II.A. Conceptual Framework

This study aims to examine the extent to which the agro based industries help in developing a region. This is done with reference to various objectives laid down in the plans for the development of agro based industries. This study attempts to examine various economic aspects of agro based industries in Saurashtra region over a period of time (1970-71, 1990-91). The study also examines the socio-economic aspects of the region at macro and micro levels before and after the development of ABI.

The development of the region and special planning techniques are studied both form quantitatitive and qualitative aspects at regional (macro level by district) sub regional (meso level by taluka) and village level (micro level by households). A number of methods like, statistical, tabular and cartographic techniques along with graphical representation of data are used to analyze the subject matter. The salient feature of the study is that in the case of cartographic techniques, both conventional and modern automated methods are used to depict spatial phenomena through maps.
II.B. Methodology adopted in the Study

1. Cartographic technique, bar diagram, graphical presentation and tabular methods are used to show the factors that are related to the spatial distribution of ABI at taluka and village level.

Pie diagrams are used to show the pattern of distribution of population, occupation pattern, industries under different categories over two decades at the regional level, landuse and cropping pattern along with agro based and non agro based industries at regional level as well as at the taluka and village level.

2. Statistical techniques like correlation and chi square testing, also have been used to test a number of hypotheses.

3. Cartographic techniques are used to depict the landuse pattern, land holding, cropping pattern, and yield per hectare, industrial distribution, employment pattern, and socio-economic and demographic factors for different periods of time.

II.A.1.1. Specific Methodology Adopted

II.A.1.1.a. Industrial Location Quotient

A regional development is often associated with the change in the industrial structure. To know how the taluka performs in comparison to the region economy. Location
analysis is used to answer important questions related to a taluka industrial structure. Such as, is the industrial structure is specialised or diversified enough. The value of location quotient indicates the degree of relative concentration of an industry in the taluka. If the value of the location quotient is less than one the region's share in the particular industry is less than 'fair'. If it is more than one, the share of the region has more than the proportionate share. If the value of location quotient is 'one', it indicates that workers employed in that industry in the taluka are equal to relative to that of the district. Location quotient is one of such technique, which can demonstrate a taluka share of employment in a particular industry.

$$L.Q = \frac{E_{ij} / E_j}{E_i / E}$$

Where, $E_{ij}$ = employment in the $i$ th industry in $j$ taluka
$E_j$ = employment in all industry in $j$ taluka
$E_i$ = employment in $i$ th industry in the region
$E$ = employment in all industry
If $L.Q > 1$, the concentration of an industry in a taluka is higher than that in the region, $L.Q = 1$ = same as the region, $L.Q < 1$ = lower than the region.

To know the industrial structure of Saurashtra Region, the location quotient is used which can demonstrate the share of employment in an agro based or non agro based industry at regional or taluka level.
The coefficient of specialization is derived from the location quotient, which can show the degree of concentration of industry in a particular taluka.

II.A.1.1.b. Population Potential Model

The population potential of a village or any centre is a measure of proximity of that village or center to other villages or centres in a region. Potential of any village is an aggregate measure of influence of all other villages as directly proportional to the mass of village and inversely proportional to the distance from other centers.

\[
P_{pi} = \sum_{j=1}^{n} \frac{P_i \cdot P_j}{D_{ij}} \quad \text{(where } j = i \text{)}
\]

Where,

- \( P_{pi} \) = Population potential of center \( i \)
- \( P_i \) = population of centre \( i \)
- \( P_j \) = population of centre \( j \)
- \( D_{ij} \) = distance between \( i \) and \( j \) (half nearest if \( i = j \))

In other words, it measures the potentiality of a center to grow due to presence of other centers around it, which provides the basis of socio-economic interactions. This exercise has been used in a dynamic way by changing the data to analyse the changes of population potential surface over a period of time 1971 and 1991 with the help of computer mapping. The whole exercise is done with the help of computer where X and Y co-ordinates for each taluka head quarter and the population of 1971 and 1991 of the...
corresponding taluka head quarter are entered in the computer and the potential of each taluka is calculated with the formula.

High population potential values indicate that centers are large in size, closely spaced and more developed, whereas low potential values indicate that centers are small in size and sparsely spaced and are less developed.

