MAIZE PRODUCTION AND HARVESTING SYSTEM IN KARNATAKA

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Abstract: India is the sixth largest producer of maize in the world, and contributed about 2 per cent to the global maize production of 855.72 million tonnes (Mt) in 2012-13. During the past 5 years (2007-2011), its production has registered an impressive annual growth (6.4%), the highest among all food crops in India. The maize area in Karnataka has almost doubled during the previous decade and has become the leading producer and exporter of maize in the country. Rajasthan has the second largest maize area (13% of total maize area), but contributes only 9 per cent to the total production in the country. On the other hand, Maharashtra and Tamil Nadu are the two new emerging states, where the area under maize crop has increased almost 2.5-times due to the growing maize demand for feed and industrial purposes. in the present study an attempt has been made to study the maize production, harvesting system & Maize trade in India in general and in Karnataka in particular. Data & information collected from published & unpublished sources like various reports, theses, books, journals, & various websites. Information & data were arranged and analysed in tabular & Graph format.

Key Words: Maize Production, Maize Producers, Maize Trade.

I. INTRODUCTION.

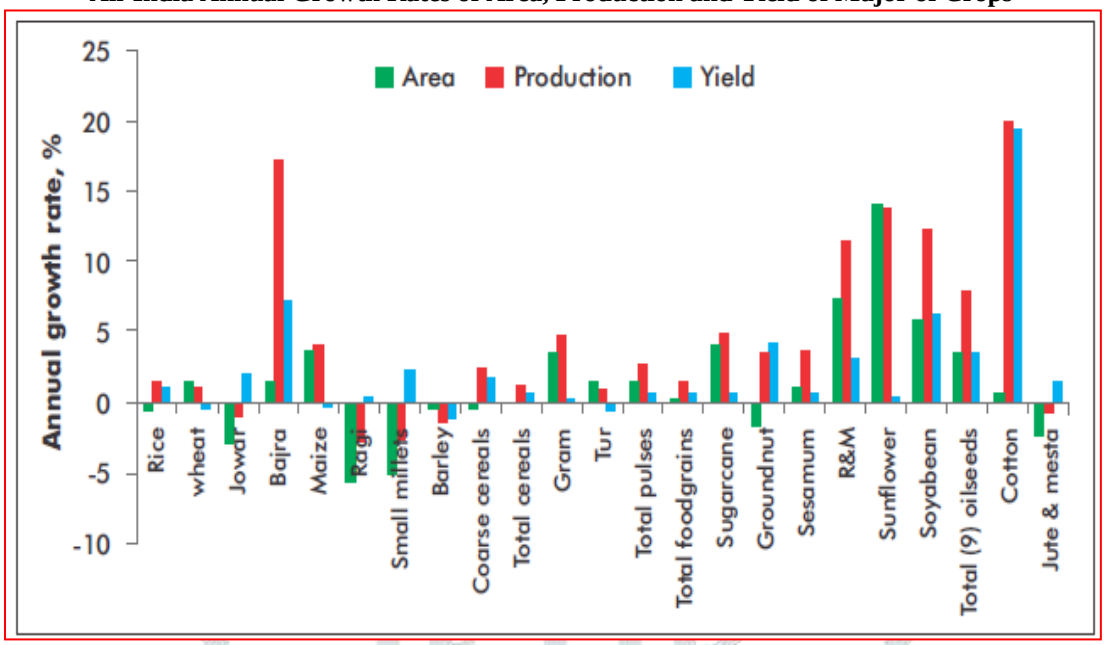
The maize output supply is very much fragmented, as the marketed surpluses of millions of small and marginal farmers are too small to be economical. They grow different varieties/hybrids of maize with different cropping periods. The produce arrives in the market with varying moisture content sometimes as high as 18-19 per cent, making it susceptible for fungal infection. Since the demand of maize for poultry feed and starch remains almost continuous round the year, the supply of grain is also consistent in India, with about 5-months windows of no fresh arrivals in the months of July-September and January-February. As the consumption centres (feed or starch manufacturers) are located in different parts of the country, maize stocks are transported mainly by time-consuming poor rural roads and in some cases by rail-rakes, mostly packed in 50-kg gunny bags. Thus, transportation of maize from production to consumption regions makes the transaction cost quite high. It has also been observed that storage of maize grain takes place at two major points in the supply chain: (a) at the farm level for few weeks, which is mostly done in an unscientific way, and (b) at the consumer level, by feed millers or starch manufacturers for 4-6 months. In between, the traders involved in the supply chain stock the grains in gunny bags at flatbed storehouse for a few days. Thus, the chance of rising moisture content and developing myco-toxins are quite high in the upstream of the chain. However, with the advent of commodity exchanges and futures market in the maize sector after 2003, the entire gamut of handling, storage and transport system of the grains is slowly changing. In future, with necessary policy changes, an efficient and integrated bulk handling and storage (silo) system is expected to increase the shelf-life of grain, reduce the wastages and cost of handling and make the commodity export ready.

