

# An Overview of Agriculture in Mysore District; Proposal of an Agriculture Hub in Mysore City

Ar. Uma. S M, Shankar. B, Joshua Rego



**Abstract-** To cater to the demands of the increasing population and support the economy which has been projected to grow, agriculture in India will have to focus more on measures such as optimum usage of land and other limited resources, appropriate implementation of machinery and manpower, increased productivity, production of high-quality products and exploring and adopting integrated farming systems and controlled-environment agriculture (CEA). Other significant domains include agricultural education, training, research and development. This article aims to study the state of agriculture in Karnataka's Mysore district, identify trends and issues and propose a district-level agriculture hub in Mysore city, that aims to equip the user with knowledge and skill to incorporate the above mentioned measures.

**Keywords:** Agricultural data, Agricultural education, Agricultural marketing, Crop productivity

## I. INTRODUCTION

### A. Agriculture in India

India with its vast population and diversity is very dependent on agriculture. The agriculture sector with its allied sectors is undoubtedly a significant contributor to the Gross Domestic Product (GDP) of the country. Over the past few decades, Indian agriculture has witnessed the Green Revolution (adopting modern technologies such as high yielding variety seeds and several other systems, products and machinery), the Blue Revolution (fish production), the White Revolution (dairy farming), the Yellow Revolution (edible oil and oilseed production), and various other similarly named revolutions that were a result of discoveries or implementation of new inventions and technologies in a way that drastically altered the rate and quality of production in a more favorable way. According to the Food and Agriculture Organisation (FAO) of India, agriculture and its allied sectors are the largest source of Indian livelihood. Much of this dependency on agriculture is in the rural households, with more than 82% of farmers being marginal.

Manuscript received on October 05, 2021.

Revised Manuscript received on October 18, 2021.

Manuscript published on November 30, 2021.

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India's total food grain production has been increasing – it was estimated at 275 million tonnes (MT) in 2017-18, crossed 295 MT in 2019-20, and is estimated at 303 MT in 2020-21. As of 2021, India has surpassed Brazil and has the largest cattle inventory in the world, accounting for roughly 30% of the world's inventory. Furthermore, India is the world's largest producer of milk, pulses (total), jute, banana, mango, guava, and lemon, and the second largest producer of rice, wheat and sugarcane. Agriculture's contribution to the GDP, although significant, has steadily decreased over the years due to economic diversification and growth. The State of Food Security and Nutrition in the World report reported a 60% decline in the number of undernourished people in India over a decade from 249.4 million in 2004-06 to 189.2 million in 2017-19. However this reduced number is still much higher than the total population of any European country. In other words, a country with a population equal to the number of undernourished people in India would be the eighth most populous country in the world. Despite achieving record numbers for total food grain production, a considerable number of people are undernourished and living in poverty.

The success of Indian agriculture brings with it certain drawbacks. One of the main issues commonly observed is that the production has become "cereal centric" (the production of wheat and rice is proportionally higher than that of protein-based products like oilseeds and pulses). This demands usage of generous amounts of land, water, fertiliser and other resources. For example, the national output for pulses comes predominantly from land which is unirrigated. On the other hand, a significant portion of output in rice, wheat and sugarcane comes from irrigated land. Nearly 80 per cent of Maharashtra's sugarcane is reportedly grown in acutely water-scarce areas. Although sugarcane cultivation makes up less than 4 per cent of the total cropped area, it takes away almost 70 per cent of irrigation water. Thus, agriculture has become more resource-intensive and regionally-biased, which poses serious risks and issues for sustainability. It is prudent to match production and supply to the rising demand of protein-based products, which encourages greater protein consumption. But if the rising demand for pulses has to be met, there needs to be a large increase in pulses production on irrigated land. This would require redesigning and reconsideration of existing policies. Further challenges are provided by population growth, rapid industrialisation and even the effects of climate change, which necessitate developing sustainable strategies and implementing them in order to get the most out of land and water, which are under increasing stress of overexploitation.

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No single state in India is the definitive best producer of every crop. The differences in productivity is because of factors such as climates, soil conditions, availability of resources, local development and infrastructure and farmer knowledge.

## B. Agriculture in Karnataka

The state of Karnataka has the fourth largest economy in India, and agriculture is a core contributing sector. According to the State Agricultural Infrastructure Development Plan (SIADP) report for Karnataka (2015-16 to 2019-20), 68% of the population depend on agriculture for their livelihood. It is the profession of 90% of the rural population. The report also states that the food requirement of the state depends on the agricultural sector to a great extent. In addition, the agriculture sector also supports other related industries such as rice mills, flour mills, mills for spinning, ginning and weaving, industries for confectionaries, condiments and spices, bakeries, sugar mills, solvent extraction units, oil extraction units and cattle feed plant units. At least 65% of the total geographical area of the state is cultivated. The majority of the cultivated area is heavily dependent on the southwest monsoon. The Karnataka State Natural Disaster Monitoring Centre (KSNDMC) has suggested that Karnataka is second only to Rajasthan in having the most extent of land ravaged by drought. In 2016, 160 out of 176 taluks in Karnataka were declared drought hit. The remaining irrigated area is also indirectly dependent on rainfall. Hence the overall success of agriculture in the state depends on rainfall and its fluctuations. Effective and optimum utilisation and harvesting of rainwater becomes important. There are three agricultural seasons - Kharif (April to September), Rabi (October to December) and Summer (January to March). The main crops grown in Karnataka include paddy, ragi, jowar, maize, sugarcane, pulses (black gram, Bengal gram etc.), sunflower, groundnut, castor, cotton, coconut, arecanut, cashews, and tobacco. Karnataka is also a significant player in horticulture, sericulture and floriculture. Horticulture crops, especially fruit and vegetable crops are grown by many marginal farmers, which helps increase their income. Farmers engaged in horticulture are more engaged throughout the year as it is spread over 8-10 months. These crops are important sources of essential nutrients. Furthermore, fruits and flowers have higher export values compared to agricultural crops. Sericulture is an important cottage industry in Karnataka, which is the leading producer of silk in India. In floriculture, estimates indicate flowers are grown across more than 22,000 hectares across the state, with Karnataka reportedly accounting for almost three-quarters of India's floriculture production. As of 2021, Karnataka has 31 districts, all of which are dependent on agriculture, not just for food requirements but to also support the various agro-based industries. Agro based industries can be directly or indirectly dependent on agriculture and are further classified into agro-produce processing units (rice mills), agro-produce manufacturing units (textile mills), agro-inputs manufacturing units (implements, fertilisers, pesticides etc.) and agro service centers (equipment services), each with several subdivisions and examples. This implies the vast domain and influence of

the agriculture sector even at the district level. Improvement in agriculture can no longer be thought as a mere attempt to increase farmers' incomes. It can boost the economic growth of the entire district.

## II. AGRICULTURE IN MYSORE

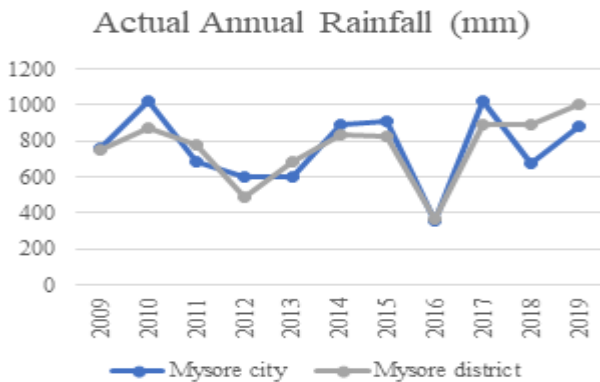
### A. Introduction

Mysore district is the administrative headquarters of the Mysore division (Karnataka has four administrative divisions, the others are Bangalore division, Gulbarga division and Belgaum division). With an area of about 6307 km<sup>2</sup>, it is the 13<sup>th</sup> largest district, and the third most populous according to the 2011 census. The nine administrative subdivisions or taluks within Mysore district are Mysore city, Nanjangud, Piriapatna, Hunsur, Krishnarajanagara, Heggadadevanakote, Tirumakudalu Narasipura, Saragur and Saligrama. Agriculture is the backbone of the economy of Mysore district as it is with the rest of India and the rest of Karnataka. Though the agriculture is highly dependent on the rainfall, the rivers Kaveri and Kabini provide the irrigation needs required for agriculture in this district. According to the 2001 census, about 3,25,823 farmers are involved in cultivation in this district. In the year 2001–2002, Mysore district yielded a food grain production of 608,596 Tonnes which is a contribution of 6.94% of the total food grain production in the state for the year. Some of the important crops grown here are cotton, grams, groundnut, jowar, maize, ragi, rice, sugarcane, sunflower and tur. Horticulture is another area contributing significantly to the economy; especially the palm oil production in H D Kote Taluk.

