insignificant decrease by 0.03 per cent which reveals its less dynamic nature. However, in the unit area (village) perspective, ten villages showed increase between 0.02 and 1.36 per cent and 23 villages showed decrease between 0.01 and 2.37 per cent. Thirteen villages did not show any change at all. Thus, in 50 per cent villages it decreased in 22 per cent it increased, and in 28 per cent it remained unchanged. The larger percentage of villages showing decrease establishes the negative trend of change in this use.

7.6.2 The mangrove forests:

Found only in one coastal village, Malpur, remained unchanged through out.

7.6.3 The Settlement-Area:

It increased from 0.44 per cent of the base year to 0.48 per cent at the second point of time. Of the 47 villages at the base year, one village Isanpur is administratively merged with Zamdi though the settlement remained, and one village, Chandpur Marva, was evacuated due to seeping off of the tank water, the only source of water supply, leading to abandonment and subsequent total obliteration of the settlement. The settlement area of the latter village was put to other uses. So, only 45 villages reported

the settlement area. No change is seen in 38 per cent of the villages while 62 per cent of them (i.e. 45 villages) showed positive changes. However, Zamdi shows negative change in percentage due to its increased area as a consequence to inclusion of Isanpur, and increase in hectarage. It is taken as a positive change. Thus, the settlements being directly linked with the increasing population would, as expected, invariably show the growing trend. Other things being equal, more positive changes are expected in future due not only to natural growth of population but also to the influx of population from outside for exploiting the mineral oil, natural gas[1] and also the salt resources of the area.

7.6.4 Transportation:

It includes roads (PWD). field tracks and the railway, (N.G.). In all they occupied 1.67 per cent of the total area in 1959-60. But by 1979-80, some positive and some negative changes took place in the first two while the railway remained unchanged. The implementation of road development schemes, improved accessibility, and increased area under roads (PWD) by 0.16 per cent (93.02 ha.) over the former 0.12 per cent (68.32 ha.). This has been a significant positive change, and yet more is on cards. But the field-tracks were subject to negative change by 0.20 per cent (115.04 ha.). Thus, out of the hectarage under the three types of the lines of transport, the first increased, the second decreased, the third remained unchanged. It is the policy factor that acted for the increase of the first, the economic factor that caused the decrease of the second, and the inherent nature of the railway system that maintained the status quo in the third.

7.6.5 Tanks and Ponds:

Tanks and ponds held 0.98 per cent of the total area in 1959-60. Ponds spread over the fields, decreased as the need for more land for cultivation increased, whereas the tanks retained their significance as the only source of drinking water in all the villages of the study area. By 1979-80, they held 0.94 per cent showing a decrease by only 0.04 per cent (20.46 ha.), which

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1. They have been added to the geography of the area after the study period.

comes to an average of 0.45 ha. per village. Inspite of the supply of tap water through North Bara Water Supply Scheme[1], the importance of tanks as a prime source of water supply has not diminished. The downward trend in this use is quite insignificant. Of the 46 villages 26 (57%) show no change, while 20 villages (43%) show change between 0.01 per cent and 0.44 per cent. Thus, it may be said that the tanks have been the least changeable features of the landuse of the area during the study period. The tanks are purposefully constructed and they are associated with each village and are placed close to the village sites.

The population and tank area ratio in 1959-60 was 1:27 (that one ha. of tank was supporting 27 people). That ratio changed due to increased population to 1:92 in 1979-80. Since the tank areas have not increased and the other variable is ever increasing it is essential to find some efficient alternative source of water supply. Piped water supply scheme is an attempt in that direction, though not quite satisfactory.

7.6.6 Kharland and wasteland:

This sub category occupied the second largest percentage of land area after N.S.A. In 1959-60 it occupied 28.65 per cent of the total land, and in 1979-80 with a nominal decrease by 0.85 per cent, it held 27.80 per cent. The increasing population, the various land management, land improvement and kharland reclamation schemes are bound to reduce this large piece of area, and put it to some better economic uses. However, over two decades little has been done. It is anticipated that a large portion of this natural landscape would be turned into a cultural landscape in the form of agricultural, social forestry, and salt exploitation zones in times to come.

7.6.7 Other Uses:

In the list of other uses are: (1) Graveyards, (2) Cremation ground, (3) barn, (4) Garbage dumping ground (Ukardo), (5) easing place (for women), (6) schools (7) places of worships and (8) cattle resting place.

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1. Implemented after 1980.