The Indian maize sector has several opportunities in all its sub-sectors like seed, non-seed inputs, farm mechanization, processed foods, industrial products, market-related infrastructure, storage and processing, etc. It has also enormous potential to provide food security, feed security, nutritional security, and enhanced income to maize growers. The need is to make higher investments on maize R&D to address the problems of technology, inputs, post-harvest management, processing and marketing constraints at upstream levels.

II. MAIZE PRODUCTION TRENDS AND SYSTEMS.

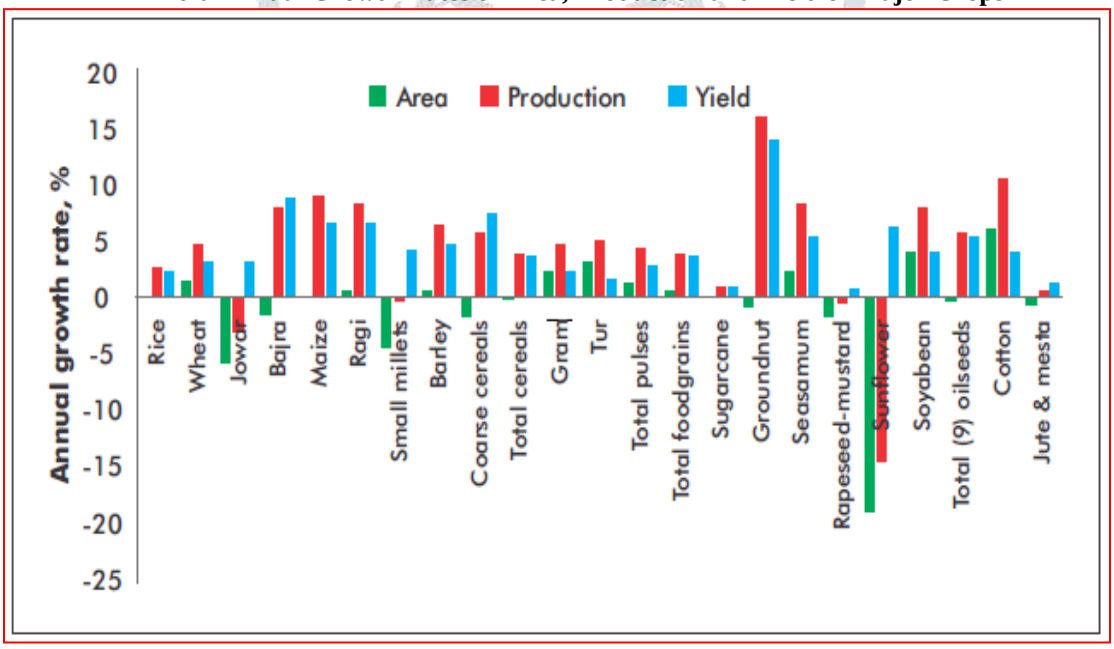
Over the years, maize has emerged as the third largest food grain crop after rice and wheat. Amongst coarse cereals, its performance has been stellar as well as dramatic. Although primarily a normal *Kharif* season crop, it is cultivated during the *Rabi* season also in parts of southern and eastern India. In 2011-12, maize was grown in 8.7 million hectares (M ha) occupying about 4 per cent of the gross cropped area (GCA) with a record production of 21.76 million tonnes (Mt) in India, comprising 16.49 Mt in *Kharif* season and 5.27 Mt in *Rabi* season. As per the fourth advance estimates provided by the Department of Agriculture & Cooperation, Government of India, the total maize production in 2012-13 is expected to be 22.23 Mt from about 8.62 M ha land of the total production, 16.04 Mt would come from rainy season (*Kharif*) maize, while 6.19 Mt from winter (*Rabi*) and spring maize. A comparative picture of average annual growth rates of area, production and yield of different crops for two previous Five Year Plan the (FYP) periods, viz. 10 FYP (2002-03 to 2006-07) the and 11 FYP (2007-08 to 2011-12) is given in Graphs 1 and 2, respectively. There is clear evidence that maize is the only food crop for which area and production have consistently increased with impressive growth during both the plan periods.

