



India as an agriculture and high value food powerhouse: A new vision for 2030

Food and Agriculture Integrated Development Action 3

April 2013



Confederation of Indian Industry

McKinsey & Company

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Foreword

The Indian farmer has done a commendable job in providing for a billion strong and growing population. Going forward, there is a strong need to support farmers with technology and modern farming practices to increase yield per hectare to ensure food security.

If India is to realise its vision of becoming a global powerhouse in food and agriculture it needs a second Green Revolution. For this, we believe that India must shift from a programmes and schemes approach to a mission mode, and launch an Agri Renewal Mission that will create an enabling environment for greater partnerships and investments (private and public). The Mission mode should drive outcomes and ensure that project initiatives are aligned with the 12th Five Year Plan. Rolling these out at the state level could ensure greater success.

As the largest sector in the country employing 52 per cent of the population, a high degree of correlation has been witnessed between India's GDP growth and growth in agriculture. As per the National Agricultural Policy declaration, 4 per cent growth in agriculture is necessary to achieve 10 per cent GDP growth. Maintaining the agriculture growth momentum in the long run is not possible without a thrust on inclusiveness and sustainability.

When the Confederation of Indian Industry (CII) and McKinsey & Company started this joint journey to prepare the third Food and Agriculture Integrated Development Action (FAIDA) report, we set ourselves three objectives: increasing agricultural productivity to ensure farmer prosperity, strengthening the consumer value proposition, and the enabling policy and related capacity development. The focus was on high value agriculture and food as catalysts for the next wave of growth.

Over the last six months, the team has done extensive research, fieldwork, and conducted interviews and meetings with all stakeholders to put together a true picture of the food and agriculture sector, as well as map the aspirations of the people on the ground. The CII National Council on Agriculture actively participated in the deliberations.

Industry–farmer partnerships also have a key role to play in the development of agriculture over the next two decades. Development of the food processing industry in particular will create vital links and synergies between these two pillars of India's economy. Food processing is both an element of the infrastructure and a demand catalyst. It can help cater to the consistent growth in demand for high value food products from the domestic consumer by providing for nutritious food at an affordable price, thereby also playing a role in tackling food inflation and providing farmers a ready market for their output.

Driven by changing consumption patterns, the future of the agriculture and food sectors will lie in crop diversification to high value crops and higher value addition. Add to that the potential to export and increase agriculture's share in the export pie, and you have a compelling business case for private participation. It is evident that private capital participation that drove the agriculture and food sector in several developed and middle-income countries is yet to take off in India. There is a big opportunity for the state governments, along with necessary support from the central government, to attract global food majors.

Revisiting some of the current legislations and taking focussed policy initiatives could make India a food hub in Asia. Policies related to stock limits and differential taxation across states could be revisited. The government can also consider favourable tax regimes and incentives for value chain sectors that need focus, like infrastructure. Also, the policies which dis-incentivise large farms could be modified so that the private sector can play a more meaningful role in bringing investments in technology and sustainability.

Appropriate legislations will enable strong industry–farm linkages and bring in marketing efficiencies, while successful interventions could be scaled up and replicated across commodities and geographies.

Infrastructure such as cold chains, better extension services to the farmers, better quality inputs, and appropriate scaling of mechanisation so as to make it affordable for small and marginal farmers will go a long way in improving quantity and quality of the produce and, in turn, multiply returns for the farmers.

This report has been developed through vibrant and stimulating consultations with all the FAIDA Steering Committee members and other stakeholders. I would like to thank each one of them for their valuable contribution and commitment to take Indian food and agriculture to the global level. My special acknowledgments for Piruz Khambatta, co-chair of FAIDA 3 and Chairman of CII Food Processing Committee, who provided us valuable inputs and facilitated the participation of his committee members for this report.

I sincerely hope that the interventions suggested in this report will help Indian farmers enhance their income, increase the availability of quality food products at the right price to Indian consumers, and make India a global powerhouse for agriculture and food.

Rakesh Bharti Mittal

Chairman, CII National Council on Agriculture and
Vice Chairman and Managing Director, Bharti Enterprises Limited



Confederation of Indian Industry

Preface

FAIDA has stimulated a great deal of interest ever since the first report was published in 1997. A second edition followed in 2003. Many of the suggestions and recommendations made in those two reports have been translated into action over the years. The government has taken steps to create an enabling environment and the industry has started to participate more actively.

However, despite the momentum, Indian agriculture is far from realising its holistic potential. If India is to achieve the inclusive growth it aspires to, there must be robust progress in agriculture. Agricultural growth cuts poverty faster than other approaches.

This inclusive approach is what forms the core of the third FAIDA report. Improving farmer incomes through sustainable agricultural practices and making food more accessible and affordable for consumers are the two guiding principles for this report. Every recommendation and suggestion made in these pages has been tested on two simple grounds. First, will it help the Indian farmer enhance his income? And second, will it benefit the Indian consumer by making quality food easily available and at the right price? The issue of food inflation is a complicated one and this report does not try to offer solutions to tackle it, but the suggestions it makes aims to help address inflation, accessibility and affordability.

This report is a forward looking one and has selected the produce categories which have the potential to change the landscape of Indian agriculture in the future. The report does not study crops such as wheat, rice, pulses, cotton and sugarcane because they have been examined in detail in other reports. The report also does not study the issues around minimum support price and fertiliser subsidy.

Mango, banana, soya bean, potato, and poultry represent the crop categories that could lead the charge as India aspires to become a global agricultural powerhouse by 2030. They have the potential to provide solutions for India's nutrient deficiency, be powerfully branded as Indian produce and exported, and undergo food processing to be converted into products with a longer shelf life.

All of these will require interventions, right from the quality and judicious use of inputs to scientific farming, to the use of technology to make mechanisation affordable for small farmers by sharing services, to the development of an infrastructure backbone, to branding, to processing and research and extension. Each of these requires a series of actions which will in turn accelerate the economic development of India.

The central and state governments and the industry have clear roles to play. The most important job will be to create an environment where farmers and industry can thrive and grow together.

The government has launched missions and programmes and outlined clearly that agriculture needs to grow at 4 per cent annually if India is to achieve its GDP growth target of 10 per cent. This report builds upon that vision. It should be seen as a first step to enable constructive dialogue between multiple stakeholders. Engaging with the states is a crucial imperative to drawing up a detailed roadmap based on suggestions made in the report.

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Executive Summary

The Indian food and agriculture industry made significant strides in the last three decades. It met the challenge of securing the production of basic staples like rice and wheat to feed India's growing population. Agricultural GDP increased at an annual rate of 3 per cent between 1980 and 2012, making India the third largest agricultural producer by value (behind China and the United States).

