

CHAPTER VI

THE CATALYSTS OF CHANGE

## CHAPTER - VI

### THE CATALYSTS OF CHANGE

Though, the change is the law of nature, it hardly occurs without a relevant cause; the nature of change, therefore, depends on the nature of cause. The two major forces nature and man either individually (in case of nature) or interacting with each other produce changes in the terrestrial environment. Land use is one of that which is most affected by their individual or joint actions.

In the course of study on the dynamics of land use in Bara tract of Jambusar, a host of factors have been found operative. The following are factors taken to be the most significant:

- |     |                        |       |  |
|-----|------------------------|-------|--|
| 6.1 | Physical factors       | 6.1.1 | Topography   |
|     |                        | 6.1.2 | Climate  |
|     |                        | 6.1.3 | Soil   |
| 6.2 | Man-made factors       | 6.2.1 | Artificial drains (Kans)                               |
|     |                        | 6.2.2 | Check dams (Bundh)                                     |
|     |                        | 6.2.3 | Roads  |
| 6.3 | Socio-economic factors | 6.3.1 | Population   |
|     |                        | i)    | Growth   |
|     |                        | ii)   | Agriculture work force and<br>GCA Agricultural density |
|     |                        | iii)  | Total population and G.C.A.                            |
|     |                        | 6.3.2 | Yield  |
|     |                        | 6.3.3 | Prices   |
|     |                        | 6.3.4 | Distance effect (Application of Von<br>Thunen's model) |

- |     |               |       |                                     |
|-----|---------------|-------|-------------------------------------|
| 6.4 | Technological | 6.4.1 | Tractors                            |
|     |               | 6.4.2 | H.Y.V. and Fertilizers              |
| 6.5 | Political     | 6.5.1 | Government Policies and Programmes. |

#### 6.1 PHYSICAL FACTORS :

On any aspect of the land use or its change, the significance of physical factors cannot be ignored. Though, their influence, with the advancement of technology, is declining in most parts of the developed world, they have yet a strong control in most of the developing countries; which contributes, much to the shaping of the behaviour and life-style of the people.

##### 6.1.1 Topography:

As explained in earlier pages, the study area presents a landscape of a monotonous very gently rolling plain rising about 4.31 meters (14 feet), from the eastern coast of the Gulf to about 12.92 meters (42 feet) on the north-eastern periphery. At places, it is almost completely flat, and at other places its shallow depressions are liable to be inundated during heavy spells of monsoon. Such depression have, for long, been a retarding factor in crop land use during the kharif season. Besides these depressions, estuaries of the rivers Mahi and Dhadhar, and several backwater creeks from the Gulf and the two rivers have been the pronounced features, the marshes swamps and the kharlands are others which have affected land use in the area in various ways.

The parabolic loop of river Dhadhar near the village Dolia underwent a phenomenal change owing to the flood action and was modified (Fig. 2.4 a & b). Land linked shoals emerged near the mouth of river Mahi alongwith a few other land features which were non-existent earlier.

A few significant factors responsible for such physiographic and structural changes may be (1) discharge of sediments by Mahi and Dhadhar rivers during their spate; (2) the upraised silt deposits in the Gulf bed (Fig. 2.4 b) and (3) the Kadana and Vanakbori

Dams over river Mahi which effectively checked the perennial flow and stalled its erosive action, causing deposition of heavy layers of silt at the estuary of Mahi, and also into the eastern coastal waters of the Gulf. The lands thus emerged have not been put to any specific use during the study period. Any suitable use may be made of these in future.

#### 6.1.2 Climate:

Of all the factors responsible for land use changes in general, and cropland use in particular, the climate, specially its significant component, rainfall, plays the role of catalyst. On one hand, it functions as the washing agent for the reclaimed hectareage of the kharland on the other hand as a grower of grass for the pastureland and the moisture supplier for the cultivated land. The erratic nature of rainfall, its variation in space and time, are the most crucial factors for the survival and growth of Indian agricultural economy, (Ali Mohammad, 1979). The rains determine the extent and hectareage of cultivation in the whole country in general, and in the unprivileged (lacking in irrigation) areas in particular. However, the climate is that control which accounts for at least 50% of the variability of crop yields over a series of years (Sinha, 1959). The study area comes in the latter group where the rainfall has almost been the determining factor for the general, but more for the cropland use. Besides, the rains are the most important influencing factor for the location of settlements, and even the density and distribution of population. The prime source of drinking water, ever since the area was inhabited, has been the rain water stored in tanks. In case, the tank lost the storing capacity, the village had to be abandoned, e.g. Chandpur-Marva and Isanpor. The influence of rainfall may be seen on the cropland use over a period of two decades at five year's interval in Table 5.1.

The table shows the crop-rainfall relationship. It is seen that as long as the amount of rain received is around 20 inches (500 mm) which is the minimum essential for the cultivated area, the G.C.A. ranged between 60 to 62 per cent, divided among different crops. But as the rain went below 500 mm (as 286 mm in 1974),

Table - 6.1

Percentage Area Under Crops - 1959-60 - 1979-80

Year	N.S.A.	Jowar	Bajri	Rice	Wheat	Pulses	Fodder	Oilseeds	Cotton	Grass	G.C.A.	Rainfall
1959-60	59.62	7.42	1.66	2.33	30.21	2.61	4.44	0.59	48.46	1.76	60.48	1109
1964-65	60.19	5.41	1.87	1.67	17.49	1.67	5.13	0.989	64.66	0.69	60.44	1201
1969-70	60.60	6.31	3.99	1.26	7.58	1.29	4.09	2.19	72.20	0.42	60.98	725
1974-75	36.03	33.12	2.43	0.86	9.91	1.05	16.07	3.02	33.08	0.29	36.36	286
1979-80	61.41	5.02	1.87	1.22	10.26	1.57	3.64	1.79	74.02	0.37	61.56	636

Source: Mamlatdar and Taluka Development Officer, offices, Jambusar.

the G.C.A. went down to only 36.36 per cent which is 24.63 per cent and 25.21 per cent less than those of 1969-70 and 1979-80 respectively. A unique change in cropping pattern is also noticed. For example, Jowar, which always ranged between five and seven per cent of G.C.A. earlier occupied 33.12 per cent - the largest share ever enjoyed by it, bringing down even the most popular crop, cotton, to only 33.08 per cent. The next crop that acquired significance in 1974-75 after Jowar and cotton was fodder which occupied 16.07 per cent as against its usual record of three to five per cent or slightly more. Thus, any abnormality in rains upsets the established cropping pattern. Thus, the significance of rain factor as the catalyst of change cannot be under-estimated.

The years of deficient rains have shown that greater percentage of land is left as fallow - which is not a usual practice. In 1974-75, the year of lowest amount of rain in the two decades, three villages - Asarsa, Kapuria and Malpur - had to leave their total cultivated land as fallow as they did not receive rains enough to cultivate. Four villages - Devla, Nada, Bhadkodara and Islampur - could cultivate one to three per cent of their total cultivated land only. Others ranged between the minimum eight and maximum 93.44 per cent, according to the amount of rain received by them. The variable percentage indicates that rains in that year were less and sporadic.

A glance at Table 6.2 shows the rain affected use of cropland in the three regions:

Table - 6.2

Regionwise Average Cropland Use - 1974-75 (in per cent)

Regions	Percentage cultivated (Average)	Percentage uncultivated (Average)
I	73.82	26.18
II	57.51	42.49
III	21.83	78.17

Region I received relatively higher amount of rains which enabled it to cultivate 73.82 per cent and leave only 26.18 per cent. Region II could use 57.51 per cent and left 42.49 per cent. The worst hit was Region III which could use only 21.83 per cent and left 78.17 per cent (average) unused. In this respect the rain is undoubtedly very significant catalyst of change encouraging or hampering the usual agricultural system of the area.