Graph 1
All-India Annual Growth Rates of Area, Production and Yield of Major of Crops



Source: Ministry of Agriculture, Government of India.

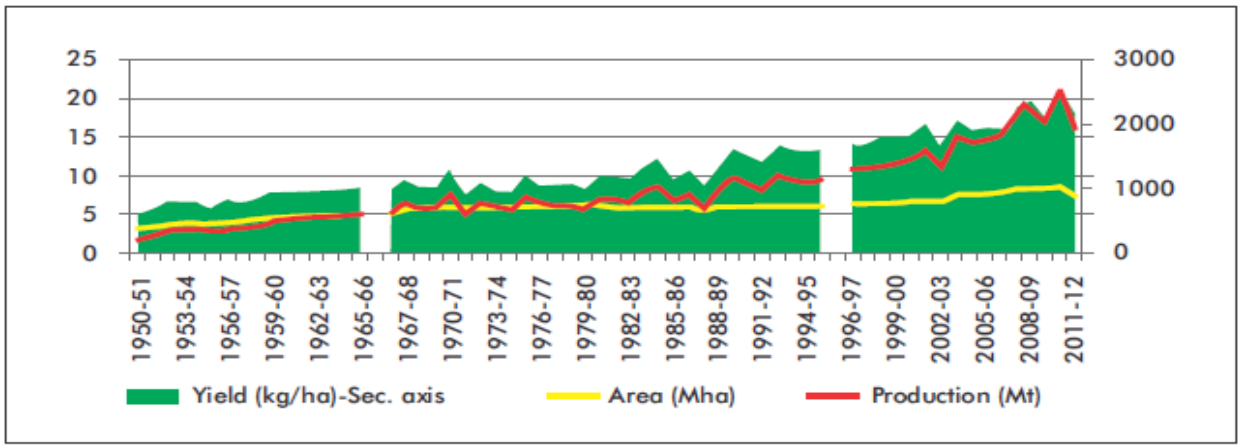
Graph 2
All-India Annual Growth Rates of Area, Production and Yield of Major Crops



Source: Ministry of Agriculture, Government of India.

