CHAPTER - I
INTRODUCTION AND RESEARCH DESIGN

The liberalization was adopted by India in 1991. Due to severe economic crisis, India had approached IMF for loan and IMF granted the loan with certain conditions, which made India to initiate structural changes in the Indian economy. These changes took place in the form of liberalization, which sought to gradually phase out government control of the market, privatize public sector organizations and to reduce export subsidies and import barriers to enable free trade. However, reforms in the agricultural sector, in particular, came under severe criticism in the late 1990’s, when farmers in the south Indian state of Andhra Pradesh committed suicide in large number.

The annual compound growth rate saw a sharp drop in agricultural area indicating the growth from 4.69 per cent in 1996 to 2.06 per cent 1997 and 1.1 per cent in 2005. Cropping pattern means the proportion of area under various crops at a point of time\(^1\). The present pattern of cropping patterns has been evolved by farmers after centuries of experience, but from the national point of view, it is not essentially the most systematic use of land. In India, cropping patterns were traditionally based on the principles of self-sufficiency in all communication in a village, when the means of communication were very poor and dependence on marketing agencies was very much limited. It had to change with the improvement in technology and economic factors. It can be noted that sugar and cotton average shrinks, when the prices are favourable for grain crops and vice versa. Cropping pattern means both the time and space sequence of crops. It includes the identification of the most efficient crops of the region, which is

considered a homogeneous soil and climate belt: the rotation in which the crops fit and the intensity of cropping. This study deals with growth and trends in cropping pattern changes and productivity with reference to Sivagangai District, Tamil Nadu, and India. Before making an empirical analysis, there is need to assess the factors affecting cropping pattern in India, role of irrigation to cropping pattern and regional variation in cropping pattern.

The cropping pattern has changed with the Five Year Plans in India. The factors that influence the cropping pattern in any particular region are many, but the farmers in India have made adjustment to the twin developments. They are the intensification of irrigation and the marketing facilities and price support policy in the irrigated area along with the improved methods of dry farming and drought resistant High Yield Variety (HYV) of seeds in the rain-fed areas. During the Plan periods, agricultural potential has been properly put into use with the application of new technology of production. Demand for a wide range of produce, supported by subsidies and prices have encouraged diverse and flexible farm economy and the adoption of successful new practices.

In general, the normal cropping pattern may be disturbed as to the consequences of climate changes. Rainfall induces changes in cropping pattern and it is local and transient in nature. Irrigation changes the cropping pattern in India. It could be noted that an area, which was cultivated with un irrigated millets before irrigation, was covered under paddy after provision of irrigation. The consideration influencing the cropping pattern at the micro-level can be taken to be related to soil, climate variations,

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development of markets and transport and supply situation. At micro-level, the important considerations are farm size, tenancy, irrigation, net return on crops and certain other considerations like food habits. It is also observed that the food and fodder requirements of the farmers introduce rigidity in the cropping pattern by fixing a limit in the area that can be spared for the economic crops. These have a considerable hold on cropping pattern, because of the small size of the holdings over greater parts of India.

A survey on the various changes in the percentage undertaken for individual crops reveals that there has been a notable shift from inferior to superior food grains and fibers from less remunerative to more remunerative crops. The important crops, which have shown increase, are wheat, rice, oil seeds, cotton, jute and sugarcane. At the same time, their area coverage and percentage strength are considerable. The modern farmers need cash income in their hands to buy improved implements and articles of convenience. Therefore, their main consideration is the economic gain. The overall shift picture is from inferior cropping to superior cropping. It is from grain to either superior grain or grain fibers or grain to oil seeds. The shift is impressive in Gujarat where cotton and oil seeds are gaining importance. Cotton in North-East Maharashtra and South-West Punjab, oil seeds in the Southern Parts of Telungana, Tamilnadu and Kerala, Sugarcane in Uttar Pradesh Plains and in Hooghly and Assam Valley are progressing strength. The change in cropping pattern has been motivated by extension of irrigation, increase in population, improvement in dry land farming techniques, the tendency of farmers to each cash and technical and organizational changes.

4 Uppal, H.L., “Crop Patterns for the Bakra Canal Area,” Indian Council of Agricultural Research, 1961, pp.41-44.
ROLE OF IRRIGATION IN CROPPING PATTERN

Irrigation plays a significant role in agricultural development. Many research studies have established a favourable impact of irrigation on cropping pattern, generation of additional rural employment and income from agricultural sector. It has been observed that the level of agricultural productivity has improved much, over the plan periods with the expansion of irrigation facilities in the country. However, the productivity of Indian agricultural land is low as compared to the other countries of the world.