However, it is also seen that regular and sufficient rains in most cases helped to increase the N.S.A, as seen in 1979-80. But rains alone may not be taken responsible for the changes having taken place in the cropland use of the area.

Some times the scarcity of drinking water due to less or no rains forces enmasse out migration of the people with their animals and other belongings. The desertion due to unavailability of drinking water has led to the change in the whole land use system in the two villages (Chandpur Marva and Isanpur).

Since the sub-terranean water is brackish, the sources of irrigation are near absent. Of late, Degam, Chhidra, Kimoj, Runad, Bhadkodara and Jantran villages being apprehensive of the uncertainty of rains, attempted to install tubewells, which cast the only effect on their cropland use, as to save their crops during the long dry spells. But hardly any notable change is seen in their G.C.A. Table 6.3 may substantiate this statement.

Table - 6.3

Tubewells and Change in Cropland Use - (in per cent)

-Village	- N S A		- G C A	
	1959-60	1979-80	1959-60	1979-80
Bhadkodara	78.83	81.20	78.83	81.20
Chhidra	88.02	88.81	89.90	91.71
Degam	25.84	26.43	25.84	26.43
Jantran	89.31	89.99	89.31	89.99
Kimoj	92.48	93.44	93.13	93.44
Runad	92.03	92.43	92.03	92.43

The table shows that inspite of the tube wells, these six villages did not show any substantial increase in their G.C.A. It is itself the proof that the tubewells are used in emergency conditions, to save the drying crops. Farmers reported that the tube well water increases the salinity of the top soil which is a strong reason for less use of this water. This factor further reinforces the significance of rainfall in the land use of the area.

Dependence on rainfall is hampering factor for the innovative measures to be adopted in agriculture. Whereas in the areas of dependable sources of irrigation in the state, as in Kheda and Surat Districts, the modern methods have been widely adopted. In Surat District, almost a complete replacement of cotton by Sugar-cane has taken place. The Bharuch District and particularly the study area persist with most of their old traditions, cotton continues to be their principal crop. However, the hybrid seeds, developed for dry farming are widely used, but the restricted use of chemical fertilizers is due to the rain factor. So, the innovations assuring better economic gains are yet to be adopted subject to dependable source of irrigation.

#### 6.1.3 Soils:

The importance of soils in the rural economic environment cannot be underrated. But, to reckon them as the catalyst for land use change, may not be reasonable unless any conspicuous change in the soils themselves takes place. It is found that the soils are categorised on the basis of crops normally cultivated on them e.g. the alluvial loamy soils for wheat, jowar, bajri, etc., the black cotton soil and 'Besar' for cotton, but often wheat is sown in black soils and gives desired yield (other things being equal) and similarly other crops are also cultivated, which shows that there is no need to strictly follow the classification. It, therefore, shows that soils have no role as the catalyst of change.

### 6.2 MAN-MADE FACTORS:

#### 6.2.1 The Artificial Drains (kans)

Though an artificial feature, the 'kans' functions as the natural drainage channel. A net work of such drains have been



constructed in the area (Fig. 6.7). The need to construct them was to provide outlet to the waterlogged areas. Some of them are joined with the village tanks and serve as feeder channels, and some are joined with the main drains, while a few meet the creeks. They have brought about change both in the general and the cropland use. In case of the former, they have become a regular physical feature giving a change in formerly existing landscape of the area, and in case of the latter, they eliminated the waterlogging and made the waterlogged areas fit for use during kharif season, of which larger share went to cotton cultivation. However, one adverse effect, though not of big magnitude, is that it introduced soil erosion to this almost flat area, which was unknown earlier. However, no report of any major change in cropping pattern due to soil erosion has been given by the farmers.

On the basis of the significant changes brought about by these drains, at both physical and economic fronts they may well be taken as the catalyst of land use change for this area.

#### 6.2.5 Check dams (Bundh):

Another artificial feature added to the physical geography of the coastal margins of the area is the check dams lying in both continuous and discrete shape. These dams have checked the tidal ingress, which had turned as much as 26 per cent of the study areas's total geographical area into 'kharland' along the coast and the estuaries of Dhadhar and Mahi rivers. These dams helped to reclaim atleast 0.84 per cent of the total kharland.

By 1979-80, the following villages had reclaimed the varying hectareage of their kharland for cultivation, afforestation and the salt extraction purposes.

Table - 6.4

## Area Reclaimed from Kharland for Mixed Purpose

Region	Villages	Area (in ha.)	% to geographical area.
I	Kalak	27.40	0.05
II	B.Timbi	0.76	—
	Bhadkodara	0.06	—
	Khanpur Dech	28.16	0.05
	Madafar	2.07	0.01
	Mf.Neja	22.21	0.04
	Vanseta	19.09	0.03
III	Asanvad	16.27	0.03
	Devla	70.52	0.12
	Dolia	7.87	0.01
	Islampur	33.46	0.06
	Kapuria	42.66	0.07
	Malpur	26.83	0.05
	Nada	16.35	0.03
	Tankari	165.03	0.29
Total: R. I		27.40	0.05
R. II		72.35	0.13
R. III		378.99	0.66
Grand Total		478.74	0.84

It shows that by 1979-80, the process of reclamation was quite slow, and also the specification of the areas for these three purposes was not finalized.

Thus, the two artificial features - the 'kans', and the check dams are the feats of human conquest over the nature and a land mark in the present and future land use changes of the study area. Both of them have acted as catalysts of change in the land use pattern of the area.

### 5.2.3 Roads:

Roads have ever been important in the economic growth of the area. Their marked influence on pattern of land use cannot be ignored. They have the effect of changing the cropping pattern from the traditional crops to ready cash earners like vegetables and fruits, as it did around Baroda, and Kheda Districts in Gujarat.

The study area till quite recently was not well served with all-weather roads except for one joining Jambusar town with Tankari and Devla. It was used mainly to haul cotton for shipment through the Tankari port. The heavy silting and recession of the Gulf water made the port obsolete. The road, however, continued to serve as a linkage between the Jambusar town and the coastal village Devla, via. Tankari. It, on the one hand, linked the producing, consuming and distributing centres of the area, on the other hand, it encouraged the salt extraction works along the coast.

By 1979-80, the area under road (all-weather and dry-weather) increased from 68.32 ha (0.12%) to 161.34 ha (0.28%) bringing about a conspicuous change in the general land use of the area. But so far the cropland use, and the cropping pattern are concerned, any conspicuous change due to influence of roads is not identified. The traditional crops have almost remained the same, except that the cotton covered the largest percentage of the G C A and other crops got their shares as the natural as well as the domestic situations permitted at both points of time.

### 5.2.4 Distance Effect:

The Von Thunen's model does not apply in this area in its true spirit as the villages nearest to the Jambusar town cultivate the same crops as those far removed from it. However, an attempt in this direction is made to observe the influence of distance from main market centre on cropping pattern of the villages.

In the light of his idea of 'economic' rent the villages are grouped according to distance from the main market, Jambusar. The hectareage under each crop in each group is plotted on a graph (Fig. 6.1) individually for the two points of time. Even though some of the general criteria set by the model is found in the area viz. the cost of transportation born by the farmer and the isotropic condition of the location, the cultivation of perishables and potatos are rare of the rarest; but there are two markets functioning as pull factor. One is Jambusar (main), the other is Kavi (subsdiary). It is noted that in 1959-60, the small crops viz. Jowar, bajri, rice, pulses, oilseeds were more or less affected by the nearness to the two markets. But typically all start low at 1-5 km, go up at 5-10, come down at 10-15, again go up at 15-20, again come down at 20-25 and in cases at 25-30, and go up at 30-35 km, wheat, fodder and cotton start low, then go up, descend a bit in progression. Cotton goes highest at 20-25 km, fodder at 15-20 and wheat at 10-15. In 1979-80, the pull factor of the two markets seem to be more stronger on jowar, bajri, pulses and oilseeds; rice shows its old trend; wheat and cotton also maintain their previous pattern but fodder behaves differently i.e. rises, slowly upto 15-20 km, and falls regularly upto the last. Thus, the distance effect on the small crops is most conspicuous at 20-25 km from both markets, as their intensity is generally low at this distance while cotton and wheat show greater comparative intensity. However, this intensity may not be attributed only to distance, other factors, as soil and moisture content and the human preferences must also be given weightage.