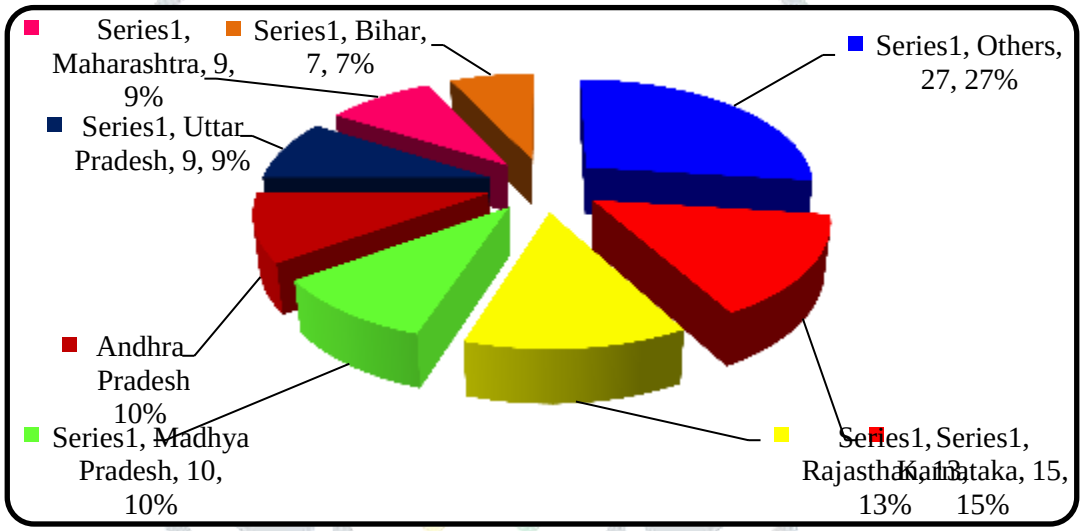
There is a steady growth in the area under maize in India, particularly from 2000-01 onwards, mainly due to the expansion of area in nontraditional regions like Andhra Pradesh,
Karnataka and Maharashtra. Similarly, a continuous growth in maize production has also been observed due to the adoption of single cross hybrids and expansion of area. The overall yield has also shown an increasing trend (Graph 3), particularly after 2000-01, on account of recent adoption of *Rabi* (winter) and spring maize and introduction of hybrid (including single cross hybrid) maize (DMR, 2013). These hybrids are being widely adopted by the farmers which has resulted in a significant increase in maize productivity with unprecedented rate of enhancement, touching 10 t/ha (DMR, 2013). This productivity is 3-4 times higher than that witnessed during the first plan period. Though, maize is cultivated in almost all Indian states and in all types of agro-ecological regions, only 7-8 states together account for more than three-fourths of maize area as well as production of the country. Also, only four states, viz. Karnataka, Rajasthan, Andhra Pradesh and Madhya Pradesh, constitute about half of the total maize acreage in the country, and six states, viz. Karnataka, Andhra Pradesh, Maharashtra, Rajasthan and Bihar, together account for over 65 per cent of the total maize production (Graphs 4 and 5). A regional shift in production has been observed from north to south; Bihar, Uttar Pradesh and Madhya Pradesh were the major maize producing states in 1990s, but during the past two decades, southern states, especially Andhra Pradesh and Karnataka, have become the major maize-producing states. Rajasthan and Madhya Pradesh though have a large share in maize area, but depict a low contribution to maize production in India.

Graph 3
Trends in Area, Production and Productivity of Maize in India



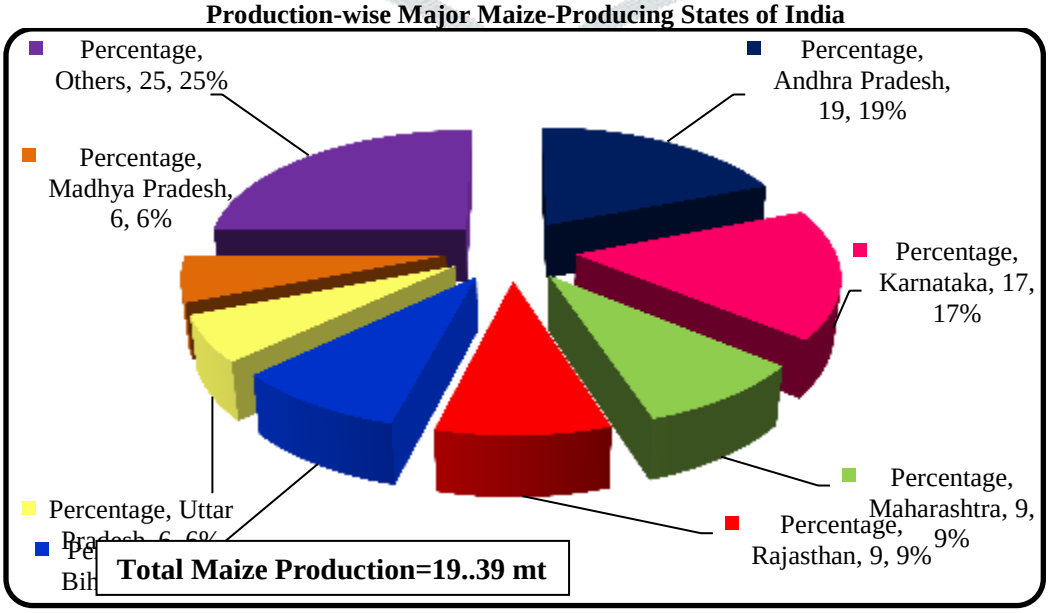
Source: Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

Graph 4
Area-wise Major Maize-growing States of India



Source: Computed from the data of Ministry of Agriculture, Government of India.

