MAIZE IN INDIA

India maize summit'14



KPMG cutting through complexity | FICCI | NCDEX



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Foreword - FICCI



Maize is one of the most important cereal crops of the world and contributes to food security in most of the developing countries. In India, maize is emerging as third most important crop after rice and wheat. Its importance lies in the fact that it is not only used for human food and animal feed but at the same time it is also widely used for corn starch industry, corn oil production, baby corns etc.

Corn production has nearly doubled from around 12.0 million tons in the early 2000s to around 22 million tons today. This remarkable production growth has been largely driven by adoption of single cross hybrids in the late 1980's and continuous demand in domestic and export market. The increasing use of maize as feed, increasing interest of the consumers in nutritionally enriched products and rising demand for maize seed are the core driving forces behind emerging importance of maize crop in India.

However, despite the production strength, Indian corn yields are significantly below the yields in major corn producing countries. There is immense scope for an increase in India's corn production by increasing area under hybrids, adoption of better genetics and improved agronomic practices.

Driven by structural changes in agriculture and food consumption patterns, maize is bound to hold its share as an important cereal crop in future. In current scenario, the need is to focus not only on production and productivity but also on building a competitive maize supply chain. The study on maize is an effort to bring fore the global and domestic scenario of maize and issues confronting the maize supply chain.

FICCI has always thrived in providing thought leadership. It is our strong belief that this report would be helpful in focusing India's potential in the maize sector and immensely useful to various stakeholders in the maize industry in identifying the critical constraints and challenges confronting the industry and is instrumental in designing the possible interventions by the market players and the Government.

Dr. A. Didar Singh,
Secretary General,
FICCI

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Foreword -NCDEX



The global maize revolution is characterized by new technology, consumer demand and industrial farming. Maize has become is today used as an important raw material in food processing, poultry, dairy, meat and ethanol industry and along with its traditional uses makes it one of the fastest growing cash crops in the world.

Two factors responsible for enormous success of maize as an industrial ingredient are its molecular versatility and development of high yielding seed varieties. While former made breaking down and reassembling of maize starch molecules easy, the latter has increased yields by 40% in last 20 years. Traditionally, most maize went to livestock as feed but modern technology has helped it find new uses in food industry with animal protein and starch driving global demand today. International maize trade is now larger than international rice trade. USA, Brazil, Argentina and India are the major exporters of maize while Japan, South Korea, Mexico are the major importers. China, having turned a net importer recently, has launched a maize revolution using modern technology and high yielding varieties of seeds.

India is also on the threshold of a similar maize revolution. The introduction of new hybrid seeds that can survive low winter conditions, off-season diseases and pests with high productivity has made maize a profitable alternative even for small farmers in UP, Bihar, Andhra Pradesh and Karnataka. Hybrid seeds are also responsible for making maize a pan-India crop. Increase in rabi production, along with increased acreage and supply, has turned Indian into a net exporter. Rise in rural incomes has provided further fillip to demand for cereals and protein foods and shifted poultry farms from backyards to organized business.

Transparent price signals and scientific grading have contributed in a large way to the farm-gate efficiency of maize. NCDEX futures trading in the last decade helped develop the value chain and physical market for maize in India by giving advance price signals and allowing risk management. The technology platform created by the exchange has enabled integration of markets across geographies and has ensured wider participation. There has been a significant improvement in the warehousing infrastructure in the country, empowering maize farmers with 'waiting power', which leads to better price realization. Futures trading has also benefited poultry farmers and starch manufacturers working with thin margins to lock in prices of their raw material. Tangible benefits of futures trading have also prompted state governments to encourage electronic trading in physical markets as well, especially in Karnataka where the state government, in partnership with NCDEX, has created a Unified Market Platform linking physical markets. NCDEX has been playing a pivotal role in providing a platform for the entire value chain and has brought in its fold farmers, aggregators, traders, retail chains, exporters, food-processors, agricultural companies and consumers.

Initiatives of NCDEX has brought in the corn revolution in Bihar. Engagaing with the state governments, NCDEX has introduced innovations in warehousing like developing the revolving basis centres for delivery of maize produce. Thus, Gulabbaug in Bihar that has a bumper rabi crop and Nizamabad in Andhra Pradesh giving a robust kharif harvest not only serve as delivery centres but have also helped in efficient price discovery to farmers along with reducing the crop damage.

This report provides a framework to explore the opportunities in Indian maize crop. It is an apt platform to deliberate on the challenges as well as to suggest reforms to strengthen the maize value chain. We hope it will compliment efforts of various stakeholders in making agriculture based systems productive and sustainable.

Samir Shah,
MD & CEO,
NCDEX

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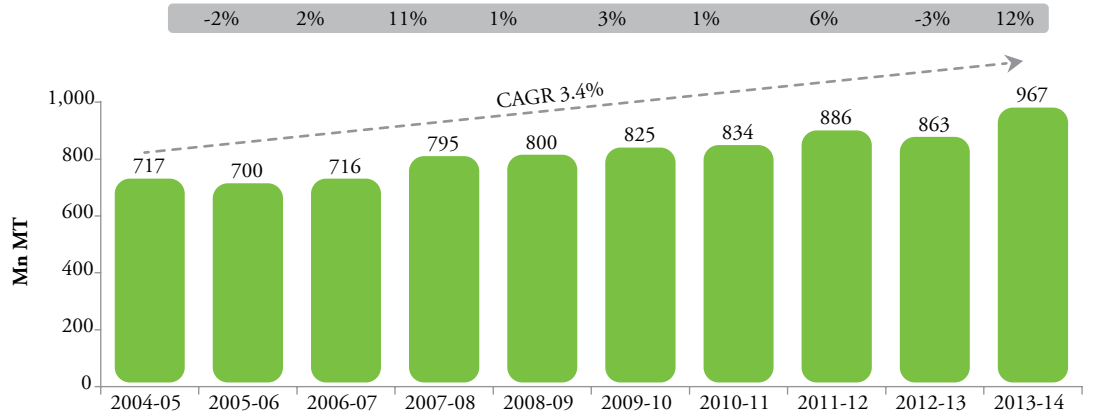
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Global Maize Scenario



Global maize production has grown at a CAGR of 3.4 per cent over the last ten years from 716 MnMT in 2004-05 to 967 MnMT in 2013-14

Global Maize Production



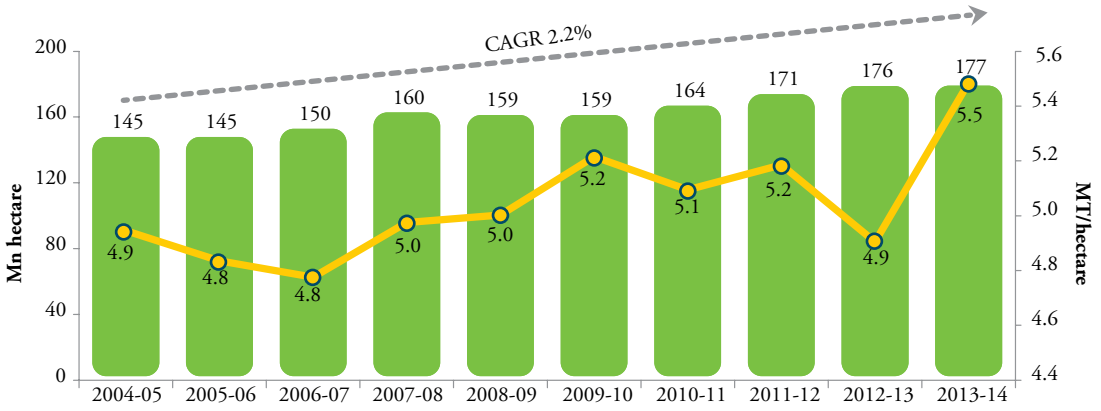
Source: USDA

Maize is a cereal crop which is cultivated widely throughout the world and has the highest production among all the cereals. The worldwide production of maize was more than 960 MnMT in 2013-14. It is an important food staple in many countries and is also used in animal feed and many industrial applications. The crop has tremendous genetic variability, which enables it to thrive in tropical, subtropical, and temperate climates.