However, the sector is yet to realise its full potential in terms of yield, processing and exports. Given the country's agro-climatic conditions, the sector fulfils only 50 to 60 per cent of the potential yield for most crops. Private capital participation in processing, branding and marketing that drove the agriculture and food sector in several developed and middle-income countries is yet to take off in India. Despite the volumes, India's share in global exports is below par compared to the top five agricultural producers.

To examine the sector and its opportunities, McKinsey & Company and CII have jointly developed the third edition of the FAIDA report. This effort builds on the first and second FAIDA reports, and provides detailed suggestions for an integrated roadmap for the sector. FAIDA 3 focuses on mango, banana, potato, soya bean and poultry which represent crop categories that are likely to drive the next wave of growth.

DREAMING BIG: POWERHOUSE BY 2030

The country's progress in the last decade proved that, despite structural barriers, the Indian farmer matched domestic demand growth with commensurate yield increases. India overcame a structural nutrition-deficit situation early in the last decade and produced enough to feed its people, thanks to the perseverance and resilience of its farmers.

Anchoring an inclusive growth model

Success for the next two decades depends on how India responds to the next wave of demand and ensures sustainable supply to create a win-win situation for consumers and farmers. India's current average farmer income is 30 to 40 per cent of its per capita income with an ever widening gap with urban counterparts. Robust agricultural growth can ensure poverty levels decrease at a rate faster than most other approaches, making it a necessary component of India's inclusive and integrated growth model. By overcoming key obstacles, India could become a global agricultural and food powerhouse, and a leader of agricultural practices and techniques for several crops. It can provide the nutrition for a healthy and growing nation and create opportunities in allied business fields, thereby adding momentum to the country's march forward. For example, food processing currently enjoys a share of less than 10 per cent of production, while for other relevant countries the processing share is between 30 to 50 per cent, going up to 100 per cent for developed countries. Agricultural growth, and the vision to make superior quality food products with a long shelf life available to the consumer, can give tremendous impetus to food processing. In fact, a competitive agriculture sector and superior quality nutritious food could make India one of the top five exporters of agriculture and food products, and cement India's place as a true global powerhouse.

With these aspirations for 2030, India can potentially bring about a balance where rising incomes could improve the lives of millions of farmers, and high quality food at affordable prices could reach 1.5 billion consumers, thereby becoming an integral part of inclusive growth transformation.

Setting an inspirational goal for 2030

India's per capita GDP is expected to increase by 320 per cent in the next 20 years (from 2012 till 2030, calculated at 2000 prices). This rising affluence and the growing population is likely to increase India's overall food consumption by 4 per cent per annum to reach USD 483 billion in 2030 from USD 242 billion in 2010 (at 2010 prices). Per capita consumption is expected to increase from USD 206 to USD 346 (an annual increase of 3 per cent, at 2010 prices). This represents a huge investment opportunity across the food chain.

Urban India's food consumption will grow by 5 per cent, nearly twice as fast as its rural counterpart (2.5 per cent). It will change from being primarily driven by basic foods to more "high value foods" like fruits, vegetables and complex proteins. This is in line with global trends seen in countries like China, Japan, Indonesia, and Brazil as they transitioned into middle-income economies.

Given the expected rise in consumption, agricultural output (at farm gate prices) could grow from USD 266 billion in 2011 to USD 615 billion by 2030. At the same time, processing could grow from USD 23 billion in 2011 to USD 119 billion by 2030, while India's food exports could grow from USD 29 billion in 2011 to USD 162 billion by 2030.

As an outcome of the agricultural produce, processing and export growth, the food and agricultural sector could potentially grow at 5.2 to 5.7 per cent (in real terms) over the next 20 years. With such improvements, in 20 years the country can aspire to improve farmer income by over four times (real terms) to keep pace and reduce the gap with the national average income. Consumers could also benefit from the increase in supply to match per capita consumption, and access to safe and healthy food at affordable prices. The challenge for the industry and policy makers is to give the consumer enough choice by making available a world class variety of food products in the most convenient manner. They will have to overcome supply side barriers and ensure seamless end-to-end linkages to realise the true demand potential.

A 12-POINT PROGRAMME TO REALISE POTENTIAL

Based on extensive research and inputs from multiple stakeholders, 12 interventions across five themes could transform the sector's performance to meet its true potential, and achieve the vision of converting India into a global food and agricultural powerhouse. Four of these suggestions—instituting the National Agricultural Sustainability Mission, National Agricultural Technology Mission, setting up of world class food and agricultural universities, and agri-entrepreneurship—are already aligned with the missions and projects announced in India's 12th Five Year Plan (12th FYP).

The 12 suggested interventions are detailed below.

Accelerate sustainable yield improvements

For many crops, India ranks the lowest in terms of yield. This is partly due to structural constraints such as fragmented land and the low use of farm technology and best farming techniques. In spite of these, there is room to accelerate production and ensure sustainable yield increase in the long run. Two new initiatives may address this potential:

1. **Institute a "National Agricultural Technology Mission"**—The lack of high quality seeds and scientific farming techniques is the biggest deterrent to accelerate yield across India. The lack of other necessary inputs like modern water efficient irrigation systems and adequate mechanisation, coupled with poor farming practices impedes yield improvement in several states. Balanced and scientific use of inputs for soil health, plant protection, agronomical practices, etc., is critical to ensure sustainable agricultural growth. Making relevant technology available in a scaled down manner, especially customising mechanisation and offering it as a service, will make it affordable for the small farmers.

India needs a focussed programme to create high yielding, disease resistant varieties of seeds across crops; set up a targeted, well marketed "farmer education" and distribution programme to encourage them to adopt high quality seeds; promote relevant mechanisation and modern irrigation practices; catalyse the deployment of modern technology; align farming techniques to best practices; and encourage private participation in ensuring world class farming practices.

2. **Institute a "National Agricultural Sustainability Mission"**—India faces sustainability challenges in its land and water resources. The objective of this Mission should be to dissolve the supply side barriers and provide farmers with seamless linkages to scientific inputs and best practices to realise the true potential of agriculture. To get started, such a Mission must establish soil and water testing facilities and then create a national map of soil type and water availability to identify areas that need to replenish specific nutrients. Integrated nutrient management is critical for India at this stage. Providing incentives to organisations to promote the use of organic manure and micro-nutrients, as well as balanced nutrient management will help in their quick adoption, thereby improving soil health

and productivity. Farmers need to be supported through soil health cards and trained on seed treatment and prevention of insects, diseases and weeds build up to ensure both quality and yields of crops. Similarly, financial assistance to the private sector to reclaim “problem soils” and allotting area to develop it into special crop zones may significantly improve this sector.

Irrigation is the one of the most critical and scarce resources required for farming. The combination of irrigation with fertigation improves crop yield and quality, while significantly saving water and nutrient losses. For example, Gujarat encourages farmers to adopt drip irrigation and fertigation.

In partnership with state governments and enabled by the Planning Commission’s budgetary support, focussed flagship initiatives need to be launched to address areas of greatest opportunity and risk, starting as pilot projects and scaled up once proof of concept is established. This would better manage India’s resources and create a sustainable basis for a globally competitive agricultural sector.

