CHAPTER-VII
SUMMARY AND FINDINGS

Out of 191791 Square Kms of geographical area of Karnataka, 52.07% area (9919871 Square hectares) was under agriculture use during 2003-04, while it was 55.11% (10499477 square hectares) during 2004-05. The net sown area is almost to the maximum extent as remaining geographical area of Karnataka is devoted to forest, settlements, roads, railways, water body and rugged terrain. The keen observation of data of taluk level reveals that there is no scope to bring new land / additional land under agriculture and hence only way available for increase of crop productivity is by way of intensity of cropping through irrigation and better management of rain water, soil and adopting scientific methods to manage various crops. By 2001 Karnataka had reached a total population of 52733686, of which males were 26856343 and Females were 25877343. The growth rate of population was 1.5% while density of population was 275 per Square kilometers. The literacy level was 67.04% while life expectancy was 62.5 years. The sex ratio was 964 while birth rate was 22 per 1000 population and death rate was 8 per 1000. Therefore, it is needless to say that pressure on agricultural land is increasing and hence agriculture should lead to higher productivity with intensity in cropping as well as modernity by abandoning the primitive and traditional agriculture even by the smallest land holder in Karnataka. The rural population in Karnataka is about 66%. The per Capita income in Karnataka is Rs. 11254 (during the year 2001) while population living below poverty line is 156 lakh. The mean per capita expenditure is Rs. 270 per month. The share of agricultural income in the state is 29% during 2000 while it was 39% during 1993. The economic growth rate of Karnataka during 2003-04 was 6.2%. The economic growth rate in rural Karnataka was 2%. The net irrigated area in Karnataka is about 23.63%. The rural Karnataka has large number of scattered villages depending on agriculture as their source of income. The rural Karnataka has low level of infrastructure like roads, electricity, housing, and water supply. Rural Karnataka is also low in its human developmental parameters like literacy, health services and skill development. Therefore the development of rural areas in Karnataka would imply improving the productivity of agriculture and other economic activities. The infrastructure facilities are very important input for agricultural, industrial and overall economic development of Karnataka. But lack of appropriate investment and management has retarded the growth of infrastructure.
The percentage of net irrigated area is highest in Punjab with 93.3% followed by Hariyana 75.6% and UP with 65.6% while Karnataka has only 23.3% as against 35.2% of all India. Karnataka has 29% of black soils, 32% red soils, 19% laterite soil and 5% mixed coastal soil. The soil erosion has covered 114 lakh hectares (60%) of arable land of Karnataka. The Karnataka state with only 6% of India's geographical area has 15% of drought prone area. According to irrigation commission of India at least 54% of Karnataka's total geographical area is inhabited by nearly one half of the people of the Karnataka which falls under the category of drought affected areas. Karnataka Government has identified 117 taluks of 16 districts as being drought prone. However, the central Government has removed 29 taluks from the list of 117 taluks by applying two conditions: (1) Those taluks where 30% or more area is irrigated and (2) Where only a small portion of the district has an adequate rain fall or irrigation. Agriculture occupies very important place in any developing economy. Besides contributing a substantial part of the Karnataka State's domestic product, it is the largest employer of people, more so in the rural areas. Out of total 19.36 million workers in Karnataka, as per 2001 census, 13.11 million or 67.7% were working in the agricultural sector. However the share of agriculture in S.D.P has come down from 59% in 1960-61 to less than 30% during 2001. Thus non declining population on the one hand and reduced income per capita in the agriculture sector has resulted in high poverty ratios. Apart from this, the overall performance of Karnataka state vis-à-vis the neighboring states and the nation has not been that encouraging. In Karnataka food grain production has tremendously increased despite decline in area under food grains. The positive impact of yield growth consequent to the H.Y.V. technology is responsible for this. The crops like jower, bajra, wheat, minor millet and cotton are giving way to horticulture, plantation and other types of commercial crops. The maize among cereals, tur and gram among pulses, sunflower among oil seeds and sugarcane have registered substantial increase in out put. This is mainly due to higher and increasing yield rates of the respective crops. However, Karnataka's performance in agriculture does not compare favourably with that of the nation. For instance, the per capita food grains productions in Karnataka was 129.5 kg. compare to 169.34 kg. in all India. This is mainly because of less than 25% area under irrigation. Irrigation development in Karnataka is not only tardy but also inadequate and very low compare to its neighboring state and the nation. Of it, the canal irrigated area also is hardly one-third. Nearly 80% of Karnataka's cultivable area receives less than 1000 mm.
rainfall and 88 taluks have been identified as drought prone. This puts a severe constraint in raising productivity and production. Another crucial factor relates to the size of agricultural land holdings, where census revels that in 2001 about 73% of farmers fell under small and marginal category who cultivated hardly one third of the agricultural area of Karnataka. The average size of the land holding has come down from 4.4 hectares in 1955-56 to 1.72 hectares in 2001. For the small and marginal farmers it is a mere 0.82 hectares. Thus erratic rain fall, under development of irrigation and dwindling size of land holdings have constrained the agricultural performance of the Karnataka.