Global production of maize has grown at a CAGR of 3.4 per cent over the last ten years, from 717 MnMT in 2004-05 to 967 MnMT in 2013-14.

The area under maize cultivation in the period has increased at a CAGR of 2.2 per cent, from 146 Mn hectare in 2004-05 to 177 Mn hectare in 2013-14, the remaining increase in production is due to increase in yield. Productivity of maize has increased at a CAGR of 1.2 per cent, from 4.9 MT/hectare in 2004-05 to 5.5 MT/hectare in 2013-14.

Land Area Under Maize Cultivation and Yields



Source: USDA
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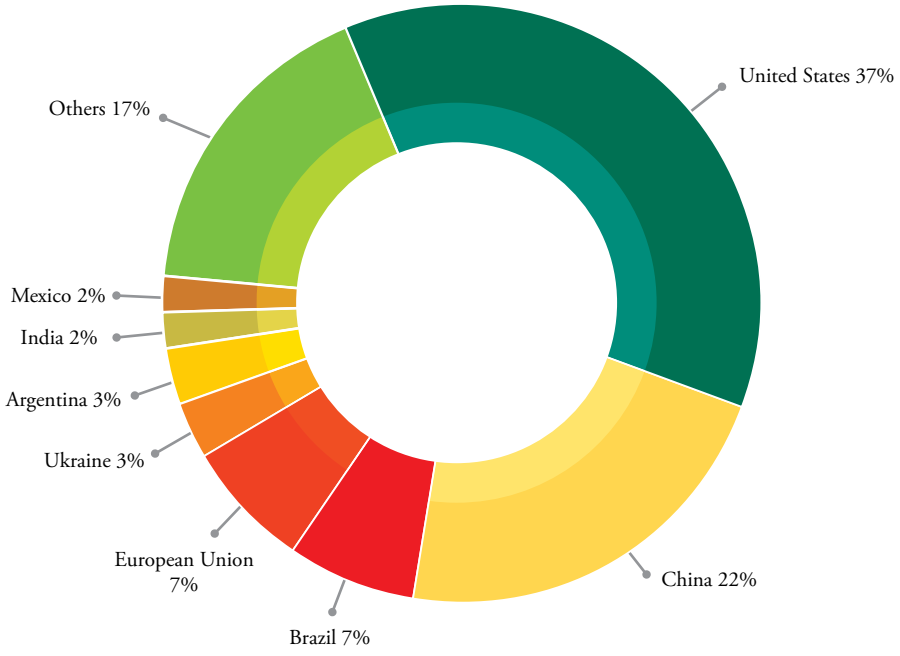
USA is the largest producer of maize in the world, followed by China and Brazil; USA is also the largest exporter of maize

United States is the largest maize producer and also has a large surplus, which also makes it the largest maize exporter. Brazil, Ukraine and Argentina are the other key maize producing countries behind USA. The four countries together account for 80-85% of the total exports in maize.

Maize is by far the largest component of global coarse-grain trade. Most of the maize that is traded is used for feed; smaller amounts are traded for industrial and food uses.

Japan has negligible maize production and has consistently been the top maize importer in the world. ~90 per cent of Japan's maize requirements comes from USA and another 8-9 per cent from Argentina and Brazil. China and Mexico, though being amongst the top maize producing nations, are also top importers.

Top Maize Producing Countries, 2013-14



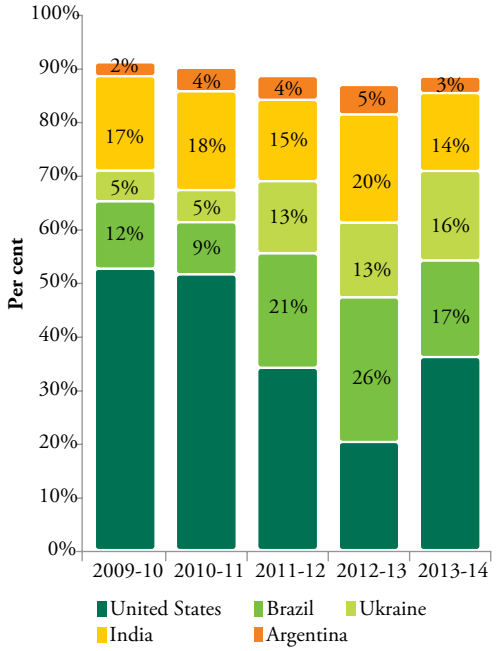
Source: USDA

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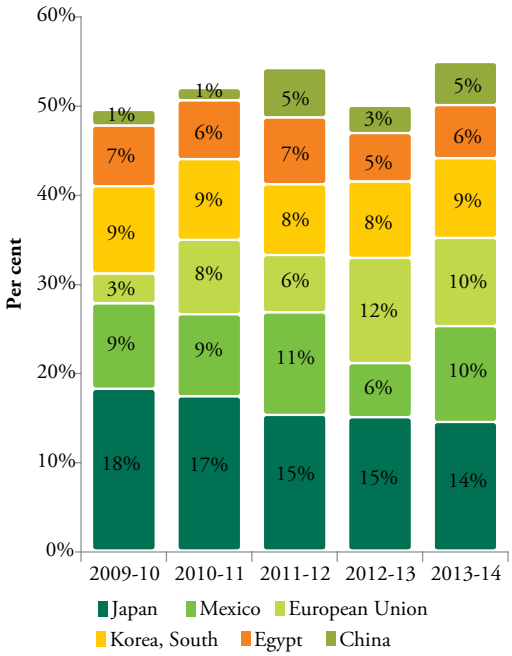
Mexico, due to its close proximity to USA, imports 99 per cent of its maize from USA. While Mexico has consistently been amongst the top importers; China has become a maize deficit country over the past five years due to the high demand growth from feed industry.

However, there has been a declining trend in maize exports from USA. The reason for decrease in exports from USA is due to maize being consumed locally for production of ethanol. The rising demand for maize and decrease in exports from USA has led to an increase in prices globally.

Top Maize Exporting Countries



Top Maize Importing Countries



Source: USDA



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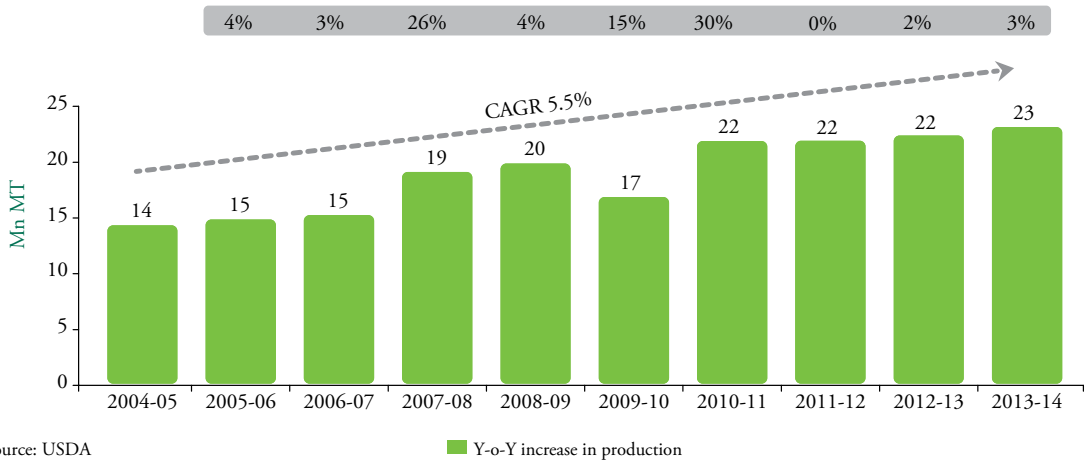
02