Promote win-win farmer–industry interaction

Indian farmers have gained knowledge and skills by sharing within the community, through government programmes and through the private sector involved in inputs, processing and trade. However, there has been limited experience sharing with the private sector on yield improvements, good agricultural practices and sustainability. That said, many examples of successful corporate–farmer collaborations have emerged which demonstrate mutually beneficial situations for both. We propose two initiatives to scale up these interaction models rapidly:

- 3. Encourage scalable farmer–industry partnerships**—There are various emerging models of successful interactions. The initiative should be to promote and scale these up rapidly. The first is funding the growth of Farmer Producer Organisations (FPO) and Farmer Producer Companies (FPC) that allow small farmers to use collective strength and increase their competitiveness by offering them easier access to credit and technology, reducing costs of distribution and providing greater marketing power and negotiation capacity. Scaling up FPOs and FPCs can ensure farm competitiveness for domestic and international demand. The government could scale up equity participation in FPOs/FPCs through focussed grants, provide cheaper access to credit and facilitate linkages with the private sector. The National Bank for Agriculture and Rural Development (NABARD) can play this role on the lines of what the Small Industries Development Bank of India is doing for the micro, small and medium enterprises sector.

Promoting local aggregators, who are in direct contact with the farmers helping them with extension services and yield improvement, and are linked to marketers, is another idea. By combining selective incentives and policy and infrastructure support, these aggregators can become the “connective tissue” of a globally competitive food and agriculture sector, linking supply and demand and bridging a major missing link in the current ecosystem. The government could also promote organised agri-input retail, which can deliver suitable technologies and farm inputs to the farmers. The government may also consider enabling other land aggregating measures such as long-term leases (e.g., 10 years) for select crops. Such aggregation could help promote long-term investments in technology.

An interesting framework to make these different partnership models work could be the creation of the open public–private partnership (PPP) model, which will be flexible and dynamic enough to enable multiple farmers, multiple aggregators and marketers to work together.

The government could encourage corporate farming in select high value agriculture areas, particularly for exports (enabled by necessary review of the land ceiling legislation).

- 4. Consider a favourable policy regime, which improves agricultural marketing mechanisms**—An overall policy regime should enable farmers to decide to whom and where they can sell their produce. The current policy framework creates several bottlenecks which impedes farmers from effectively interacting with the private sector. There are seven specific considerations that could address these concerns:

- The effectiveness of the Agricultural Produce Marketing Committee (APMC) Act across states could be revisited. A detailed study is needed to examine the effectiveness of policy reforms in states that have either amended the APMC Act or abolished it completely. For perishables, farmers could be given the freedom to sell directly to processors, aggregators and traders outside the mandi (consider delisting perishables from APMC).
- Caps on subsidies for essential agricultural investments, like drip irrigation and greenhouses, could be reviewed.
- The government could review taxation structures and stock limits so that priority initiatives (processing, branding, exports) are incentivised, while also considering modifying policies which dis-incentivise large farms so that the private sector can play a role.
- The government could promote and fund the scaling up of a number of technology solutions (for example, Kisan Call Centres, mobile solutions) to ensure complete price transparency for the farmer.
- The government could consider a unified regulatory regime for organised input retail providing farmers with access to a “one-stop shop” for all agricultural inputs such as seeds, fertilisers, soil nutrients and pesticides.
- The government could promote aggregation of land through long tenure leases, e.g., for a period of 10 years, while protecting ownership rights and providing no tenancy rights to the lessor to ensure the land reverts automatically to the owner when the lease period expires.
- The government could consider amendments to the Land Ceiling Act to encourage corporate farming in select areas, especially for exports.

Scale up food processing and exports

India is at an inflection point on food consumption with the domestic demand likely to grow at 4 per cent per annum in the next 15 to 20 years. Our analysis suggests that this growth could be much higher (5 to 6 per cent) across high value food items like animal products, fruits and vegetables and processed food (6 to 8 per cent). In addition to this demand, consumers and export markets would require cleaner and healthier food. Three interventions will help open up demand:

- 5. Stimulate food processing through an emphasis on branding**—Given India’s affinity towards branded goods in most consumer sectors such as apparel and electronics, and the increasing demand for food, there is a large potential to create a new segment of branded food. The industry sector could generate demand through promotions, campaigns and advertisements to illustrate how consumers could benefit. The development of branded food would assure consumers of its freshness, healthiness, quality and traceability. Once this is done, the enablers need to be put in place, including (a) implementing back-end procurement mechanisms to work directly with farmers; (b) setting up post-harvest infrastructure; (c) working with the evolving modern retail formats to promote and sell.

The brand promise to customers could be delivered through a set of norms to assure freshness, healthiness, quality, traceability. However, this must be industry-led and voluntary. One such example in India is Woolmark. The creation of the Food Safety & Standards Authority of India (FSSAI) is a step in the right direction to promote focus on quality, safety and innovation in food products.

- 6. Launch a “National Agriculture and Food Export Mission” in select categories**—The government could consider taking an active part in promoting the export of select crops. Currently, India loses out on exports with other producers due to the failure to be cost competitive, lack of a powerful “Indian” brand in food, weak adherence to quality and safety standards and poor infrastructural linkages. The Mission, set up by the government in association with private players, could enable (a) identifying the right products and markets (e.g., fruits like banana, mango; markets like the Middle East and South Asia); (b) investing in market creation; (c) updating evacuation and access infrastructure such as cold chains and ports; (d) adhering to internationally

acclaimed benchmarks for quality and traceability enabled by a stable long-term agriculture and food exports policy. India should learn from countries who have successfully marketed their products worldwide, e.g., Florida oranges.

7. **Attract private capital and world class expertise**—This would ensure global expertise and the latest technologies in all parts of the agriculture and food value chain. In particular, global food and agriculture companies could bring their experience in enabling emerging country agriculture transformations, provide their expertise in processing, branding and exports, and bring the requisite long-term private capital into the food and agriculture sector needed to achieve India’s potential. Global food majors could be attracted to India through targeted campaigns such as road shows, and by creating a conducive investment environment.