### B. Climate

The climate of the district can be described as moderate. The summer season usually starts in March and lasts until May. The monsoon season immediately follows in June and lasts until September. The period from October to December experiences post monsoon rainfall. The winter season that follows lasts through February. April tends to be the hottest month, while December is the coldest. Temperature variations can range anywhere from 35 °C in summers to 15 °C in winters. Mysore experiences the interplay of the two opposing air masses of the southwest and the northeast monsoon. The southwest monsoon, that flows from the sea to the land, carries more moisture, and is more dominant in the district than the northeast monsoon. Much of the annual rainfall that the district receives is from the southwest monsoon, which is between June and September. The northeast monsoon brings lower amount of rainfalls for shorter durations over smaller areas of the district. Studies of the rainfall deficit patterns by the Census organisations, and comparisons with long term data have strongly suggested increase in deficiency of the pre-monsoon rainfall periods, whereas the southwest monsoon period and the northeast monsoon period saw increased and decreased deficiencies in different parts of the district.

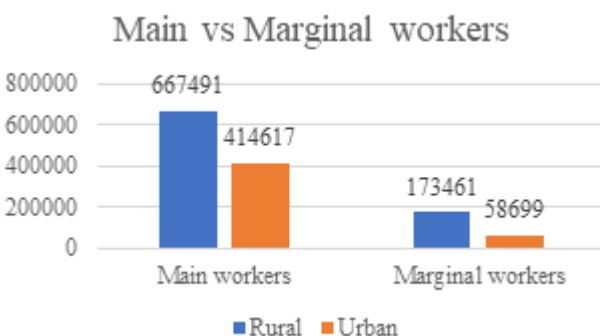
The line graph shows the actual annual rainfall (in mm) for both Mysore city and the Mysore district. While the trends for both are similar, it is worth noting the drastic fluctuations throughout the years. The annual rainfall recorded in 2016 was the lowest for the district in over 60 years.



Source: District Statistical Office, Mysore

The distribution of resources and prevailing climatic conditions are not even throughout the country. Therefore to ensure optimum usage and maximum production, it becomes necessary to delineate various zones based on various factors such as soil properties, rainfall, temperature, topography etc. These zones are called agro climatic zones. India has 15 such zones and Karnataka has 10. Mysore district comes under two agro climatic zones- the southern dry and the southern transition zones. Mysore city, Nanjangud, Krishnarajanagara and T. Narasipura fall under the southern dry zone. More than 50% of the rainfall is received during the Kharif season, and the soils in this zone are predominantly red sandy loams, but there are also areas with black soils. Principal crops like paddy, ragi, pulses and sugarcane are suitable for cultivation. The rest of the taluks fall under the southern transition zone, which receives more than 60% of the rainfall in the Kharif season. The soil for the major part of these zones are red sandy loams, but there are red loams in the remaining areas, making the zone suitable for growing paddy, ragi, jowar, pulses and tobacco. The rainfall and climate of the district are quite important to the workers of the agricultural sector.

C. Total workers



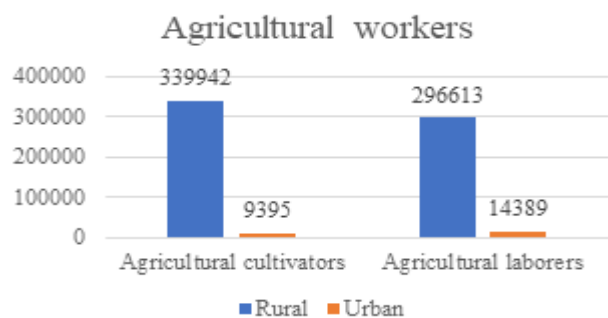
Source: As per Population Census 2011

The above bar graph shows the distribution of main workers and marginal workers in Mysore district. The total workers

are broadly classified into main workers and marginal workers. The year preceding the census is usually considered as the reference period. Therefore, the workers who have worked for the major part of the reference period i.e. 6 months or more are classified as main workers. Workers who engaged in only work for less than 6 months are considered to be marginal workers. For example, agricultural labourers who don't own land, but work on land owned by others for an income, at different times of a year, but with the total duration not exceeding 6 months or 183 days to be precise, are considered marginal workers. The rural population of Mysore district is higher than its urban population. However it is worth noting that the urban population of Mysore city is much higher than the urban and rural populations of any other taluk in the district. It is evident from the data shown in the bar graph, that the rural areas contain more main and marginal workers compared to the urban areas. There are thrice as many marginal workers among the rural population than the urban population. Further analysis suggests that Mysore city has the highest number of main and marginal workers and the new taluk of Saraguru has the least number of both. Moreover, 82.34% of the total workers in the district are main workers. However, workers formed only 43.79% of the total district population. 56.21% of the district population were non-workers, who had not worked any time at all in the year preceding the census.

D. Agricultural workers

As mentioned earlier, a large portion of the population depends on agriculture for their livelihood. Agricultural workers are further divided into agricultural labourers and agricultural cultivators. The Agriculture labour Enquiry Committee defines agriculture labourers as those who derive their main source of income by working on farms of others for a wage. They are engaged in agriculture and/or allied activities, and work for wages for the whole year or parts of the year, depending on which they can be marginal workers or main workers.



Source : As per Population Census 2011

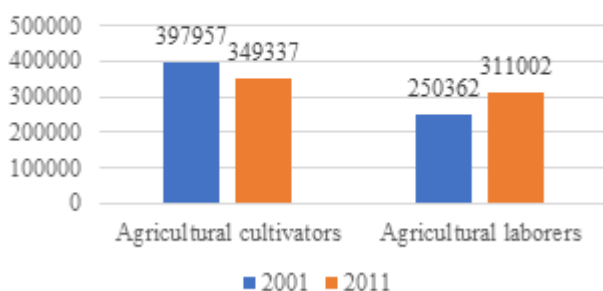
The standard of living and the income levels of most agricultural labourers is extremely low in India. The advent of machinery and technology in agriculture coupled with drastic climatic conditions such as low rainfall and drought are primarily responsible for low wages and even unemployment.

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As a result, they find it very difficult to support their families and repay their debts. Agricultural cultivators are engaged in land owned or held from private sector or the government for money or crop share. Cultivators are involved in supervising the cultivation. People working in another person's land for wages aren't treated as cultivators. Similarly, the land owners who lend their land to cultivators, but who do not directly supervise its cultivation aren't considered as cultivators either. The bar graph also indicates a great difference in the number of cultivators and workers between the rural and the urban populations. There are 36 times as many cultivators and nearly 21 times as many labourers among the rural population compared to the urban population. Another important observation is of the unfavorable development which has seen the decline in the number of agricultural cultivators and increase in agricultural labourers during the 2001-2011 decade. Compared to the results of the 2001 census, the number of agricultural cultivators decreased by 12.22 % and the number of agricultural labourers increased by 24.22 % in Mysore district. There was a decrease of 8.6% in the male population of cultivators, while the number of female cultivators decreased by 21.57%.

In addition, the number of male agricultural labourers increased considerably by 31.1%, while for females, this number has increased by 17.15%. Similar trends were observed when comparing the total number of agricultural cultivators and labourers in India and comparing the numbers with the 2001 census. The numbers strongly suggest the decline in the number of farmers and increase in the number of farm labourers throughout India, including Mysore district.