II.A.1.1.C. Infrastructural Facility Index (IFI)

The Infrastructural Facility Index, a partial indicator of development potential, is calculated with the help of a weightage given to major six infrastructural facilities of each taluka. The functional importance of any facility is limited by the existing number and distribution of function. The hierarchical level of functional importance has been given on the basis of total functional score and individual taluka. Thus center with less number of high order functions have been given more importance than the centers with large number of lower order functions. The amenities data provided by the Census Handbook of 1971, and 1991 are used to find out the Infrastructural Facilities Index of each taluka to make a comparative study over time (1971-1991) and space. The weightage for each function is calculated with the availability of functions in 1991 and the mean weightage is used for 1991 and 1971, to standardize the values for comparison over time. The functional weightage is calculated by the scarcity method, which is as follows
\[ \frac{N}{FW} = \frac{F}{N} \]

Where,

- \( FW = \) Functional weightage
- \( N = \) Number of taluka in the region
- \( F = \) Function available in the taluka (No of talukas)

The following are the main facilities as given the census.

<table>
<thead>
<tr>
<th>Education Facilities</th>
<th>Medical Facilities</th>
<th>Drinking Water</th>
<th>Communication Facility</th>
<th>Connectivity</th>
<th>Power Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary school</td>
<td>Hospital</td>
<td>Tap</td>
<td>Post office</td>
<td>Bus stand</td>
<td>Domestic</td>
</tr>
<tr>
<td>Secondary school</td>
<td>Health center</td>
<td>Well</td>
<td>Post and Telegraph</td>
<td>Railway station</td>
<td>Agriculture</td>
</tr>
<tr>
<td>College</td>
<td>Maternity Home</td>
<td>Tank</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other institutions</td>
<td>Child Welfare center</td>
<td>Tube well</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Despancery</td>
<td>River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family Welfare center</td>
<td>Cannal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Census of India

The census handbooks have provided six types of basic infrastructure functions as educational, medical, drinking water, post and telegraph, transport and communication and power facilities. Each index shows the functionality of each amenity separately to
know the development of each sector over time. Three choropleth maps are prepared to see the functionality of each taluka over time and the space. The weightage by scarcity method for five categories of amenities with their availability for two decades are given in the Appendix No. II. 5 to see the change in the availability of amenities over the decades (1971-1991).

II.B.1.2. Development Indices

II.B.1.2.a Agricultural Development Index (ADI)

Agricultural development of any taluka or village depends on various factors, which are directly related to agriculture. These factors could be termed as indicators of the agricultural development and have been used to determine the backwardness or development of each taluka. Since the economic activities of Indian villages depend on agriculture to a great extent the agricultural development index plays a vital role. The indicators considered are the percentage of cultivated land, irrigated land, cultivators, agricultural workers to total workers, are yield per hectare. All these indicators are related to agricultural activities. The same method is followed for TDI to get weightage for each taluka ranging from high to low for 1991 and is depicted through chloropleth map. The score 5 is given to higher value and score 1 is given to the talukas with the lower values.
II.B.1.2.b. Demographic Index (DI)

Demographic Index is one of the important indices as it influences a taluka in a distinct way. The factors considered here directly influence the demographic pattern. The density of population and population potential, sex ratio, dependency ratio and percentage of SC/ST population, growth rate and age group of 0-6 highlight composition of population. Considering the above factors, weightage for each indicator and cumulative value for each taluka is calculated ranging from 1 to 5. It is represented through a choropleth map with five categories to show the spatial pattern for 1991.

II.B.1.2.c. Occupation Index (OI)

The occupational structure reflects the economic characteristics of any region or taluka in terms of the type of work, level and skill of workers, nature of work and the pattern of distribution of different activities. In the district census hand books occupation is divided into nine categories ranging from I to IX, which are broadly classified into primary, secondary and tertiary activities. In almost all the talukas major participation is in the categories of cultivators and agricultural workers, which are indicator I and II respectively. In this study, people are engaged in activities like mining and quarrying (indicator IV), construction (indicator VI) transport and communication (indicator VIII) are negligible. For all the indicators the percentage of the total workers are found out for each taluka and with the help of computer software the mean (average) and the standard deviation for each indicator is calculated. All the talukas are divided into five categories. The talukas are divided into v.high, high, medium, low and very low with
1/2 standard deviation. The calculation is done for 1971 and 1991 to see the change on the occupation structure over time and space.

II.B.1.2.d. Integrated Development Potential Model (IDPM)

A composite development potential is computed for each taluka, to know its potentiality for development in physical, demographic and socio-economic aspects. In the case of physical factors, rainfall is taken as an important factor. The total weightage for each taluka is obtained by superimposition of the taluka map with appropriate weightage. Six types of basic infrastructural functions are educational, medical, drinking water, post and telegraph, transport, communication and power facilities. Population potentiality, density of population and percentage of literates are taken as main demographic factors while percentage of industrial workers, number of industries, yield per hectare, as economic factors. In the case of land use pattern, percentage of irrigated land to agricultural land and culturable waste are considered.