Indian Maize Scenario



Production of maize in India has increased at a CAGR of 5.5 per cent from 14 MnMT in 2004-05 to 23 MnMT in 2013-14

India Maize Production



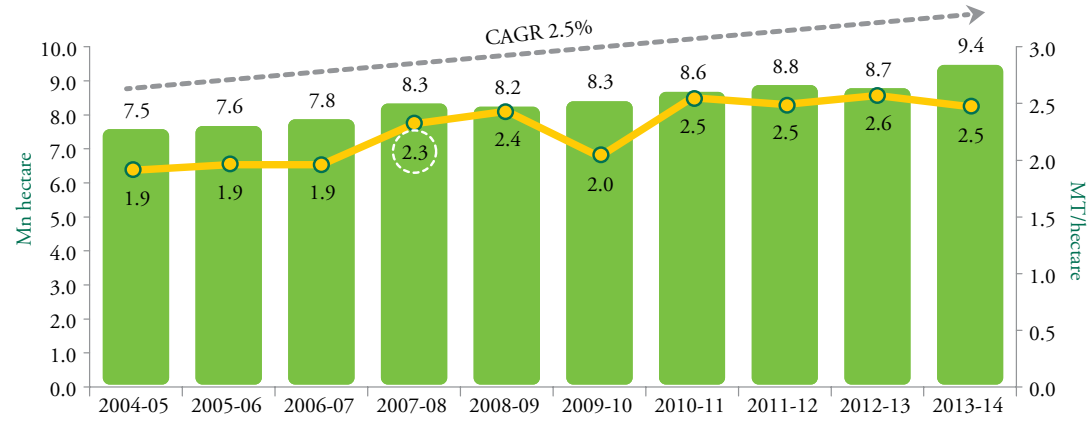
Source: USDA

Maize is grown throughout the year in India. It is predominantly a kharif crop with 85 per cent of the area under cultivation in the season. Maize is the third most important cereal crop in India after rice and wheat. It accounts for ~9 per cent of total food grain production in the country.

Maize production in India has grown at a CAGR of 5.5 per cent over the last ten years from 14 MnMT in 2004-05 to 23 MnMT in 2013-14. During 2009-10 there was a decline in production primarily due to drought that affected production of kharif crops in the country. The area under maize cultivation in the period has increased at a CAGR of 2.5 per cent from 7.5 Mn hectare in 2004-05 to 9.4 Mn hectare in 2013-14, the remaining increase in production is due to increase in yield. Factors such as adaptability to diverse agro-climatic conditions, lower labour costs and lowering of water table in the rice belt of India have contributed to the increase in acreage.

Productivity of maize (yield) has increased at a CAGR of 2.9 per cent from 1.9 MT/hectare in 2004-05 to 2.5 MT/hectare in 2013-14. Introduction of Single cross hybrid (SCH) seeds coupled with adequate rainfall in 2007-08 contributed to 20 per cent increase in yield.

Land Area Under Maize Cultivation and Yields

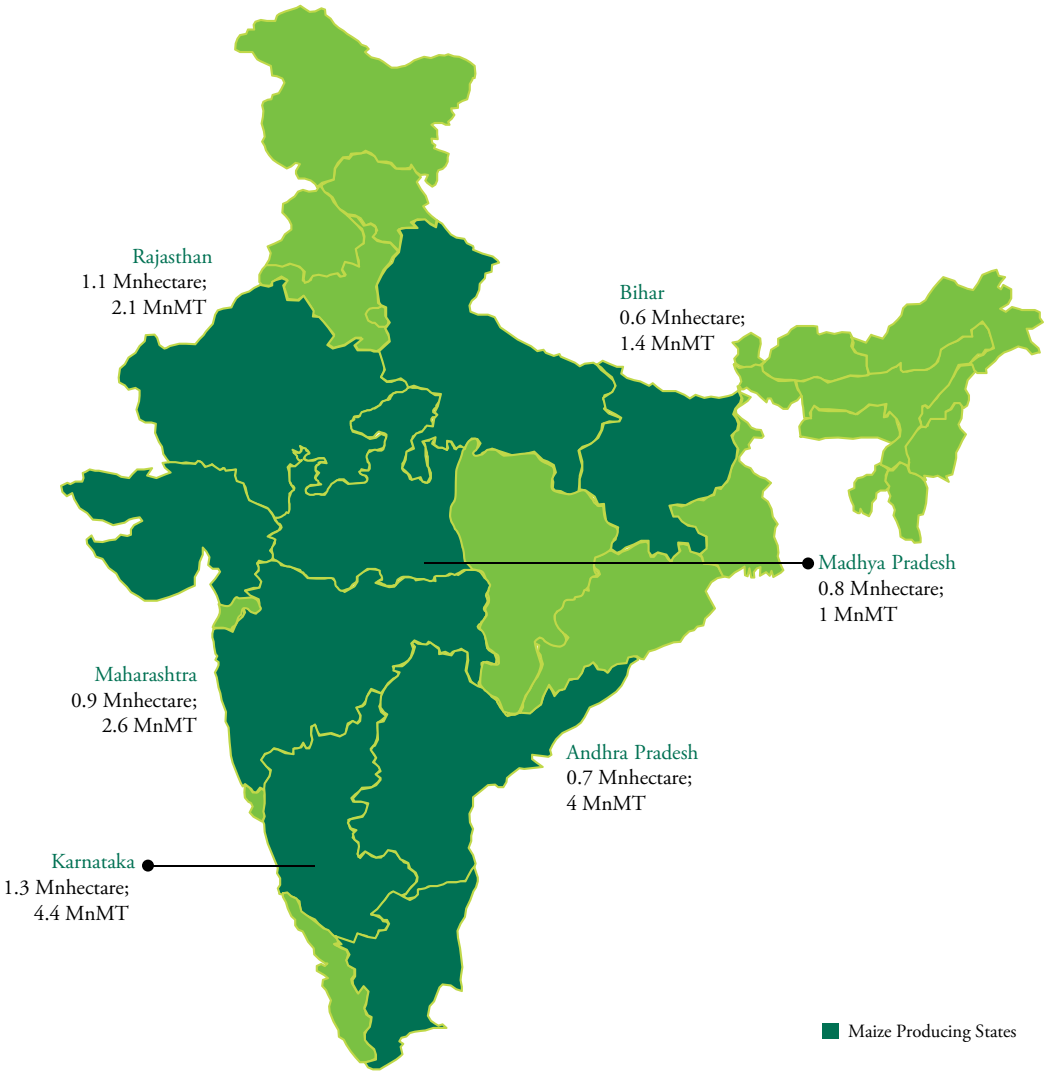


Source: Source: USDA, Directorate of Economics and Statistics, Department of Agriculture and Cooperation

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Production of maize in India is dominated by Andhra Pradesh and Karnataka which contributes to ~38 per cent of the total production

State Wise Maize Acreage and Production, 2010-11



Maize production is dominated by Andhra Pradesh and Karnataka, producing ~38 per cent of India's maize in 2010-11.