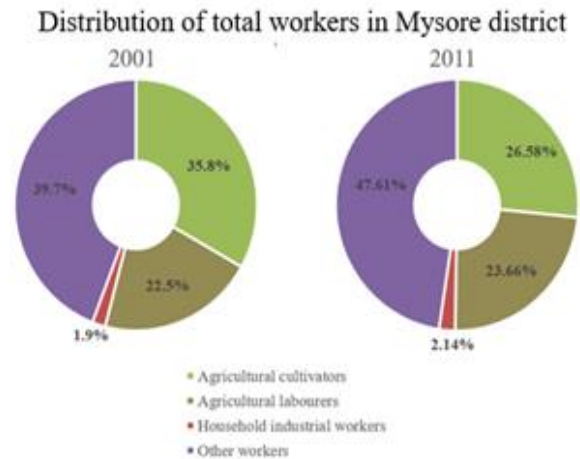
Total Agricultural workers (2001 census vs 2011 census)



Source : As per Population Census of 2001 and 2011

This shift towards agricultural labour during the period between 2001 and 2011 can be attributed to several reasons which include dwindling numbers and sizes of land holdings, climate change resulting in drought years, infeasible circumstances in farming and the development and growth of the non-agricultural sector which consists of household and non-household industries. This is evidenced by the fact that the total number of household industry workers in the district increased over the decade by 30.37%. Comparing the percentage distribution of various categories of the working population, every category of the working population has seen an increase over the decade except that of the agricultural cultivators, which has gone from 35.85%

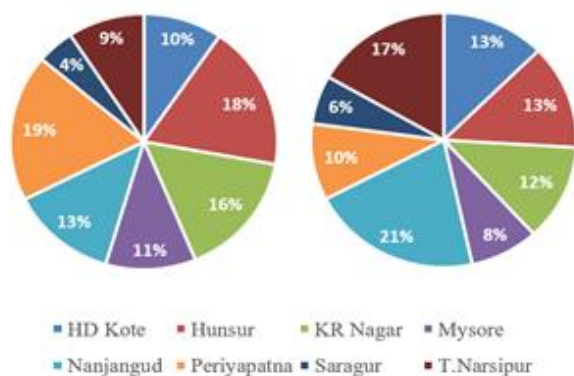
of the total workers in Mysore district in 2001 to just 26.58% in 2011.



Source : As per Population Census of 2001 and 2011

According to the 2011 census, Periyapatna had the highest number of agricultural cultivators whereas Nanjangud had the highest number of agricultural labourers. The new district of Saragur had the least number of both. However it is worth noting that a much higher percentage of the total workers in Saragur are agricultural cultivators and labourers than in Mysore city. This is because Saragur was enumerated to be the least populated taluk in Mysore district, the majority of the which were dependent on agriculture for their livelihood. On the other hand, the majority of the population of Mysore city comes under the category of "Other workers", which comprises of all those workers engaged in economic activity, other than cultivators, labourers or household industry workers.

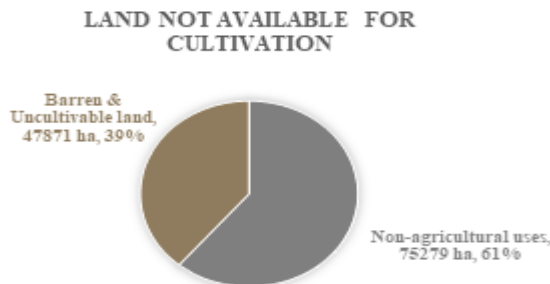
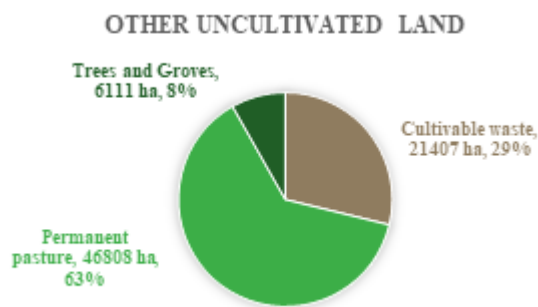
Distribution of Agricultural cultivators and Agricultural labourers in Mysore district



Source : As per Population Census of 2001 and 2011

### E. Land Utilisation

The following pie charts show the land utilisation of the district of Mysore as per Annual Season and Crop Report of 2018 – 19. The total geographical area of the district is 676,382 hectares. 48% of the total geographical area comes under the net sown area.

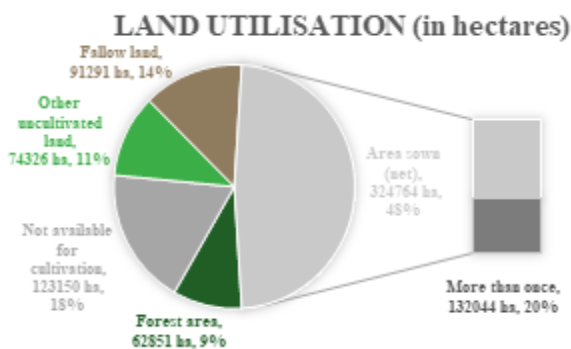


Source: As per Annual Season and Crop Report : 2018 - 19

9.29% of the total geographical area is occupied by forests. This number has been consistent since at least 2 decades. HD Kote, Periyapatna and Saragur have the highest areas under forests in the district. Krishnarajanagara and T. Narasipura had the least forest areas in the district and the least forest cover with respect to their geographical areas (0.27% and 0.26% respectively).

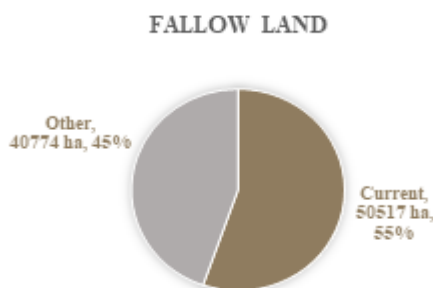
Source: As per Annual Season and Crop Report : 2018 – 19

Another category within uncultivated land is that of cultivable waste lands, which comprises of lands that area available for cultivation but are either not taken for cultivation or have been cultivated once before but not during the year of enumeration and the previous five years in succession. In other words, lands that are left uncultivated for more than five years are cultivable wastelands. These lands can be covered with thick vegetation due to not being used or they can be fallow. HD Kote and Saragur have the highest area of cultivable waste, way more than any other taluk, while Krishnarajanagara and T. Narsipur have the least. Before Saragur was separated as a taluk, HD Kote had more cultivable wasteland than all other taluks combined. Since 1998-99, the land under other uncultivated land has decreased by over 12%. It can be concluded that from the total geographical area of the district ie. 6,76,382 hectares, 38.48% or 2,60,327 hectares are not available for cultivation as of 2018-19. This number is a slight increase from the 2,60,149 hectares of land recorded to be unavailable for cultivation in 1998-99. The remaining 61.5% of the total area or 4,16,055 hectares that are under cultivation can be classified under fallow lands and net sown area.



Source: As per Annual Season and Crop Report : 2018 - 19

The land not available for cultivation occupies nearly double the area occupied by forests. 61% of the land not available for cultivation is used for non-agricultural purposes such as land occupied by buildings, roads, rail, bridges, canals, water etc. The rest is barren land like mountains and deserts, which cannot be easily brought under cultivation without high costs. HD Kote has the highest area of barren and uncultivable land. Overall, Mysore city has the highest area of land not available for cultivation with respect to its geographical area at 28.72%, while Periyapatna has the least, with 10.27% of its geographical area not available for cultivation. The barren areas and the areas under non-agricultural use have increased over the last 2 decades by 4.5% and 12.5% respectively. Furthermore, nearly 11% of the total geographical area of the district is classified under “other uncultivated land”. The majority of the other uncultivated land area is occupied by permanent pasture, which includes meadows and village common lands used for grazing. Land under trees and groves may consist of plantations of miscellaneous trees and shrubs, which may be put to some agricultural uses, but is not included in the net sown area. HD Kote has the highest area and percentage of permanent pasture, trees and groves



Source : As per Annual Season and Crop Report : 2018 – 19

Fallow lands can be classified into current fallow lands and other than current fallow lands. Current fallows are areas that are left uncultivated during the year of enumeration or for one or less than one agricultural year. Other than current fallow lands are cropped areas that are left fallow for a period over 1 year but not exceeding 5 years. Nanjangud has the highest area of fallow lands. The net sown area is the total area of land that is sown with crops.