Since the attributes of the model do not perfectly apply in the study area, any concrete zoning does not seem workable. However, if generalized, it is found that the distance decay effect is somewhat felt. Though, all the crops (Fig. 6.1) are grown at every range of distance from the two immediate market centres, the intensity of small crops recedes as the distance from the markets increases, and that of cotton increases at the former pint of time, while a change is noted in the latter

# Cropping Pattern Influenced by Distances from Market (Jambusar & Kavi)

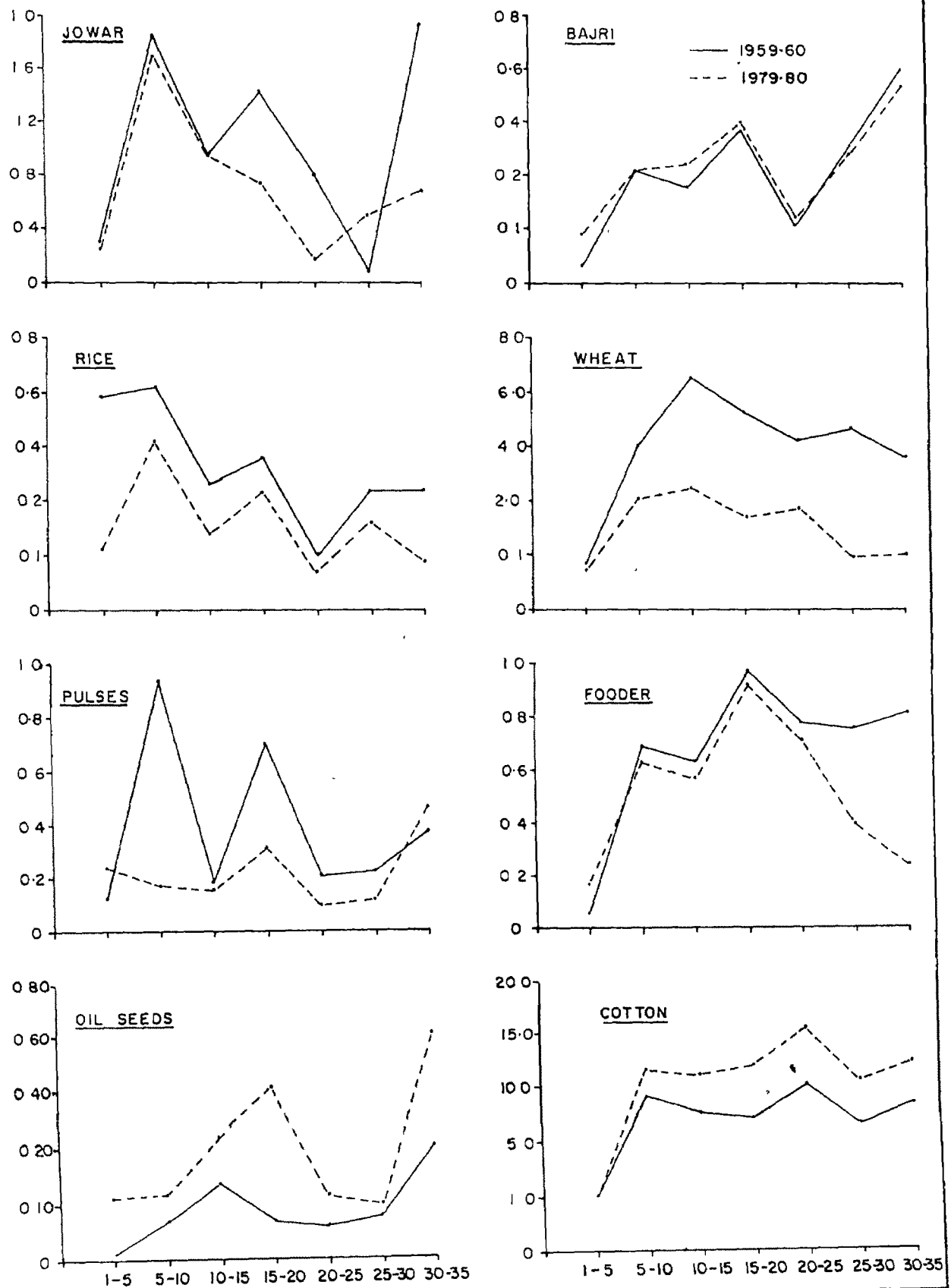


Fig. 6.1

point of time. Jowar slumps down more sharply with increasing distance but bajri maintains the same pattern. Rice descends more or less maintaining the old pattern, but wheat changes, that it shows greater intensity at 20-25 km which is a bit away from the zone of influence of both markets, and slumps near the markets. A change in pulses is conspicuous, and also in fodder that slumps down steeply near the second market, oilseeds show rise near the markets and fall at 20-30 km zone. Cotton maintained same intensity as of its previous, of course, with a higher tone.

This is how the influence of distance from the two markets - Jambusar and Kavi - may be discerned. It may, thus, be taken as a novel application of the model according to the situations of the study area. The following linear representation of the model may well explain the cropping pattern as influenced by distance.

Intensity of cropping

<u>Markets</u>	<u>Kms.</u>	<u>Crops</u>
Jambusar	1-20	Cotton, wheat, jowar, bajri, pulses, oil-seeds, rice, fodder.
	20-25	Cotton, wheat, fodder.
Kavi	1-20	Cotton, wheat, jowar, bajri, pulses, oil-seeds, rice, fodder.

The above shows that the intensity of crops decreases beyond 20 kms. from the markets.

Besides the roads, the field tracks (Hade Pakedelo Marg) serve as the linkage between the villages and the fields, and also between the fields. In 1959-60, they occupied 888.72 ha (1.54%) which in 1979-80, decreased by 115.04 ha (0.20%). This decrease was mainly due to the road development programmes, which took major share (0.16%), the rest being taken over by the expansion of N S A. However, as the catalyst of change they find no place.

### 6.3 SOCIO ECONOMIC FACTOR:

#### 6.3.1 Population:

Land use sans population is meaningless. People are the users of land in the ways they like, which develops the concept, and also the dynamics of land use.

For the fulfilment of his basic needs of food, clothing, shelter, and other needs as education, recreation, transport, health services and so on, man has to look at the land. In the process both general and cropland uses are subjected to change along with the change in number, distribution, density and other characteristics of population.

#### (i) Growth:

A view over the general and cropland use and population statistics of the study area shows considerable relationship between the two over a period of two decades. In case of the general land use, the impact of the growth of population is seen in the reshuffling of land for better uses. Table 6.5 substantiates it.

Table 6.5

Impact of Population on General Land Use 1959-60 - 1979-80

Sr. No.	Types	Positive change	Sr. No.	Types	Negative change	Types	No change
1.	Population	+ 38	8.	Cultivable waste	- 0.18	Railways	0.00
2.	N S A	+1.87	9	Grazing land	- 0.03	Mangrove	0.00
3.	Settlements	+0.04	10	Other waste lands	- 0.08		
4.	Schools	+0.01	11	Tanks & ponds	- 0.04		
5.	Roads	+0.16	12	Field tracks	- 0.20		
6.	Kans	+0.06	13	Cremation	- 0.02		
7.	Graveyard	+0.01	14.	Kharland	- 0.83		
-----x-----				-----x-----			

It shows that with the increase of population by 38 per cent, the land under essential uses has increased and that under non-essential has decreased. The increase in population induced increase in more useful land resources than others by managing and improving upon the parts of non-arable lands. By 1979-80, the N S A increased by 1.87 per cent and settlements, roads etc. also increased. In the process of readjustment, the areas under wasteland, kharland etc. decreased. The reclamation of kharland by 0.84 per cent seems to have been a major achievement in this direction.