In Karnataka 9919871 hectares of land is used for cultivation of various crops (net sown area) during 2003-04, which is 52.07% of the total geographical area (19179100 hectares). Eleven taluks namely Davanagere, Harihar, Naragund, Byadagi, Shiggaon, K.R.Nagar, T.Narasipur, Aurad and Gangavati have shown more than 92% of their geographical area under agriculture, while 29 taluks have shown less than 36% of geographical area under agriculture. These 29 taluks are belonging to Western Ghats and Coastal region of Karnataka and as such they have little scope for expansion of area under agriculture. However, there are 58 taluks in Karnataka where percentage of cropped area is in the range of 36% to 64% and these taluks are outside the Western Ghats region and therefore these 58 taluks need further attention in the development of agriculture. The higher intensity of crop land-use is an indication of agriculture development as the land in such taluka is being used more than one or two times in a year, consequently there can be more income generated from the same hectares of land. In this regard there are 8 taluks having very high intensity of cropping with more than 148.65% intensity, while 104 taluks are in the low range of 99.55% and below intensity. Therefore these 104 taluks need further thrust for the intensity of cropping. The correlation analysis shows very high significant correlation between intensity of crop land-use and total population, net area shown and intensity of irrigation. Therefore these factors are to be considered for further development of intensity of cropping in 104 taluks. The correlation analysis shows positive high significant correlation between area under food crops, area under commercial crops and net cropped area. Therefore, the taluks which show more area under commercial crops as well as total cropped area can also be further considered for the development of food crops. Under commercial crops (cotton, sugarcane, tobacco, mulberry, etc.) Karnataka has 1686784 hectares of land which shows 14% of
the total cropped area. In Karnataka horticulture crops share 1012254 hectares of land, which is about 8.56% of total cropped area. About 106 talukas of Karnataka show less than 3% of land under horticulture crops, where further development of horticulture crops can be strengthened as there is positive very high significant correlation between net area sown and horticultural crops.

In Karnataka the consumption of chemical fertilizers (NPK) during the year 2001 was 1225016 tones, which shows 119 kg. per hectares of cropped land of Karnataka. In Karnataka we notice 105 talukas utilizing 24 to 118 kg. of chemical fertilizer per hectare and another 6 talukas utilizing below 24 kg. per hectare of cropped area. The correlation study reveals that the fertilizer consumption is positive low significant with net area sown and net area irrigated. Therefore 111 talukas need further improvements in irrigation pattern as well as area under crops, so that these talukas can utilize more chemical fertilizers and thereby these talukas may improve their agricultural productivity. In Karnataka out of total geographical area (19179100 Sq.hectares) 9919871 hectares of land is under agriculture, which being 52.07%. The agricultural economic status of each taluka depends on the extent of net sown area, nature of topography, types of soils, amount of rainfall, and percentage of irrigation. If all the such factors are favorable and even then if net sown area in a particular talukas is not satisfactory then it is necessary to examine the other socio-economic conditions of the farmers, so that appropriate remedial measures can be taken to increase the land under agriculture. There are 28 talukas in Karnataka where land under agriculture (net sown area) is in the range of 45% to 54%, while another 47 talukas have below 45%. Out of these 47 talukas (28+47-75), nearly 39 talukas belonging to Western Ghat region where it is difficult to bring more land under agriculture, while 28 talukas having net sown area in the range of 45% to 54% are found in South Eastern part of Karnataka. Therefore in these 28 talukas further land under agriculture can be increased by way of extending more land under irrigation. In Karnataka the land under irrigation is 2506060 hectares, which is 23.25% of net sown area (10467757 hectares). In Karnataka State 89 talukas have less than 23.75% of land under irrigation, while another 6 talukas show less than 2.84% under irrigation. The area under food crops in Karnataka is 9077877 hectares, being 73% of net sown area (9919871 hectares). In Karnataka jowar, rice and ragi are the major food crops, while maze is also cultivated as important food crop. In recent decades, bajra and wheat are also cultivated as food crops in North Karnataka at an insignificant level.
Karnataka 53 talukas show 20% to 40% area under food crops, while another 28 talukas show less than 20% of area under food crops, nearly 94 talukas show net sown area in the range of 40% to 80%. The correlation study reveals positive high significant correlation between area under food crops and total cropped area. Therefore it is needless to pinpoint that it is necessary to increase area under agriculture in 81 talukas. In Karnataka about 1686784 hectares of land is under commercial crops, which works out to be about 14.32% of the net sown area (9919871 hectares). There are 76 talukas where area under commercial crops is in the range of 22% to 40% and another 31 talukas in the range of below 22%. The remaining 68 talukas show area under commercial crops in the range of 40% to 75%. The positive high significant correlation is established between total cropped area and total commercial crops, as well as area under food crops. Therefore these factors can be further strengthened to bring more area under commercial crops. In Karnataka about 1012254 hectares of land is used for the cultivation of horticultural crops, which shows just 8.59% of the net area sown (9919871 hectares). The talukas of Western Ghat and Coastal region show 3% to 10% net sown area under horticulture crops. Similar is the case of the talukas of Kolar and Chitradurga. There are 109 talukas where land under horticulture crops is below 4%. The high significant positive correlation is found between area under horticulture crops and total cropped area. Therefore it is necessary to increase area under total crops in 109 talukas, so that it may boost to increase area under horticulture. In Karnataka 50 talukas show the percentage of agricultural labourers in the range of 26% to 46%, 37 talukas shows in the range of 12% to 26% and 18 talukas show below 12%. However 4 talukas viz Hadagali, Shiraguppa, Manavi and Raichur show very high percentage (54% and above) of agricultural labourers and 66 talukas show in the range of 40% to 54% of agricultural labourers. The correlation analysis shows high significant positive correlation between agricultural labourers and total cropped area which is quite natural in populous region like Karnataka. In Karnataka State the total number of registered tractors during 2001 were 108138, which works out to be 10.28 tractors per 10,000 hectares of net sown area. The three talukas like Harappanahalli, Jagalur and Belatangdi have only one tractor each per 10,000 hectares of net sown area. There are 95 talukas where the tractors are up to 8. There are 57 talukas where tractors are 9 to 19 per 10,000 hectares of net sown area. There are 13 talukas where the tractors are 22 to 29 and 7 talukas have tractors more than 30 per
10,000 hectares of net sown area. The correlation between number of tractors and fertilizers consumption shows positive significant level.