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Areas that are sown more than once per year are counted only once. The number of times an area is sown is of no relevance in calculating the net sown area. Rather, it is the area of the land used for sowing which is considered only once. The net sown area as of 2018-19 was calculated to be 3,24,764 hectares or 48% of the total geographical area. This is a 14.82% decrease from the 3,81,256 hectares recorded in 1998-99. Hunsur has the highest net sown area of 64,435 hectares, followed by Nanjangud. The total cropped area or the gross cropped area is calculated by adding the areas sown more than once in a year to the net sown area. While the net sown area is the total area of the cropped areas, the gross cropped area is the total area of land sown once or more than once in one agricultural year. Nearly 40% of the net sown area or 1,32,044 hectares is sown more than once per year. Therefore, the total cropped area for the district in 2018-19 was 4,56,808 hectares. Nanjangud has the highest area of land sown more than once followed by Hunsur. The total cropped area in 2018-19 has decreased 1.96% from the 4,65,961 hectares recorded in 1998-99. Over 43% of the net sown area or 1,41,607 hectares of land are provided with irrigation facilities and constitute the net irrigated area, an increase of 25% since 1998-99. Fallow lands are arable lands that are suitable for growing crops, but which have been left uncultivated for a season or a period of time. The main reason for this is to allow the soil to replenish nutrients and by so doing, regain its fertility. This method of land management is sustainable, since a field, or a number of fields are taken out of the crop rotation process for a period of time ranging from 1-5 years depending on the crops grown. 14% of the total geographical area of the district comprises of fallow lands

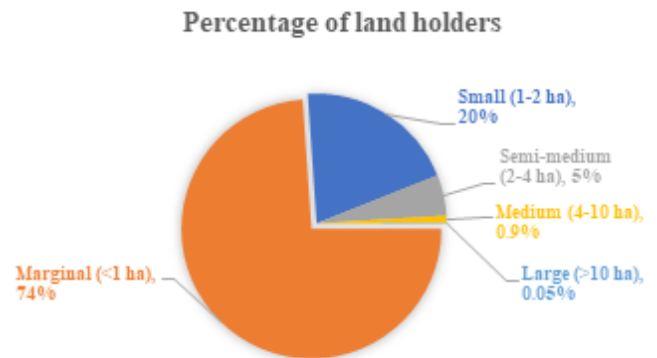
### F. Land holdings

Agricultural land is distributed over a large number of land holders. Over the years, there have been several

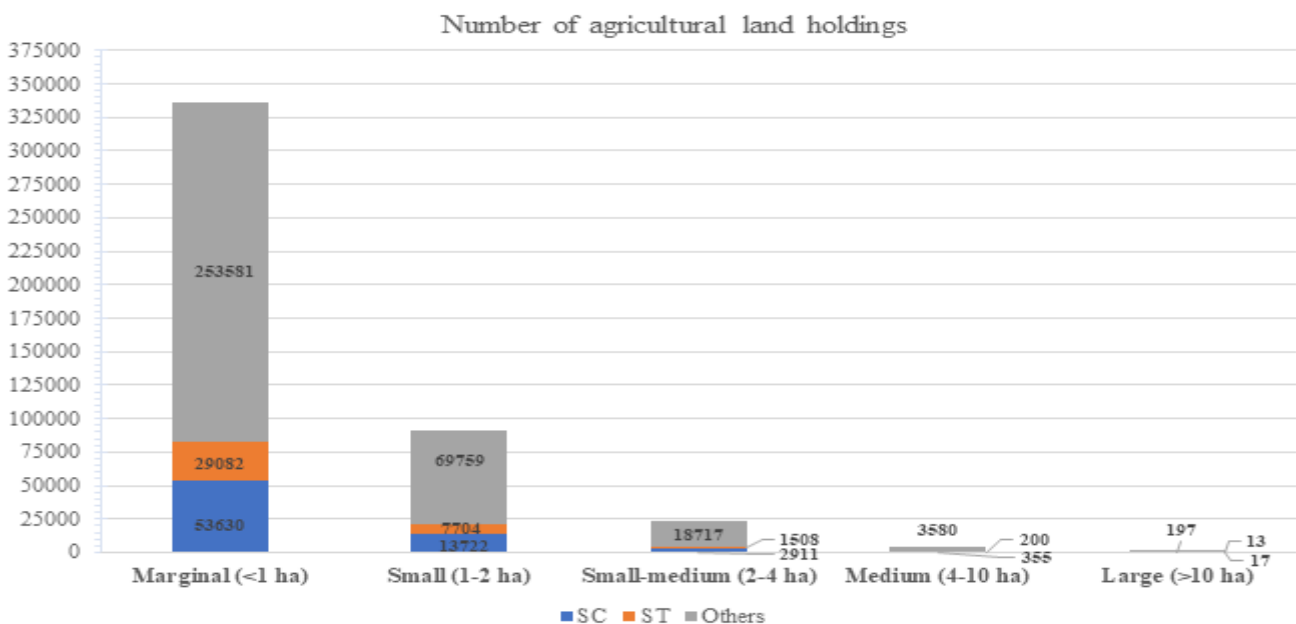
implementations and reforms, such as tenancy and ceiling laws. Ceiling laws specify the maximum area of land that could be owned by an individual, family or corporation. The land exceeding the ceiling limit is termed as surplus land, and can be claimed by the government to be redistributed or reused.

Land holdings are classified into five categories depending on the areas of the holdings:

- Marginal (<1 ha)
- Small (1-2 ha)
- Semi-medium (2-4 ha)
- Medium (4-10 ha)
- Large (>10 ha)