The fact is the carrying capacity of land has not been fully utilized. In order to improve, there is necessity of changing and intensifying the cropping pattern with inclusion of high yielding varieties of more profitable crops and applying yield inputs like fertilizers and plant protection measures. But it is not possible to bring about the desired changes in the absence of irrigation facilities.

There is a wide gap between the average yield rates of irrigated areas and unirrigated areas. Irrigated area is the cropped area to which irrigated water has been applied at least once in a season, irrespective of whether the irrigation is adequate, inadequate or in excess of requirement. Irrigated area does thus take into account the depth or the frequency of watering. The importance of irrigation is traced so that it can raise the overall productivity of land in three ways viz., by making possible multiple cropping, by increasing the yield per unit cost and by making possible the

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7 Murthy, V.K. Utilization of Irrigation Facilities, Published in Role of Irrigation in the Development of India’s Agriculture Seminar Series, XIII, Indian Journal of Agricultural Economics, 1976, p.16.
8 Sharma, J.S., “Concepts of Irrigation and Problems of Measurement”, Published in Role of Irrigation in the Development in India’s Agriculture, Seminar Series XIII of Indian Journal of Agricultural Economics, 1976, p.4.
production of more lucrative crops. The output per acre of irrigated land is higher in India than in dry lands by 100 percent to 400 percent. It is estimated that an acre of the uncultivated land brought under irrigation will give an additional yield of 1,120 lbs of rice. Thus the importance of irrigation has increased all the more with the introduction of the HYV programme and the multiple cropping programmes in India. The so called Green Revolution in wheat production in the Gangetic plain is the direct result of the integrated use of water from cultivator’s controlled private tube wells along with new seed varieties and fertilizers. The agricultural year is divided into two main seasons viz., Kharif, the season of rains and Rabi, the season of winter crops. The sowing of Kharif crops begins with the advent of the monsoon, generally in the second week June. Almost all the Kharif crops are produced without much irrigation with the exception of paddy and sugarcane. The Rabi crops are sown in October and harvested in March and April. During this season the rainfall is meager and variable and all the Rabi Crops generally rely either on residual moisture in the soil or on irrigation from various sources. There is not much scope for extension of cultivated area except in certain regions. Therefore, intensity of cropping and increasing the yield from the existing cultivated areas are problems of paramount importance in the agricultural economy in India.

The total cropped area i.e. gross sown area as a percentage of net sown area gives a measure of land use efficiency which really means the intensity of cropping. The intensity of cropping refers to the number of crops raised on a field during an agricultural year. It could be seen that if one crop is grown on a field in one year, the

10 Babu, Ashok., “Technical Possibilities of Indian Agriculture”, Firma KLM Ltd., 1978, p.15
index of cropping intensity is 100 percent, and if two crops a year are produced, the intensity of index will be 200 percent. Therefore, the higher the index of intensity of cropping, the higher will be the land use efficiency. The extent to which the net sown area is cropped in India depends on human traditions and initiative, the possibility of irrigation of dry land farming and the methods practiced.

These controls are subordinate to limitations imposed by the scarcity of agricultural water supply and the soil problems. The paucity of cultivated land, the high density of cultivators and the extension of irrigation in the Sutlej Gangetic plains, East Coastal plains and the Kerala Coastal Plains have caused a significant shift in cultivation from single cropping to double cropping. The land with good irrigational facilities and good soils texture and structure can bear two crops a year provided the soil is carefully cultivated.

The Kharif and Rabi sowings correspond to the bursts and restart of monsoons in India, particularly in rain fed areas. There is a tendency for the area under Rabi crops to rise with normal and well distributed rainfall and to decline with uncertain rainfall. The Kharif area is not affected where there is early cessation of rains or long dry spells and it remains unaffected even in the case of belated monsoon, because of the drought resistant characteristics of the primary Kharif crops raised in kharif areas. On the other hand, a normal rainfall tends to make the field ready in goodtime for Rabi.

An early cessation of monsoon is a disadvantage, because it is not possible to preserve soil moisture for six or eight weeks before the normal sowing time of Rabi crops. A successful season of monsoon is the controlling factor for the intensity of cropping in irrigated areas. Further, the normal monsoon is one of the primary determinants affecting the use of the net sown area, because of maximum dependence
on dry farming. In India about 70 per cent of the net area sown is still dependent on
rains for crop husbandry.