Graph 5
Production-wise Major Maize-Producing States of India

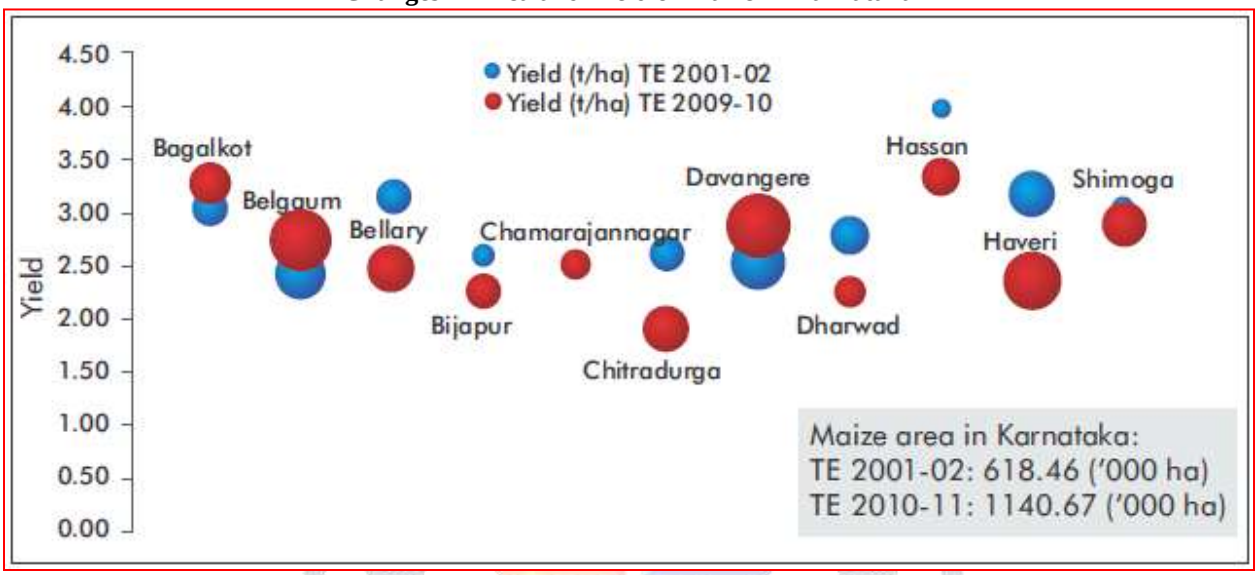


Source: Computed from the data of Ministry of Agriculture, Government of India.