These are the necessary uses of land though required in smaller bits. The first two are used for the disposal of corpses. The next two are related to agricultural purpose of which one is used as barns for thrashing the harvest, the other for dumping the cowdung to be processed as manure or cakes (as fuel). The fifth is a typical landuse rarely found elsewhere. The sixth and seventh are for the educational and religious purposes and the eighth is used for cattle resting. In all, they occupied 240.31 ha. (0.41%) at the first, and 241.43 (0.42%) at the second points of time. There was, in all, an insignificant decrease by 0.09 ha only. This was mainly because the area under graveyards increased by 6.71 ha. (0.01 %) and the others decreased by 5.80 ha. (0.01%).

In this category the negative change is conspicuous. Barring the graveyard as stated above, the khali, etc, the cremation ground and the schools have lost areas by 4.06, 0.55 and 0.94 ha. respectively.

Other uses have also decreased though quite insignificantly. It, therefore, establishes the negative trend of change in most of these sub categories, excepting that having the socio-cultural demand for land such as the graveyard.

In sum, no other factor in the dynamics of general landuse seem to have been as strong as the growing population. It isfor the sake of accommodating the growing population and to provide them better socio-economic amenities, that the existing land area is being shifted partly from one use to other, either done by the government in a planned way, as the construction of checkdam, reclamation of the kharland and ravines, and the artificial drains, or done by the people of the area themselves. Thus, in this context, the population and more so, its decision making skill, in the light of the existing environment, and supported by the intervention of the government, may be considered as the strongest /catalyst of change, in the various sub categories of general land use.

7.7 CROPLAND USE:

While the general landuse system is subject often to very sluggish change, the changes in cropland uses are very rapid.

The characteristics of change in the two are also quite different from each other. Land under general landuse normally changes its function, for the better, e.g. the ravines and wastelands are improved as arable lands, and similar others change for better socio-economic uses. The cropland normally remains a cropland and changes only in terms of type of crops or fallow as a system of rotation. Thus, the changes in cropland use are not of the functional type, but of the rotational type. The crops are rotated, in normal cases, either to preserve the fertility of the soil, or to gain more advantages depending on the existing price and demand in the market, or both.

The cropland use in the study area at the two points of time (1959-60 and 1979-80) presents two slightly different pictures. At the first point of time, the G.C.A. was distributed between various crops in a somewhat balanced way except for cotton. Cotton was the crop of prime importance. It alone shared 48.50 per cent of the G.C.A., leaving 51.50 per cent for the other ten crops. By 1979-80. the picture radically changed overwhelmingly in favour of cotton. Various innovations, particularly the hybrid seeds, the increasing prices and demand for cotton in the market and the artificial topographical changes extended strong support to cotton which surpassing all other crops reigned over 74.02 per cent of the G.C.A. leaving only 25.98 per cent for all other crops. Thus in a period of two decades cotton went up by 25.52 per cent. The cotton, therefore, became the only staple crop of the area and has retained its supremacy over others eversince. However, during the periods of first and second five year plans and more due to the Grow More Food Drive, other crops like wheat, bajri, jowar etc. gained significance which again dwindled due to the dwindling effect of that scheme. On the other hand growing population, developing industrialization and expanding international trade led to higher demands for home-spun cloth. The demand for cotton, thus, prompted the farmers to devote more and more area to it.

In connection with the rank and order of crops grown in the study area, invariably cotton held the first rank in 39 of 46 villages in 1959-60 while it became first ranking in all but one

village in 1979-80. The seven villages, Chandpur Bara, Dolia, Kansagar, Kapuria, Pachakda, Sindhav and Vad, in the former year had wheat as their first ranking crop, which descended to second giving first place to cotton. In 1979-80, Kundhal alone got wheat as its first ranking crop and cotton as the second. However, the area has predominantly been cotton cultivating through out its historical past. Wheat, however, always stood as the second ranking crop at both points of time in most of the villages under study.

Among the third ranking crops were jowar, fodder, rice, wheat, pulses, cotton and bajri. In this rank, jowar, was the crop of great significance with 22 villages devoting five to eighteen per cent of their G.C.A. to it. It was followed by fodder, rice, wheat, pulses, cotton andd bajri with decreasing number of villages and their share of G.C.A. However, the noteworthy fact is that cotton, the crop of supreme significance in most of the villages could also meet the fate of being the sixth among the third ranking crops. It is seen in the village Panchpipla which had wheat as its first ranking crop devoting 66 per cent of G.C.A. in 1959-60 It is only the artificial drains (kans) which by 1979-80, draining off the waterlogged depressions made the entire arable land available for kharif crops. Thus, cotton surpassed all crops taking a major share of the G.C.A. in majority (45) of villages. Wheat, though, greatly subdued in each village, maintained its second position in most of the villages and first only in one. But its former supremacy as the most significant second ranking crops is further challenged by jowar, oilseeds, bajri, fodder, rice and even grass. They have also occupied second rank interchangeably in some villages.