A large proportion of the net sown area in the country has limited rainfall with
no or negligible irrigation facilities. These lands sustain a greater proportion of farm
workers and their dependents. Frequent crop failures resulting through drought in these
regions cause widespread misery. To overcome the catastrophe for increase in the
intensity of cropping through the development of new technology has become an
urgent socio-economic necessity. The objectives of planning should be to identify the
factors limiting double cropping and yields of dry land and to find out solutions by
evolving new cropping patterns and conserving the available moistures in the soil for
raising two crops in a year.

REGIONAL VARIATION IN CROPPING PATTERN

There is a common feature in the cropping pattern in India in terms of
domination of food grains, but inter-regional variations are observed. The variation is
observed between Kerala, Kathiawar Peninsula, Gujarat Plains, East of Maharashtra
plateau, the Narmada Valley, the Tapti basin and Western Satpura range on the one
hand and the reminder of India on the other hand. In the former areas, cash crops like
tea, coffee, cardamom, coconut, horticultural crops, groundnut and cotton predominate
and it is food grains in the latter areas. Even within the areas of food grains
domination, the differences are observed. Bajra, Jowar and Ragi hold higher ranks in
the cropping pattern and stand without a close rival in the drier sandy areas of
Rajasthan and Gujarat and rain shadow zones of the Deccan Plateau. Rice is a crop of
first order in the coastal plains, Orissa, Eastern Madhya Pradesh and the valleys of
Kashmir. Wheat dominates in the Sutlej Gangetic plains; Pulses hold significant
importance in the drier parts of Rajasthan, Deccan plateaus and the humid rice growing areas of Bihar, West Bengal, Orissa and Madhya pradesh. Gram occupies the first crop position in the South Western parts of Haryana, Ganga nagar and Alwar districts of Rajasthan, Southern uplands of Uttar Pradesh, Eastern Bhind – Moraine Plains and the North Western Vindhyan Scrap lands.

The rational cropping pattern is basically weak and regional patterns portray the same picture. The regional variations in cropping pattern are apparent, because of special differences in agronomic, economic and cultural conditions. In the light sandy shallow black, red and stony soils inferior food grains hold permanent status and in the loam and deep black soils, superior food cereals and economic crops gain important position. Further, the regional variation in the cropping pattern is induced by the spatio-temporal variations in rainfall characteristics. The zones of low and unreliable rainfall support millets and pulses. In humid areas, rice cultivation obviates the cultivation of other crops. In Punjab, Haryana and West Uttar Pradesh plains, Western parts of South Bihar plains, Western parts of West Bengal basin, the Mahanadi delta and basin, the Krishna Godavari delta and basin and Tamilnadu, the development of irrigational facilities has modified the cropping pattern. The higher the intensity of irrigation, the lesser the area under millets and pulses and the greater the area under superior cereals, economic crops and fodders.

There is a diversified cropping pattern in India but there is a wide gap between the contemporary cropping pattern and recommended cropping pattern, indicating that agricultural resources are not being properly utilized. It is economically undesirable to waste agricultural water not to put the agricultural potential to recommended use. Hence, practical action is needed to adjust the cropping pattern towards the
recommendations in the areas where the net sown area is intensively irrigated from different sources. There is enough scope for upgrading the present cropping pattern in the areas where the intensity of irrigation is increasing and the volume of changes in the other controls like tenancy, land use population, etc.

GLOBALIZATION AND CROP DIVERSIFICATION

With the advent of World Trade Organization (WTO) and India being a member and signatures of General Agreement on Trade and Tariff (GATT), the scenario of the agricultural sector will not be the same as that of past. There is a need for diversified agriculture, due to liberalization of agricultural trade. The crops which are traditionally exported like basmati rice and spices and condiments also need to be supported in terms of area expansion and quality improvement to look towards much more opportunity for export. Crop diversification in the areas of certain tropical fruits and also a few vegetables also need support for both production and post harvest handling in terms of their export opportunity. Accelerated growth in fruits and vegetables production is also required for improved nutrition of the country’s population. In future with improved living standards along with increased purchasing power, more and more people will look for nutritional and quality foods which will also call for greater crop diversification. There are some production areas such as food crops plantation crops, poultry, dairy, sugar, cotton and oil seeds and in which India has made its marks. There are some in which its emerging strength is already evident sericulture, marine and inland fisheries. For example, there are also others which now attract less attention, but in which the competitive advantages that India possess can put it on the top of the world. No country grows such a wide range of fruits, vegetables and flowers and in such abundance as India and yet it has no record worth mentioning in horticultural
exports. The rice variety when processed and marketed can help India to take care of
the health needs of its population, besides being exporting commodities in olden days.

