The production pattern of agriculture is by and large the combined effect and interaction of environmental, socio-economic, technological and organisational factors. In farm economy production is the most important factor in regional economic development. The study of inputs and outputs per unit area are the main objects giving rise to a type of agriculture. Jasbir Singh (1974) stated that the level of production as a concept means the degree to which the economic, cultural, technical and organisational variables are able to exploit the physical resources of the area for agricultural production.
Production characteristics of agriculture respond to the question of how much, what and for what purpose it is produced i.e., what are the effects of agriculture and disposal of its products. The most important production characteristics of agriculture are productivity and commercialisation. The productivity of agriculture could be expressed in different ways by the indices of land productivity, labour productivity and commercial productivity. The attributes of social system and organisational aspects act as threshold in measuring the degree or level of the agricultural production in a given unit area. The gross agricultural production derived from the various sources like crops, animal husbandry, poultry etc., reflect the dynamic aspect of agricultural efficiency and are the best dependable sources of measuring farm economy.

According to the IGU Commission on Agricultural Typology, the production attributes include seven variables. They are (i) land productivity in terms of gross agricultural output in conventional units per hectare of agricultural land (ii) productivity of cultivated land in terms of gross agricultural output in conventional units per hectare of actually cultivated land, (iii) labour productivity in terms of gross agricultural output per person engaged in agriculture, (iv) commercial labour productivity in terms of commercial (sold or delivered off- farm) agricultural production (in conventional units) per person engaged in agriculture, (v) degree of commercialisation as the percentage of commercial production in gross agricultural output, (vi) commercial land productivity as the amount of commercial agricultural production per hectare of agricultural land and (vii) the degree of specialisation as a coefficient of the degree to which the commercial part of agricultural production is concentrated on the least number of times.
In the present study, the relevant various production variables of Chittoor district are analysed which throw some light on the state of productivity of agriculture and help in the typification of agriculture of the district.

Attribute-15 Land Productivity in terms of Gross Agricultural Output in Conventional Units Per Hectare of Agriculture Land:

This variable refers to the land productivity expressed in gross agricultural output in conventional units per hectare of agricultural land. Both crop production and animal production are taken into account to findout the total agricultural production.

In Chittoor district, the gross agricultural output per one hectare of agricultural land is 24 c.u. which is seemingly low to moderate productive capacity of the land. Chittoor division accounted the high agricultural output of 33 c.u. and it followed by Tirupati (31 c.u.) and Madanapalle (18 c.u.) divisions. The intensive cultivation of paddy and sugarcane, high degree of machaniasation and intensive small scale dairy farming and poultry are the favourable factors for high productive capacity in Chittoor division in contrast to other divisions.

There has been a significant spatial variation in land productivity in the district ranging between a maximum of 50 c.u. in Thavanampalle mandal to a minimum of 7 c.u. in Kurabalakota mandal. The high (30-40 c.u) and very high (>40 c.u) productivity levels are found in 20 mandals distributed in central and eastern parts of the district. Intensive cultivation of sugarcane and paddy as well as small scale intensive dairy farming in central parts and intensive cultivation of paddy and irrigated groundnut, high
rainfall conditions and well development of irrigation and hybridization of farming in eastern parts of the district are favourable for high agricultural productivity.

Moderate level (20-30 c.u) of land productivity is found in 29 mandals which accounted for 43.9 per cent of the total in 29 mandals of the district. They are distributed mostly in eastern and western parts of the district. Low (10-20 c.u) and very low (<10 c.u.) land productivity levels are found in 17 mandals distributed mostly in the western region of the district. Here, the frequent occurrences of drought, prolonged dry spells, and sometimes crop failures, scanty irrigation facilities, extensive cultivation of dry crops, and low consumption of modern technological inputs have had shattering effect on crop productivity of western parts of the district.

Attribute-16 Productivity of Cultivated Land in terms of Gross Agricultural Output per Hectare of Actually Cultivated Land:

This variable refers to the gross agricultural output in conventional units per hectare of actually cultivated land. It represents the real performance of the agricultural lands which are actually brought under cropping in an agricultural year.