However, jowar was a significant third ranking crop in 1959-60 and it remained so till 1979-80. Its associate crops numbering six in the former year remained almost unchanged in the latter year. Thus, no major change in the ranking is noticed, but a great change is seen in the cropland shares of each crop. In some cases their locations have also changed (Fig. 5.1 & 2 a).

With the application of Weaver's Minimum Deviation Method, the area has been divided into nine combination regions in 1959-60

and eight in in 1979-80. The number of villages with mono cropping precipitiously went up from two in the former year to 26 in the latter year. Two-crop combination came down from 19 to only six. Three-crop combination went down from 10 to nil. Four-crop combination increased from one to four, and five crop combination decreased from four to two. Six-crop combination appeared in the latter year with only one village. Seven and eight-crop combination doubled to their former figure and nine-crop combination having six villages in the former year, disappeared in the latter. However, in the combinational analysis it is noted that all combinations in both years have been dominated by cotton and wheat as first and second ranking crops, and other crops have found their places in changing orders. This shows that inspite of theprecipitious ascent of cotton and descent of wheat, both have almost retained their former ranks (first and second).

Comparing the maps of 1959-60 and 1979-80, the former year is found more diversified than the latter. There have been four to ten crops cultivated in 1959-60, and three to nine in 1979-80. The decrease is one in the lower and one in the higher. As such, a little difference should have occured in total values, but when calculated it gave a difference of 50 per cent, which is the result of larger areas devoted to a single crop, cotton, and other crops are reduced to insignificance. However, the indices of the former year show the status of crop diversification, while that of the latter year clearly indicates the tilt towards specialization or mono cropping.

Scrutinizing the pattern of diversification and specialiization it is seen that the number of crops cultivated at both points of time were in all ten, and nine respectively. It is only the areas devoted to each crop that have substantially changed, cotton grabbing the largest share of G.C.A., leaving a fraction for others. Thus, in terms of the number of crops and their shares of G.C.A. it may be said that diversification was higher at the first and lower at the second point of time. Inspite of the general tilt towards cotton, it is seen that the three soil based sub regions have been varying in levels of diversification. The Dhadhar flood plain area

including parts of the region of Balota Onjal series shows trend towards low diversification. A mixed trend is apparent in the mainland plain, whereas the littoral villages show a trend towards greater degree of diversification. The average indices worked out for each edaphic region are : 25.18 for Region III, 21.15 for Region I and 13.77 for Region II. It shows that on average Region III is more diversified than Region I while Region II is the least diversified.

In all, the cropland use has undergone changes in area, type and pattern of cropping as well as in their ranking, combinations, and diversification.

7.8 CATALYSTS OF CHANGE:

In the quest of the identification of the catalyst of change it has been found that no single factor on its own can be said to be instrumental in bringing about the changes in the general and/or cropland uses. Rather a host of factors - physical, social and cultural, economic and political - have contributed their share in varying proportions. However, the political and cultural factors have been found to be more influential in respect of the general landuse. For example, the change in landuse brought about by the reclamation of kharland has been purely a result of government poicy decision. Thus, about 500 ha. (app. 1%) of kharland was reclaimed. The growth of population has been instrumental in the increase of N.S.A., settlement area, and in the decrease of various other uses e.g. the culturable waste, unculturable waste, the grazing land, the ponds, etc. The road development resulted into taking slices from different other uses. For the changes in the cropland use several factors have been found acting singly or collectively.

The bitter experience about the irregularity, erraticity and uncertainty of rainfall may be placed at the top, as, in the absence of the dependable source of irrigation, it always played a decisive role in the agricultural system of the area.

The artificial drains (kans) is another significant catalyst, that paved the ground for greater percentage of occupance of G. C.A. during the kharif season . The formerly innundated or

waterlogged areas which were made fit for cultivation were given mostly to cotton in place of rice.

The decision making skills of the farmers in the light of the innovations, marked forces of supply and demand and price elasticity have been found to be other significant catalysts of change in the cropland use. Human factor is therefore very significant prime catalyst of change.