PATTERN OF CROP DIVERSIFICATION INDIA

With the advent of modern agricultural technology, particularly during the
period of the green revolution in the late Sixties and early Seventies, there is a
continuous surge for diversified agriculture in terms of crops mainly on economic
considerations. Many factors are responsible for change in crop pattern such as (i)
resource related factors covering irrigation, rainfall and soil fertility (ii) technology
related factors covering not only seed, fertilizers and water technologies, but also those
related to marketing, storage and processing (iii) household related factors covering
food and fodder self-sufficiency requirement as well as investment capacity (iv) price
related factors covering output and input prices as well as trade policies that affect these
prices either directly or indirectly and (v) institutional and infrastructure related factors
covering farm size and tenancy arrangements, research, extension and marketing
systems and government regulatory policies.

The above-discussed factors are inter-related in determining crop diversification
in India. The adoption of crop technologies is influenced not only by resource related
factors, but also by institutional and infrastructure factors. Similarly, government
policies both supportive and regulatory in nature affect both the input and output prices.
Likewise, special government programmes also affect area allocation and crop
composition. More importantly, both the economic liberalization policies and the
globalization process are also exerting strong pressure on the area allocation decision of
farmers, essentially through their impact on the relative prices of inputs and outputs.
Their influence varies from region to region and from one farm group to another. The
factors such as food and fodder self-sufficiency, farm size and investment constraints are important in influencing the area allocation pattern among smaller farms and larger farms. Similarly, economic factors play a relatively stronger role in influencing the crop pattern in areas with a better irrigation and infrastructure potential.

The issue of crop diversification assumes significance in view of its effects on the demand and supply balance of main crops and crop groups. The rice and wheat centered specialization, for instance, indicates an increase in the supply of wheat and rice, but a reduced supply of coarse cereals. Since the demand for coarse cereals is declining and that for wheat and rice is increasing due to changes in the income pattern, the changes in their supply are actually necessary to achieve the required demand-supply balance. A similar line of argument can also be extended to other crops where, in addition to domestic demand, international demand and supply also assumes significance.

India is a country of about one billion people. More than 70 percent of the population lived in rural areas where the main occupation is agriculture that employs 60 per cent of Indian population today, yet it contributes only 26.6 percent to the Gross Domestic Product (GDP). Agricultural production fell by 12.5 percent in 2003. The growth rate of agriculture came down to 1.1 percent from 4.69. This slow down was in contrast to the 6 percent growth rate of Indian Economy for almost the whole of past decade. The average farm size is only 1.57 hectares. About 93 per cent of farmers have land holding smaller than 4 hectares. Around 55 per cent of farmers have land holdings smaller than 4 hectares and they cultivate nearly 55 percent of arable land. On the other hand only 1.6 of the farmers has operational land holding above 10 ha. And they utilize 17.4 percent of the total cultivable land.
COMMON FACTORS AFFECTING CROPPING PATTERN IN INDIA

a) Geographical Features

Cropping pattern of any region depends upon geographical features as soil, climate, rainfall, etc. Apart from this, it depends on the nature and availability of irrigation facilities.

b) Economic Motivations

Economic motivations are also important in determining the cropping pattern. The prices influence the acreage under the crops in two ways. Firstly, variations in the intercrop price disparities led to shifts in acreage between the crops. Secondly, maintenance of a stable level of prices for a crop provides a better incentive to the producer to increase the output than what a very high level of price does, if there is no uncertainty of this level being maintained over a number of years.

c) Government Policies

Fixed procurement price of wheat and rice and other Government controls have induced farmers to shift the cultivation to cash crops like sugarcane. Farmers also would choose the combination of crops which would give them maximum income. Relative profitability per acre is the main consideration which influences the crop pattern. Small farmers are first interested in producing food grains for their requirements and devote only a small relative acreage to cash crops than large farmers. Food Crop Acts, Land use Acts, intensive schemes for paddy, cotton, oil seed etc. all these bring sharply into focus the possibility that while each individual measure may push the crop pattern in the direction intended to, but if the overall effect of all measures taken together on the entire crop pattern is taken, it may not be in accordance with national requirements.
PRESENT SCENARIO OF CROPPING PATTERN IN TAMIL NADU

The gross cropped area under all crops has slightly increased to 60,32,718 ha in 2010-11 from 58,890,69 ha in 2004-05. While the area under Food crops accounted for 72.9%, that of non-food crops formed 27.1% of the gross cropped area during the year under report. The following table shows the cropping pattern in the state during 05-06 besides indicating relative share of area under principal crops to total cropped area.