In Karnataka the total number of livestock as per animal censes carried out during 1998 are 16727528. This works out 48067 animals for every one lakh rural population of Karnataka. Eight taluks show less than 32121 livestock units per 1 lakh rural population, 84 taluks show 32122 to 48211 livestock, 58 taluks show 48212 to 64301 livestock units, 15 taluks show 64302 to 80391 livestock units and 10 taluks show more than 80392 livestock units per 1 lakh rural population. The correlation between number of livestock units and number of agricultural labourers show positive significant relation. Therefore the development of agriculture by more number of human labours will influence on the positive growth of livestock units in Karnataka. The correlation between intensity of irrigation and intensity of crop land-use show significant positive correlation therefore, the higher intensity of crop land-use as well as higher intensity of irrigation will definitely add to the higher growth of agriculture in a taluka. In Karnataka State we notice 4393 agricultural co-operative societies which works out to be not even one society per every 10,000 rural population. The taluks of Navalagund and Nargund show more than 2.65 agricultural co-operative society per every 10,000 rural population. About 35 taluks show 1 to 2.64 agricultural co-operative societies and the remaining 138 taluks show less than one agricultural co-operative society for every 10,000 rural population. The study of level of agricultural development based on 18 indicators, in a composite manner shows Magadi taluka as very high development. About 34 taluks appear as high development which are located in South Eastern part of Karnataka. About 49 taluks located in Bombay Karnataka and Central Western Karnataka show as mediumly developed. About 55 taluks located in South Western Karnataka and North Central Karnataka show low development of agriculture, about 32 taluks located in Hyderabad Karnataka and 5 taluks located in South Western Karnataka show very low development of agriculture. The Southern Karnataka shows one taluka under very high development of agriculture, based on 18 indicators, while not a single taluka is found in North Karnataka. Under high development of agriculture about 34 taluks are identified in South Karnataka while, no taluka is found in North Karnataka. Under medium development of agriculture 17 taluks are identified in the district of Chitradurga, Davanagere, Kolar, Shivamoga, Tumakur and Chikkamagalur whereas in North Karnataka 32 taluks are identified as medium development. Under low
development of agriculture. 38 talukas are identified in South Karnataka whereas 17 talukas are found in North Karnataka. In case of very low development of agriculture 31 talukas are identified in North Karnataka, while only 5 talukas are found in South Karnataka.