Invest selectively in infrastructure, with private participation

The pre-requisites to accelerate yield and attract investment are robust infrastructure, and storage and evacuation points. Two major initiatives are required:

8. **Create a “National Farm Gate to Market Infrastructure Authority” (NFMIA)**—India lacks adequate farm gate infrastructure in terms of sorting, harvesting, packaging, storage and transportation. There are many bodies like the National Center for Cold Chain Development, National Horticulture Board, Agricultural and Processed Food Products Export Development Authority, and Ministry of Food Processing Industries (MoFPI), who are currently involved in building and managing different parts of this infrastructure. However, due to multiple players, there is fragmentation and insufficient accountability for an integrated solution. We propose the creation of an independent body (similar to the National Highways Authority of India) that will have the authority and be accountable for the development of this pan-India infrastructure. The NFMIA will create a national blueprint for viable agricultural infrastructure that will reduce operating costs for agricultural and food producers and then, either build it themselves, or oversee the creation of this infrastructure through the appropriate contracting and Special Purpose Vehicle (SPV) models.
9. **Create mega demand servicing and export hubs**—The government could consider setting up mega hubs that will allow companies to procure, store, process and export from a single location. These could either be set up near production centres of major crops or near a port to facilitate exports. Such hubs will help put in place the necessary forward and backward linkages, along with the storage infrastructure and provide for end-to-end facilities across the value chain.

For example, the MoFPI has announced a mega food parks scheme. They have set out over USD 570 million to develop food parks over the course of the 12th Five Year Plan. The aim is to increase the extent of processing to around 20 per cent of the produce by 2015. This type of scheme could be enhanced and scaled up significantly.

Nurture the next generation of agri-business technocrats and entrepreneurs

There is no dearth of quality entrepreneurs in Indian agriculture. Be it the Punjab farmer who has designed his own potato harvesting machine or a Tamil Nadu exporter who set up a best-in-class banana cultivation ecosystem, there have been several pockets of excellence. However, apart from government subsidies, entrepreneurs have not received any structured help to scale up their initiatives and make it a viable business. The inherent risks in agriculture have impeded the adoption of newer technology. There is a shortage of agriculture and food technocrats who could shepherd the next wave of growth. This could be met through three interventions:

10. **Scale up agricultural extension services through private participation and new infrastructure creation**—Even though agriculture has done fairly well in terms of food production, adoption of technology is limited. The government could encourage and enable industry, where there is viability, to participate in extension services. Extension services are imperative to introduce and integrate science and technology into the farming system. The government could consider PPP models in extension services (where possible), encourage contributions from farmer training centres at the district level attached to Krishi Vigyan Kendras (KVKs) by defining and monitoring performance standards, and encourage scaling up of farmers

cooperatives which proactively participate in extension services in the region. The government may encourage the private sector to participate in farmer training centres to bring their learnings and practices to KVKs. The government could consider creating dedicated institutes providing vocational training in extension services which will provide facilities to train the last mile farmer, the extension worker and facilitators. Public extension, however, should continue in the remote areas where farmers do not have access to or knowledge of agricultural best practices.

11. Create a network of four to five new world class food and agricultural universities and research laboratories to stimulate agriculture research—India ranks poorly in terms of quality and quantity of research vis-à-vis the rest of the world. Setting up world class universities will enable cutting edge research and ensure commercialisation through private investment and market linkages. These institutes, enabled by more autonomy, should be set up in collaboration with private sector players and foreign universities and classified as universities of national importance. These can be branded as “Indian Institute of Agriculture and Technology” (IIAT). An alternative in the short run would be to set up agriculture colleges in current institutes of national importance like the IITs, or upgrade existing agriculture and biotechnology institutes. Further, strong lab–farm links must be established so that innovative products developed by these universities are used in the agriculture and food processing sectors. The government has already taken the first steps by proposing the National Agricultural Education Project and the National Agriculture Entrepreneurship Project in the 12th Five Year Plan.

12. Set up agri-business focussed angel and venture capital funds as a PPP initiative between central and state governments and private capital providers—With the reduction in agricultural workforce due to rapid urbanisation and migration to cities, there is a need to create a generation of agri-entrepreneurs who will lead the next wave of growth. The central and state governments and private players could contribute to a professionally managed fund that finances innovative entrepreneurship ideas in agriculture. In addition, it is important to set up “business incubation centres” in regionally contiguous zones (potentially the demand servicing and export hubs, the mega food parks) that will help farmers shape their business ideas and train them on aspects like financial management, marketing and commercialisation and establishing networks with industries.

The 12-point programme could meaningfully transform India’s food and agriculture sector and improve the welfare of all stakeholders. However, current governance and implementation mechanisms need to be strengthened and new ones introduced to drive implementation. The report suggests five actions that could accelerate implementation—formation of enabler mechanisms, creation of enhanced governance for missions, an empowered group of stakeholders to oversee a national agriculture and food forum, an empowered industrial food and agriculture council, and food and agriculture action committees in states. The central government could consider budgetary support to these action committees, linking fund committed to tangible outcomes or enabling viability gap funding. This is just the beginning of the journey. These recommendations and their on-ground implementation will have to be revisited periodically to keep track of the progress and to make timely course corrections, if the need arises.

* * *

This study of the food and agriculture sector reveals India’s immense potential in the global agriculture and food space. Equally notable is the resilience of the Indian farmer, who has constantly responded to changing demand patterns. The challenge to feed India’s population has moved from making enough, to creating an inclusive ecosystem where the populace has access to quality food, farmer welfare is ensured, and the country’s economy grows. With the concerted, consistent and focussed efforts of the government, supported by the private sector and research and dissemination organisations, India is on the brink of becoming an agriculture and food powerhouse.



Summary of recommendations

Theme	Issues	Recommendations
Accelerate sustainable yield improvement	<ul style="list-style-type: none"> ▪ Limited deployment of quality seeds ▪ Limited deployment of technology particularly in cutting edge yield improvement techniques ▪ Unscientific usage of fertilisers and pesticides ▪ Absence of farm mechanisation technology which can adapt to small Indian farm sizes ▪ Degradation of soil and sharp depletion of water table 	<ol style="list-style-type: none"> 1. Launch a “National Agricultural Technology Mission” (12th FYP) with the following mandate: <ul style="list-style-type: none"> ▪ Develop and disseminate high yielding, disease resistant varieties of seeds ▪ Set up a targeted, well marketed “farmer education” programme ▪ Stimulate adequate and judicious use of inputs ▪ Promote mechanisation and modern irrigation practices for smallholdings in particular ▪ Catalyse deployment of modern technology in the fields of inputs, irrigation technology ▪ Encourage private participation in ensuring world-class farming practices 2. Create a “National Agricultural Sustainability Mission” (12th FYP) with the following mandate: <ul style="list-style-type: none"> ▪ Create a national map of soil type and water ▪ Establish soil and water testing facilities across states with soil health cards to farmers ▪ Encourage nutrient management ▪ Incentivise reclamation of problem soil ▪ Promote integrated micro-irrigation and fertigation ▪ Encourage cropping practices promoting sustainability ▪ Train extension engine to focus on sustainability ▪ Provide budgetary support to successful state pilots to ensure national scale-up
Promote win-win farmer–industry interaction	<ul style="list-style-type: none"> ▪ Lack of linkages create an ineffective and economically inefficient supply chain ▪ Overcoming trust barriers between farmers and industry 	<ol style="list-style-type: none"> 3. Encourage scalable farmer–industry partnerships through various models: <ul style="list-style-type: none"> ▪ Fund growth of Farmer Producer Organisations and Farmer Producer Companies (through NABARD or other government institutions) ▪ Promote local aggregators, who are in direct contact with the farmers, and are linked to marketers