Nine states viz. Karnataka, Andhra Pradesh, Tamil Nadu, Rajasthan, Maharashtra, Bihar, Uttar Pradesh , Madhya Pradesh and Gujarat account for 85 per cent of India's maize production and 80 per cent of area under cultivation.

Area under hybrid seeds in 2010-11 is estimated to be 60 per cent of the total area under maize cultivation.

Andhra Pradesh has the highest yield followed by Tamil Nadu due to majority of the area being covered under Single Cross Hybrids (SCH).

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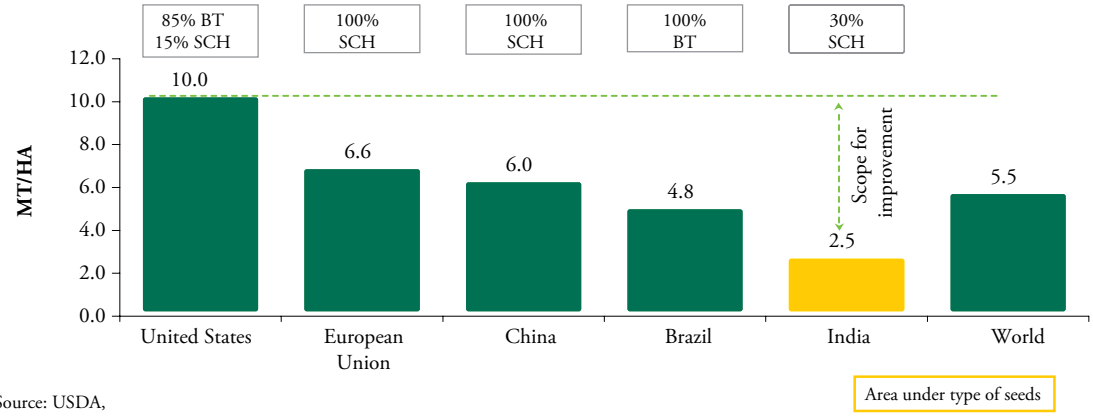
State Wise Maize Cultivation Statistics, 2010-11

State	Area under Hybrids *	Area under cultivation	Production	Yield
	Per cent	Mn Hectares	Mn tonne	Tonnes / Hectare
Karnataka	100%	1.3	4.4	3.5
Rajasthan	25%	1.1	2.1	1.8
Madhya Pradesh	16%	0.8	1	1.2
Maharashtra	100%	0.9	2.6	2.9
Andhra Pradesh	100%	0.7	4	5.3
Uttar Pradesh	21%	0.8	1.1	1.5
Bihar	80%	0.6	1.4	2.2
Gujarat	21%	0.5	0.8	1.6
Tamil Nadu	100%	0.2	1	4.5
Ohers	60%	1.5	3.3	2.1
All India	**60%**	**8.6**	**21.7**	**2.5**

Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation
Note: * Includes approximate area under Single Cross hybrids, three way cross and Double cross hybrid seeds

India's yield at 2.5 MT/hectare is less than half the global average of 5.5 MT/hectare

Maize Productivity Comparison, 2013-14



Source: USDA,

USA has the highest productivity when compared with the global average of 5.5 MT/hectare due to 85 per cent of the area under BT-SCH and remaining 15 per cent under SCH seeds backed by temperate climate and long duration crop. The yield in EU nations is as high as 6.6 MT/hectare due to 100 per cent area under SCH, temperate climatic conditions and long duration crop. The yield in China is low when compared to EU nations due to sub-tropical climate and medium duration crop. Brazil has lower yield due to dependence on rainfall and tropical climatic conditions.

The differences in yield across the globe is mainly due to environmental, technological, economic and organizational factors. In most developed countries the climate is temperate; likewise they use sufficient inputs and a well mechanized system for the maize production.

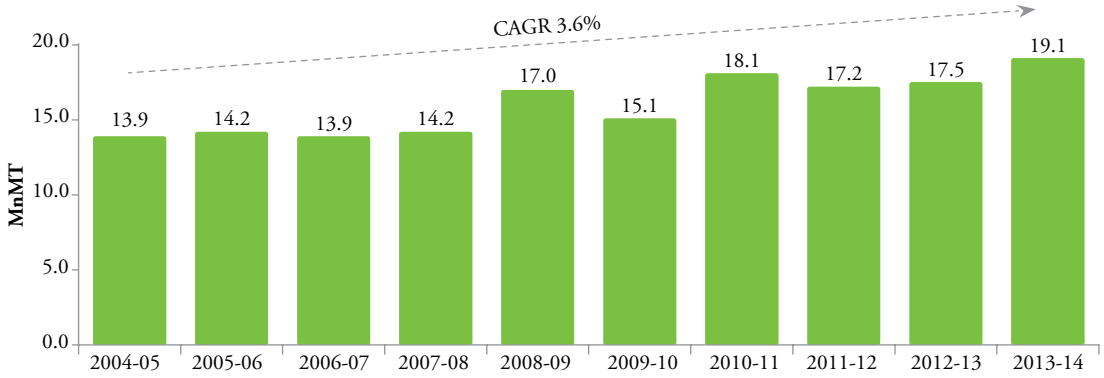
In India, the yield is half of the global average. Constraints for low productivity include:

- Climatic conditions resulting in drought/excess water associated with increased pressure of diseases/pests
- Cultivation in kharif is mainly under rain-fed conditions on marginal lands with inadequacy in irrigation
- Only about 30 per cent of the area is under SCH. Lack of development of single cross hybrid technology, which is a key to higher productivity gains like USA, China and other countries
- Limited adoption of improved production-protection technology
- Deficiencies in the production and distribution system of quality seed
- Small farm holdings and limited resource availability with farmers

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Maize consumption has increased at a CAGR of 3.6 per cent over the last five years; poultry feed accounts for ~50 per cent of maize consumption

India Maize Consumption



Source: USDA, KPMG Analysis

Maize consumption in India has grown at a CAGR of ~4 per cent over the last ten years from 14 MnMT in 2004-05 to 19MnMT in 2013-14. There was a decrease in domestic consumption in 2009-10 primarily due to the drought that lead to decline in production.

End-use for maize

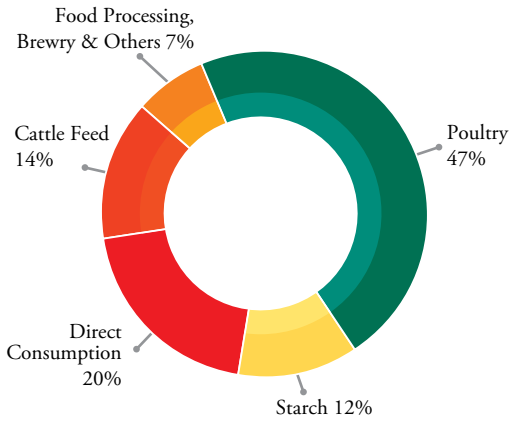
Maize consumption in India has grown at a CAGR of ~4 per cent over the last ten years from 14 MnMT in 2004-05 to 19MnMT in 2013-14. There was a decrease in domestic consumption in 2009-10 primarily due to the drought that lead to decline in production.

Most of the maize in India is used in the poultry feed industry. Poultry industry is heavily dependant on maize as it forms 50-60 per cent of the input required for broiler feed and 25-35 per cent of the input required for layer feed. Maize is the preferred source of energy in feed when compared with other substitutes due to availability, higher energy and price economics. Poultry feed's share has remained around 45-50 per cent of the total demand for maize in the country over the past 4-5 years.