Paddy, Cholam (Jowar), Cumbu (Bajra), Ragi, Maize, Small millets, Pulses, Sugarcane, Spices and Condiments, Fruits and Vegetables constitute the Food crops. The area under food crops has increased by 1,71,987 hectare i.e. 4.1% in 2005-06 over the previous year. Fibers, Oilseeds, Drugs and Narcotics, Dyes, Fodder crops, Green-manure crops, Flowers and Other Miscellaneous tree crops and Groves constitute Non-food crops. The area under non-food crops has decreased by 28,338 ha i.e. -1.7% in 2005-06 over the previous year.
<table>
<thead>
<tr>
<th>Crop</th>
<th>2010-11</th>
<th></th>
<th>2009-10</th>
<th></th>
<th>% var. previous year</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Area</td>
<td>%</td>
<td>Area</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td><strong>FOOD CROPS</strong></td>
<td></td>
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<tr>
<td>Paddy</td>
<td>2050455</td>
<td>34.0</td>
<td>1872822</td>
<td>31.8</td>
<td>9.5</td>
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<td>Jowar (Cholam)</td>
<td>316274</td>
<td>5.2</td>
<td>376739</td>
<td>6.4</td>
<td>-16.0</td>
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<tr>
<td>Bajra (Cumbu)</td>
<td>81925</td>
<td>1.3</td>
<td>97608</td>
<td>1.7</td>
<td>-16.1</td>
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<tr>
<td>Ragi</td>
<td>99549</td>
<td>1.7</td>
<td>108845</td>
<td>1.8</td>
<td>-8.5</td>
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<td>Other Millets</td>
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<td>4.0</td>
<td>240541</td>
<td>4.1</td>
<td>1.1</td>
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<td>Pulses</td>
<td>525237</td>
<td>8.7</td>
<td>590250</td>
<td>10.0</td>
<td>-11.0</td>
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<td>Sugarcane</td>
<td>335397</td>
<td>5.6</td>
<td>222188</td>
<td>3.8</td>
<td>51.0</td>
</tr>
<tr>
<td>Other Food crops</td>
<td>746433</td>
<td>12.4</td>
<td>717487</td>
<td>12.2</td>
<td>4.0</td>
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<td><strong>Total food crops</strong></td>
<td>4398467</td>
<td>72.9</td>
<td>4225480</td>
<td>71.8</td>
<td>4.1</td>
</tr>
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<td><strong>NON-FOOD CROPS</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cotton</td>
<td>109742</td>
<td>1.8</td>
<td>129364</td>
<td>2.2</td>
<td>-15.2</td>
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<td>Groundnut</td>
<td>618835</td>
<td>10.3</td>
<td>615877</td>
<td>10.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Gingerly</td>
<td>65118</td>
<td>1.1</td>
<td>72725</td>
<td>1.2</td>
<td>-10.5</td>
</tr>
<tr>
<td>Coconut</td>
<td>370515</td>
<td>6.2</td>
<td>357056</td>
<td>6.1</td>
<td>3.8</td>
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<td>Other Oil seeds</td>
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<td>33393</td>
<td>0.6</td>
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<td>Tobacco</td>
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<td>0.1</td>
<td>6049</td>
<td>0.1</td>
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<td>Fodder crops</td>
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<td>3.4</td>
<td>221294</td>
<td>3.8</td>
<td>-6.4</td>
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<tr>
<td>Coffee</td>
<td>31501</td>
<td>0.5</td>
<td>30683</td>
<td>0.5</td>
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<tr>
<td>Other crops</td>
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<td>3.2</td>
<td>196148</td>
<td>3.3</td>
<td>-1.4</td>
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<td><strong>Total non-food crops</strong></td>
<td>1634251</td>
<td>27.1</td>
<td>1662589</td>
<td>28.2</td>
<td>-1.7</td>
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<tr>
<td>TOTAL FOOD &amp; NON-FOOD CROPS</td>
<td>6032718</td>
<td>100.0</td>
<td>5889069</td>
<td>100.0</td>
<td>2.4</td>
</tr>
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</table>

Source: Government of Tamil Nadu, Department of Economic and Statistics, Session and Crop Report 2010-11
CROPPING PATTERN AND LAND HOLDINGS IN SIVAGANGAI DISTRICT

The Agricultural census data reveals that the number of operational holdings increases from 90 lakhs in 2000-05 to 3.05 lakhs in 2010-11. Contrarily, the area under agricultural operation increased marginally from 2.0 lakhs ha to 1.9 lakhs ha.