Theme	Issues	Recommendations
	<ul style="list-style-type: none"> ▪ Insufficient aggregation of farmers and avenues to market produce ▪ Limited penetration of farming techniques and technology 	<ul style="list-style-type: none"> ▪ Encourage technology investment by permitting long-term leases while guaranteeing ownership rights to farmers ▪ Promote an open PPP model which incentivises the private sector players to participate actively ▪ Promote organised agri-input retail ▪ Encourage corporate farming in select high value agriculture areas <p>4. Develop a favourable policy regime, which improves agricultural marketing mechanisms:</p> <ul style="list-style-type: none"> ▪ Revisit APMC Act across states ▪ Review caps on subsidies for essential agricultural investments ▪ Review taxation and stock limits for agriculture and food processing ▪ Consider delisting perishables from scope of APMC Act and give farmers freedom to sell outside the mandi ▪ Promote and fund the scaling up of technology solutions for price transparency ▪ Promote land aggregation through long tenure leases while protecting ownership rights ▪ Consider unified regulatory regime for organised input retail ▪ Consider amendments to the Land Ceiling Act
Scale food processing and exports	<ul style="list-style-type: none"> ▪ Rising food demand with greater emphasis on higher quality food and greater hygiene ▪ Sub-scale processing industry ▪ Limited exports today ▪ Limited investments and expertise transfer in processing and branding 	<p>5. Stimulate food processing through emphasis on quality and branding:</p> <ul style="list-style-type: none"> ▪ Enable a scalable business model by (a) implementing back-end procurement mechanisms, (b) setting up post-harvest infrastructure, (c) working with the evolving modern retail formats ▪ Develop a branded food movement with focus on customer proposition and norms on quality and traceability ▪ Ensure a conducive policy environment for growth and investment (including taxes, capped subsidies and FSSAI)

Theme	Issues	Recommendations
		<p>6. Launch a “National Agriculture and Food Export Mission” in select categories:</p> <ul style="list-style-type: none"> ▪ Identify the right agri-products for exports ▪ Invest in market creation ▪ Update evacuation and access infrastructure, e.g., cold chain, ports, particularly in export hubs ▪ Adhere to internationally acclaimed benchmarks for quality and traceability <p>7. Attract and develop private investments and world class expertise:</p> <ul style="list-style-type: none"> ▪ Conduct road shows to attract global food and agriculture majors to India ▪ Create a conducive investment environment to enable investment in latest technologies for processing, branding and guaranteeing quality
<p>Invest selectively in infrastructure, with private participation</p>	<ul style="list-style-type: none"> ▪ Limited scale in post-harvest infrastructure leading to waste and loss of income to farmers who are unable to sell for best prices in best season ▪ Lack of consistent and stable supply of quality produce to the customer ▪ Challenges in ensuring a quality proposition for exports 	<p>8. Create a “National Farm Gate to Market Infrastructure Authority” (NFMIA):</p> <ul style="list-style-type: none"> ▪ Create an independent body with authority to be accountable for the development of such pan-India farm gate to market infrastructure ▪ Mandate NFMIA to create a national blueprint for viable agricultural infrastructure focussed on reducing operating costs and providing the backbone infrastructure ▪ Build the infrastructure or oversee the creation of this infrastructure through the appropriate contracting and Special Purpose Vehicles (SPVs) <p>9. Create mega demand servicing and export hubs:</p> <ul style="list-style-type: none"> ▪ Create mega hubs with the necessary forward and backward linkages (similar to mega food parks) ▪ Ensure presence of anchor tenants for guaranteed demand offtake ▪ Scale up funding support by Ministry of Food Processing Industries (align to mega food park scheme)

Theme	Issues	Recommendations
<p>Nurture the next generation of agri-business technocrats, entrepreneurs, researchers and workers</p>	<ul style="list-style-type: none"> ▪ Lack of professional training and education of on-ground extension workers ▪ Lack of facilities for research and development of new technologies and innovation in agriculture ▪ Lack of commercialisation of existing research due to limited linkages between institutes and industry ▪ Limited encouragement for investments in agri-businesses 	<p>10. Scale up agricultural extension services through private participation and new infrastructure creation:</p> <ul style="list-style-type: none"> ▪ Encourage private sector participation in extension services so as to ensure efficient incentive-led performance on the field ▪ Build extension bodies that could set up farmer training centres at the district level attached to KVKs and encourage scaling up of farmers cooperatives ▪ Enforce performance standards on KVKs and farmer training centres ▪ Create dedicated institutes to provide training in extension services <p>11. Create a network of four to five new world class food and agricultural universities and research laboratories to stimulate agriculture research (12th FYP):</p> <ul style="list-style-type: none"> ▪ Set up world class universities – Indian Institutes of Agriculture & Technology (IIAT) – with more autonomy to enable cutting edge research, and ensure commercialisation (new institutes or upgrade existing institutes) ▪ Encourage private sector players and foreign universities to partner with universities through grants and tie-ups ▪ Establish strong lab–industry–farm links so that innovative products developed by these universities are used in the agro and food processing sectors <p>12. Set up agri-business focussed angel and venture capital funds as a PPP initiative between central and state governments and private capital providers (12th FYP):</p> <ul style="list-style-type: none"> ▪ Create a professionally managed fund financing innovative agri-entrepreneurship ideas ▪ Build business incubation centres in regionally contiguous zones (in the mega demand servicing zones or export hubs)



Vision 2030

This report is divided into two parts. Chapters 1 to 7 present a brief report card of Indian agriculture over the last decade, outline the vision for the next two decades, and delve in detail into how that vision will be realised. The second part of the report, constituting Chapters 8 to 12, specifically deals with four crops and one produce—mango, banana, potato, soya bean and poultry. These represent the categories of fruits, vegetables, oilseeds and animal produce, which have the potential to transform both the domestic and international markets. Their consumption will drive Indian agriculture on the road to becoming a powerhouse by 2030.

The vision for Indian agriculture has been developed based on the increasing momentum of the sector in the past decade, the various islands of excellence, and by estimating the true potential of the sector and its stakeholders, including the Indian farmer.

Most of the initiatives suggested have been discussed by stakeholders in some form and are by no means comprehensive. This effort selects the most important ones to develop an integrated holistic view of it. The report focusses not only on what should be done but, more importantly, how these initiatives could be implemented, providing examples of states and corporations who developed successful models. The sector could use these examples to continue developing and scaling up to achieve unparalleled growth by 2030.