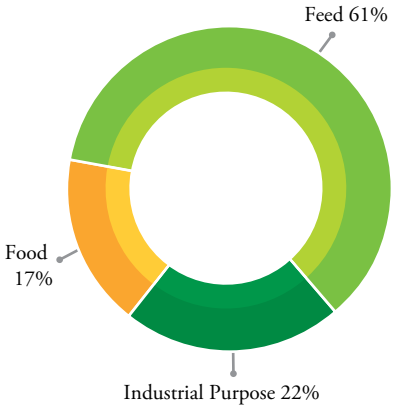


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End-Use Split, India, 2012-13



End-Use Split, Global, 2012-13



Source: IMA, KPMG Analysis

Maize is the basic raw material required for manufacturing starch and constitutes 60-70 per cent of the total operating costs. Maize has 60-65 per cent starch content, hence cannot be easily substituted by other commodities.

Historically maize was used more for local consumption and less for commercial use. Maize utilized for direct human consumption has reduced over the years and is expected to further reduce due to rising income levels which has made preferred cereals like wheat and rice more affordable, increasing commercial demand from poultry and starch industries leading to higher farmer realization.

Developed countries like USA and European nations have a very low ratio of maize going towards direct maize consumption as most of the maize goes toward production of feed, starch and ethanol. Maize is consumed directly as food primarily in developing countries of Africa and Central America.

Economic development in the country is expected to shift India's maize consumption pattern to that of developed countries and result in a further drop in direct consumption of maize.

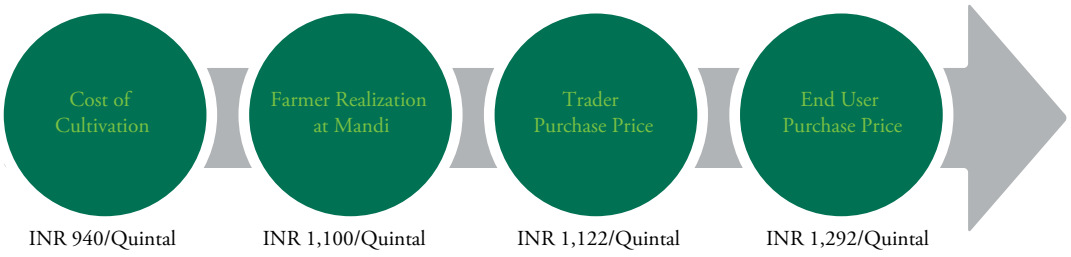


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Procurement through the trader and broker network is the most prominent channel adopted by the end users for procuring maize

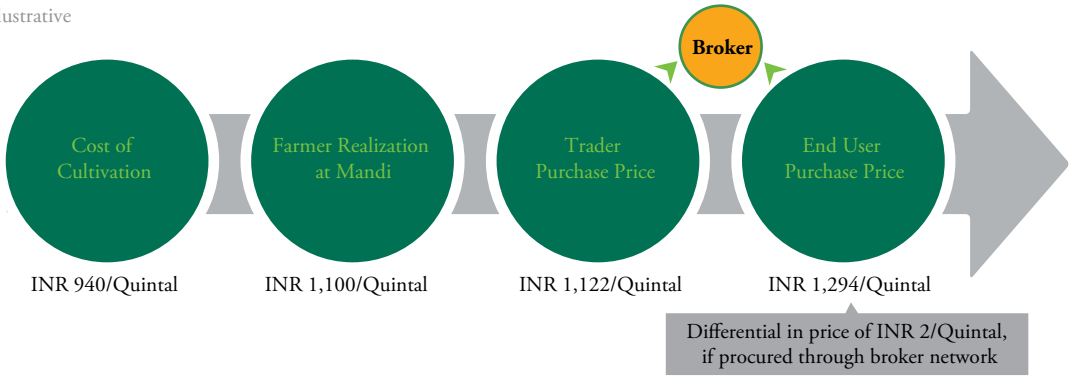
Model 1 – Procurement Through the Trader Network

Illustrative



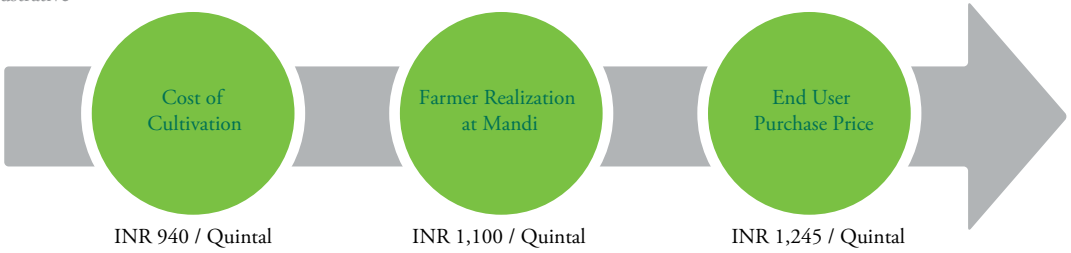
Model 2 – Procurement through the broker network

Illustrative



Model 3 – Procurement through farmers

Illustrative



Procurement directly from farmers could result in a saving of approximately INR 50/Quintal, but is not a prominent model in the country today due to factors such as:

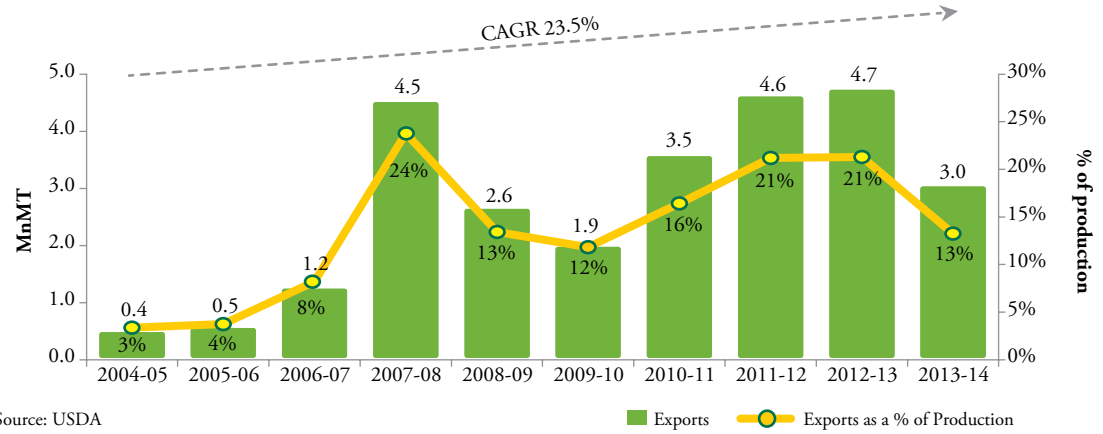
- Payment of cash to farmers
- Credit period of 15-30 days provided by traders
- Concerns around continuity of supply from farmers
- Problems faced managing multiple farmers due to fragmented land holdings

Source: KPMG (KPMG India Pvt. Ltd.) Analysis

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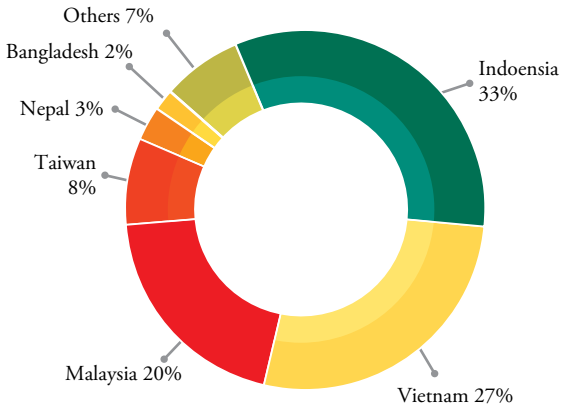
Export of maize has increased significantly over the years; Indonesia, Vietnam and Malaysia are the key export destinations