7.9 CONCLUSION:

In keeping with the three-point objective of the present study, the following conclusions may be drawn:

(1) Levels of change: According to the rule of dynamics of landuse, both positive and negative changes have been observed. However, general landuse, owing to the rural setting, has not showed much change, except those brought under landuse management programme of the government. On the whole a sluggish and minimal changes have been discerned over the period of two decades except in cases of settlements, graveyards and roads all other uses of non-agricultural land have shown decline.

But remarkable changes have been observed in case of the croplands, the prominent being as follows:

(i) At the first point of time, the ratio between the cotton and other crops in respect of their shares in the G.C.A., was 12:13 (or 1 : 1.08), showing a sort of balance between cotton (48%) on the one hand and other crops (52%) on the other. By 1979-80, cotton overwhelmingly rose to occupy 74 per cent of the G.C.A. leaving only 26 per cent to other crops.

(ii) Food crops, in 1959-60, had reasonable significance occupying 40 per cent of the G.C.A., the lion's share going to wheat (30%), followed by jowar (7%), rice and bajri (2% each). By 1979-80, the cereals were confined to 19 per cent of G.C.A. with wheat occupying 10 per cent, followed by jowar (5%), bajri (2%) and rice (1%).

(iii) So far as ranking of the crops is concerned, wheat and jowar maintained their second and third ranks respectively, even though their individual share of the G.C.A. were much reduced.

(iv) Besides cotton, only two crops - bajri and oilseeds - registered increase in their G.C.A. shares (by 0.21 and 1.19% respectively), all other crops showed a downward trend.

(v) Crop combinational changes show a move from multi to mono cropping, in that, in place of only two mono-cropping regions in 1959-60, there emerged 26 such regions by 1979-80, thus showing a preference for specialization (for cotton) in place of diversification.

(2) Catalysts of Change: The changes in landuse are brought by a host of factors acting both in unison and individually and it is difficult to isolate any one factor responsible for a particular change. But, for the purpose of study one could isolate the most significant factors operating in the study area as follows:

(i) The embankments constructed along thecoastline to check the ingress of the seawater has been most effective in the reclamation of considerable area of land for agricultural as well as non-agricultural uses. About 500 acres (app. 1%) of saline wasteland has thus been reclaimed for social forestry and agriculture, while more areas are in theprocess of being reclaimed.

(ii) The construction of kans i.e. the artificial drainage channels, to drain off the waterlogged areas has worked wonders with the agricultural land. When waterlogged the areas were used for growing kharif rice or rabi wheat, but after the removal of waterlogging by the 'kans' cotton has taken over, overwhelmingly.

(iii) Rainfall with its characteristic regime seems to the present researcher the most important factor of change. The area experiences shortage of rainfall every third year. The farmers, therefore, keep on adjusting their cropping scheme accordingly. However, this can be termed as short term change. The general long term change in rainfall regime has not been ascertained which could be related to long term changes in the cropping pattern or the general landuse pattern.

(iv) The human factor is itself a potent catalyst of change. Their growing number and density can be said to have reflected in the expansion of the area under N.S.A. Their ability, ingenuity, knowledge and experience - the guiding elements in his decision

making faculty, help him to face and ward-off even the vagaries of nature. Thus, even in the year of extremely meagre rainfall (1974), 43 per cent of the 46 villages managed to use their cropland to the extent of 5 to 75 per cent of G.C.A., though selecting jowar in place of cotton. In his decision making activities he is also influenced by the prevailing socio-economic and political factors.

(3) Constraints to better landuse change: The study brings out the following factors which hamper a better use of land and a change for the better in the area:

(i) Deficiency, seasonability and erraticity of rainfall is the permanent factor that almost determines the landuse pattern in the area and hinders the progress towards a desirable change.

(ii) The salinity of the soil as well as of the underground water is another permanent feature which restricts the use of soil and water for growing the type of crops one desires. Extensive areas are lying as saline waste (kharland) which need special treatment.

(iii) The nature of the black cotton soil with its saline underground water table is such that canal water cannot be employed for irrigation as this will raise the saline water table resulting into the development of hard pan under the top soil leading ultimately to waterlogging and salinity making them infertile.

(iv) The existing tanks also may not be deepened to accumulate more water for irrigation, as the sub-soil is porous which leads to percolation of tank water following greater deepening, as has been the case with the tank in village Chandpur Marva, resulting in abandonment of the village by the people.

(v) The proposed Narmada Project irrigation canal also may not serve the area on account of the same reason - the nature of the soil. Apprehensions have been voiced about the possibility of the soil becoming salt-encrusted and waterlogged if Narmada canal water is used to irrigate the fields in the traditional manner.