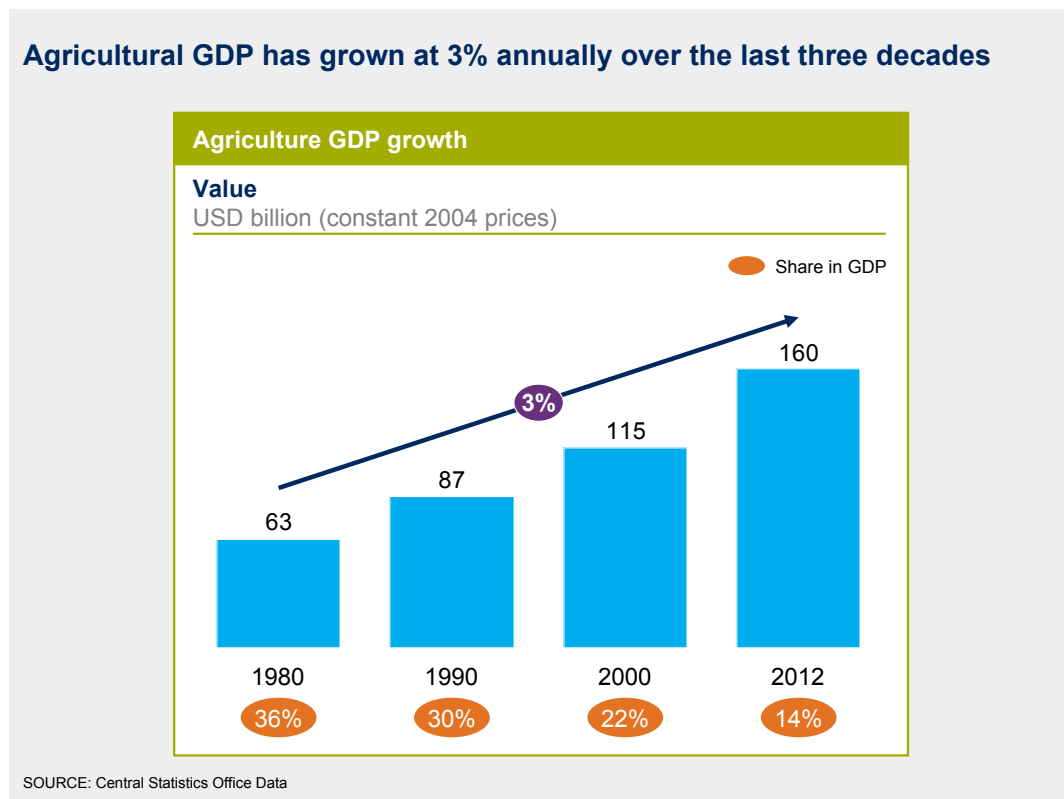
Chapter 1

2000–2010: A decade of growth

The story of Indian agriculture in the last decade was a combination of impressive growth and some missed opportunities. Consumption rose and farmers responded with a corresponding increase in production. Policy focus on agriculture increased and the cumulative result was an increase in farmer incomes. However, the story was not all rosy. The decade also missed several opportunities to further strengthen the Indian food and agriculture sector. The most important ones were the slowing of yield increases, unrealised potential in processing and exports and low involvement of the organised sector.

Agriculture is the foundation of India's socio-economic fabric. The sector employs 52 per cent of the workforce¹ and occupies 52 per cent of land.² It was valued at USD 160 billion³ (constant 2004 prices) and contributed 14 per cent to the GDP in 2012. The agriculture processing sector was valued at over USD 14,537 million (constant 2004 prices)⁴ in 2010, and the value of total exports was USD 20,900 million (constant 2004 prices)⁵ in 2012. Agricultural GDP grew at 3 per cent over the last 30 years as shown in Exhibit 1.1.

Exhibit 1.1



- 1 Report on Employment and Unemployment Survey 2011–2012, Ministry of Labour & Employment.
- 2 'Agricultural Statistics at a Glance 2012', Directorate of Economics and Statistics.
- 3 Annual Agriculture Report 2011–2012, Department of Agriculture & Cooperation. At current (2011 to 2012) prices, agri-GDP stood at USD 266 billion.
- 4 Ministry of Food Processing Report, 2011–2012. Latest consolidated data available is for 2010.
- 5 Finance Minister's budget speech 2013.

Moreover, supply proved itself resilient and responsive to the economy's constantly evolving demands—both in terms of increasing per capita consumption and the shift in consumption toward high value foods. Production also improved with agricultural output growing at 3.1 per cent between 2000 and 2010, more than 1.5 times the global average growth rate.⁶ India is the third largest agricultural producer (by value) in the world after China and the United States,⁷ and contributed 7 per cent of the total value of the world's agricultural produce in 2011 (see Table 1 in Exhibit 1.2). India is among the top producers of some of the most consumed crops (rice, wheat, millet, peas, pulses, onion, potato, banana, mango, papaya and sugarcane; see Table 2 in Exhibit 1.2).

Exhibit 1.2

India is the 3rd largest agri producer by value









Table 1

Top agri producers by value in 2010			
Rank	Country	Value of agri. produce in 2011 ¹ USD billion	Per cent of share in value of world agri producers
1	 China	546	25
2	 USA	210	10
3	 India	149	7
4	 Brazil	85	4
5	 Japan	72	3
6	 Nigeria	66	3
7	 Turkey	58	3
8	 France	53	2
9	 Russia	52	2
10	 Indonesia	48	2
	 World	2,194	100

¹ Value of output (at constant 2004 prices)

SOURCE: CSO data; global data sourced from FAOSTAT

Table 2

Crops where India is No. 1 producer (2010)			
Crop	Production quality Million tonnes	Per cent of world output	
 Bananas	30	28%	
 Mango	15	40%	
 Papaya	4	36%	
 Milk	117	16%	
 Buffalo meat	2.5	4%	
 Spices	1.5	74%	
 Sesame	0.9	21%	
 Castor oil seed	1.3	77%	