India Maize Exports (MnMT)



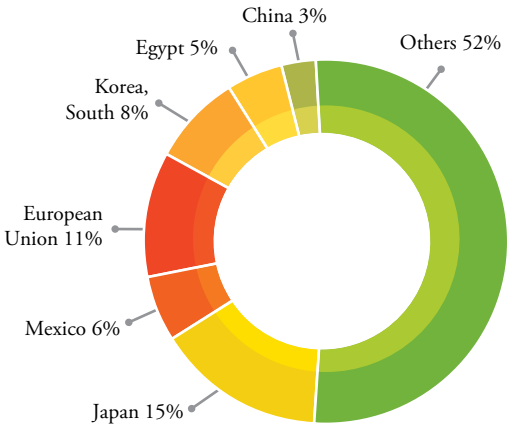
Source: USDA

India key maize export destination, 2012-13



Source: Department of Commerce

Global key maize importers, 2012-13



Source: USDA

India has witnessed a jump in maize exports from 2007-08. The increase in export volumes is a result of increased production, higher realization and demand for maize from international markets. Export volume declined during the period 2009-2011 due to drought conditions leading to low production. Increase local demand for maize from poultry and starch industries, within India, and application in diversified industries such as alcoholic beverages, bio-fuel, processed food, corn oil, etc., has kept maize prices relatively steady. Exports have declined in 2013-14 due to weak export demand which is due to relatively weak global prices on improved supplies from other competing locations.

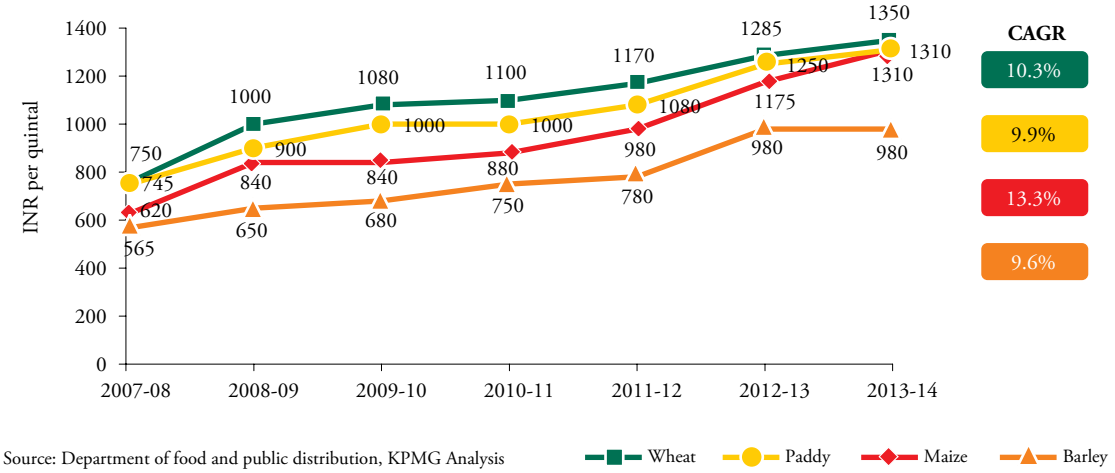
Maize currently accounts for 22 per cent of total cereal exports from the country. Declining exports from USA and price parity offered by Indian maize provides an opportunity to supply maize to importing countries within Asia.

Amongst the top importing countries, Japan, Korea and China are both much closer to India than USA, Brazil and Argentina (top exporting countries). India could have a cost advantage due to lower shipping costs. Malaysia, Vietnam, Philippines, Indonesia are the other Asian countries which import maize and the high demand in these countries is expected to increase their maize import quantity.

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The Government has been providing price support mechanism to encourage farmers to grow maize

Minimum Support Prices (MSP)



Source: Department of food and public distribution, KPMG Analysis

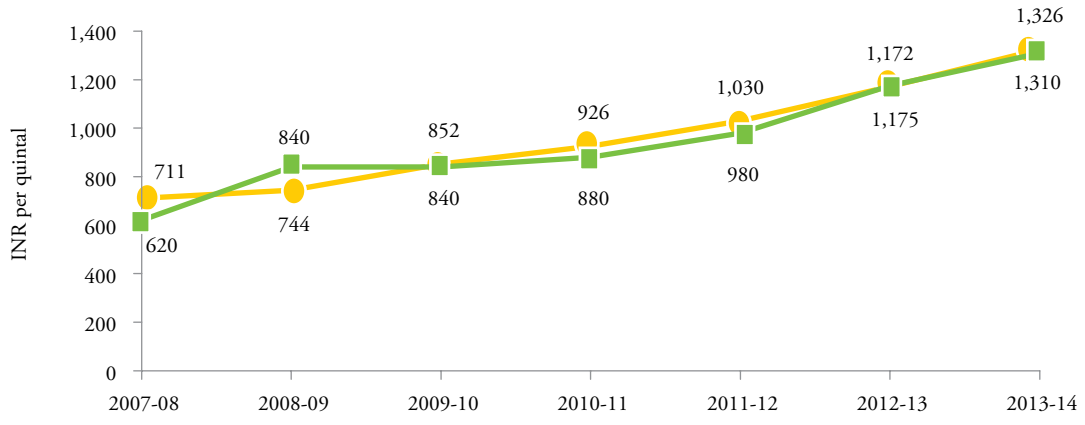
Government has been providing price support mechanism to encourage farmers to grow maize as it has ready use in starch and feed meal industries. For the first time ever, the government has fixed the MSP of maize for 2013-14 crop season at Rs 1,310 per quintal, which is same as that for common paddy, with a view to encourage farmers to plant more maize replacing paddy. Maize has also seen the highest CAGR of 13.3 per cent in MSP over the last years as compared to others crops.

Groundwater tables can be greatly enhanced if maize cultivation is promoted in place of paddy as it requires just One fifth* of the total water required to grow paddy and gives much higher returns to the farmers.

The crop has been included in the government's INR 500 crore crop diversification strategy for North Indian states of Punjab, Haryana and western Uttar Pradesh.

Annual maize prices have been following the MSP declared by the Government, as can be seen from the graph below.

Maize Prices and MSP

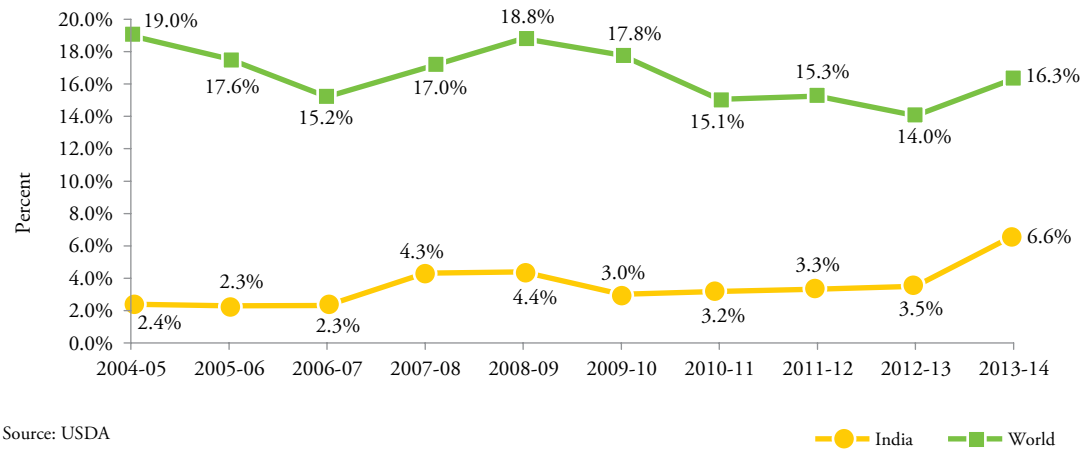


Source: CMIE database, Department of food and public distribution,
*Commission for Agriculture Costs and Price