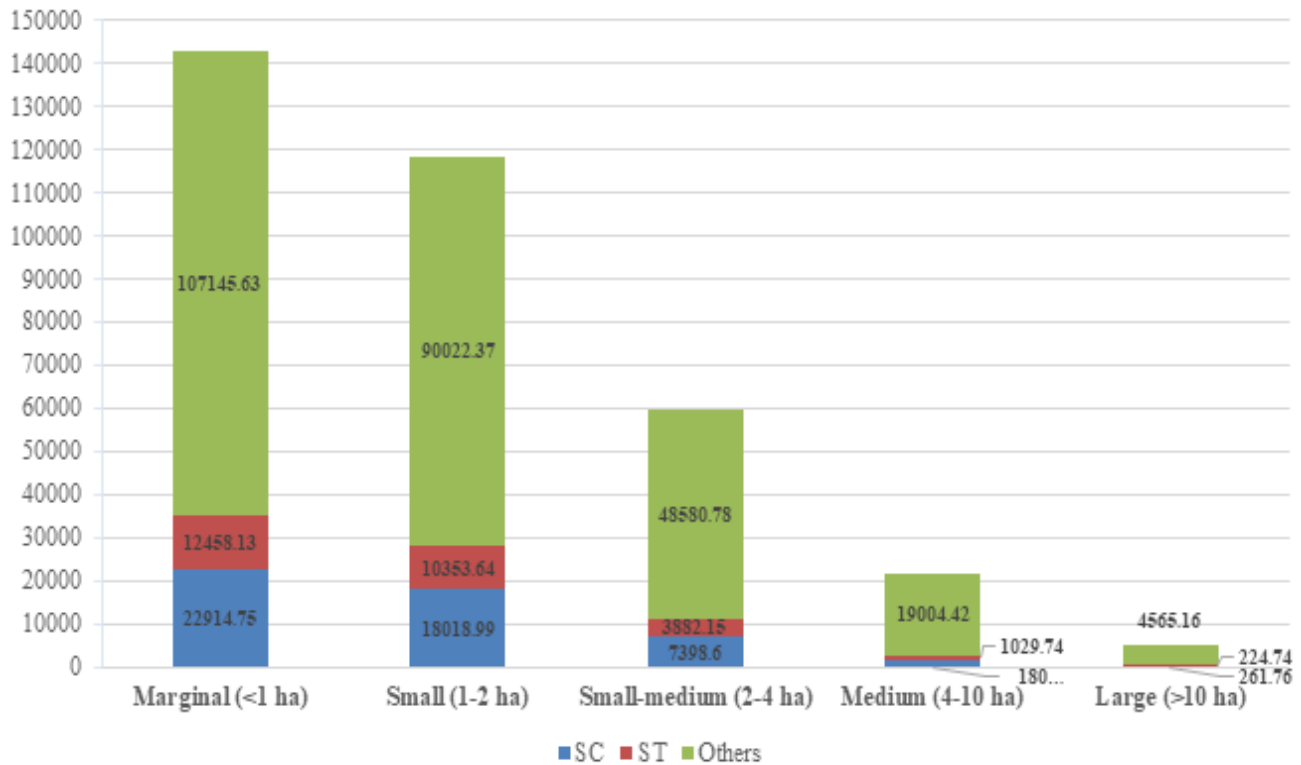


Source: As per 2015-16 Agriculture Census, DES



Source: As per 2015-16 Agriculture Census, DES

Area of agricultural land holdings (in hectares)

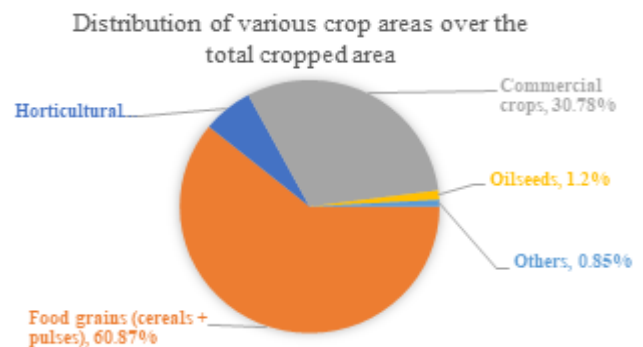


Source : As per 2015-16 Agriculture Census, DES

It is very evident from the pie chart that the majority of the land holders own marginal land below one hectare. The percentage of marginal land holders has increased from 52.25% in 1997-98 to over 74% in 2015-16. T. Narsipur had the highest number and percentage of marginal land holders (with 86% of total land holders owning marginal land holdings), while Nanjangud had the highest cumulative area of marginal land holdings. Small land holdings rank second, being owned by 20% of the land holders, followed by semi-medium land holders at 5%, medium land holders at 0.9% and large land holders being the minority at 0.05%. Nanjangud has the highest number of small, semi-medium, medium and large land holdings, and the highest cumulative area of all land holdings. The above bar graphs show the number and areas of the land holdings in the district, with distribution among the scheduled castes (SC), scheduled tribes (ST) and others. It can be observed that the number of land holders and the cumulative areas of the land holdings decreases as the area of the land holding increases. Furthermore, there is unequal and uneven distribution of agricultural land among these land holders. The vast difference between the number of marginal and small land holdings is not of the same magnitude in terms of areas of the land holdings. While the number of marginal land holders is 74% of the total land holders, the total land held by them constitutes 41% of the total agricultural land. Similarly, 0.9% of the total land holders own land upto 10 hectares and 0.05% own large land holdings over 10 hectares, the total extent of the land held by these two minority categories is over 7.7%.

G. Area, production and average yield of crops

Some of the most important parameters regarding the state of agriculture are area, production and average yield of the various crops grown.



Source: As per Annual Season and Crop Report : 2018 - 19

As mentioned earlier, the total net sown area of the district was 3,24,764 hectares as of 2018-19, of which 1,32,044 hectares is sown more than once per year. Hence the total cropped area was calculated to be 4,56,808 hectares. The vast majority of the total cropped area is dominated by food grains, which consists of cereals, millets and pulses. Paddy, ragi, maize and jowar are the major cereal crops cultivated in the district, with paddy and ragi cultivated over the most area. Krishnarajanagara had the highest area under paddy, while Hunsur had the highest area under maize as well as the highest total area under cereals and millets.

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Cereal crops and millets alone cover 39.89% of the total cropped area.

Pulses are a very important source of nutrition. They also fix nitrogen naturally from the atmosphere, and in the process, provide organic matter to the soil, improving its fertility. Some of the pulses grown in the district include Tur, Avare, Black gram, Bengal gram, Horse gram etc. Nanjangud has the highest area under pulses.

The total area under pulses is 20.97% of the total cropped area. Pulses are grouped with cereals and millets under food grains, which collectively cover 60.87% of the total cropped area. Other categories of crops grown include oilseeds such as groundnut, sunflower, safflower, sesamun etc. Oilseeds are crops whose seeds are used to extract oils that can be used for culinary or industrial purposes, and together are cultivated on 1.2% of the total cropped area. Nanjangud has the highest area under oilseeds.

Horticultural crops include fruits and vegetables, and cover 6.3% of the total cropped area. Commercial crops are grown with the intention of selling for profit. Cotton, Tobacco and sugarcane are notable examples.

Almost a third of the total cropped area is under commercial crops. The total amount of a crop grown and harvested in the areas it covers is the total production of the crop, usually expressed in tonnes. Estimates can be obtained by the product of the average yield and the corresponding area covered. Average yield is defined as the amount of crops grown per unit area (usually in kg/ha). The higher the yield, the higher the production and potentially, the profits.

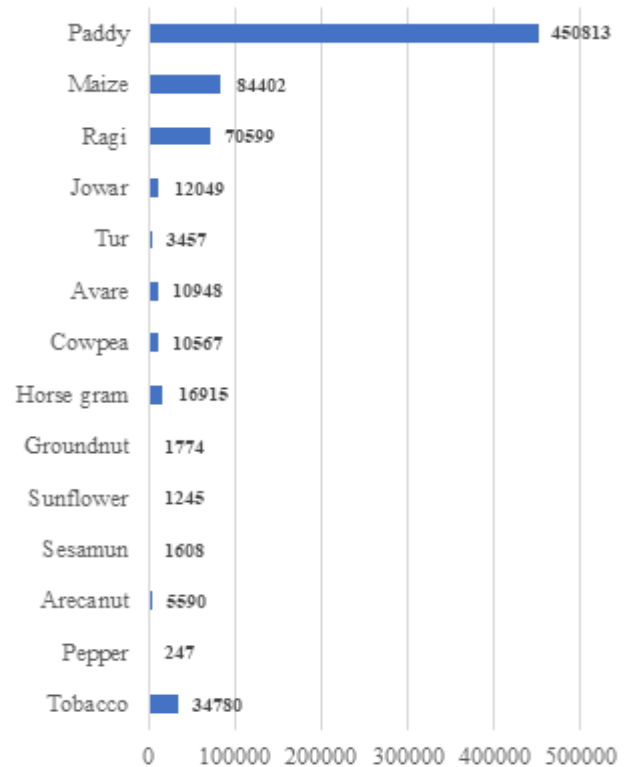
The following bar charts show the production (in tonnes), and the yield (in kg/ha) of some important selected crops. Paddy is the most produced cereal crop in the district, and has an average yield of 4758 kg/ha. T Narsipur recorded the highest production of cereals in 2018-19, while Nanjangud had the highest production of pulses.

That same year, the total food grain production in the district was 6,69,760 tonnes, a 12.33% increase from the 5,96,269 tonnes recorded in 1998-99. Tobacco is a commercial crop, which saw a production of 34,780 tonnes with Hunsur producing the highest amount of Tobacco. Sugarcane is another prominent commercial crop grown in the district with a production of 8,61,142 tonnes in 2018-19.