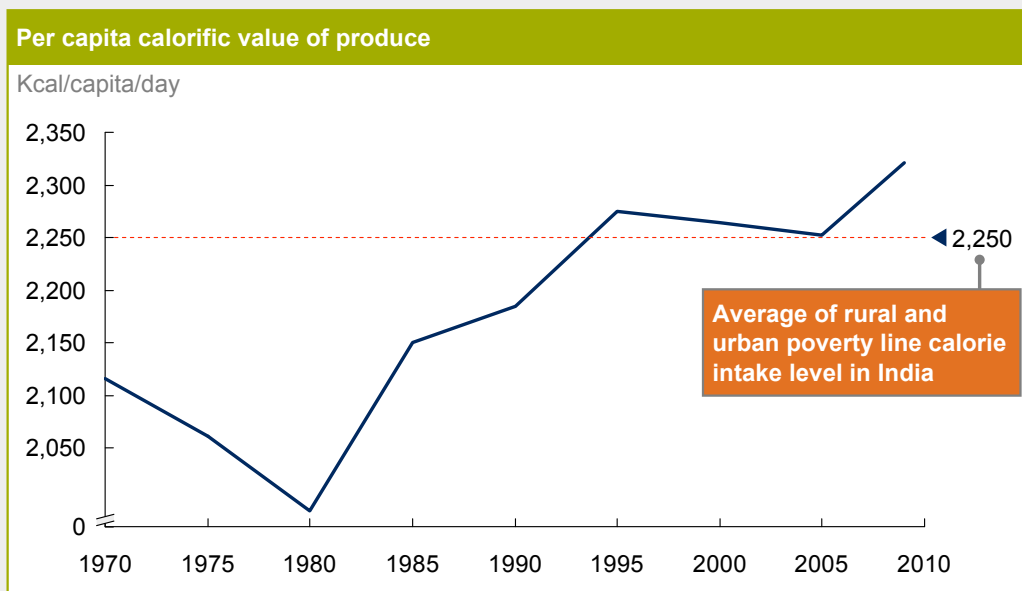
In the last two decades, India's agricultural output grew to provide enough food to fulfil the calorie requirements of its entire population. As Exhibit 1.3 shows, India's per capita calorie consumption crossed the government recommended level of 2,250 calories per day for the first time in 1994. Post the period 2005 to 2006, per capita calorie consumption shot up significantly. However, the country's real challenge to food security is affordability and access to the right quality of nutrients.

⁶ FAOSTAT (agricultural output calculated in value terms at constant 2004 prices).

⁷ FAOSTAT.

Exhibit 1.3

India is self sufficient in food grain availability since the early 1990s



SOURCE: FAOSTAT; GoI

A DECADE IN TRANSITION: POSITIVE TRENDS IN INDIAN AGRICULTURE

The socio-economic changes India went through in the last decade presented opportunities for the agriculture sector. Between 2000 and 2010, India's population grew by 1.5 per cent, with 16 million people added to the population each year. In the same period, the percentage of people in the lowest economic class fell from 69 per cent to 56 per cent. India also became more urbanised during this period with 31 per cent of its population living in cities in 2010, compared to 28 per cent in 2000. A significant portion of the labour force moved from agricultural to non-agricultural activities, reducing disguised unemployment and increasing per capita productivity.

Following these changes, India has seen major shifts in consumption trends and production patterns. Agriculture has also enjoyed an increased policy focus over the last decade. All these led to an increase in farmer incomes across crop categories, especially in the high value crop segment. We now briefly examine these facts.

Changing consumption trends towards premium food

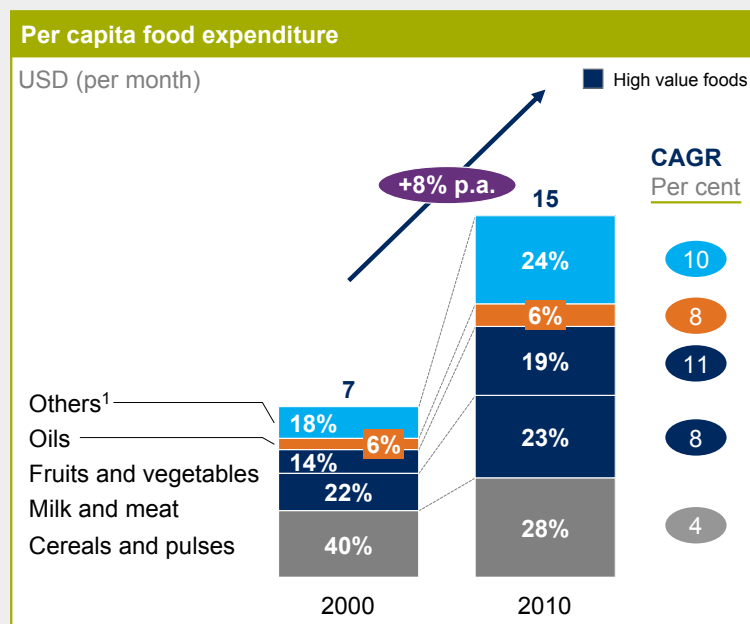
India's dietary patterns have been changing across both the urban and rural landscapes, led by increasing disposable incomes⁸ and rapidly evolving consumer needs. While increasing disposable income naturally alters spending patterns at the higher level (from food to non-food), it also affects how people spend on food. Hence, predictably, Indians are now spending much more on high value foods (Exhibit 1.4). In fact, the ratio of cereals and pulses in the overall food budget of the average Indian consumer has dropped by more than 25 per cent. Consumption has been shifting from plant-based proteins such as pulses, to animal-based protein such as milk and meat. Between 2000 and 2010, the contribution of cereals and pulses in the overall per capita food expenditure reduced from 40 per cent to 28 per cent, while that of animal-based products, fruits and vegetables rose from 36 per cent to 42 per cent. Exhibit 1.4 shows per capita food consumption growth of 8 per cent in nominal terms, which is equivalent to 1.6 to 1.7 per cent in real terms. Population growth over the last decade was

8 As per RBI data, GDP per capita increased at 6 per cent in real terms over the period 2001 to 2010.

1.5 per cent,⁹ which means the quantity (in real terms) of total food consumed grew by just over 3 per cent per annum.

Exhibit 1.4

Expenditure on food has shifted toward high value foods over the last decade



SOURCE: NSS Survey

Responsive supply

This shift in consumption or demand has led to a corresponding change in production patterns or supply. Agricultural GDP, a measure of total production, increased by 3.1 per cent over the last decade, thus keeping pace with the growth in consumption as discussed earlier. The growth in production was due to an increase both in the area under agriculture and yields. The total area under foodgrains (cereals and pulses), fibre crops, fruits and vegetables and oilcrops grew at almost 1 per cent per annum between 2000 and 2010, from 178 million hectares to 195 million hectares.¹⁰ Yields have increased steadily across most crop categories (except pulses), as Exhibit 1.5 shows, ranging from 0.5 per cent to 7 per cent over the past 10 years. These facts prove that Indian agriculture has not only been resilient, but also responsive to changing and growing consumer demand.

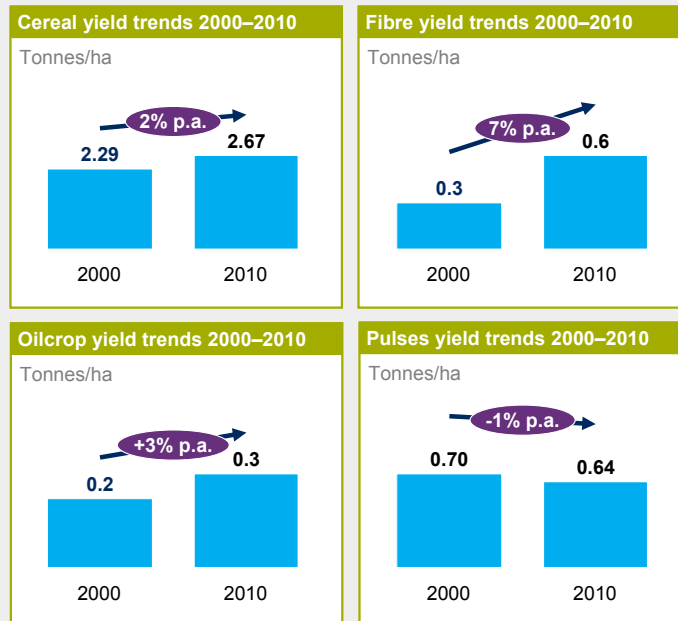
The productivity of Indian agriculture rose as well. Exhibit 1.6 shows that agricultural output per worker increased by two times between 2000 and 2010.