Table 1.2
DISTRIBUTION OF FARMERS ON THE BASIS OF OPERATIONAL LAND HOLDING

<table>
<thead>
<tr>
<th>Categories</th>
<th>% of the farmers</th>
<th>% of the area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal farmers</td>
<td>81.1</td>
<td>83.48</td>
</tr>
<tr>
<td>Small farmers</td>
<td>8.66</td>
<td>10.92</td>
</tr>
<tr>
<td>Semi medium</td>
<td>8.99</td>
<td>4.37</td>
</tr>
<tr>
<td>Medium</td>
<td>1.42</td>
<td>1.10</td>
</tr>
<tr>
<td>Large</td>
<td>-0.17</td>
<td>0.13</td>
</tr>
<tr>
<td>All</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td>(290083)</td>
<td>(394431)</td>
</tr>
</tbody>
</table>

Source: District Hand book

The total of medium and small holdings accounts for as much as 94 % of the total holdings and have 65% of the cultivated land in the district. The percentage of large, medium and semi medium farmers account for 5% of the total holding and they possess 35% of the land under cultivation. The district reported cropping intensity of 100%. This indicates only one crop is raised in a year and the second crop is not followed in the district. In fact, there are likely changes of more than one crop in a year but the area under second crop may be insignificant to bring it under separate record.
The vast majority of the workforce is dependent on agriculture (72.8%). In fact, the principal crop of Sivagangai district is paddy while majority of the district has red soil. The other crops that are grown are sugarcane, groundnut, pulses, and cereal such as millets. In response, the Tamil Nadu Agricultural University plans to set up the State’s first Red Soil Dry land Research Centre in Sivagangai district soon.

As of December 2010, the Spices Board is also setting up a new spices park at Sivagangai on an investment of Rs. 180 million crore. It would be immensely helpful to farmers of chilli, turmeric, medicinal plants and tamarind, as the focus would be to export their products. The proposed spices park would establish machinery for cleaning, sorting, grading, packaging, storing, and sterilizing among others. The focus would be to encourage the farmers to plant chilli, a leading crop in Ramanathapuram, Sivagangai and nearby districts, as well as turmeric crops. Medicinal plants, being raised in and around Sivagangai district, would also get a boost, as it was planned to patronize farmers of medicinal plants.

SOCIAL RELEVANCE OF THE STUDY

Viewed from the angle of social feasibility and feasibility of the economy, the present pattern of cultivation is somehow or other detrimental to the pace of the growth of the economy. This can be very well understood by the close examination of the trends revealed in the cropping pattern of Indian Agriculture. A peep into the general trend of cultivation of crops tend one to conclude that people are always running after profit at the expense of local economic food security, especially in the cultivation of food crops like rice and tapioca.
In this context, it is highly imperative to formulate certain legislations by the legislature, which should be implemented by the executives so as to protect the local economy from the evil effects of commercialization of cultivation.

The enactment and enforcement of legislations by the competent authority in respect of the conversion of land can be to a great extent lead to the reduction in the intensity of ecological degradation and severity of water shortage. The message contained in the present study is that, if implemented with indomitable will and courage, the pathetic scenario of Tamilnadu agriculture scene can be very well be surpassed. Hence, this study has been purposively selected.

**STATEMENT OF THE PROBLEM**

This study makes an attempt to examine the growth rate and changes in cropping pattern in Sivagangai District of Tamilnadu. The land use pattern is one of the aspects of analyzing the cropping intensity. The land use pattern varies in consequence of spatial-temporal changes. The total cropped area as percentage of net area sown gives a measure of land use efficiency. Hence, the analysis of land use pattern is essential to identify the magnitude of cropping intensity in any given region. Hence, this factor is to be taken into consideration in the present study.

For a study of changes in cropping pattern, relevant factors influencing crop varieties need to be looked into. Among the relevant factors, rainfall and sources of irrigation are important. The assessment of growth of irrigation infrastructural facilities and growth of area under irrigation is one of the major aspects of the present study. Here, an attempt is made to examine the same for the purpose of present study. The analysis of irrigation intensity is an essential aspect of the present study. The irrigation
intensity is not the same in all parts of the district. Hence, Taluk-wise assessment is made to analyze the spatial variation in irrigation intensity in the district.