The impact of the growth of population on agricultural front is felt differently. The increase in rural population should, in normal cases, be marked with increase in agricultural population also. But a different trend is observed, that the percentage of the agricultural population to total population has decreased by 2.86 in Region I, 13.90 in Region II and 9.10 in Region III. The growth of population has, however, brought several changes in general and the cropland uses. Several types of wasteland have been attempted to be reclaimed, areas of several settlements have increased and the high yielding varieties of crops are being grown. The N S A has increased in almost all the villages.

(ii) Agricultural Workforce and G.C.A:

An attempt is made to correlate the agricultural workforce and the corresponding G C A for the two points of time (1959-60 - 1979-80) by linear regression using the Pearsonian Product Moment Correlation Co-efficient Method ( $r$ ), and the following values are obtained:

1959-60	-	$r$	=	0.66	$t$	=	5.82
1979-80	-	$r$	=	0.59	$t$	=	4.85

The difference between the  $r$  values (66 & 59) shows that the G C A in the former year influenced 66 per cent of the agricultural population, and in the latter year only 59 per cent of the same population. The scatter diagrams (Fig. 6.2 and 6.3) also establish this finding.



It is, therefore, established that inspite of the increase in N S A, the level of influence of the total arable land has decreased which indicates that only physical increase in the land area is not enough to satisfy the population depending on it, but the level of productivity should also be increased.

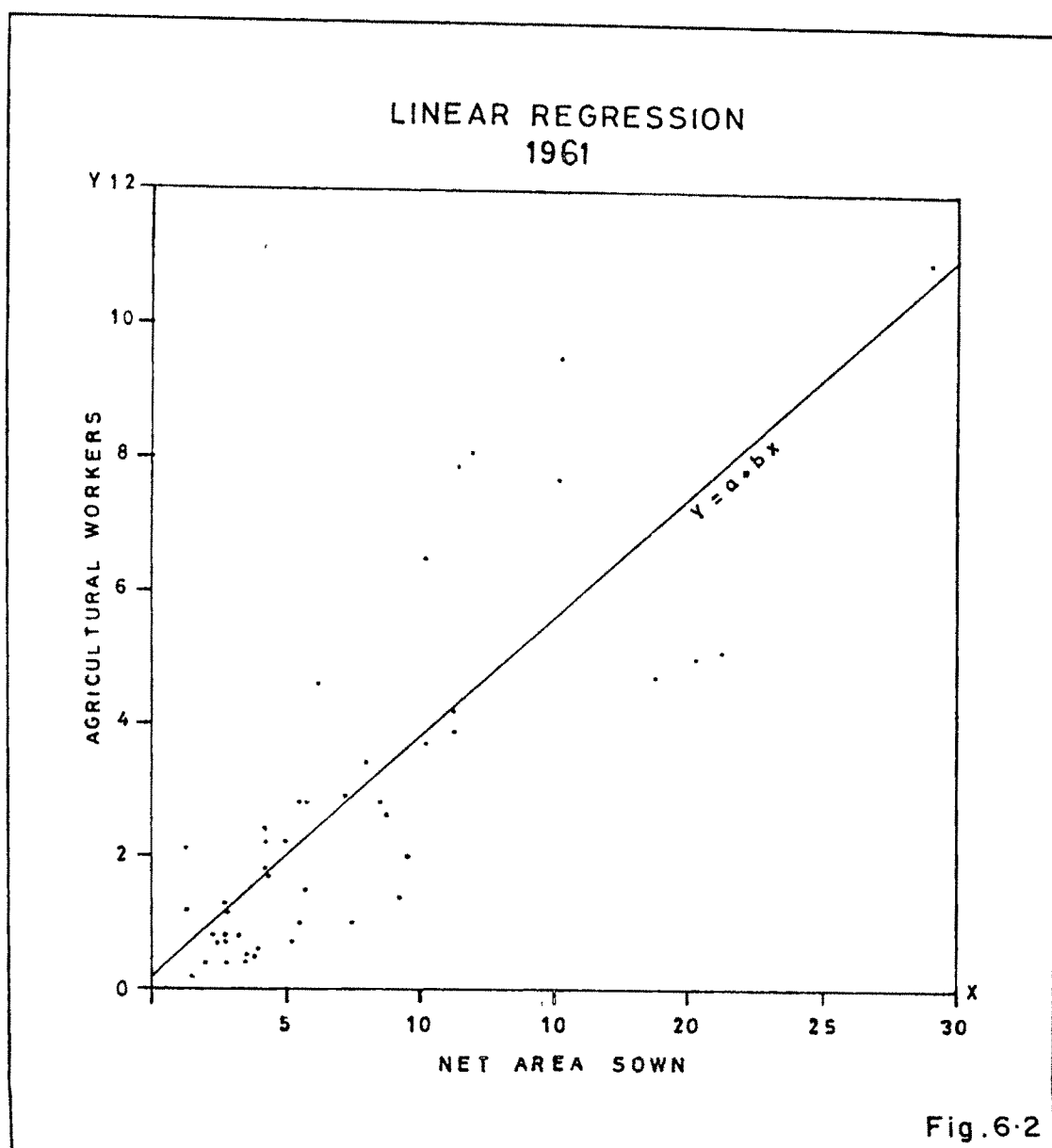
(iii) Total Population and G.C.A:

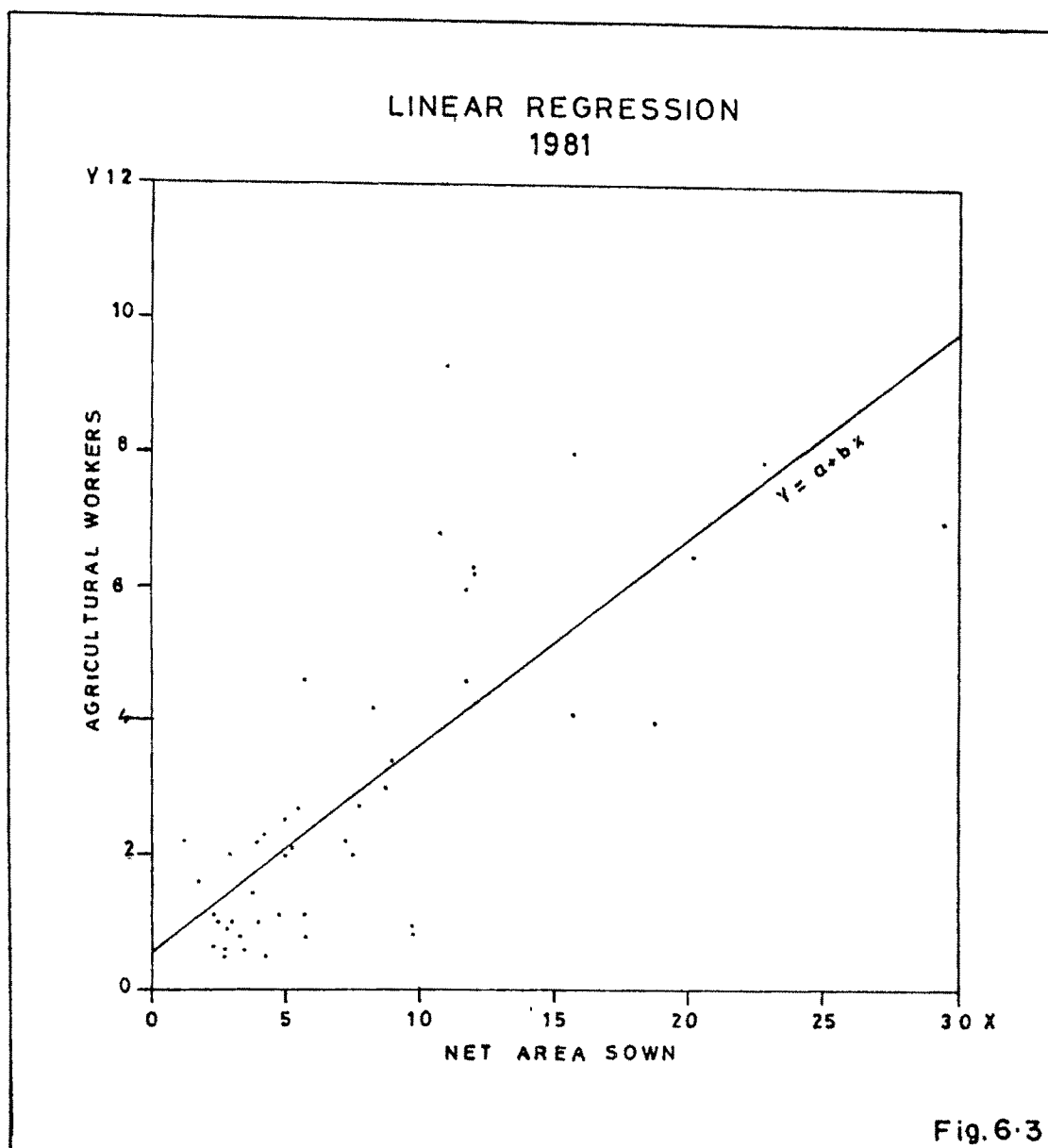
A view over the cropland statistics gives the idea that of the forty six villages, thirty nine (85%) show increase in N S A, and only twelve (26.09%) in G C A six villages (13%) show decrease in NSA, while eleven villages (23.91%) show it in their G C A, one village, Chandpur-Marva did not change its N S A, but showed a negative change by 0.01 per cent in its G C A. Increase in N S A ranges between 0.01 and 31.26 per cent, and in G C A between 0.02 and 4.11 per cent. The population increased in all but one village (Panchpipla). Even if the increase in N S A be attributed to increase in population, it does not coincide in all the cases, as the six villages showing decrease in N S A and also in G C A show increase in their population between 39 per cent and 60 per cent except in Panchpipla where it decreased by 15 per cent. In this connection, the routine practice of fallowing should not be ignored, as these six villages show the fallowing in 1979-80, between 0.27 per cent in Thanava and 4.57 per cent in Asarsa. Thus, the ever changing phase of cropland use and also the general land use takes shape as strongly by no other element as the ever changing (positively or negatively) phenomenon of population. A major role in this regard is played by the decision making attitude of the local inhabitants, and planned developmental programmes of the Government.

An attempt is made to examine any correlation between the total population and the G.C.A. for both points of time to test the hypothesis, higher the population density, larger the cropping intensity (Area under G.C.A.). The correlation co-efficient

are, :

$$\begin{array}{lcl}
 1950-60 & r = 0.95 \text{ (95\%)} & ) \\
 1979-80 & r = 0.88 \text{ (88\%)} & )
 \end{array}
 \quad ( \quad r = \frac{\sum xy - (\sum x)(\sum y)/N}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{N}} \sqrt{\sum y^2 - \frac{(\sum y)^2}{N}}}$$





This proves the hypothesis that higher population density leads to higher cropping intensity. Both values show very highly significant correlation. But, the former year's value is higher by 07 per cent than the latter which indicates that the farm dominated society of the rural areas is gradually being less influenced by the farm economy. Coincidentally the same percentage difference in the level of influence is seen as that of the agricultural work force and the G C A. This shows a shift of a portion of the population to non-agricultural pursuits which is a healthy sign of development.

### 5.3.2 Yield:

It is a variable phenomenon varying with the agro-climatic circumstances. Among the different crops cultivated in the area, the yield data of only four - cotton, wheat, jowar and bajri - could be procured. Table 6.6 gives the yield of the four crops at both points of time:

Table - 6.6

Year	Average Yield Per Unit Area (in kg)			
	Cotton	Wheat	Jowar	Bajri
1959-60	72.00	213.00	79.00	98.00
1979-80	202.00	176.00	186.00	197.00

Source: Records of Mamlatdar Office, Jambusar.

In 1959-60, cotton gave the lowest per ha. yield and wheat gave the highest, as at that time Desi strain of cotton giving low yield and the 'Daud Khani' strain of wheat giving good yield under dry conditions, were grown. The cotton held 48 per cent and wheat only 30 per cent of the total G C A. By 1979-80, various experiments on hybridization of cotton yielded the 14/69 Gujarat Cotton and Gujarat-11 strains proving most suitable to the conditions of the area. They gave the highest average yield (202 kg/ha) and also occupied the largest share of G C A (74%), while wheat yield decreased due to hybrid seeds requiring more water and fertilizer which

could not be supplied due to natural constraints. Thus, the area under wheat dropped from 30 to 10 per cent. The yield of jowar and bajri also increased due to the hybrid seeds suited to the conditions of the area. The yield is itself a dependant factor, may, however, be taken to be influencing the cropland use.

### 5.3.3 Prices:

Prices deeply affect the selectivity of the crops. Better reward of labour is the natural desire of all workers. Prices may be taken to be highly influential in changing the cropping pattern of any area, so has been the case in the study area. The ever increasing price line, and also the average per hectare yield made cotton the most popular crop. Table 6.7 shows the correlation between the prices and hectareage of selected crops grown in the area.

Prices of cotton show an ever increasing trend and so is the area under it, except in 1974-75 - the year of very scanty rainfall (257 mm), when cotton's G C A share dropped to an all time low (33%) while prices soared even higher, again its G.C.A. share ascended to the highest of all these years along with the rising prices- (Fig 6.4 a & b) - wheat prices and area show almost an inverse relation, where the prices maintained the increasing trend till 1974-75, the wheat areas decreased except that it went up by only two per cent in 1974-75, and maintained the same in 1979-80, but the prices dropped (Fig. 6.4 b). In case of jowar, like wheat, the prices were increasing till 1974-75, but its area showed ups and downs. However, in 1974-75, it went up to probably all time high. In the next year both its prices and area dropped. Bajri had still a poor relation. It probably was least affected by the prices, as it didnot pace well in area with its rising prices, and so is the case of oilseeds. The prices of pulses and their area seem to show an inverse relation, when the prices are low, the area is high, and when the prices are high, the area is low, and stagnancy is seen in both of them together.

This review suggests that other things being equal, the rising prices largely influence value based and market oriented crops. The farmers base their decision for preferences on the price

Table 6.7

## Prices and Percentage Area Under Selected Crops

Year	Cotton		Wheat		Jowar		Bajri		Oilseeds		Pulses	
	P.	%A	P.	%A	P.	%A	P.	%A	P.	%A	P.	%A
1959-60	124	48	57	30	55	7.00	45	1.66	46	0.59	77	3.00
1964-65	140	65	75	18	63	5.00	80	1.87	145	0.99	85	2.00
1969-70	223	72	97	8	88	6.00	81	4.00	140	2.19	85	1.00
*1974-75	359	33	165	10	170	33	152	243	280	3.02	215	1.00
1979-80	414	74	147	10	120	5.00	114	1.87	340	1.79	281	2.00

\*Scanty rainfall year.

Source: (1) Prices: (P) Office of the Deputy Director, Agriculture Sahejanand College, Campus, Ahmedabad.

(2) Area(A): T.D.O. &amp; Mamlatdar Office, Jambusar.