Each variable is classified into five classes and weightage are given from 1 to 5 lower value is given as 1 to poor category and higher value of 5 is given for the first category. A total composite weightage is calculated for each taluka by adding the individual weightages and is plotted in a map to see the spatial pattern.
II.C Formation of Hypothesis and Hypothesis Testing Methods

In order to understand the impact of agro based industries on regional development in the Saurashtra region of Gujarat, the following hypothesis are formed keeping the objective into consideration. These hypothesis are tested statistically, graphically and cartographically.

Hypothesis-1

There is a spatial variation of distribution in ABI and employment within the region of Saurashtra. This hypothesis has been tested in the following manner.

1. The uneven distribution of ABI and employment among the districts have been tested by chi-square test as $X^2 = \sum (O-E)^2 / E$

2. Location quotient are also worked out to study the dispersion of ABI in Saurashtra along with this coefficient of localization is also done.

3. For analysis the growth, distribution, concentration of ABI and employment in Saurashtra and their district wise distribution, through graphical method, are used.

Hypothesis-2

There has been a change in the number of units and of workers over period of time in ABI.
1. To know whether ABI are developing or declining in number, a chi square test has been done.

2. Coefficient of correlation ($r$) between number of industries and number of employment was calculated.

**Hypothesis-3**

Locational aspects, such as, availability of raw material, nearness to the market, availability of transportation facilities etc., are some of the major factors for the growth of ABI.

1. A graphical method and statistical diagrams are prepared which show the structure of the region for locational aspects.

2. To know the locational aspects of ABI, a chi-square test has been done, along with correlation coefficient analysis.

**Hypothesis-4**

1. The Agro-based industries show more of backward than of forward linkages.

To know the linkages of agro based industries and to know development of agro industries on forward and backward linkages, coefficient of correlation have been done with employment, raw material, network density, market with ABI.
Hypothesis-5

The Regional differences in the socio economic development are related to agro based industries.

The regression analysis is calculated between the development potentialities by taluka with agro based industry by taluka. Coefficient of correlation analysis are done.

1. Distribution of population by size, area, density, growth rate and composition of population has been done. Test for demographic index, statistical diagrams and graphical methods have been used.

2. The infrastructure facility index (IFI) is used to know the correlation of ABI and development pattern.

II.D. Sampling Technique

The study area, known as Saurashtra region excluding Kutchchh covers 6 districts and 69 talukas of Surendranagar, Bhavnagar, Amreli, Rajkot, Jamnagar and Junagadh district. They are surrounded in three sides by water and one side with the main land of Gujarat. A sampling technique has been adopted to select the relatively important area of ABI in Saurashtra region of Gujarat in relation to country as a whole.

II.D.1 Selection of District (Macro-Level) and Taluka (Meso Level)

For the selection of the District and talukas, multi stage sampling technique has been considered. Major industries in agro based industries in saurashtra are groundnut,
cotton and sugarcane and their spatial distribution over six districts of Saurashtra region has been taken into account. Firstly, all the three major industries are taken separately and their distribution has been converted into percentage. In the second stage, the highest and the lowest percentage of the 69 talukas has been taken. Then two talukas have been selected on the basis of land use pattern, production, cropping pattern, cultivated area, percentage of irrigated area to total cultivated area, percentage of agricultural labours to total workers in 1991 respectively. Along with this the development of ABI is also taken taluka wise.

According to multi stage sampling technique, six talukas for three major crops are based i.e. Dhoraji and Kotada-Sangani talukas in Rajkot district for groundnut, Lakhtar from Surendranagar district and Botad taluka from Bhavnagar district for cotton, and Kodinar in Junagadh district and Una taluka in Amreli district for sugarcane have been taken. Out of six talukas three talukas are developed i.e. Dhoraji, Botad and Kodinar while the other three talukas are less developed i.e. Kotada Sangani, Lakhtar and Una talukas respectively. It is now proposed to give an idea of each of these industries and their impact on regional development in terms of each of these aspects over a period of time from 1970-71 to 1990-91.

II.D.2 Selection of Village (Micro-Level Study)

In this connection, it is needed to know that the development of ABI depends mostly on regular and adequate supplies of raw materials, and how the agricultural sector should
be able to supply the maximum amount by quality. The selection of villages for micro-level is based on land and its utilization at different points of time, irrigation facility, the size of land holding, population and its occupational distribution, agricultural practices, distribution of ABI etc. This would give the necessary background for the study of different socio-economic aspects and its overall impact on ABI and on the regional development.