The different sources of irrigation in Karnataka show that 38.20% of irrigated area is shared by river canal irrigation, from various dams built across the rivers, sharing an irrigated area of 952021 hectares. Out of total irrigated area 19.21% i.e. 478818 hectares is irrigated by wells, another 18.04% i.e. 449674 hectares is irrigated by borewells, about 10.36% i.e. 258178 hectares is irrigated by other sources like streams, small ponds, etc., about 10.23% i.e. 254965 hectares is irrigated by tanks and about 3.94% i.e. 98215 hectares are irrigated by lift irrigation. During 2003-04 the Karnataka state has nearly 24.94 lakh hectares land under irrigation. The progress could not be viewed satisfactory as: (1) it so far cover only about a fifth of the cropped area, and (2) nearly two thirds of the available water resource potential remains undeveloped. For want of irrigation, drought continue to take a heavy toll of crops in 80% of the cropped area and a second or a third crop cannot be raised during the year in 87% of arable land. Paucity of irrigation is mainly responsible for the low performance of the new technology in 80% of the cropped area. Irrigation is the most essential for a successful harvest in view of the low (below 75 cm) and highly erratic rainfall in the eastern two-third of the Karnataka state and almost no rainfall in three-fourth of the year (from October to May) over the whole state. The ultimate potential for irrigation in the state is estimated at 55 lakh hectares including 35 lakh hectares from major and medium projects and 10 lakh hectares each from minor surface schemes and underground water. The state at present has used water for 25 lakh hectares i.e. about 45% of total potential. The state hopes to develop the remaining 55% potential by the year 2010. The states irrigation resources can be augmented by inter-basin transfer of water from water surplus basins, especially from the west flowing rivers in which water (58% of the total) now simply flows as waste. Irrigation is essential in the state for raising crops in dry weather from October to May. The low intensity of cropping in Karnataka with 113% when compared to 126% in India as whole and 156% in Haryana and 172% in Punjab is yet another adverse consequence of the states poor irrigation development. More than 85 taluks of Karnataka are below average intensity of 113% and most of them are in Maidan region. There is, in fact, a high degree of positive correlation between the extent of irrigation and cropping.
intensity, all through the state. The methods like rain harvesting, watershed management, soil bunding and adoption of scientific methods in management of irrigation can improve the status of irrigation in Karnataka where nearly 102 taluks at present have less than 28% area under irrigation.

The net sown area in Karnataka during 2003-04 was 52.07% (9919871 hectares), while during 2004-05 it was 55.11% (10499477 hectares) which shows an increase of 3.04%. There is no scope to expand the area for agricultural purpose as the remaining land is occupied by other uses like forest, settlements, etc. and hence if Karnataka has to progress in the agricultural growth leading to the production of various food grains, etc., then Karnataka has to increase its area under more than one sowing, which can be possible only when there is an increased area under irrigation. The area sown more than once during 2003-04 was 1738187 hectares (17.52%), while during 2004-05 it was 2307925 hectares (21.98%). Theoretically the area sown more than once can be increased 200% to 300% if Karnataka achieves 100% irrigation on its present agricultural land, which would show 200% to 300% of intensity of cropping and thereby agricultural prosperity can be achieved successfully. The study carried out by this researcher with reference to yields of various crops in Karnataka shows that the yields wherever are low are because of inadequate rainfall, shortage of irrigation water, shortage of electricity, shortage of fertilizer, shortage of HYV seeds, shortage of human labour, effect of floods and droughts besides unscientific management of land, crops and irrigation water, as well as illiteracy of farmers in adopting innovations of agricultural diffusions. In chapter-V a detailed account of area and yield of 11 food crops, 3 commercial crops and 7 horticultural crops is given. In this account a critical analysis to improve yield of the crops and other managerial aspects related to sown area and plant related aspects of each of the crop is given and they have to be achieved by the respective farmers of respective taluks to reach optimum yield. It is also to be noted that the suggestions given by agricultural scientists for improvements in dry farming are of noteworthy and these are mentioned at length in chapter-V. The ten agroclimatic zones drawn by the department of agriculture, government of Karnataka are mentioned in the chapter-V, and they provide most scientific guidelines to farmers of Karnataka, so as to grow which crop in which soil and which should be the combination of double/triple crop with it.
In order to know the problems and prospects of agriculture as well as farmers, with reference to land use pattern, cropping system, yields of crops, labour requirement, migration of the farmers, literacy of the farmers, their interest in adopting the new methods of agriculture and profit and loss of agriculture, an attempt is made to analyse in chapter-VI, where eleven villages are surveyed by this researcher by way of sample survey in which he has made door to door survey to collect data through questionnaire consisting of 70 questions. The eleven selected villages not only represent the different geographical regions of Karnataka but also represent such aspects like literacy, irrigation, drought conditions, commercial farming, etc., which play impact on yields of the crops and agricultural system of the village/farmers.