In Chittoor district the average productivity of cultivated land is 33 c.u. per hectare which reveals the moderate productivity of agriculture. Among the three divisions, Chittoor has the highest agricultural productivity of 45 c.u per hectare of cultivated land and it is followed by Tirupati (36 c.u.) and Madanapalle (26 c.u.) divisions. Spatially it varies from a maximum of 70 c.u. per hectare in S.R.Puram mandal to a minimum of 10 c.u. in Kurabalakota mandal and thus showing a significant spatial variation in the distribution of per hectare productivity of cultivated land.
FIG 5.2

CHITTOOR DISTRICT LAND PRODUCTIVITY (1991-92)

Agricultural output per hectare of cultivated land (in conventional units)

INDEX:
- < 20
- 20 - 30
- 30 - 40
- 40 - 50
- > 50

0 Km 25

N
The High (40-50 c.u) and very high (50 c.u) productivity levels of cultivated land are noticed in 17 mandals distributed in central and eastern parts of the district. Chittoor, Thavanampalle, Bangarupalem, S.R.Puram, Tirupati Urban and Chandragiri mandals are found with very high productivity of cultivated land. Moderate (30-40 c.u.) productivity is found in 23 mandals distributed mostly in eastern and central regions as well as in some parts of western region of the district.

Low (20-30 c.u.) and very low (<20 c.u.) productivity levels are found in 26 mandals largely distributed in western and northern parts of the district. The development of irrigation, moderate to high rainfall conditions and intensive application of technological inputs in many parts of eastern and central regions have had a bearing influence on high degree of productivity of cultivated lands.

Attribute-17  Labour Productivity in terms of Gross Agricultural Output per Person Engaged in Agriculture:

This variables refers to labour productivity expressed in gross agricultural output in conventional units per one person actively employed in agriculture. Same as land productivity, labour productivity refers to the gross agricultural production per person actively employed in agriculture. It represents the overall carrying capacity of the farms. Here production is depending on size of holding. If the holding size is larger, then the production is higher per person and vice-versa.

The average labour productivity of the district is 16 c.u. per person actively engaged in agriculture which is seemingly very low when compared with the classification of this variable in world agricultural typology. Among the three divisions,
FIG. 5.3

CHITTOOR DISTRICT
LABOUR PRODUCTIVITY
(1991-92)

INDEX

Agricultural output per person engaged in agriculture (in conventional units).

< 10
10 - 15
15 - 20
20 - 25
> 25
Chittoor division has the highest labour productivity of 18 c.u. per person and it is followed by Tirupati (16 c.u.) and Madanapalle (15 c.u.) divisions.

At mandal administrative unit level, the labour productivity varies from a maximum of 28 c.u. per person in Thavanampalle mandal to a minimum of 8 c.u per person in Kurabalakota and Santhipuram mandals. Very high labour productivity (25 c.u. per person) is found in four mandals namely, chittoor, Thavanampalle, Bangarupalem and Pulicherla mandals located in central region. High labour productivity (20-25 c.u. per person) is found in 7 mandals have a scattered distribution in south central and north western parts of the district. Moderate labour productivity is found in 26 mandals accounted for 39.4 per cent of the total mandals of the district. They are mostly located in western upland region, central transitional zone and a few in extreme eastern part of the district. the higher size of land holdings and low density of agricultural settlements and less consumption of human labour are due to limited agricultural operations in western upland region; and the high intensity of both crop and livestock farmings, high degree of mechanization and low consumption of human labour in central transitional region are causes for moderate to high labour productivity.

Low (10-15 c.u. per person) and very low (<10 c.u. per person) levels of labour productivity are found in 29 mandals mostly located in eastern plain region, South-western and north-western parts of the district. The causes for low labour productivity in eastern plain region though it is found with higher land productivity is due to high pressure of population, large number of small size of holdings, and very high consumption of human labour in the year-round agricultural operations and a low level of mechanization.
Attribute-18 Commercial Labour Productivity In terms of Commercial Agricultural Production Per Person Engaged in Agriculture:

This variable described the commercial labour productivity in terms of commercial (sold or delivered off-farm) production in conventional units per one person actively employed in agriculture. The labour output in terms of commercial production is depending on people employed in agriculture and their capacity of producing farm products which are of market value.