The changes in cropping pattern are studied on the basis of growth of area under different crops in a particular region. Hence, in this study an attempt is made to identify the growth rate and fluctuation in area under crops in Sivagangai district. The growth and fluctuations in areas under these crops are assessed on the basis of taluks-wise analysis and also overall district level analysis. This study aims at analyzing the yield potential of different crops in Sivagangai district. The population and productivity effects of area shifts can be evaluated by considering both the growth rates of output, area and yield of various as well as the crop groups. Specific pattern is evident in the relative contributions of area and yield to overall output growth.

This study brings to focus the yield difference among the cereals, among the pulses, among the oil seeds, etc., in Sivagangai district. The assessment of areas under different crops examines the level of cropping pattern in Sivagangai district. The analysis of proportion of cropping area of each crop determines its relative share to the overall cropping pattern in the district. The identification of crop diversification is one of the key constituents of the present study. Crop diversification is intended to give a wider choice in the production of variety of crops in a given area so as to expand production-related activities on various crops and also to lesser risk. Crop diversification in India is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. Hence, in this study an attempt is made to analyze the crop diversification status in Sivagangai district during the study period.
Thus, in the study, growth rates and cropping pattern changes in agriculture with reference to Sivagangai district could be assessed by taking various indicators such as land use indicators, irrigational infrastructural facilities, rainfall level, trends in gross cropped area, net cropped area, gross irrigated area, area under different crops, trends in productivity and crop diversification. The regional variation in cropping pattern is assessed on the basis of taluks-wise analysis.

SCOPE OF THE STUDY

The Present study is based on Sivagangai agriculture to study the impact of various components of total productivity, growth and total output. All taluks are taken to analyze the cropping pattern and particularly three taluks. This study is divided into six chapters.

The outcome of the study will help in understanding the problem of implementation in shifting the cropping pattern. It will help in formulating the better policy and strategy for increasing the production and productivity of various crops in the study area.

OBJECTIVES OF THE STUDY

To pursue the present study, the following objectives are framed,

1. To study the trends and status of land use pattern in Sivagangai district.

2. To examine the inter-taluks variation in the growth of irrigational infrastructural facilities in Sivagangai District.

3. To measure the taluks-wise growth rates and fluctuations in gross cropped area and net cropped area in the district during the study period.

4. To study the variation in the magnitude of cropping intensity and irrigation intensity in the study area.
5. To measure the growth rates and fluctuations in areas under different crops in the district.

6. To study the cost of cultivation of selected crops in the sample taluks in Sivagangai district.

7. To suggest rational policy measures for effective formulation and implementation of agricultural regional planning in Sivagangai district.

**HYPOTHESES**

In order to undertake the present study, the following hypotheses are formulated and they are tested employing appropriate statistical stools.

1. There is a significant inter-taluks variation in the growth rates of land use pattern.

2. There is a significant inter-taluks variation in irrigational infrastructural facilities and also their growth rates in the study area during the period of assessment.

3. The growth rates of gross cropped area and net cropped area differ significantly among the taluks of Sivagangai district in the period of assessment.

4. The cropping intensity shows a significant inter taluks variation in Sivagangai district.

5. There is a significant variation in the growth of production and productivity of different crops in Sivagangai district in the period of assessment.

6. There is no correlation between the cost of cultivation and the cost of sugarcane, paddy and coconut cultivation.
METHODOLOGY

a) Choice of the study

Sivagangai district is predominately an agricultural district where more than 60 per cent of the people are engaged in agricultural work. Sivagangai District agriculture faces various challenges. The continuous reduction in size of holdings, decline in area under cultivation due to competition for land from non-agricultural sectors and water scarcity, excessive dependence on monsoon rains, reduced investment in agriculture, over exploitation of ground water, deterioration of the irrigation tanks and lack of maintenance, agricultural labour scarcity, inadequate post harvest and storage infrastructure could largely affect agricultural growth. Hence, this study has been purposively selected.

b) Method of data collection

This study fully depends upon both primary and secondary data. The primary data were collected through well structured interview schedule from the sample respondents of marginal farmers, small farmers, medium and larger farmers.