III. MAIZE PRODUCTION IN KARNATAKA

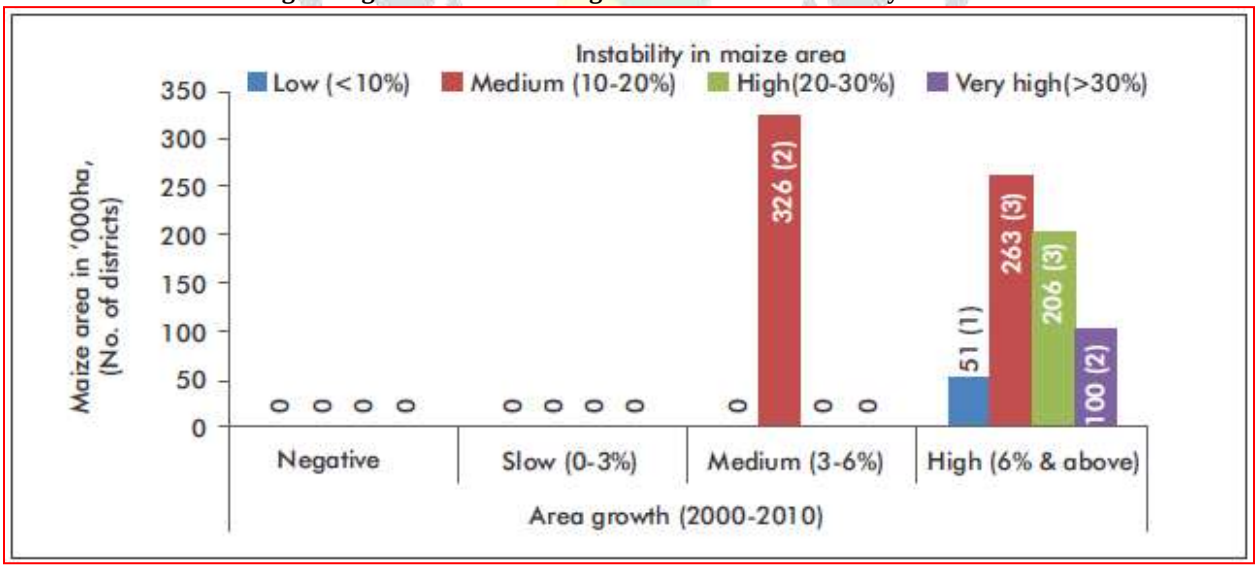
The maize area in Karnataka has almost doubled during the past one decade and, currently it is the largest among all the states in India. It was also the leading producer and exporter of maize in the country with a contribution of about 19 per cent (4 Mt) to the national maize production from 15 per cent of maize area (1.33 M ha) in 2011-12. Since it is grown for commercial purposes, hybrids have been adopted in more than 90 per cent of maize area, mostly grown in Kharif season, though in some regions, it is grown in all the three seasons. Six districts–Davangere, Belgaum, Haveri, Bellary, Bagalkot and Chitradurga constituted about 60 per cent of the total maize area and contributed about 50 per cent to the total grain production in the state in 2009-10. The maize area has increased in the past one decade in major districts except in Dharwad (Graph 6). Unfortunately, among the major maize-growing districts, only 3 districts–Chitradurga, Hassan and Shimoga have experienced improvement in maize yield during the past 5 years, although none of the districts could achieve the previous record yield harvested, due to high dependency on erratic rainfall in the recent past. District-wise growth and instability in the maize area in Karnataka are presented in the Graphs 7 and 8, respectively. Slightly more than 54 per cent area is under high growth in the state with low to very high instability.

Graph 6
Changes in Area and Yield of Maize in Karnataka



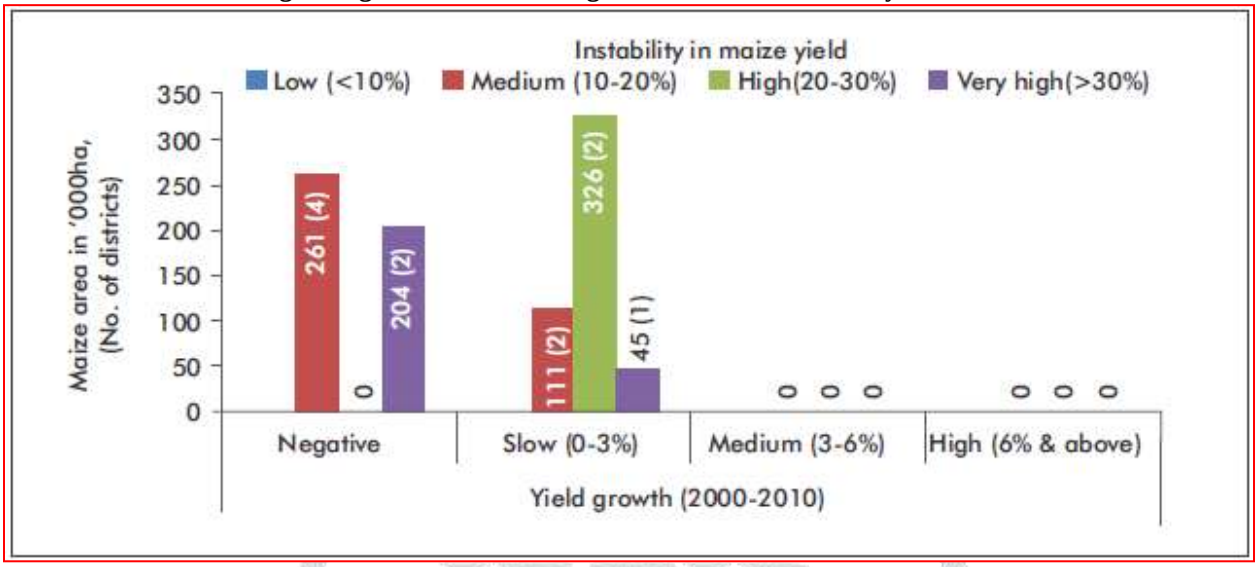
Source: Computed from the data of Ministry of Agriculture, Government of India.