In the district, the average commercial labour productivity is 12 c.u. per person actively engaged in agriculture. Chittoor division has the highest commercial labour productivity of 14 c.u. per person and it is followed by Madanapalle (12 c.u per person) and Tirupati (10 c.u. per person) divisions.

At mandal level, the commercial labour productivity varies from a maximum of 24 c.u. per person, in Thavanam palle mandal to a minimum of 5 c.u. per person in four mandals (Tirupati Urban and Rural, Kurabalakota and santhipuram). The high Commercial labour productivity (15 c.u. per person) is found in 13 mandals distributed in transitional central part of the district. Here the intensive cultivation of commercial crops like sugarcane and garden crops including both fruits and vegetables and dairy and poultry farming accounted for the high commercial labour productivity. Moderate commercial labour productivity (10-15 c.u per person) is found in 30 mandals distributed mostly in the upland and transitional areas of western and central regions of the district. Here extensive groundnut cultivation is the mono-cause for moderate commercial labour productivity.
FIG. 5.4

CHITTOOR DISTRICT
COMMERCIAL LABOUR PRODUCTIVITY
(1991-92)

COMMERCIAL AGRICULTURAL
output per person engaged
in agriculture (in conventional units).

INDEX

>V 10
10-15
15-20
>20

0 km 25

N
Low commercial labour productivity (10 c.u per person) is noticed in 23 mandals mostly located in eastern plain region and north-western and south-western parts of the district. Very low yield levels of groundnut in north-western region and extensive foodgrain farming as well as high consumption of labour in eastern plains are accounted for the low commercial labour productivity.

Attribute-19 Degree of Commercialisation as the percentage of Commercial Agricultural Production in Gross Agricultural Output.

"Commercialisation is a process of transformation of agriculture and peasant way of life" (Jasbir Singh, 1984). This implies changing the traditional subsistence economy into a market economy. The measurement of commercialisation may serve as an indication to differentiate the cash cropping areas from subsistence ones. As such, commercialisation is one of most important functioning forms of agriculture and is an important indicator of agricultural development of area. The cash crops are market oriented and therefore their role in district economic structure is very important. The degree of commercialisation is related to the farmer's enterprising nature, capability of agricultural farms for the expansion of cash cropped area, marketing feasibility, transport accessibility and the investment of capital. In Commercial agriculture, much use of capital is made for the purchase of tractors and machinery, fertilizers, pesticides, improved plants, better breeds of animals and many other technologies innovations (Anderson 1970). The degree of commercialisation is based upon the spatial spread of commercial farming in the total scenario of the agriculture.

Chittoor district is significant for commercial farming which is evident from the fact that the average degree of commercialisation is 76 per cent in the total agricultural production. Among the three divisions, Chittoor division consisted the highest degree
of commercialisation which accounted for 81 per cent in the total agricultural output and it is followed by Madanapalle (78%) and Tirupati (65%) divisions. Mixed commercial farming consists of sugarcane, groundnut and garden crops as well as dairy and poultry farming is significant in Chittoor division.

At mandal level, there has been a significant spatial variation in the distribution of commercialisation which varies from a maximum commercial production of 90 per cent in Thavanampalle and Irala mandals to a minimum of 54 per cent in Narayanavanam mandal. Very high degree of commercial production is found in 3 mandals, namely Thavanampalle, Irala and Pulicherla mandals. High degree (80-90%) commercial production is found in 24 mandals distributed largely in the transitional area of central region and in few parts of western upland region. Here, the cultivation of cash crops like sugarcane, groundnut and garden crops as well as intensive small scale dairy and poultry farming have a positive impact on the degree of commercialisation. Moderate degree of commercialization (70-80%) is found in 24 mandals distributed in eastern plains and western uplands. The spectacular groundnut cultivation and higher size of land holdings in uplands of the west; and intensive irrigated groundnut, sugarcane, garden crops and small scale dairy in the eastern plains contributed to the moderate degree of commercialisation.

Low (60-70%) and very low (<60%) levels of commercialisation are found in 15 mandals distributed in eastern plains and in some parts of western uplands where food grain production is significant.