According to the same method applied for selection of taluka i.e. multi-stage sampling technique is used for the selection of six villages in three major ABI. In Rajkot district Dhoraji and Kotada Sangani talukas were first selected for the study of groundnut related ABI. Out of Dhoraji, Supeedi village was taken. Botad taluka, Lathided village were selected from Bhavnagar and in Saurashtra district Lakhtar taluka, Adalsar village selected for cotton, while Kodinar taluka, Singhaj village in Amreli district where as selected in Junagarh district, Khapat village of Una taluka for sugarcane crop respectively. In such villages three of the village is developed i.e. Supeedi, Lathided and Singhaj while other three villages are less developed i.e. Kotada-Sangani, Adalsar and Khapat village (Figure No.II.1). This picture of development and how for ABI developed the region and indirectly effects the regional development.
FIGURE NO.II.1

Selection of District, Taluka and Village for Sampling of Field work on the basis of Raw material and ABI

SAURASHTRA REGION

SURENDRANAGAR DISTRICT
  UNDER DEVELOPED TALUKA
    LAKHTAR TALUKA
      ADALSER VILLAGE
        (COTTON)
  DEVELOPED TALUKA
    BOTAD TALUKA
      LATHIDED VILLAGE
        (COTTON)
  DEVELOPED TALUKA
    KODINAR TALUKA
      SINGHAI VILLAGE
        (SUGARCANE)
  DEVELOPED TALUKA
    DHORAGI TALUKA
      SUPEEDI VILLAGE
        (GROUNDNUT)
  UNDER DEVELOPED TALUKA
    KOTADA SANGANI TALUKA
      KOTADA SANGANI VILLAGE
        (GROUNDNUT)
  UNDER DEVELOPED TALUKA
    UNA TALUKA
      KHAPAT VILLAGE
        (SUGARCANE)
  DEVELOPED TALUKA
    RAJKOT DISTRICT
  DEVELOPED TALUKA
    JAMNAGAR DISTRICT
  DEVELOPED TALUKA
    JUNAGARH DISTRICT

Source: Developed by the Author
II.D.3. Selection of Respondent

The study comprises of three groups of respondents. They are:

1. Agriculturists (i.e. cultivators)
2. Workers employed in agro based industries.
3. Agro based industrial entrepreneurs.

The data collected from the first category of respondents represent the villagers who are raw material growers, while the next two categories represent the industrial workers to know the socio-economic status of the employees and the economic standard of living.

The Table No II.1 gives an idea of the selection of respondents for the study. The selection of the respondents in the case of agriculturist, agro based industrial workers 20% systematic random sampling technique has been used. Agro based industrial entrepreneur (i.e. units) is based on the Annual Survey of India and census system as shown in Table No. II.1

In order to collect data from the villages, the households or agriculturists (cultivators) were identified in terms of the large and the small farmers. Stratified, systematic random sampling technique has been used. The selection of respondent among the workers employed in agro based industries has also been done by the systematic random sampling technique depending upon the nature of employment (permanent,
seasonal permanent, seasonal and casual). All industrial units of the selected agro based industrial places have been covered by the study.

TABLE No.II.1
Selection of Village and Respondents from the Villages

<table>
<thead>
<tr>
<th>Name of village</th>
<th>Number of agriculturist</th>
<th>Number of agro based industrial workers</th>
<th>Number of agro based industrial entrepreneur</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large farmer</td>
<td>Small farmer</td>
<td></td>
</tr>
<tr>
<td>Adalsar</td>
<td>20</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Lathidad</td>
<td>20</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Kotada Sangani</td>
<td>20</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Supedi</td>
<td>20</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Singhaj</td>
<td>20</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Khapat</td>
<td>20</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>60</td>
<td>120</td>
</tr>
</tbody>
</table>

Sample size: 180 Agriculturist, 120 Agro industrial workers

22 Number of agro based industries

Source: Primary data collection from villages by the author

II.E. Data Aspect:

II.E.1 Source and Type of Data

The type of analysis which is undertaken in the present study requires the information about employment, capital, output, raw materials, market, network pattern etc., pertaining to agro based industries to analyse the development of agro based industries at taluka level and at village level. The data on above mentioned aspects have been
collected both at the regional level (talukas) and at the micro level (village). The data have been collected in terms of primary as well as secondary type.

I.E.2. Secondary Source of Data

The secondary data published by various government agencies have been used in the study are as follows.

1. The secondary demographic data on decadal change of total population, literate, rural-urban population, numbers and type of occupational category in Saurashtra over time period and area of occupational pattern, amenities by talukas were collected from District Census Handbook of Gujarat.

2. The secondary data like rainfall, irrigation, land use, cropping pattern, land holding, productions per hectare etc was obtained from “Directorate of Agricultural Department” Ahmedabad.