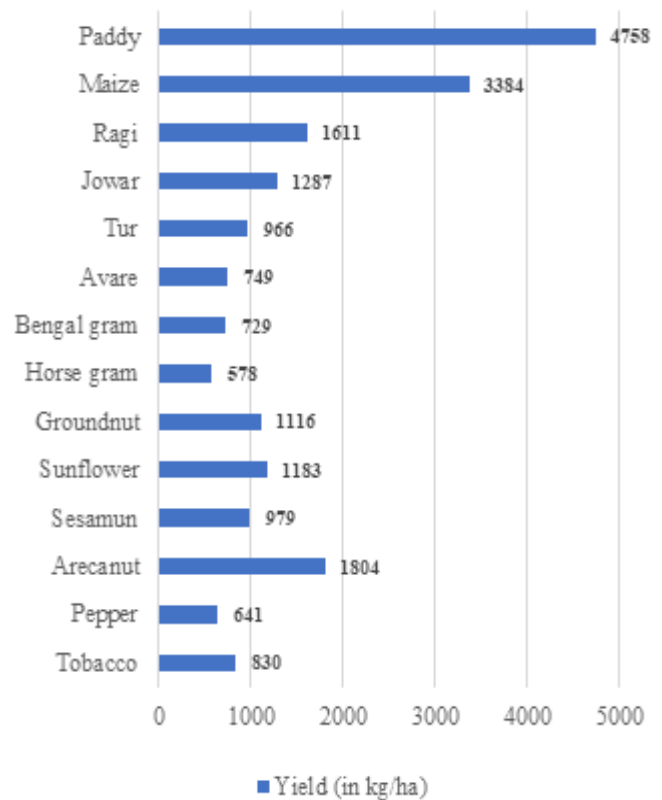
It can also be observed that the amount of paddy produced is much higher than some of the other crops listed. The amount of paddy produced is more than 5 times the total production of maize and nearly thirteen times the amount of tobacco produced. However, differences of such magnitudes aren't observed when comparing the average yields.

The vast differences in the production of different crops is mainly due to the area under each crop. For example, the production of groundnut is higher than that of sunflower, despite the yield of the latter being marginally higher. This is because there are more areas under groundnuts than sunflowers. This highlights the importance of all three parameters to understand the state of agriculture in a place.

Production of important crops (in tonnes)



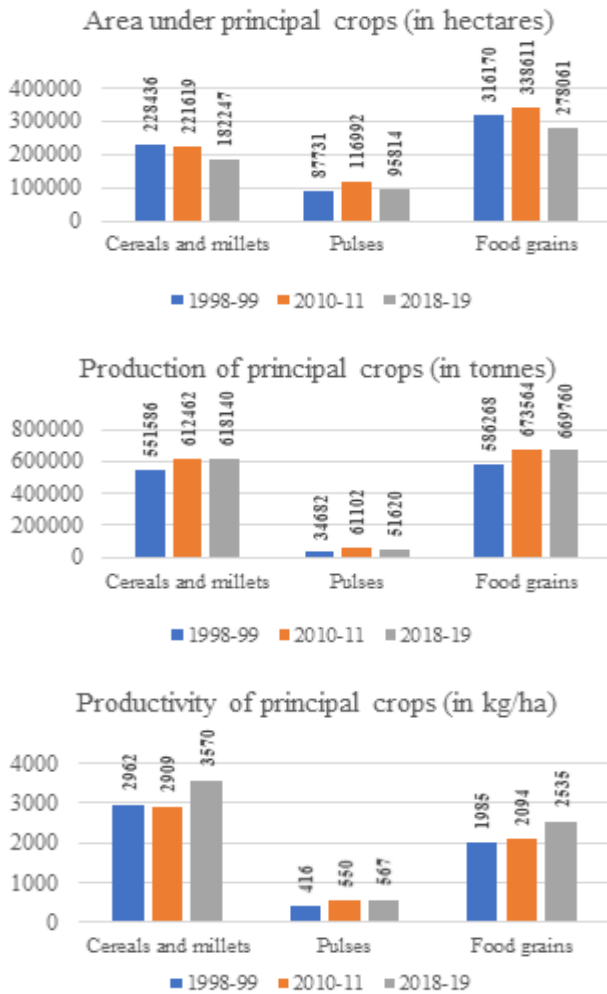
Yield (in kg/ha)



Source: As per Annual Season and Crop Report: 2018 - 19



The following three bar charts show the trends for all three parameters over two decades. These charts show that while the area under food grains have slightly decreased, the production of cereals, millets as well as the overall production and productivity of foodgrains have improved from 1998-99.



Source : As per Annual Season and Crop Report : 2018 - 19

**H. Agricultural marketing**

In order to handle production of various food crops, oilseeds and other crops, which range in lakhs of tons, agricultural marketing is important. To enable the farmers to market their produce, and enhance consumption, marketing boards such as Agricultural Produce Market Committee (APMC) are established by the state governments for various constituent towns and districts. These arrangements also aim to protect the farmers from exploitation by intermediate private players and large retailers for profit, who intentionally undervalue the quality of the produce and buy it at disproportionate prices, reducing the profit margins or even causing the farmers to incur losses. The extortion of agricultural produce at throwaway prices which often caused losses, coupled with high costs of marketing were serious problems that compromised the interests of the farmers, prompting the government to introduce several mandatory policies that sought to regulate agricultural marketing. One of the main initiatives was establishing well laid out market yards and sub yards. APMCs were constituted for each market area to formulate and enforce new rules for market

regulation, making agriculture marketing more organised. Karnataka has over 160 APMCs and more than 350 constituent markets. Marketing at APMCs is a significant contributor to the state economy

**I. KSAMB**

The cooperation between the state government and the marketing committees such as APMCs for overall development of agricultural marketing is ensured by the marketing boards. In Karnataka, the Karnataka State Agricultural Marketing Board (KSAMB) was established in 1972 to improve marketing regulations, impart education, train officers and staff of marketing committees, provide financial assistance when necessary and organise relevant seminars, workshops and exhibitions and film screenings.

**J. Schemes**

Moreover the board has implemented several insurance schemes to assist dependents, who have to apply through the APMCs in order to sanction the amount. The Raitha Sanjeevini scheme was implemented for the benefit of farmers and their kin, aged between 15 to 60 years who may get seriously injured or die while performing agricultural operations or selling produce in the market yards. The pledge loan scheme allows farmers to avail loans of up to Rs. 2 lakh by pledging their produce for a maximum period of six months. Operations pertaining to the maintenance of the produce and storage facilities such as protection from fire, theft and pests are overseen by the marketing committee. There are also insurance and housing schemes for the porters/hamals working in APMCs across the state.

**K. Education and Training**

The board has established two training centers in Mysore and Hubli. The Karnataka Institute for Agricultural Marketing in Hinkal, Mysore offers several courses on marketing intelligence, accounting, office procedures, auditing etc. to farmers and members of gram panchayat and market committees. Furthermore, progressive farmers as well as officials from APMCs and Central and State Warehousing Corporations (CWC and SWC) can avail co-ordinate training programs with NIAM (National Institute of Agricultural Marketing) & other associated institutions. These programs provide training in legal reforms, management of harvest and exports, warehouses and godowns, quality control, information technology and market infrastructure development.

**Publication:** For over 45 years, the KSAMB has been publishing a monthly Kannada journal titled 'Krishipete' that focuses exclusively on agricultural marketing and other related activities. An issue costs Rs. 12/- and over 25,000 copies are printed per month.

**L. APMC marketing**

As mentioned earlier, a state may have several APMCs across its constituent towns and districts. Most of these APMCs have market yards or mandis, where traders looking to buy produce from the farmers are licensed and provided with stalls.