Thus, the irrigation provided by the Narmada canal may not bring about the desired changes in the existing landuse pattern, unless some innovative measures are taken to adapt the system to the peculiarities of the soil and terrain.

(vi) There is an extensive area of mud-flats along the coastline. These mud-flats need special treatment; no usual landuse practices can be employed on them. The local people lack the requisite technical know-how to deal with this special type of terrain.

(4) Applicability of Von Thunen's Model: Though no intensive and purposive investigation has been made to test the validity of Von Thunen's model in the area, a brief examination of landuse pattern and their spatial distribution relative to the two local market centres, Kavi in the north and Jambusar in the south-east, suggests some influence of distance on the location of certain types of crops. In the vicinity of Jambusar market we find a greater concentration of rice and fodder (signifying dairying and grass for the market). Within a distance of 20 km from Jambusar and Kavi, we find a variety of crops - cotton, wheat, jowar, bajri, pulses and oilseeds - signifying greater diversification, while in a belt of 5 km between these two zones, we find a clear cut specialization in cotton, wheat and fodder. The zonation of crops also indicates a greater pull of the bigger market centre of Jambusar as compared to Kavi. Higher proportions of G.C.A. under cotton signifiy more extensive landuse with cotton occupying the land for the whole year, while a variety of crops of both kharif and rabi seasons signifies a comparatively greater intensification. Thus, the intermediate zone of less intensity flanked by higher intensity zones near the two market centres, lends some credence to the Von Thunen's model of landuse,

At the end, it can be concluded that the study corroborates the assumption with which we started - that nature very much inluences the landuse pattern, with rainfall and soil being the most dominant factors; (assumption 1), but the human responses with decision making capability of the people moulds the use of

land (assumption 2 and 3), though their decisions are influenced by the various institutional factors (assumption 4) which are in turn moderated by the constraints posed by the natural environment. (assumption 5), thus completing the circle of man-environment interaction.

7.10 SUGGESTIONS:

Based on the study of the landuse of the two points of time and of the changes in the landuse and cropping pattern brought about by the various factors operating in the area, the following modest suggestions may be made for a better and proper landuse in the future.

1. The first pre-requisite for a better landuse in the area is the provision of irrigation water. But this is extremely ticklish question. The Narmada Project canal water is scheduled to be available to the area by the year 1992. This is the first area which is to recceive the Narmada water. As stated above, the traditional flow, irrigation may cause the formation of hard pan and waterlogging and also increased salinity of the top soil. So, it is proposed that instead of letting irrigation water flow through the agricultural fields, the area should be provided with a large number of tanks (their number and spacing to be planned meticulously) from which the farmers may be advised to take water to the fields in a well controlled manner. A still better method would be to introduce sprinkler irrigation, but this would prove to be expensive under the existing conditions.

2. The same Narmada water may be utilised to wash down the salts of the kharland, thus making a vast area cultivable within a few years. Technical feasibility of this measure should be examined and proper introduction, advice and incentive provided to the people to whom the kharlands should be apportioned for reclamation.

3. A proper crop rotation system should be devised so that increasing areas may be brought under double cropping. Presently, cotton occupies most of the land for most of the year, and there is almost an absence of double cropping. A sort of zoning may

be done for rotating cotton with rice-wheat or other crops, which will go a long way in improving the soil fertility as well as in balancing the production from land and the diet of the people.

4. The proposed canal distributaries as well as the existing 'kans' (artificial drainage channels) should properly and invariably be lined to prevent seepage and waterlogging in the first case and soil erosion in the second case.

5. The northern coastal areas, for example, in Degam and Sigam, which have extensive white sands may be developed as a tourist beach resort.

6. The vast stretches of culturable wastelands should be made productive for a variety of grasses and fruit tree crops (such as plums and berries). The Narmada water may help to make this a possibility.

7. The reclaimed kharland should be utilized for social forestry which may meet the immediate needs of fodder, food and firewood of the inhabitants. Such measures are afoot, and they should be expanded and accelerated.

8. Attention should also be paid to reduce extreme specialization with cotton as the only crop. A move towards greater crop diversification would be beneficial from the point of view of both of balance in landuse and balance in diet. This will be termed as an attempt to swim against the prevailing current . But this is worth attempting from ecological and socio-economic point of view. This will also work as an insurance against the extensive damage to cotton crop by pests and diseases, which is often the case in the area. If these measures are taken, even in parts, it is hoped, the area will experience a move towards a quality of life much better than what one finds today.

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