Graph 7
Distribution of Maize-growing Districts According to Growth and Instability of Maize Area in Karnataka



Source: Computed from the data of Ministry of Agriculture, Government of India.

Graph 8
Distribution of Maize-growing Districts According to Growth and Instability of Maize Yield in Karnataka



Source: Computed from the data of Ministry of Agriculture, Government of India.

Table 1
Farm-size-wise Maize Area in Different States of India
(% of maize area cultivated)

State	Large farmers (above 10.0 ha)		Medium farmers (4-10 ha)		Semi medium farmers (2-10 ha)		Small farmers (1-2 ha)		Marginal farmers (1-2 ha)	
	2001	2011	2001	2011	2001	2011	2001	2011	2001	2011
Andhra Pradesh	5.23	3.52	14.62	14.07	24.46	24.62	27.85	30.15	27.69	27.64
Chhattisgarh	10.64	12.96	29.79	24.07	27.66	27.78	19.15	18.52	12.77	14.81
Gujarat	6.34	7.13	28.94	27.44	32.03	31.78	22.28	22.64	10.41	11.01
Himachal Pradesh	2.95	2.42	12.39	12.12	23.01	23.03	27.73	28.18	33.63	34.55
Karnataka	7.37	5.91	25.52	24.35	30.09	30.16	25.66	26.94	11.36	12.54
Madhya Pradesh	9.94	9.36	30.42	30.47	27.54	28.27	20.00	20.15	12.10	11.84
Maharashtra	3.15	-	21.62	-	31.98	-	28.83	-	14.41	-
Odisha	1.39	1.45	9.72	8.70	26.39	26.09	34.72	34.78	27.78	30.43
Punjab	15.30	14.29	33.33	32.00	27.87	28.00	14.75	16.00	8.74	9.71
Rajasthan	7.47	6.23	25.28	23.81	28.97	29.05	22.11	23.02	16.27	17.98
Tamil Nadu	8.57	3.07	22.86	17.79	27.14	26.38	24.29	26.99	17.14	25.77
Uttar Pradesh	1.50	1.05	10.33	8.82	20.06	18.07	25.58	23.74	42.53	48.53
All India	6.05	5.65	21.08	20.65	26.38	26.37	24.06	24.31	22.43	23.01

Source: Agricultural Census Database, Ministry of Agriculture, Government of India.

IV. MAIZE PRODUCERS IN INDIA

According to the ninth Agriculture Census 2010-11, there are 137.76 million farmers in India, out of which 67 per cent are marginal farmers, 18 per cent are small farmers, 10 per cent are semi-medium, 4 per cent are medium and less than 1 per cent is large farmers. Thus, Indian agriculture is pre-dominant with small holders. The maize cultivation is also not an exception. Traditionally, maize has been a poor man's crop in India and therefore, only small and marginal farmers used to cultivate it, mainly for household food/feed consumption. Though, the trend has changed in recent years, even then, the percentage of maize area cultivated by small and marginal farmers have been increasing in many states. According to the data available in All India Report on Agriculture Census 2005-06, there were 12.34 million maize growers out of about 131.66 million farmers in India during 2005-06. Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh each had more than 1.5 million maize growers. It is evident from Table-1 that about half of the maize area in the country was cultivated by small and marginal farmers, while medium and large farmers together cultivated one-fourth of the total maize area.