Attribute-20 Commercial Land productivity as the Amount of Commercial Agricultural Production per Hectare of Agricultural land:
This variable deals with the commercial productivity of land (level of commercialisation) in terms of an amount of commercial agricultural production in conventional units per one hectare of agricultural land. Level of commercial production depends upon the size of land holdings, input of labour and intensity of cropland use, application of technological inputs and modernization of farming activities. The commercial production includes both cash crops, and market oriented livestock products.

The average commercial land productivity of the district is 18 c.u. per one hectare of agricultural land. Among the three divisions, Chittoor division has accounted for the highest commercial land productivity of 27 c.u. and it is followed by Tirupati (20 c.u) and Madanapalle (14 c.u) divisions.

Spatially it varies from a maximum of 45 c.u. per hectare in Thavanampalle mandal to a minimum of 4 c.u. per hectare in Kurabalakota mandal. High (20-25 c.u. per ha.) and very high (25 c.u. per ha.) levels of commercial land productivity are found in 27 mandals distributed largely in transitional areas of central region and eastern plains. In these areas high intensive cultivation of crops with assured water facilities and sufficient inputs of technology have fairly and positively contributed towards high productivity. Moderate (15-20 c.u. per ha.) level of commercial land productivity is found in 22 mandals distributed in eastern, central, northern and south-western parts of the district.

Low (10-15 c.u. per ha.) and very low ( 10 c.u per ha.) levels of commercial land productivity are found in 17 mandals mostly distributed in western and
CHITTOOR DISTRICT
COMMERCIAL LAND PRODUCTIVITY
(1991-92)

INDEX

\begin{tabular}{c|c}
\hline
 & \\ \hline
< 10 & 10 - 15 \\
15 - 20 & 20 - 25 \\
> 25 & \\
\hline
\end{tabular}

Commercial production per hectare of agricultural land (in conventional units)

FIG. 5.6
south-western parts of the district. Here the extensive dry farming and low application of technological inputs are the inhibiting factors for low productivity.

Attribute-21 Degree of Specialization as a Coefficient of The Degree to which the Commercial part of Agricultural Production is Concentrated on the Least Number of Items:

It is the sum of the shares of all commercial production in the commercial production of a unit of study. Degree of commercialisation cannot be calculated when commercial production does not exist. Therefore, there is no specialization if there is no commercial production. The degree of specialization is calculated by the help of the following formula.

\[ W_i = a_{ij}^2 \]

Where \( W' \) = indicates degree of specialization

\( a_{ij} = \) share of the \( j^{th} \) item in the commercial Production of the \( i^{th} \) unit.

In Chittoor district the average degree of specialization is 0.35. The three revenue divisions have also consisted more or less uniform pattern of specialization. At mandal level it varies from a maximum of 0.79 in Peddamandyam mandal to a minimum of 0.14 in Kuppam mandal.

High degree of specialization (0.4) is found in 23 mandals distributed in north-western and extreme eastern parts of the district. In these areas the specialization, of farming is confined to few commercial crops namely groundnut and paddy. Moderate (0.2-0.4) degree of specialization is found in 39 mandals distributed in all over the district. Low (0.0) degree of specialization is found in 4 mandals namely Kurabalakota, Ramakuppam, Santhipuram and Kuppam mandals respectively.
FIG. 5.7

CHITTOOR DISTRICT
DEGREE OF SPECIALISATION (1991–92)

INDEX

0.0

0.2–0.4

0.4–0.6

0.6

Coefficient values

0 Km 25
In the analysis of production attributes, it is found that there has been a distinct spatial variation in the distribution of different productivity levels as is influenced by distinguished physico-socio-economic and technological factors. Firstly, many parts of the central transitional zone are found with high land productivity, labour productivity, commercial land productivity and degree of commercialisation. Secondly, the eastern plains are significant in moderate to high land productivity. Here, the degree of commercialisation and commercial labour productivity are low due to high orientation of foodgrain farming and large input of labour power and more number of small size of land holding. Thirdly, the western upland region is significant for high degree of commercialisation and specialization due to spectacular spatial spread and production of groundnut cultivation. But the productivity of agriculture either per hectare of land or per labour is generally low due to obvious factors of rainfed cultivation, and low level of technology input application.