Secondary data have been collected from the official records of statistical office at the block level, district level office, and Director of Agriculture, and other related documents. The data on area, production and productivity of the selected crops were collected from the various publications of the Government of Tamil Nadu like Economic review, statistics for planning, agricultural statistics and season and crop reports.

c) Sampling Technique

For the sake of analysis of inter taluk variations in the growth rates of land use pattern, variations in irrigational infrastructural facilities, variation in cropping
intensity, variation in growth rates of area, all taluks in Sivagangai districts have been taken for the study. In order to have depth study on the growth of production and productivity of four crops, three taluk in Sivagangai district were taken.

The sample respondents are classified as four groups as shown in the following table.

Classifications of Land holding

<table>
<thead>
<tr>
<th>Below 2 acres</th>
<th>Marginal farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 to 4</td>
<td>Small farmers</td>
</tr>
<tr>
<td>4 to 10</td>
<td>Medium farmers</td>
</tr>
<tr>
<td>Above 10</td>
<td>Large farmers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Taluk</th>
<th>Type of Farmers</th>
<th>Sample</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manamadurai</td>
<td>Marginal farmers</td>
<td>78</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Small farmers</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium farmers</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large farmers</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Ilayangudi</td>
<td>Marginal farmers</td>
<td>84</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Small farmers</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium farmers</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large farmers</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Devakottai</td>
<td>Marginal farmers</td>
<td>87</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Small farmers</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium farmers</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large farmers</td>
<td>39</td>
<td></td>
</tr>
</tbody>
</table>

| Total       | 900                   |

Three taluks of out of seven taluks in Sivagangai district were selected at random. The sampled three taluks are Manamadurai taluk, Ilayangudi taluk and
Devakottai taluk. The proportionate Probability sampling technique has been used to select 300 samples from each taluk. Hence, the sample size constitutes 900.

**Statistical Tools applied**

1. In order to study the fluctuations in growth rates of land use pattern, cropped area, irrigated area, and area under different crops, the general growth rate model and co-efficient of variation have been applied.

   \[
   \text{Gr} = \left\{ \frac{X - Y}{Y} \right\} \times 100
   \]

   \[
   \text{Gr} = \text{Growth Rate} \\
   X = \text{Current year value} \\
   Y = \text{Constant year value}
   \]

2. The areas under current year and constant year denote area under different crops, extent of irrigated areas, extent of land use pattern, and extent of crop diversification. Co-efficient of variation is worked out to show fluctuations in the growth rates.

   It is written as

   \[
   \sigma
   \]

   \[
   \text{C.V} = \frac{\sigma}{\chi} \times 100
   \]

   Where,

   \[
   \text{C.V} = \text{Co-efficient of variation} \\
   \sigma = \text{Standard deviation} \\
   \chi = \text{Mean}
   \]

3. Correlation and Regression analysis is have been employed
4. In order to know the fluctuation in cropping intensity in various taluk of Sivagangai district the following formula was used. Cropping Intensity (C.I)= Total cropped area /Net sown area x 100

5. SPSS package is used for data analysis.

PERIOD OF THE STUDY

The present study conducted for Sivagangai District pertains to the period of 2003-04 to 2012-13.

LIMITATIONS

1. The findings of this study are applicable to agricultural development and it does not represent the development issues of allied activities of agriculture.

2. This study does not deal with technical aspects of agricultural development.

3. The production and productivity of crops are assessed only at the district level and not at the taluks level, due to non-availability of data at the micro-level.

4. This study does not deal with agricultural marketing, land improvement techniques, impact of agricultural development programmes on farm household and extent of application of modern technology in agricultural production, because studying of all aspect of agricultural development is not possible at the level of an individual researcher, due to constraints imposed by money, time, energy and effort.

5. The majority of the respondents did not maintain proper records of their sources of income, expenditure and savings. Hence this study was made on this basis of facts and information provided by the respondents from their memory.
CHAPTER DESIGN

This study has been divided into six Chapters.

The FIRST CHAPTER introduces the subject followed by the significance of the study, statement of the problem, scope of the study, objectives of the study, hypotheses, period of the study, statistical tools applied, limitations of the study and chapter design.

The SECOND CHAPTER deals with survey of related literature along with concepts.

The THIRD CHAPTER presents profile of the study area.

The FOURTH CHAPTER discusses land utilization pattern in Sivagangai district.

The FIFTH CHAPTER analysis the cost of cultivation and yield per acre in quintals of selected crops in the sample taluks of Sivagangai district.

The LAST CHAPTER summarizes the findings, suggestions and conclusions.