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Stock to consumption ratio for India increased from 3.7 per cent in 2004-05 to 6.6 per cent in 2013-14 vis-à-vis global average of 16.3 per cent in 2013-14

Stock to Consumption Ratio India versus World



Source: USDA

India Maize Balance Sheet

Figures in MnMT	Beginning Stocks	Production	Imports	Exports	Total Consumption	Ending Stocks	Stock to consumption ratio
2004-05	0.5	14.2	0.003	0.4	13.9	0.3	2.40%
2005-06	0.3	14.7	0.004	0.5	14.2	0.3	2.30%
2006-07	0.3	15.1	0.004	1.2	13.9	0.3	2.30%
2007-08	0.3	19	0.004	4.5	14.2	0.6	4.30%
2008-09	0.6	19.7	0.013	2.6	17	0.7	4.40%
2009-10	0.7	16.7	0.024	1.9	15.1	0.5	3.00%
2010-11	0.5	21.7	0.019	3.5	18.1	0.6	3.20%
2011-12	0.6	21.8	0.003	4.6	17.2	0.6	3.30%
2012-13	0.6	22.2	0.01	4.7	17.5	0.6	3.50%
2013-14	0.6	23	0.01	3	19.1	1.5	6.60%

Source: USDA



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Given the increasing thrust placed on maize by the government, maize has witnessed the highest growth in acreage, as well as production over the last ten years

Average Annual Growth Rates (per cent) of Area, Production and Yield of Principal Crops

CAGR (2004-05 to 2013-2014)	Area	Production	Yield
Barley	0.40%	3.30%	2.90%
Maize	**2.50%**	**5.50%**	**2.80%**
Millet	-1.10%	0.70%	1.70%
Sorghum	-4.50%	-3.00%	1.60%
Wheat	1.20%	2.90%	1.70%
Rice	0.30%	2.60%	2.30%

Source: USDA

There has been an increasing trend towards substituting other coarse cereals with maize. Increasing consumption and exports, government incentives, etc. have given a push to maize production.

Maize recorded the highest annual growth rate of 2.5 per cent in the area as well as 5.5 per cent in production during the period 2004-05 to 2013-14. Yield has also seen a high growth rate of 2.8 per cent as compared to other cereals. Other major coarse cereals such as millet and sorghum displayed a negative growth in area during the same period.

Government has appointed an inter-ministerial panel on crop diversification to help farmers look beyond paddy, which consumes huge amount of water, fertilizer and power. By cultivating maize, farmers can protect the worsening quality of soil, save 90 per cent of water and 70 per cent of power as compared to paddy and earn far more than they are earning through paddy and wheat.

Source: Punjab Agricultural University



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Improvement in supply chain, use of proper drying techniques and efficient storage and handling can help reduce post-harvest losses

Post-harvest management and losses

Post- harvest management can be defined as methods and techniques applied to increase the life and retain produce.

Post-harvest loss (PHL) is the loss of grains between harvest and consumption. PHL happens at every stage of the supply chain, but in developing countries losses are the most significant. Following harvest, about 60-70 per cent of food grain is stored on farms for variable periods, normally in traditional structures and at dangerously high moisture levels. This makes them particularly vulnerable to infestations of pests and micro-organisms. Significant losses also occur during processing. Most processing units are small and use outdated technologies.

PHL in Maize could be of two types:

- Quantity losses can occur because of inconsistent harvest methods, spillage during transportation, or damage by pest organisms causing reductions in weight or volume.
- Quality losses can occur as changes in color, smell or taste, contamination with toxins, pathogens, insects or rodent excreta and reduction in nutritional value.

Maize suffers heavy post-harvest losses estimated at 20-30 per cent. There two main causes of these losses are improper shelling and drying techniques (Moisture content) and improper storage and handling
The following are some post-harvest management techniques that can help reduce losses.

Stage at which losses can occur	Causes	Effect	Measures to be taken
Physiological maturity	• Delayed harvest (increased exposure to pests, livestock and animals) • Varieties susceptible to diseases and pests	• Losses in quality and quantity	• Timely harvest • Planting resistant varieties • Protecting crops from livestock, etc.
Harvesting	• Poor handling • Poor threshing or shelling practices • Termites and rodents	• Losses in quantity	• Careful handling of produce • Pest control • Timely harvest
Mechanical damage during harvest	• Poor handling • Poor threshing or shelling practices	• Quality decreases Increased vulnerability to pests and diseases	• Careful handling of produce • Threshing and shelling methods should reduce damage
Drying and storage	• Temperatures too high during drying • Storage pests and fungi • Insufficient drying before storage • Moisture in storage area • High relative humidity	• Losses in quality • Possible production of mycotoxins • Swelling and germination of grain	• Use of bulk handling • Control storage pests • Dry produce sufficiently before storage • Storage facility should be moisture proof and adequately aired

Source: IRRI, CIMMYT, KPMG Analysis

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03

Challenges and the Way-Forward



Maize quality, availability during rabi season, involvement of intermediaries and increase in maize prices are some of the key issues faced by maize buyers and growers

Key concerns

Consistent Quality	• Buyers do not get consistent quality of maize especially in terms of the grain size and moisture content, especially during the kharif season • Rejections occur frequently due to maize not being of the required quality / specification
Shortage	• During the months of July – September the crop stocked by traders starts to diminish and maize procurement becomes difficult in this period • Bihar is one of the key maize suppliers during the Rabi season; however there is a need for adequate storage and drying mechanism
Maize pricing	• Maize prices have consistently gone up during the past few years and maize, being a major raw material for both starch and poultry feed, margins are affected since there is a lag between increase in maize pricing and transfer of increased price to the end user
Intermediaries	• Due to the fragmented land holdings of farmers and requirement of cash payment, buyers are not being able to procure maize directly from farmers and are incurring additional cost of intermediaries
Quality hybrids	• There is a need for varieties and hybrids of different maturity groups namely, long, medium and short duration hybrids and varieties with high yield potential suitable to various agro-climatic regions. • Drought, pest and insect tolerant or resistant hybrids and varieties suitable to different agro-climatic zones are required
Farmer issues	• Inability of the farmers to spend on good quality seeds, fertilizers, pesticides and fungicides etc and persistence of traditional cultivation practices in the interior and remote areas affects the yield as well as quality of maize produced in the country
Post harvest losses	• Maize suffers heavy post-harvest losses estimated at 20-30 per cent. The main underlying factor is the lack of farmers' education, coupled with poor infrastructure and handling for transportation, improper storage and drying facilities, resulting in wastage and pilferage

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Use of hybrids, focus on rabi maize production and exports, addressing gaps through promising technologies in maize value chain, can help transform Indian maize scenario

Way ahead

1. A massive expansion in area under hybrids could transform Indian maize scenario

Single cross hybrids are the preferred seeds of maize for achieving high yield. Hybrid seed technology in maize can immediately double the yields. Year after year, area under hybrids is expanding. However, presently hybrids constitute just 30 per cent of total plantings in a given year. It is estimated by the Directorate of Maize Research that hybrids would constitute 90 per cent of the total area by 2050. This would provide a major boost to the maize seed industry.