**Marikatti village belonging to highly irrigated taluk of Mudhol has 77.54% land under irrigation.** Out of 1002 acres of arable land of Marikatti village 182 acres of land belonging to 21 families is surveyed by this researcher. **In this Marikatti village, agriculture practice is in profit where sugarcane is dominant crop with 25 tons of per acre yield and 1300 tons of total production, with total money value of Rs. 1300000 and net profit per acre of Rs. 19711. The Buddaguppe village of Maddur taluk also belongs to highly irrigated taluk. This village has 41.19% of irrigated land. The sugarcane, rice and ragi are the crops grown in order of acreages. All these crops are cultivated with profit. The highest per acre profit is Rs. 34900 for rice where its per acre yield is 29 quintals, while for sugarcane is Rs. 18214 and hence farmers of Budaguppe village can shift to rice cultivation from sugarcane. The Itaga village of Chittapur taluk (Gulbarga district) represents dry land agriculture in north Karnataka. The tur is dominant crop with 57.36% area, out of net sown area. Jowar and green gram are second important crops with 31% and 11.62% area respectively. In this Itaga village per acre expenditure for jowar cultivation is Rs. 1500 while net profit per acre of jowar is Rs. 1440. Thus jowar cultivation in Itaga village is under loss. This is mainly because of ill distribution of south west monsoon rainfall. On the other hand tur cultivation has shown net profit of Rs. 7574 per acre, mainly because of high market price, for tur. The Iddrahalli village of Kolar district is another sample for dry farming. Out of total net sown area 19.50% is irrigated by bore wells and when rain fails this irrigation comes to the rescue of farmers. **The ragi and groundnut are the dominant crops in Iddrahalli. However the mulberry cultivation provides maximum profit of Rs.**
The ragi, groundnut and jowar provide 5.75 quintals, 6.7 quintals and 13.30 quintals of yield per acre respectively. Therefore the farmers of Iddrahalli have to continue to develop the per acre yields of these crops, as these crops are adoptable to normal physical conditions. The Kavadi village of Sringeri taluk represents the agricultural activities of high rainfall zone. The plantation agricultural crops like arecanut, coffee and pepper have shown high profit than the cultivation of rice and banana in Kavadi village. Therefore the farmers of Kavadi village have to practice scientific management of plantation crops in order to get more yields from them. The Haladipur village of Honnavar taluk shows agriculture of the coastal region of Karnataka. The cultivation of rice, groundnut and coconut are proved as profitable. However, much of the modernization of agriculture is not well adopted in this coastal village mainly due to fragmented landholdings apart from lack of commercialization in agricultural crops. Therefore farmers need effective training and education in agriculture. The Kunigal village of Ramnagar taluk represents agricultural aspects under urban impact of Bangalore city. In this village coconut, ragi, silk and mango cultivation are found to be profitable, while rice cultivation is under loss. The shortage of water and high cost of labour have resulted in rice cultivation under loss. However the urban impact has facilitated the cultivation of coconut, ragi, silk and mango in profit. The Aralalusandra village represents the agriculture of a very high developed taluk of Kanakapur in south Karnataka. The rice, coconut, silk and ragi are main crops in Aralalusandra, where coconut and silk are grown with high profit, due to high economic development of Kanakapur taluk. The Tangadi village of Athani taluk in north Karnataka represents the agriculture of commercial farming. About 35.19% of arable land is under irrigation in Tangadi village. The sugarcane, jowar, wheat, gram and sunflower are cultivated in Tangadi village where the sugarcane and sunflower cultivation provide maximum profit of Rs. 11038 and Rs. 3800 per acre respectively. However the crops like jowar, wheat and gram also have provided good per acre profit of Rs. 1977, Rs. 3364 and Rs. 1200 respectively. Therefore the whole village of Tangadi is shining in agriculture, mainly because of fertile soil, use of adequate chemical fertilizers and irrigation. The Papinayakanahalli village of Hospet taluk shows agriculture of a highly literate village, having 66.87% literacy. Inspite of high literacy rate in this village, the agriculture practice and yield are very poor due to dry land agriculture, insufficient rainfall, little modernity in
agriculture and fall of dust on crops arising out of iron ore mining in the village. Therefore maize, jowar, sunflower, minor millet, and tur show less profit of Rs. 2000, Rs. 1607, Rs. 1130, Rs. 1000, and Rs. 500 per acre respectively. However, bajra shows an expenditure of Rs. 55 per acre against Rs. 444 profit. The Hiremalligawada village is studied to know the impact of agricultural university, Dharwad, on the practice of agriculture and performance in the productivity of crops. In this village out of 26 surveyed farmers, 23 farmers are not using any type of machines in their agricultural operations. Due to illiteracy and ignorance of farmers, the use of agricultural university is not taken by the farmers, and therefore, even the agricultural university should think of how to change such a village from traditional practice of agriculture to modernity. Only a few farmers who use radio, TV, newspapers, etc., to adopt new methods for agriculture is not enough to foresee the development in agriculture.