3. The secondary data on industrial projects capital output, employment value added per district fixed capital level was collected from Industries Commissioner’s office, District Industrial Centre, Chief inspector of factories, Bureau of Economic and Statistics (Govt.of Gujarat), Directorate of Gujarat Industrial Development Complex (GIDC), Udhyog Bhavan, Gandhinagar.
4. The secondary data regarding industrial development by taluka have been collected from respective taluka development offices and District Development offices as well as Factory Inspector and Civil Supply Department.

5. The remaining secondary data regarding purpose of analysis was collected from action plan of the State Bank of Saurashtra (Lead bank) and Outline Statistical Information book of respective Zilla Panchyat in Saurashtra region.


II.E.3. Primary Source of Data

Three sets of questionnaire have been prepared for agriculturist and household members and entrepreneur to know the socio-economic aspects and impact of ABI on their life style. The information is not available in published form. So field work was essential to prove hypotheses which are related to objectives of this study. A micro level study is carried out to collect the primary data and know the socio-economic development of village and to know how far the agro based industries have influenced the village or regional development. For this purpose, three different types of questionnaires are prepared of three groups of respondents. (Appendix No. I.2-4 )

Those are as follows:

- 47 -
1. The agriculturists and household members

2. The agro based industrial entrepreneurs and

3. The workers employed in agro based industries.

The data collected from the first category of respondents represent the villages and the next two categories represent the industrial situation. The following are the detailed sections of the questionnaire on agriculturists.

Family information deals with details of family members, according to age, sex, education and employment. Information on land deals with land use, cropping pattern, irrigation availability and production of crops per hectare. Information regarding impact of ABI deals with cropping pattern, use of fertilizer and other technology, irrigation facilities before and after development of agro based industries. Information about consumption pattern like food consumption of the family, types of food were collected to know the impact of agro based industries on their village.

Questionnaire for the industrial unit and their information have been collected from the industrial entrepreneur is as follows. Information regarding factors is related to the location, nature of organisational capacity and investment. Information regarding labour, raw materials, production, marketing, transportation availability, infrastructure...
facilities, and information on water, power, finance, industrial estate, material supply, subsidy, tax, incentives, and market were collected.

Questionnaire on the workers employed in agro based industries, included the information regarding number of year a person is working in the industry, family members, other occupation and their native place etc. Information about migrant, reason for migration, main occupation before ABI and after this what is the next choice. Information on his land, cropping pattern, before and after ABI, assets owned.

II.F Problems of Data

The source of data has a number of short comings. Many times the data on village level is not accurate due to indirect collection and passing from department to department before reaching the final level. The sources of all types of published data are not known, due to which the work is not completed over time. In case of primary data accurate information is given about the expenditure, income, asset of the farmer, land holding, production, consumption etc. In some cases the income is given much lower than that of expenditure. This has been cross checked to get reliable information.

Industrial entrepreneurs are reluctant in disclosing the information. Many of them thought that the interviewer was from some Government department to enquire about their records. With this fear, a majority of entrepreneurs refused to be interviewed.
Those who have given information are not much reliable. So the data could be obtained only through reference of the people. The data collected from the workers employed in agro based industries had the problem because of seasonal nature of job of the selected agro based industries.

The data were to be collected during the season only. Whatever the data is available in the District Industrial Centre or in Factory Inspector Officer Records are average in number (i.e. 7 to 10 employees) but actual number is some what different. Among the employees most of the workers are illiterate and they came for labour work and got minimum wages. The problems were related particularly to occupation, past and present earnings, migration and to assets.

The secondary data collected from different Government departments in which data regarding ABI are not available separately in any department. All the ABI are also not registered at one place. Mostly according to purpose of the Govt. Department data are collected. The data on small scale ABI are available in the DIC. It is also not reliable because to reach the target of that year, they collect data of near by centre or the entrepreneur who wants to take any subsidy or loan. Moreover, they have no accurate information about number of employees working in the factory and other variable such as investment, working capital, along with this capacity of output etc. Not only this, there is no information about lockup or closedown of units by year. The office of the chief inspector of factories, Government of Gujarat, provides data pertaining to
registered factories in the state. The number of factories and the employment therein are the only variables covered by this source. Apart from this, the information regarding number of registration, 20% to 22% of the industries, are registered in both the sector i.e. the small scale industries as well as the factory sector. This is because the factory sector is only related with total number of employees more than hundred. Hence only factory sector data and department of the industries are the two major sources of the present analysis and the Civil Supply Department, the Department of Industries, District Industrial Center are the other source of the present analysis which has been considered to be more appropriate.