# Percentage Area & Prices of Selected Crops BARA TRACT, JAMBUSAR

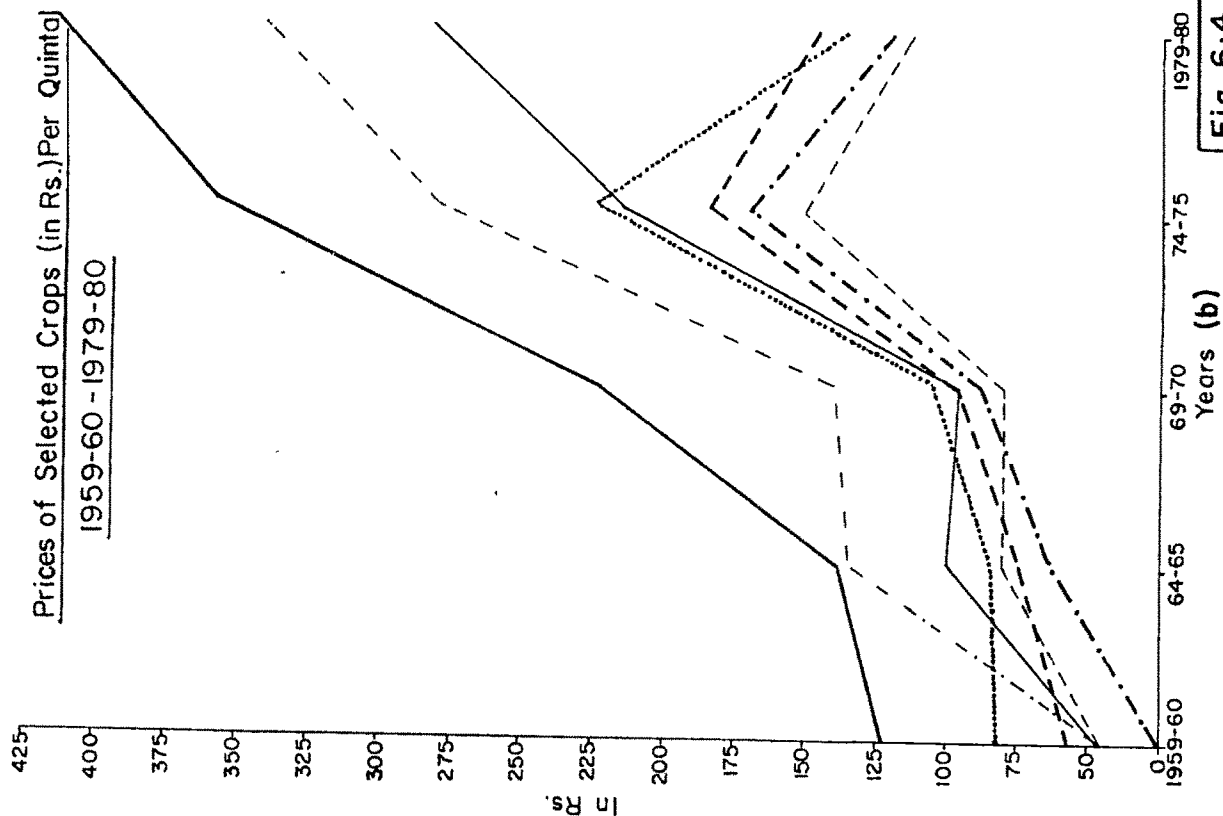
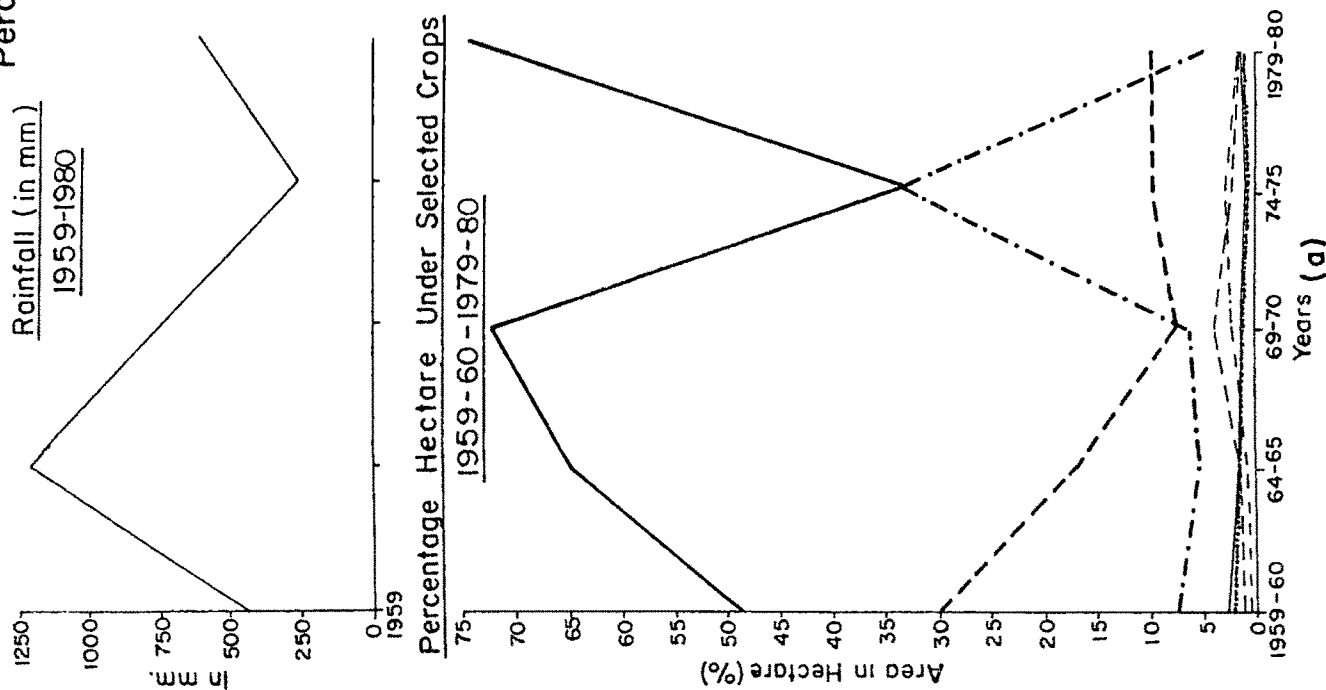