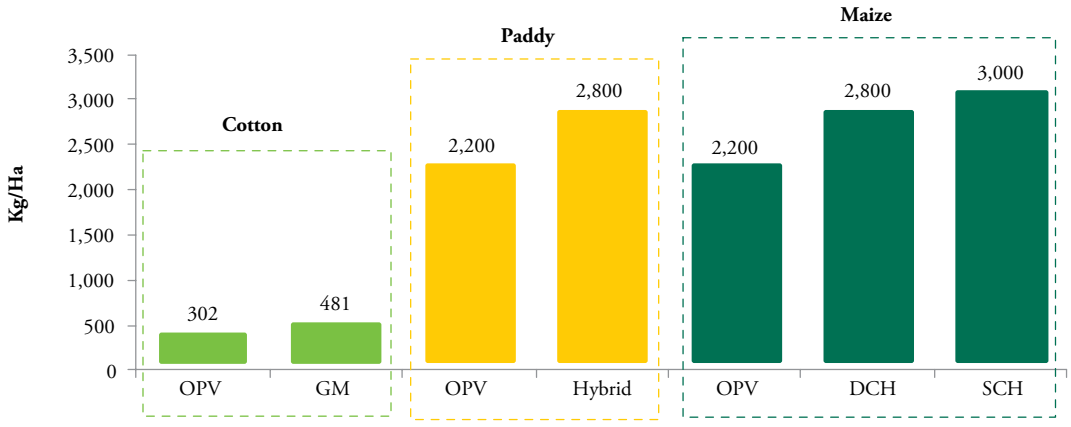
2. Public private partnership - Private sector R&D and adoption of new technology would lead to enhanced investment in maize research

The private sector involvement in Indian agriculture is a recent development. This is apparent in initiatives such as infusion of new technologies like BT cotton, hybrid seed technology in maize, pusa basmati rice, etc., suggesting beneficial outcomes from public sector partnership with the private sector farmer groups and the like.

Technology can be the prime mover of agriculture growth in future. Future breakthrough technologies in agriculture could come increasingly from the private sector. Maize is one of the most extensively researched commodities by multinational seed corporations, as it allows increased value capture due to prevalence of hybrids.

The government has to play a more proactive role as coordinator, facilitator and also as a regulator. Higher investment in basic infrastructure like roads, canal waters, watersheds, check dams, etc. could attract private investment in other areas of the supply chain.

Research Driven Improvements in Seeds: Increase in Yield through Seed Technology



Source: CSO, DGCI&S., National Seed Plan, Department of Agriculture and Co-operation, KPMG Analysis
Note: OPV: Open Pollinated Variety, GM: Genetically Modified, SCH: Single Cross Hybrid, DCH: Double Cross Hybrid

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Greater agricultural research and development efforts and investments are essential to increase agricultural productivity. Public sector working in tandem with private sector will be able to synergize the strength of both in meeting the challenges ahead.

It is estimated that all factors remaining constant, use of quality seeds alone can increase crop yield by 15-20 per cent. Difference in yields across various regions of the world can thus be partially attributed to the quality of seed used. Seed technology coupled with agronomic innovations (plant spacing, tillage etc.) can have significant impact on crop yields.

3. Rabi Maize could help meet demand requirements consistently throughout the year

Maize demand is even throughout the year, however supply is skewed with 77 per cent of production in kharif season .Rabi maize has emerged as an important crop in the non-traditional season and non-traditional areas. The predominant rabi maize growing states are Andhra Pradesh, Bihar, Tamil Nadu, Karnataka, Maharashtra and West Bengal. There is potential to increase the production of maize by increasing the production of rabi maize in the coming years as rabi maize has a higher yield at 4 MT/hectare as against 2.5 MT/hectare for kharif maize.

Though Maize favourably responds to better crop management both in kharif and rabi season, the erratic rainfall pattern of the south-west monsoon comes in the way of timely field operations of kharif season. In the absence of any major environmental impediments in rabi, the desired field operations can be planned and executed at the most desired time. Moreover, the various environmental factors, including absence of any major disease and insect pest in this season, helps in realizing better profits from every additional unit of monetary inputs.

4. Focus on post harvest management practices like bulk handling and silos to reduce wastage

Focus on post-harvest management by farmers could help in reducing wastage and spoilage at various points from farm to market yard and could lead to several benefits such as saving in time and cost of handling grain, greater expedition in loading and unloading railway trucks and greater ease in cleaning and grading. In order to decrease post harvest losses and increase the life of produce proper infrastructure for storage is required. Bulk handling as a method of storage can create cost and operational efficiencies.

Silos form an integral part of bulk handling of commodities and have many advantages over traditional warehouses in the Indian context such as requirement of lesser area for installation, larger storage life span, in-built system to protect grain from bacteria , reduce wastage of grain etc.

However, there are many hurdles for adoption of bulk handling or silos in India as it requires a complete overhaul of logistics from farm to the end processor (carriages, transport, port facilities, etc.) to handle these goods in bulk. Further, small scale farming, fragmented production and varied farming practices prevent significant aggregation. Bulk Handling systems could be an important denominator for the success or failure of post harvest management for maize.

Globally, countries are increasingly adopting affordable metal silos which enable farmers to store their crops safely, rather than lose them to pests or being forced to sell them off cheaply straight after harvest when prices are at their lowest.

5. Focus on export given India's export potential

80 per cent of India's current exports are to Vietnam, Indonesia and Malaysia. The top importing countries, Japan, Korea and China are both much closer to India than USA, Brazil and Argentina (top exporting countries). India could have a cost advantage due to lower shipping costs. Further, declining exports from USA and price parity offered by Indian maize provides India an opportunity to increase exports to these countries. Farmers should be educated on handling post-harvest cleaning, grading and switching to standardized packaging of produce to meet export market requirement.

Source: CSO, DGCI&S., National Seed Plan, Department of Agriculture and Co-operation, KPMG Analysis

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6. Better Farm to Agribusiness Linkages to enable efficient procurement of produce

Innovative farm to agribusiness linkages can drive disintermediation and enable hassle free procurement of produce. These linkages help in increasing the bargaining power of small farmers and improves their income from the marketplace, potentially increasing agricultural viability.

There are different models which help strengthen the link from farms to agribusinesses:

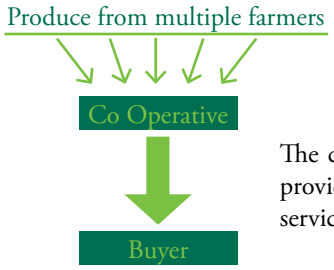
Contract Farming



The buyer and farmer form an agreement with conditions on quantity, quality, delivery schedule in lieu of pre determined price and production support

- This is primarily a buyer driven model with large corporate companies initiating it
- In this way farmers can bypass the intermediaries and sell directly to large corporate companies
- The farmers get pre determined price for their produce and technology support whereas the companies get a secure supply

Agricultural Cooperatives



The co-operative acts as an interface between the small farmers and buyers. It provides order taking, shipment and logistics, billing, collection and remittance services for farmers.

- This is primarily a producer driven model with farmers coming together to form a co-operative
- It allows the buyers to deal with aggregators rather than individual farmers
- The co-operative performs the role of an intermediary while providing support for overhead tasks to farmers
- In India, currently most of the farm co-operatives are state controlled with limited success in sectors other than dairy.

Source: KPMG Analysis

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For further dialogue, please contact:

Rajat Wahi
Head, Consumer Market,
KPMG
T: +91 124 307 5052
E: rajatwahi@kpmg.com

National Commodity and Derivatives Limited,
Ackruti Corporate Park,
1st floor, Near G.E. Garden,
Kanjurmarg, Mumbai-78
Tel : +91-22-66406789
Email: askus@ncdex.com
Website: www.ncdex.com







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