In the first chapter of the thesis, an overview of select literature on agricultural problems and agricultural development, provides an adequate knowledge on land-use, soils, their problems, role of irrigation and its set targets including watershed management, problems of farmers under different sizes of landholdings, significance of basic infrastructure in the rural Karnataka, incentives to farmers to develop agriculture such as fertilizers, HYV seeds, tools, and equipments to operate arable land and crops, providing knowledge to the farmers regarding changing prices of agricultural products in the market and taking financial assistance from banks and cooperative societies etc. Therefore the concepts and experiments put forth in the overview of literature are of great relevance to tackle the problems of agriculture in Karnataka, at various levels of geographical units (village, taluk, district).

The spatial pattern of levels of agricultural development based on 18 indicators reveals that one taluk i.e. Magadi taluk in Bangalore Rural District as very high developed, 34 taluks as high developed, 49 taluks as medium developed, 55 taluks as low developed. Therefore high priority should be given to the development of 55 taluks of low development plus 36 taluks of very low development. For the agricultural development the efficient development of infrastructure is essential. In this regard, based on 11 indicators of general infrastructure, the categorization of infrastructure development shows 4 taluks as very high developed, 31 taluks medium developed, 68 taluks as low developed and 35 taluks as very low developed. Therefore 68 taluks of low development and 35
taluks of very low development have to be strengthened on priority to develop 11 indicators of infrastructure development, based on the 5 indicators of economic development 8 taluks are identified as very high developed, 26 taluks as high developed, 47 taluks as medium developed, 56 taluks as low developed and 38 taluks as very low developed. Therefore 56 taluks of low development of economic indicators + 38 taluks of very low economic development have to be urgently considered for further development of economic indicators.

The Status and Strategy of Agriculture in Karnataka

The agriculture and allied sectors in Karnataka grew at an annual rate of 3 to 2.4 percent in 1980 and 1990. It reduced to 1 -1.5 percent during the last 5-6 years, lower than the industrial growth rate of 12.5 percent. The share of agriculture sector in gross State domestic production has reduced from 33 percent during 1990 to 26.2 percent in 2000. The other important features of Karnataka agriculture are:

- 60 percent (152 lakh ha) of the total geographical area (195 lakh ha) is prone to drought, next only to Rajasthan.
- 75 percent of cultivated area (123.07 lakh ha.) depends on rainfall.
- 25 percent of the cultivated area is under irrigation.
- The average cropping intensity is 228 percent.
- The average cropping intensity is 118 percent.
- 73 percent of holdings belong to marginal and small farmers.

Causes for stagnation:

There has been a plateau of production in various fields of agriculture. The reasons for such a situation are far too many and complex, the main causes are as follows:

1. Degradation of natural resources viz, Land, water and bio-diversity in rain fed and irrigated situations, with multiple nutrient deficiency and deterioration of soil health.
2. The production of cereals progressively increased to 92.50 lakh tonnes by 1998-99, stagnated by 2000-2001 (100.04 lakh tonnes) and declined to 89.01 lakh tonnes by 2004-2005. The production was affected during 2002-2003 (59 lakh tonnes) and 2003-2004 (60.69 lakh tonnes) due to drought.


4. Oil seeds reached the highest production level of 17.43 lakh tones during 1995-96, which remained stagnant for some years while it declined to 15.67 lakh tones during 2004-2005.

5. About 73 percent of the holdings are small and fragmented with a holding size of 1.4 ha. About 46.1 percent of holdings with a holding size of 2.56 ha.

6. Little or poor local infrastructure facilities viz local input for production and irrigation, infrastructure, farm machinery, supply, processing, value addition, packing, marketing etc., hardly 5 percent of total agricultural commodities are processed with value addition, while this proportion is 70-85 percent in developed countries.

7. Fluctuation in prices of agriculture and horticultural produce due to policies not being farmer friendly, making agriculture non-remunerative.

8. Lack of awareness and skills amongst the farmers with respect to the right variety, seed quality, organic manure, fertilizer use, irrigation, plant protection inputs.

9. Lower resource use efficiency of Land, water, seeds, fertilizer resulting in losses due to pests and diseases, besides harvest and post harvest losses.

10. Livestock suffer due to inadequate nutritive feed and fodder, drinking water, health care, medicine and other infrastructure facilities.

11. Poor resource base of the farmers in terms of education, skill, infrastructure, credit, input supply and technical knowledge.