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Farmers wishing to sell their produce have to bring it to the market yard, where it will be auctioned under the supervision of the APMC authorities to the agents and traders. The highest bidder can stake claim to the produce after depositing the final payment to the APMC, whereas the value of the produce can be realised by the farmers through the APMC. While the total horticultural produce outweighs and out values the total agricultural produce, most of the horticultural crops are not auctioned in APMC yards and are sold by alternate channels, most of which are strongholds of private traders, and a disadvantage to the farmers. Since these crops are also perishable, an efficient marketing system for these crops require a good chain of well-maintained cold storage facilities and processing units. Another point to consider is that some APMC yards which are dominated by a single commodity due to abundant production of that commodity in the surrounding region, are also expected to handle other produces when they arrive at the market. Prior to 2020, there were restrictions on sale of farm produce outside APMCs. The APMC Act had been considered for amendments by the central government due to farmers still being vulnerable to price manipulations and exploitation by traders and marketing agents. As a result, the Karnataka state government passed the Karnataka Agricultural Produce Marketing (Regulation and Development) (Amendment) Bill, 2020, which now allows farmers to sell their produce anywhere without the intervention of APMCs. Since it also allowed food processing companies to buy produce directly from farmers, the amendment was opposed as being “anti-farmer”, since it was seen by many as a benefit to multinational companies.

### M. Agricultural infrastructure

Numerous studies have concluded that development of rural infrastructure is absolutely necessary to accelerate agricultural development. Besides having an important role in enhancing agricultural productivity by increasing crop yields, development of rural infrastructure can also improve farmers’ accessibility to markets and financial institutions.

Infrastructure plays a strategic role in producing large multiplier effects in the economy with growth in agriculture (Mellor, 1976). Agricultural infrastructure includes all resources and services that are required to support the agricultural and allied sectors. It consists of facilities like roads, buildings and equipment that could facilitate transportation, assembly, storage, testing, assessment, processing, communication and other services, that contribute to the performance of the sector. Improvement in agricultural infrastructure in India can transform the existing predominant scenario of farming for subsistence to a more modern, sustainable and dynamic farming system.

Appropriate and effective infrastructure can raise crop productivity and yields, lower farming costs and provide access to mechanisation and its efficient usage. It can provide adequate means to carry out testing and quality assessments, enhance processing and packaging of goods for easier presentation in the market, encourage improved communication using modern technology, strengthen markets on scientific and hygienic lines with all the necessary facilities, provide facilities for storage and preservation and improve logistics for supply, movement of

goods and trade. Furthermore, the infrastructure should also provide facilities for the well-being of the community such as good treatment and veterinary services.

Agricultural infrastructure is a vast domain that can be broadly grouped as input based (seeds, manure, fertilizers, equipment), resource based (water, electricity), physical (transportation, storage) and institutional (centers for training, research, marketing, financial institutions etc.). Recent studies have concluded that government expenditure to develop technology and improve infrastructure have contributed to agricultural growth, with investments on road and R&D having the highest impact on productivity.

Infrastructure development could vary across sectors of agriculture (irrigation, marketing etc.) due to features or development of the sectors. District-wise variations are due to poor action by the concerned authorities, or poor allotment and mismanagement of funds. There are also instances where good quality infrastructure has been poorly utilised due to shortage of manpower, misuse of funds or lack of investments and maintenance.

### N. Inferences

By considering the climatic conditions, demographics of the agricultural sector, land utilisation, land holdings, productivity, marketing and infrastructure, the following inferences are drawn:

1. While the climate for Mysore can be described as moderate, annual rainfall trends depict drastic fluctuations over the years, with 2016 receiving the lowest annual rainfall in over 60 years.
2. Deficit rainfalls have been registered in the district in recent years. By July 2020, the concerned agencies had estimated that Mysore had received 4.9% less rainfall than it would have under normal circumstances, with five taluks registering deficit rainfall for the year until that time. Deficit rainfall compromises the sowing, production and yield of Kharif crops such as rice, which is one of the main staple crops grown.
3. The rural population of Mysore district is higher than its urban population. Consequently, there are more main and marginal workers among the rural population.
4. Although the urban population of Mysore city outnumbers urban and rural populations of all other surrounding taluks, the majority of it consists of non-agricultural workers. Most of the agricultural workers come from and belong to the surrounding taluks.
5. Among the agricultural workers, cultivators are decreasing in number, and an increase in laborers has been reported in India. This unfavorable trend of shifting to labor has been observed in Mysore district as well, and it can be attributed to several reasons like dwindling numbers and sizes of land holdings, climate change, drought years, infeasible circumstances in farming and the development and growth of the non-agricultural sector.

6. The net sown area as of 2018-19 was calculated to be 48% of the total geographical area. The majority of the net sown area is rain fed, while irrigation facilities are provided for the rest. It is henceforth a priority to conserve, treat, store and reuse rainwater.
7. Marginal land holdings (<1 ha) have the highest number of landholders. The trends suggest that the number of land holders and the cumulative areas of the land holdings decreases as the area of the land holding increases.
8. Furthermore, there is unequal and uneven distribution of agricultural land among these land holders. While the number of marginal land holders is 74% of the total land holders, the total area of the land held by them constitutes only 41% of the total agricultural land due to small area of individual marginal land holdings. Similarly, the 1% of the total land holders who own land greater than 4 hectares hold over 7.7% of total agricultural land.
9. Prior to 2020, it was not possible for farmers to sell agricultural produce without the intervention of APMCs. This is no longer restricted, and food processing companies can buy produce directly from the farmers. However it is important to provide farmers with markets with good networks and infrastructure, which follow scientific and hygienic standards.
10. Agricultural labourers in general have low income and living standards. As a result, there is migration of rural people to the urban areas in search of better employment opportunities, infrastructure and living conditions. In order to achieve greater success in the agriculture sector, retaining rural youth is important. This requires investment on training and education.
11. There is a need to maximise productivity and profits. Numerous studies have shown that there is a relationship between education and agricultural productivity.
12. The main causes for farmers' suicides today are mounting debts and agrarian distress. Insurance schemes need to be more accessible, and insurance coverages can be improved to encourage more farmers. While the farmers who borrow loans from banks and cooperative institutions are compulsorily required to avail insurance coverage, other farmers have been requested to make use of crop protection insurance by setting up Raitha Samparka Kendras (RSKs) to provide guidance on enrolment.
13. Agricultural infrastructure in the state has many constraints. While some sectors may have inadequate infrastructure with insufficient capacity or a total lack of infrastructure which hamper their growth, other cases may offer scope for expanding existing infrastructure to better support the sectors. Other problems such as shortage of manpower, lack of maintenance and mismanagement of funds also persist. Education on proper infrastructure and resource management and development can play a vital role here. Moreover mechanisation needs to be encouraged and farm machinery can be provided on a rent basis.

### III. PROPOSING AN AGRICULTURE HUB IN MYSORE

After analysing the above mentioned factors, this paper proposes to set up an agriculture hub for Mysore district, in

Mysore city, preferably in the agricultural zones. Some of the permissible land uses mentioned for the agricultural zone are agro processing units, exhibition centers, storage and sale of farm products produced in same land/premises, service and repair of farm machinery and R&D centers run by the government or quasi-government.

Features of the hub include:

- An agricultural training center providing many courses on crop production, resource management, marketing, mechanisation etc.
- A research station
- Demonstration fields for practical training, research and exhibits
- A well equipped and developed market yard
- Accommodation facilities for students and staff
- An exhibition venue for exhibits of machinery, equipment and products
- An auditorium or seminar hall, which provides a platform for discourses with private players, progressive farmers etc.
- Banking and insurance services
- A Custom Hire service center (CHSC) – an equipment rental facility that provides equipments and heavy machinery on a rent basis.
- Retail store for agricultural products and farm equipments.
- Other ancillary facilities for commercial and educational use such as seed processing units, seed banks, greenhouses, community farms, small scale manufacturing units etc.
- Integration of rooftop farming, vertical farming, edible walls, hydroponics, aeroponics etc.

Accessibility is very important in this case, as a hub meant to cater to the agricultural community of the district should be easily reachable for people travelling from other taluks.

#### A. Education and agricultural productivity

The Partnership Farming India (PFI), a developing partnership formed to bridge the gap in education and enable the farmers to be capable decision makers, conducted a baseline situation assessment in India. The aim was to study about the effects of education on productivity. 51% of the farmers in the treatment group had knowledge of soil testing compared to only 28% in the control group. The control group of farmers was not aware of many practices that were adopted by the treatment group, such as mulching (covering the soil with a protective layer called mulch to create favorable conditions for plant growth), intercropping and fertigation (integrating fertilisers into the irrigation systems). Furthermore, the number of farms with access to information from magazines and portals were higher in the treatment group than the control group. These characteristics of education gap between the two research groups were reflected in the results, which implied that farmers with access to technical knowledge were more productive and harvested better incomes. Some of the results were:

- The average yield for the treatment group was 35.65 tons of banana per acre, which was much higher than the 22.36 tons of banana per acre recorded for the control group.