Table 2
Average Maize Area Cultivated by Different Farm-size Groups
(in ha)

State	Large farmers (above 10.0 ha)		Medium farmers (4-10 ha)		Semi medium farmers (2-10 ha)		Small farmers (1-2 ha)		Marginal farmers (1-2 ha)	
	2001	2011	2001	2011	2001	2011	2001	2011	2001	2011
Andhra Pradesh	4.86	3.00	1.83	1.71	1.16	1.20	0.79	0.86	0.40	0.42
Chhattisgarh	5.00	1.00	2.33	0.42	1.18	0.31	0.82	0.22	0.33	0.15
Gujarat	7.80	11.50	3.18	3.40	1.77	1.88	1.05	1.10	0.46	0.44
Himachal Pradesh	3.33	2.67	1.50	1.60	0.98	0.99	0.62	0.62	0.24	0.23
Karnataka	4.17	4.38	2.25	2.50	1.42	1.56	0.96	1.03	0.46	0.47
Madhya Pradesh	1.15	2.39	0.74	1.29	0.53	0.81	0.39	0.55	0.20	0.25
Maharashtra	2.33	N.A.	1.33	N.A.	0.86	N.A	0.63	N.A.	0.38	N.A.
Odisha	0.50	0.50	0.21	0.24	0.17	0.20	0.12	0.12	0.07	0.08
Punjab	2.33	2.78	1.39	1.60	1.02	1.14	0.77	0.80	0.42	0.41
Rajasthan	2.52	2.52	1.45	1.54	0.99	1.04	0.65	0.68	0.31	0.32
Tamil Nadu	6.00	5.00	1.60	2.23	1.06	1.30	0.74	0.85	0.36	0.39
Uttar Pradesh	3.00	3.33	1.58	1.91	1.00	1.14	0.67	0.75	0.30	0.32
All India	2.07	2.61	1.30	1.56	0.91	1.03	0.62	0.67	0.28	0.30

Source: Agricultural Census Database, Ministry of Agriculture, Government of India.

At national level, the average area under maize has increased in the past across all the farm-size categories. Although, small and marginal farmers were cultivating maize on 0.67 ha and 0.30 ha area, respectively, large farmers were also growing the crop on more than 2.61 ha area (Table 2), but their share in total maize area cultivated is less than 6 per cent. Further, the average maize area cultivated by different farm size categories of farmers varied widely, from 0.50 ha in Odisha to 11.50 ha in Gujarat by the large farmers, and from 0.08 ha in Odisha to 0.47 ha in Karnataka by marginal farmers.

Different factors contributing to the increase in maize demand in India are:

I. growing demand for poultry products (eggs and chicken), leading to increased demand for poultry feed.
II. growing urbanization, leading to increased demand for processed food like corn flakes, bakery products, etc.
III. fast growth of dairy sector providing a good market for cattle feed products, and
IV. increased demand for bio ethanol as a fuel additive. Keeping in view the lower cost of ethanol production from maize than that from sugarcane processing (http://www.ambujagroup.com/divisionetho.asp), many private sector companies in India are expanding their capacities to crush the grain to produce ethanol as well as extra neutral alcohol (ENA).

V. MAIZE TRADE IN INDIA

The maize market in India is dynamic and diverse. It has undergone considerable changes during the past two decades due to the expansion of market size, level of production, continuous demand, suitable government policies, etc. Traditionally, maize has been produced by small and marginal farmers, primarily for domestic consumption. Only residuals were considered as marketed surplus, which was sold to the local trader in the villages or in a nearby APMC market. However, over the years, the maize markets have demonstrated a high degree of expansion, both horizontal and vertical as well as integration. With the introduction of market reforms, many states have adopted different levels of market reforms, and accordingly, the marketing system of maize varies from state to state. Usually, maize arrives in market from late-September to February. The bulk of maize trading is done at Nizamabad and Karimnagar markets in Andhra Pradesh; Patna, Khagaria, Chhapra, Begusarai, Motihari markets in Bihar; Dahod market in Gujarat; Davangere, Bangalore and Koppal markets in Karnataka; Jhabua and Ratlam markets in Madhya Pradesh; Sangli market in Maharashtra; Udaipur and Nimbaheda markets in Rajasthan and Bahraich and Kanpur markets in Uttar Pradesh.

VI. CONCLUSION

According to the ninth Agriculture Census 2010-11, there were 137.76 million farmers in India. The maize market in India is dynamic and diverse. It has undergone considerable changes during the past two decades due to the expansion of market size, level of production, continuous demand, suitable government policies, etc.

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