**Crop productivity:**

The production of major crops is low except maize (1841 kg/ha). The productivity of sorghum, wheat, rice and bajra is low occupying 3rd, 4th, 5th and 7th position among the States and are below the world average. The important pulse crops are Tur and Bengalgram with a low productivity occupying 8th and 7th position among States. Considering productivity of oil seed crops-groundnut and sunflower, Karnataka occupied 7th position in the country. In sugarcane and cotton, Karnataka State topped with a productivity of 102 t/ha and 300 kg/ha respectively.

In sorghum (Jowar) the productivity has stagnated from 1990-2000 to 2004-2005 and it reduced from 2001-2002 to 2003-2004 due to droughts. Similarly, productivity in rice has stagnated from 2001-2002 due to moisture stress, high weed intensity, and biotic stresses like blast.
Among oilseeds, productivity fall in groundnut, sunflower and soybean is apparent. The productivity of groundnut declined from 10q/ha to 7.5q/ha. In addition, groundnut area also is reduced. However, sunflower area has increased from 4.0 lakh ha during 1995-1996 to 12 lakh ha in 2004-2005, but with a low productivity (of 4.59q/ha). Similarly, soybean productivity is 750 kg/ha, below the national average (1000 kg/ha) and world average of 1750 kg/ha.

The productivity of pulses is low being around 500 kg/ha in pigeon pea, 200 Kgs per ha in green gram and black-gram and chickpea. Due to the shortage in production of pulses and protein, malnutrition is a rule in rural areas. Cotton area is about 5.6 lakh ha with more than 85 percent being rain fed.

**Strategies to improve productivity:**

Land and water resources are crucial for development and are independent of each other for sustainable development. Development of resource on watershed basis is the new paradigm for planning, development, management of land, water and bio resources with focus on socio-economic and institutional aspects in addition to biophysical aspects facilitating a participatory-bottom up approach. The following are a few strategies to enhance our capability to enhance and sustain productivity.

1. **Increasing agricultural productivity from dry lands from 1 tone to 2 tones per ha.**
   The soil and water conservation practices viz, bunding, land leveling compartment bunding, ridges and furrows, residue mulch, live vegetative barriers, good agronomic practices showed 40-60 increase in yield, these need to be popularized.

2. **Maintaining soil fertility through integrated nutrient management and crop management practices,** nutrient management based on soil tests can enhance the productivity to 2 t/ha.

3. **Promoting diversified and sustainable production systems through precision farming,** conservation tillage, integrated nutrient management, organic farming, tree based farming for sustainable production. Diversification of crops and cropping systems from commodity centered approach to farming system approach. Sustainable farming system involving agriculture, horticulture, forestry, dairy, poultry, sericulture need to be developed for increasing food, productivity and incomes per unit area.

4. **Crop improvement programme to develop varieties suited to rain-fed agriculture needs to be strengthened.** It should also focus on high productivity under irrigated ecosystem and resistance to pest and diseases.
5. Good quality seed acts as a catalyst for realizing the efficiency of resources and inputs in agriculture. The trials conducted at NARS revealed that more than 20 percent increase in productivity could be realized with the use of quality seeds at affordable price for enhancing and sustaining productivity.

6. **Improvement in seed replace rate:** According to the latest 59th round of National Sample Survey Organization report (2005), about, 48 percent of the farmers used purchased seeds, 47 percent of farmers used farm saved seeds and only 5 percent of the farmers exchanged seeds. In addition, the seed replacement rate in India has improved considerably. Currently, 30 percent of farmers replaced their seeds every year, 32 percent replaced their seeds every alternate year, 21 percent replaced their seeds after three years and 17 percent after 4 years.

The UAS, Dharwad has shown success story of implementation of the "Integrated seed supply system" through organic village concept. This is crucial to reduce the cost of seeds, timely availability of seeds at their place and availability of required quantity of seeds of crops, which are required in bulk as in groundnut, soybean, chickpea, rice and wheat. The UAS, Bangalore has demonstrated the possibility of producing rice hybrid seeds by getting parental seeds from research station at very reasonable cost to make available to farmers timely supply of quality seeds and generate enormous employment opportunities to the rural youths JSS SGSY project with head quarters at Mysore and having activity in 25 districts of Karnataka, has demonstrated that farmers can get trained in producing their own seed by getting foundation seed from research station and, this will not only generate rural employment but also provide quality seed at the right time at an affordable price to small and marginal farmers. Establishment of seed banks at Village/Hobli/Taluk level with the involvement of rural youth helps to achieve the above objectives.

7. Demonstration of improved cropping systems including improved agronomic practices, conservation tillage, crop rotation, nutrient management, soil organic matter management and good agronomy are low cost technologies to enhance the productivity of crops.