Fig. 6.4

# Rainfall=Cultivation Relationship in Villages

## BARA TRACT, JAMBUSAR

### INDEX

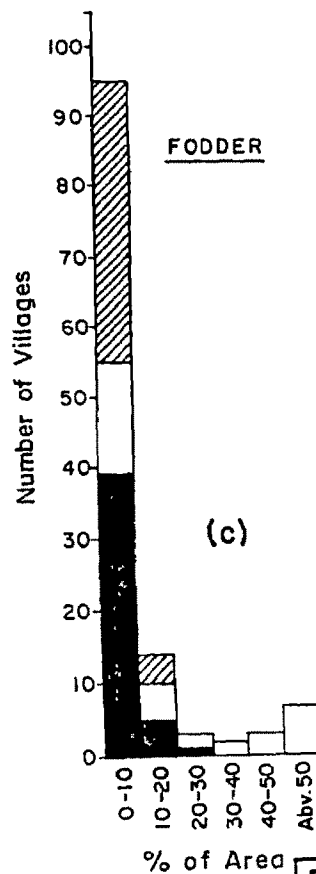
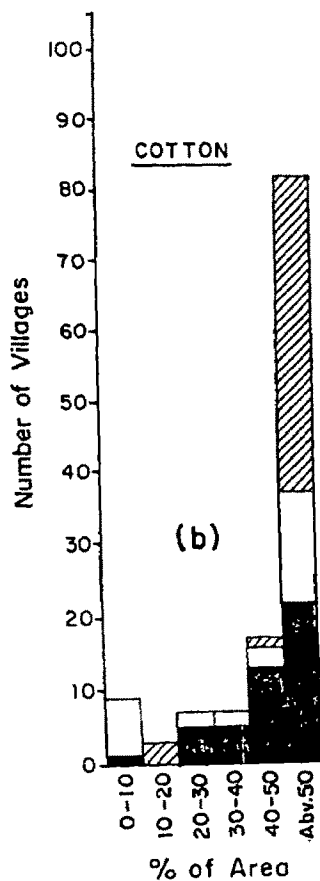
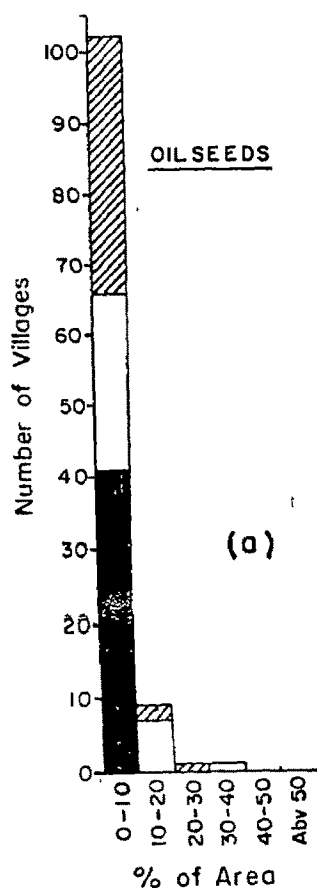
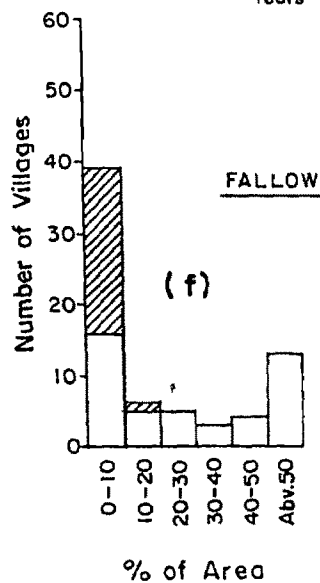
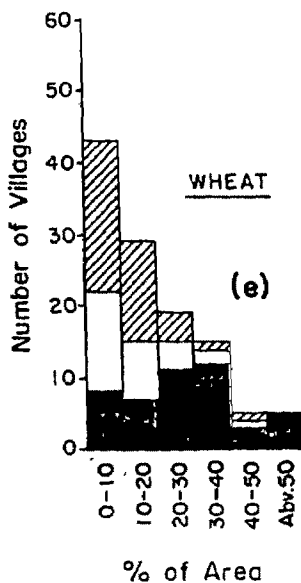
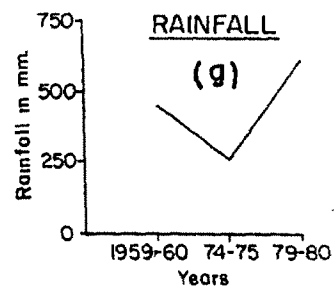
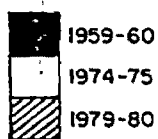


Fig. 6.5



trends and accordingly give priority to the crops. Since cotton has been the all time principal crop of this area, with the increasing demand of cotton in the markets of home as well as abroad, its prices have showed a regular ascent, and so its hectareage except in 1974-75, made continuous swell in the area under cotton alongwith its ever soaring prices led to a shrink in areas under other crops, thus pushing up their prices, sometimes, according to the law of supply and demand.

It may thus be concluded that ever rising prices of cotton have played the role of a catalyst of change in the cropping pattern of the area during the period of study.

#### 6.4 TECHNICAL INNOVATIONS:

The scientific and technological developments have so widely been diffused that not a single land use type seems to have remained unaffected.. The mechanical devices, the H.Y.V. the chemical fertilizers, etc., have in varying measures changed the agricultural milieu. However, disparity in their diffusion cannot be ruled out. The study area is one of those where, due to the physico-economic conditions, the innovations could not be widely adopted, where a few (app. one per cent) farmers could manage to have tractors, the rest of the agricultural community works with the old and traditional means viz. wooden ploughs, 'Karabs', 'Karabdi', 'Patla', etc. New iron ploughs are now getting popular.

##### 6.4.1 Tractors:

Tractors are used by the affluent farmers. During the later half of the study period, there were 21 tractors in thirteen villages. This development could influence only 28 per cent of the village computed ratio comes to 1:2.19 But the ratio of the beneficiary villages and tractor is 1:1.61. The tractor and total G C A ratio comes to 1:1688.52 (1979-80). However, the use and benefit of tractors is found mostly confined to those villages which have them.

##### 6.4.2 H.Y.V.

A shift from the traditional varieties of seeds to H.Y.Vs. is commonly found in all the villages. Even prior to 1959-60,

the hybrid seeds of cotton have been widely used. From Vijay strain to Digvijay, from Digvijay to various hybrid strain viz. Desi hybrid 7, Gujarat hybrid 13 Gujarat 14-49, hybrid 4, 6, Valaraxmi and Gujarat 11 are the strains adopted from time to time. But of all of them Gujarat 14-49 and Gujarat-11 have been found most adapted to the edaphic and climatic conditions of the area, they give, other things being equal, an out turn of 500 to 600 kg or more per ha.

In case of wheat, the former Daudkhani, and later the Mexican wheat were replaced by the hybrid varieties of Arnej, Gujarat wheat-1, Gujarat wheat-89 (G.W1. and G.W.89 and also G.W.120). Since these varieties need ample water and fertilizer, the late October rain of around 2 to 3 inches (50-75 mm) may assure a good harvest. The uncertainty of rains, have been a major reason for the lesser cultivation of wheat, wheat had been the second most important crop. The change from Daudkhani probably, brought its decline, and it was reduced from occupying 30 per cent of the G.C.A. to only 10 per cent.

The hybrid jowar seeds introduced in this area are C.S.H.5 and 6 'booth perio' etc. If rains favour, and required amount of manures and chemical fertilizers are supplied, these strains give a high yield between 2000-2500 kg. per ha. But under the conditions of the study area its average yield ranged between 450 to 500 kg per hectare.

The hybrid varieties of tur (pigeon pea - *cajanus Indicus*) are T. 15-15, B.D.2, Pusa Ageti. The first two are late maturing and the last one is early maturing variety. Their estimated yield is 1200-1500 kg/ha, but seldom it is obtained. However, under the prevailing conditions of the area they hardly touch the mark of 400-500 kg/ha, if not infested by the pests.

The hybrid sesamum (til) though not very popular in this area can give 600-700 kg/ha, it could not gain much favour in the triangular competition between itself, cotton, and wheat.

In comparison to other small crops, the hybrid bajri could gain some favour due to its high yield. If prescribed amount of manure, chemical fertilizers, and water are applied, it gives 300-400 kg/acre (15-20 desi maunds) i.e. (800-1000 kg/ha.). But this benefit has been enjoyed by a few industrious farmers. The general average yield remains around 500 kg/ha. which is almost double that of the previous point of time. It is probably the quality of its high yield that bajri could gain 0.21 per cent more area, and one more village over the figures of the previous point of time. But its over all impact is sheer incognisable on the cropping pattern of the area.

## 6.5 POLITICAL:

### 6.5.1 Government Policies and Programmes:

Recognising the importance of agriculture as a vital sector of economy large scale efforts, both by central and State Governments, have been made since the inception of planning for development in the country.

Gujarat as a separate state did not exist during first plan and around more than half of the second plan period. The approach adopted in the first phase of agricultural development (1951-1959) can be regarded as general and broad based. (Pathak, Desai and Patel, 1979 p.217). The important programmes implemented during this period included the Grow More Food Campaign and the Community Development and Extension Programmes. These programmes covered a wide range of activities such as minor irrigation, land development and soil conservation along with improvement in agricultural practices and improved modern inputs. Of them the land development programme was implemented in the area, but could materialize only after the formation of Gujarat as a separate state.