- The average net income was Rs 93,822 for the treatment farmers and Rs 81,659 for the control farmers.

- There was a clear interest shown by the farmers in improving their skillsets. Over 85% of the farmers wanted basic education on crop production and technology, with many ready to pay for undergoing such training.

Hence farmers with technical knowledge had better productivity and higher incomes due to better decision-making and technical skills, while most of those who didn't were willing to change for the better. Education enhances the technical skills and productivity of the farmers. While there are many agricultural universities and krishi vigyan kendras, making education and training more accessible to farmers is indeed the need of the hour. It will cause a chain reaction of better management of resources, improved productivity and yield, increased incomes and eventually, strengthening of the agricultural sector.

The various approaches that need to be taken for improving training, productivity and profitability include prioritising practical training and demonstrations over mere theoretical instruction, adopting practices for efficient management of time, machinery and natural resources, adopting low-cost, sustainable, energy-efficient and/or location specific technologies, and prioritising production driven by market demand and quality. This could also help in retaining rural youth, alleviating rural unemployment and shifting to a more favorable view of agriculture as a profession by choice and not by inheritance.

### **B. Training curriculum**

Training programs can be organised on different aspects of farming like organic agriculture, integrated farming system, building integrated agriculture, compost making, crop husbandry, animal husbandry, integrated pest management (IPM), nursery management integrated nutrient management (INM), agricultural marketing, cultivation techniques and management for horticulture, floriculture, greenhouses, medicinal plants, exotic vegetables, aromatic plants etc. Priority should be towards making the curriculum more practical.

### **C. Alternate farming systems**

With the spread of urbanisation and increase in population, it becomes important to address the limited area of land available for cultivation, especially in urban areas. As a response, alternate farming systems such as organic farming and vertical farming are gaining attention and importance. Therefore, the training need not be restricted only to farmers but can also benefit the general public willing to take up farming in order to meet their food demands and even earn profits. It is possible to educate people to put small accessible but unused spaces in their homes to a more productive use that could meet their food demands and yield additional income. Rooftop farming walls can be used to produce food on the rooftops of houses using green roofs, container beds etc. Edible walls use less space but can produce fruits, vegetables and herbs using less space. Both options provide increased nutritional quality and reduction

in food costs and transportation. Organic farming is a sustainable practice of producing crops and other products without the use of synthetic external agents like pesticides, fertilisers and other growth-enhancing chemicals. The advantages include healthier produce, environment friendly practice and reduction in exposure to potentially harmful chemicals. However, organic farming is still in an embryonic stage in India, compared to conventional farming. According to the Union Ministry of Agriculture and Farmers' Welfare, about 2.78% million hectares of farmland were used for cultivating organic produce as of March 2020, a mere 2% of the total net sown area in the country. However, there is a plausible scope for organic farming to spread in India due to its variety of agro-climatic zones. Despite the low percentage of net sown area under organic farming, India still has the highest number of organic producers in the world. The market is experiencing steady growth in the domestic and export sectors, and this can be tapped by potential organic producers. One of the fastest growing trends in food production, vertical farming seeks to address the issue of limited agricultural land by growing crops on vertically stacked layers in a controlled environment that aims to optimise crop growth. It employs farming techniques without soil such as aeroponics (cultivating plants with their roots suspended and getting the nutrients sprayed as mist), hydroponics (cultivating plants in water enriched with nutrients) and aquaponics (hydroponic plants are fed with nutrients from the aquaculture water, where the nitrifying bacteria convert wastes from the aquatic animals into nitrates). While vertical farming ensures protection from unpredictable outdoor conditions and provides stable crop yields throughout the year, it also comes with high upfront, operational and maintenance costs. The vertical farming market has been growing in value over the past few years, and is projected to continue the trend in the future. Local governments have expressed interest in setting up vertical farms. Many Indian entrepreneurs consider vertical farming as a profitable business. Several start-ups have been launched across India that promote vertical farming such as Bangalore-based BitMantis.

### **D. Testing and research**

Laboratories with facilities for testing samples of soil, water, seeds, pesticides, fertilisers, and other chemicals are useful for farmers, as they assist in decision making about cropping plan, and the appropriate input of micro nutrients in order to harvest maximum yield per unit area. Moreover the research station can be established, dedicated to the research and development of seed germination, tissue culture, plant breeding etc. Both the training facility and the research station need to have easy accessibility to the demonstration fields.

### **E. Agro-processing units**

The main aim of agro-processing units is to improve the income of the farmers by processing food grains. It ensures higher efficiency in the utilisation of raw materials and by-products, and in the process, reduces wastage. Employment opportunities are also created in the processing activities, trade and transport of processed material.

They can be set up for different agricultural produce like paddy, maize, pulses etc. depending on the crops grown in the surrounding region.

Rice is the main staple food in Karnataka. As seen in the graph above for production of various crops, paddy ranks highest in quantity of production. Therefore, the use of certified seeds which are produced and processed to be genetically pure with higher yield ensures higher production.

Farmers acquire certified seeds from suppliers. However there is still a shortage of supply to meet the demand. There is a tremendous scope for setting up seed processing units to meet the local demand.

Since the process involves cultivation and processing activities, it is recommended for the processing units to be set up near the farms where the crop is being cultivated. Other factors to ensure include availability of power, ease of accessibility through good road connectivity and marketing links for supply to consumers. It is therefore preferred that the proposed agricultural hub be established in the agricultural zones.

#### F. Market yard

As mentioned earlier, farmers can now sell their produce anywhere without the intervention of the APMCs. However the infrastructure for market yards throughout the state is quite poor, lacking basic facilities. A model market yard is proposed to be developed on scientific and hygienic lines with designated spaces for auctioning, marketing, loading and unloading, storage and other facilities such as public toilets.

#### G. Agricultural mechanization and custom hire centers (CHSCs)

Due to high costs of caring for cattle and shortage of labor, agriculture in India is experiencing a gradual shift from depending on animal power and manpower to mechanisation for performing farm operations.

Rural-urban migration in search of better paying jobs is common in Karnataka as the physically demanding menial tasks in farms for meagre wages drive the rural youth towards the urban areas. Mechanisation has reduced simple hand tools and tedious manual work involved from land preparation to harvesting and value addition. The availability and efficient use of farm power and mechanisation eliminates drudgery, utilises inputs like seeds, fertilisers, pesticides and water in a judicious manner, ensures operations are completed on time and therefore, enhances the agricultural productivity and profitability.

Farm machinery such as tractors/mini tractors, ploughs, tillers, harvesters, sprayers, rotavators etc. can be supplied to the farmers at a subsidised rate. However, according to the above mentioned statistics for land holdings, almost 95% of the land holders are small and marginal farmers owning land no more than 2 hectares. These farmers would most likely not be able to afford to invest in farm machinery, and even if they do, the small size of the land holding would not make it economical. Hence, the Government of Karnataka has established Custom Hire service center (CHSC) at hobli level. These CHSCs have experienced operators and booking facilities for a wide range of modern equipment

such as tractors, rotavators, post hole diggers, power tillers, paddy threshers and reapers, manual battery sprayers, weed cutters, diesel pumps etc. Moreover, providing training programs on the use, supervision and management of farm equipment and machinery creates many job opportunities and can retain rural youth.

#### IV. CONCLUSION

By bringing together the farmers, funding and marketing agents, and private players, and providing a plethora of facilities such as training, education, research and development, food processing and trading, that would improve agricultural knowledge, skills, productivity and profitability, the agriculture hub would have a significant contribution in strengthening Mysore's agricultural and allied sectors.

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## An Overview of Agriculture in Mysore District; Proposal of an Agriculture Hub in Mysore City



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