8. Irrigation water management should be accorded the top priority. The productivity gains could be achieved in the new irrigation UKP and Bhadra project areas as these commands need focus on land development, proper distribution of water, appropriate cropping systems, input management, technical know how about
irrigation water management, drainage, water saving agronomic practices, pressurized systems of irrigation - sprinkler, drip trickle irrigation. There will be growing demand for fertigation in different crops, which will result in economy in water and fertilizer use. This novel area needs skilled and trained personnel to promote efficient use of water resources and increasing irrigation efficiency to sustain the production.

9. Efficient management of marginal and shallow lands through alternate crops such as fruits, medicinal, aromatic, dyes is desirable including tree based farming and alley cropping of shrubs, trees, green manure crops glyricidia, sababul, pongamia. Promotion of organic farming be recycling of wastes will sustain the productivity and conserve the natural resources.

10. The UAS, Dharwad and Bangalore are pioneers in developing the IPM in pigeon pea, cotton, chilli, rice, sunflower, groundnut, chickpea, coconut, arecanut, pepper, cabbage and cauliflower and they need to be popularized. The Government of Karnataka has launched the farmers' participatory "Farmers Field Schools (FFS)" and is a good step in this direction.

11. There is need for policy support from the Government for improving rural infrastructure, input supply, transport, marketing and price structure.

12. Corporate culture, where professionals should participate with farmers in key activities of agriculture viz, seed production, crop production, plant protection, irrigation, processing value addition, marketing and financial investment be explored to make agriculture more remunerative. Integrated farming systems, which can sustain production and provide livelihood support to farm families must be supported.

13. Technology based farming with good network between agricultural universities, TOT centers, development Departments, RSK's and farmers will immensely strengthen the extension services of agriculture sector. The NSSO (2005) statistics reveal that only 5.7 percent of the farmers obtained information from input dealers. This shows that the present extension efforts of the State Department of Agriculture need a thorough revamping to improve their role.

14. Providing assured market with the good price structure is desirable. Encouraging contract farming and direct marketing will improve farmer's share in consumer rupee. Increase in the public sector investment in agriculture to 10 percent of the plan outlay is crucial. There is a need for agricultural intensification and
diversification with greater public investment. Technology based farming can help reduce cost, enhance marketable surplus and reduce risks. The dry land areas deserve an immediate attention and priority of Government programme. Integrated farming system approach which comprises agriculture, horticulture, animal husbandry, forestry, fisheries, agro processing and value addition are the crucial components for enhancing rural livelihood, provide greater economic security and make agriculture self sustainable.

To sustain decent living among the farming community, there is a need to assess the present innovative technologies available, which can be adopted under replicated easily. In this endeavour, the scientists, academicians and planners have to play significant role and help to create farmer friendly management practice systems both short and long-term basis. The components are:

❖ Identify the innovative technologies from the R & D sector, which can be easily, adopted by the farming community.
❖ Educate the farmers through various trainings/domestications on the practicable crop husbandry components.
❖ Develop and promote many orchards and pastures.
❖ Create Agri-info technology transfer kiosks in rural sector.
❖ Develop accessible Rural Agri/Animal clinic for support services.
❖ Create large number of Women Managers for many dairy farmers in both rural and peri-urban areas.
❖ Create employment Generation through seed village concepts minifood proceeding and semi farm/ non farm sectors.
❖ Popularize water conservation and management - Water shed approach.
❖ Popularize the performer/performance technology on large scale basis for white coverage.
❖ Create micro-credit and marketing facilities.

For a group of 4 to 5 villages located in the range of 5 to 12 kms distance one agricultural scientist with BSC in agriculture science be appointed by the Karnataka government, who shall look after the farmer’s to advise them to manage scientific farming such as type of HYV seeds, combination of crops, soil fertility status and needed fertilizers, water management, pesticide doses, changing market prices, new developments in HYV seeds, weather conditions at local level based on weather forecast done in TV, radio and news papers. Apart from his salary farmers of each
village be asked to pay yearly Rs. 25 per acre of land per year to agricultural scientist, as an incentive. Such agricultural scientist be asked to stay in a nodal village for whom a house quarter has to be built by the Karnataka government and a two wheeler vehicle also to be provided to him with petrol allowance. He should meet the entire farmers of each village at gram panchayat office and advise for each seasonal land operation system, so as to see high productivity from the cropped land and to achieve optimum level of success in agriculture of each village/each farmer. He shall also be asked to visit cropped land of villagers where his supervision/overseeing is most wanted.

It is hoped that, this entire thesis entitled “Problems of Agriculture and Agricultural Development in Selected Villages of Karnataka : A Geographical Analysis”, will add to our knowledge to understand the dimensions of agriculture in Karnataka in particular and further to the growing vistas in agricultural geography, in general.