The general policy frame work for the development of agriculture in Gujarat broadly corresponded to the general pattern for the country. The basic objectives of the various plan documents of the state were:

- (1) To evolve an institutional frame work which may be more responsive to the developmental needs of the state;
- (2) To make provisions for the necessary social and economic overheads which constitute the core foundation for any developmental effort.
- (3) To direct public and private resources for development of agriculture.
- (4) To evolve and to introduce measures for improved agricultural practices.
- (5) To change the basic attitudes and values of the people so as to bring about a change in their traditional outlook. Besides these objectives, the documents of the state plan including the perspective plan (1974-84) emphasised certain specific objectives:
  - (a) Achievement of self reliance in food grains;
  - (b) Attaining greater importance in commercial crops;
  - (c) Development of sources of minor irrigation, and other irrigation facilities.
  - (d) Evolving suitable dry farming technologies, and systematic programmes for the development of drought prone area (Fifth Plan);
  - (e) Implementing suitable integrated command area development programmes for medium and major irrigation projects.

Efforts were made to implement these programmes in each agricultural zone of the state. However, the study area could not enjoy the benefits of each developmental programme. The basic objectives seem to have been achieved but of the specific objectives, the stress, at the first point of time was laid on a, b and d, objectives, c and e were out of its precincts, as the minor irrigation or integrated command area development have yet to be materialized. By the second point of time b and d were highly stressed upon, where the commercial crop - cotton - attained all time higher percentage of the G C A and the dry farming technologies have

been implemented to achieve greater success out of the given potential of the agricultural productivity of the area. The H.Y.V. seeds, the improved techniques, and improved implements have been introduced. Along with it, the policy of industrial development, and increased demand of cotton in the international market, and the accelerated trade incentives laid great stress on cotton cultivation. Thus, the government policies and the programmes may be one of the catalysts of change in the general and cropland use system of the area.

#### 5.6 CONCLUSION:

What emerges from this discussion is that the hybrid seeds, besides cotton, could not achieve desired response in this area even though they contain the quality of attractive yield. It is only cotton which relegated all crops sharing 51.50 per cent of the G C A at their former point of time to share only in 25.98 per cent at the latter point of time. Thus, it swayed over almost two-third of the total cropped area in 1979-80. Its percentage ranged between the lowest 19.87 and the highest 93.36 in various villages of the area.

In spite of the fact that hybrids and H.Y.Vs. have been developed to suit the situations of dry farming, they, however, need relatively higher intake of fertilizers and water for a better yield. Absolute dependence on rains seldom allows the use of desired amount of chemical fertilizers. Under the expected rain conditions or the accumulated water in the embanked fields the chemical fertilizers are used, but the amount rarely exceeds 40 kg/ha. The adverse effect of their use, as felt by the farmer is that they increase the salinity of the top soil. The popular fertilizing materials of the area are compost and the green manures. About 15 cartload (one cartload is approx. one ton), of the manures is needed to refertilize one acre of land. This may be the reason why other hybrid seeds could get little response, and even wheat - the second most important crop, descended from 30.14 per cent of G C A in 1959-60 to 10.26 per cent in 1979-80. Thus, two

distinct aspects of agriculture of the area have emerged over the two decades, one is the specialization in commercial crop (cotton), the other is generalization in subsistence crops (jowar, wheat, etc.). It very clearly proves that agriculture is governed by the laws of supply and demand (Ilbery, 1985 p.100). Thus, cotton went up from 48 per cent in 1959-60 to 74 per cent in 1979-80, while wheat descended much below from 30.14 per cent to 10.26 per cent during the same points of time.

Various factors have by now, been discussed, and as such each of them are seen to have played their part in the dynamics of general and cropland uses. It is now attempted to assess as to which of them has played the dominant role as a catalyst.

It is very well admitted that population is the most significant factor which is itself changeable and accordingly changes its environment. Both general and cropland uses owe their significance to it, and their changes depend on the decision making aptitude of the people.

The changes in the physical landscape of the area i.e. the reclamation of the kharland, the construction of the check dam along the gulf coast and the creeks to check the tidal ingress, the construction of the artificial drains to drain off the water-logged depressions, mostly in the central and southern parts of the area, the road development, the conversion of non-arable and arable wasteland to arable land, and many more, are the outcome of the decisions and actions of man. However, the variety of change depends on the variety of environment, and accordingly the general land use changes of different type and scale have, in the wake of growing population, become the global phenomenon. In this regard, the role of policy and planning of the government and their subsidiary machineries should be assigned its due place. The arrangement, re-arrangement, the change of functions of land, and many others are the functions of man and his decisions. Thus population as a whole, in its hierarchical strata, is the most effective catalyst of change in land use systems.

In case of the cropland use, the change has been found to be the influence of composite factors. The human element is above all, associated with the probabilities and risks in the priorities to crops and their hectareage "The probabilities are associated not with the risks but conditions of uncertainty, which may relate to a host of variables ranging from weather patterns to market prices". (Ilbery, 1985 p.47). In the light of the Game's Theoretic Model, a farmer chooses the strategies under the uncertainties, with the intention to have the best of the worst. This is what we observe from the area that with the passage of time, 1959-60 to 1979-80, the supremacy of cotton remained unchallenged under favourable environment, but in 1974, it was temporarily dethroned by Jowar, and again it regained its status, much above the other preceding years.

Thus, change in rainfall do influence the decision making, and selection of strategies. But in normal conditions a host of other factors cast a combined influence in the dynamics of cropland use.

If we have a glance over the past, some rational clues of this issue may be had. In pre and post 1959-60, the country was facing an acute crisis of food, due to the rapid growth of population and the sluggish growth of agriculture. By policy, and through five year plans, all regions of the country had to grow more food crops (under Grow More Food Drive). Thus, the ratio between the food and non-food crops was approximately 3:4 and food crops and cotton was 7:8. But in 1979-80, the ratio drastically changed to 2:9 in the former and 2:8 in the later case. Thus, beyond 1960, the spurt of industrial growth in Gujarat, the increasing demand for cotton in home and foreign markets and the ever rising prices seem to have deeply influenced the decision making and risk taking aptitude of the farmers. As a result a cotton dominated cropping pattern swayed the agricultural landscape of the area. Another significant factor in favour of Jambusar cotton was the dwindling cotton cultivation of Amod - the adjoining Taluka where its hectareage dropped from 66 per cent in 1955-56 to 37 per cent in 1979-80, due to uncontrolled biotic menace. Amod

was also a cotton dominated taluka of Bharuch District, and Sarbhan village was the outstanding cultivator of cotton, using all innovations in its cultivation. Around 1975-76, the menace of different kinds of pests and diseases attacked their cotton crop. Since then it became an incessant malady for the Amod cotton which led to a drastic decrease in its cultivation.

To conclude, it is established that the changes in general land use have taken place by the rational and value based planning of the administrative organizers such as the State Government, the Taluka Panchayat, and the Kharland Board. In all these agencies the decision making is highly influenced by the concept of the economic gains. Thus, the human element is the super-most catalyst of change in the dynamics of general land use.

In the cropland use, the geoeconomic determinism and at times the socio-personal determinism along with various changing situations, and innovations, seem to have influenced the selection of crops and the hectareage devoted to them. It has been observed that the changing situations of the physical environment i.e. rainfall, very adversely affected the cropping in 1974-75, but the people of the area, however, managed to use their cropland between zero to 70 per cent or more. This enterprizing and the risk taking attribute as highlighted by the "Game's Theory", is seen only in the human element. It is the interaction of physical and human factors that determines the pattern of agricultural land use in the changing circumstances. Thus, the varying factors discussed above viz., the innovations, the market price etc., are the supportive factors to the decision making for the cropland use. The economic determinism, however, cannot be ignored.

Thus, man himself, above all, is most dominant catalyst of change in the patterns of general and cropland use.