⁹ Census of India data, Office of Registrar General & Census Commissioner of India.

¹⁰ FAOSTAT.

Exhibit 1.5

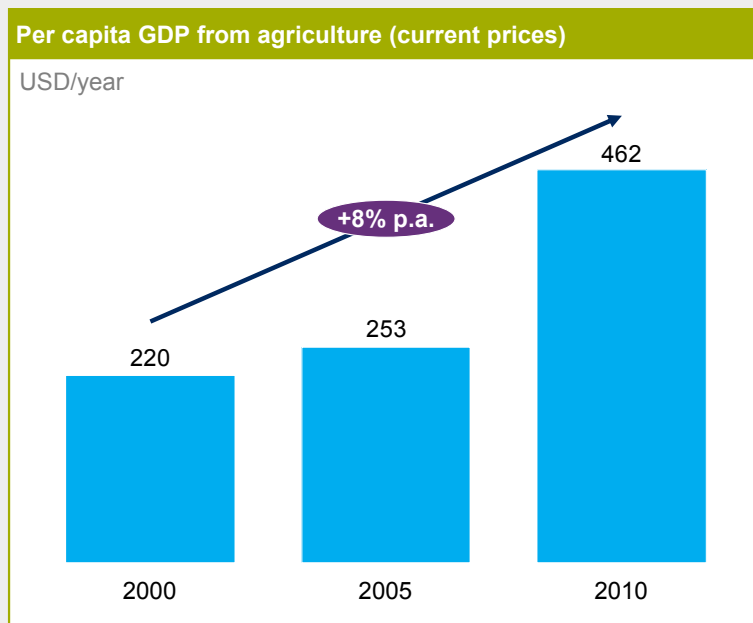
The last decade witnessed yield increase across most crop categories



SOURCE: Estimate based on data from Directorate of Economics and Statistics, FAOSTAT and GIS

Exhibit 1.6

Productivity of India's agricultural workers grew 8% over the last decade

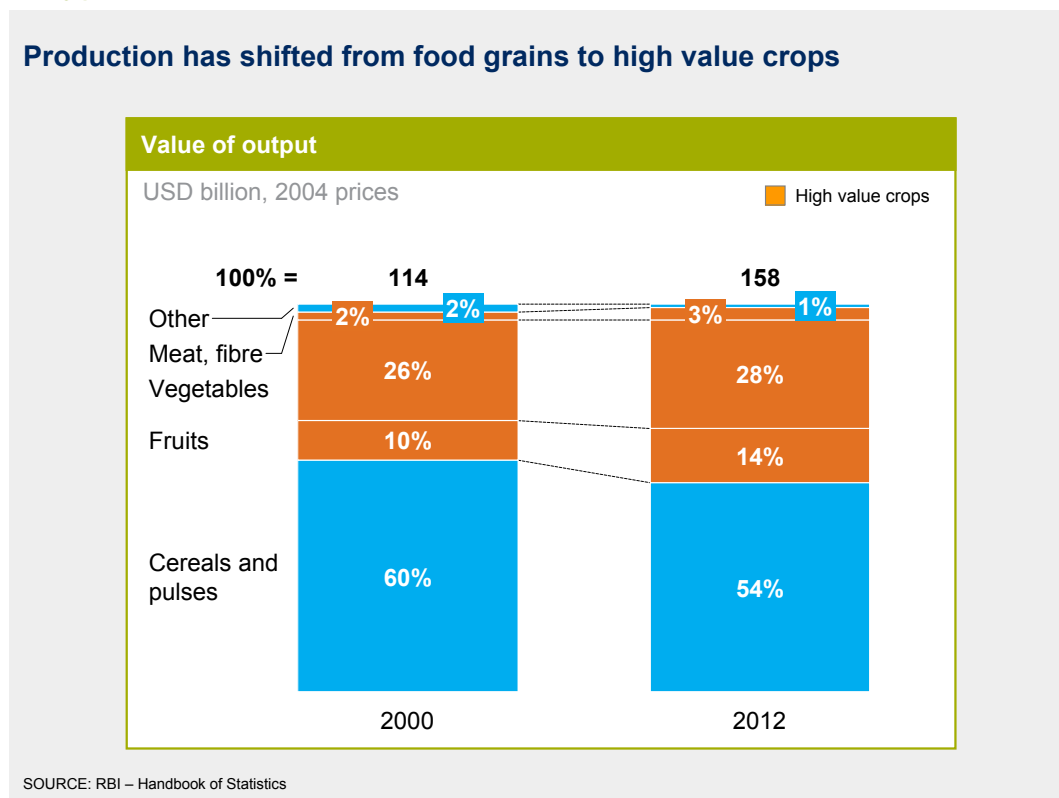


SOURCE: CSO Data

Large-scale shift to high value agriculture

A trend accompanying growing consumption and increasing production is the qualitative shift to high value agriculture. There has been a marked shift in production from basic foodgrains to high value produce, especially fruits and vegetables (Exhibit 1.7). In 2000, basic foodgrains formed 60 per cent of the total produce by weight, while fruits, vegetables, meat and fibre formed only 38 per cent. By 2010, there was a shift to high value crops, which formed 45 per cent of total production. The increase in the production of certain high value foods such as soya bean, potato, mango, banana and poultry has been up to four times faster than basic produce like rice and wheat.

Exhibit 1.7



A study of the different crops shows a distinct shift by farmers to the high value portfolio in “pockets of excellence”, where strong demand–supply links have been forged, and increased yields and quality of produce have allowed successful exports in addition to catering to domestic demand. For example, best practice cultivation and post-harvest methods for banana in Tamil Nadu have increased yields by 33 per cent, reduced post-harvest losses by 10 per cent, and improved quality. These have allowed competitive play in the export and high end domestic markets.

UHDP boosts banana yield

Cultivation best practices can boost yield to match the global optimal. For example, the practice of ultra high density planting (UHDP) has boosted the yields of the banana crop. India ranks second worldwide in terms of banana yield (among the top five producers) with a yield of 35 tonnes per hectare. This is because as per the practice of high density planting in India, 1,200 to 1,300 plants are planted per acre instead of 500 to 600 plants per acre as per usual practice.

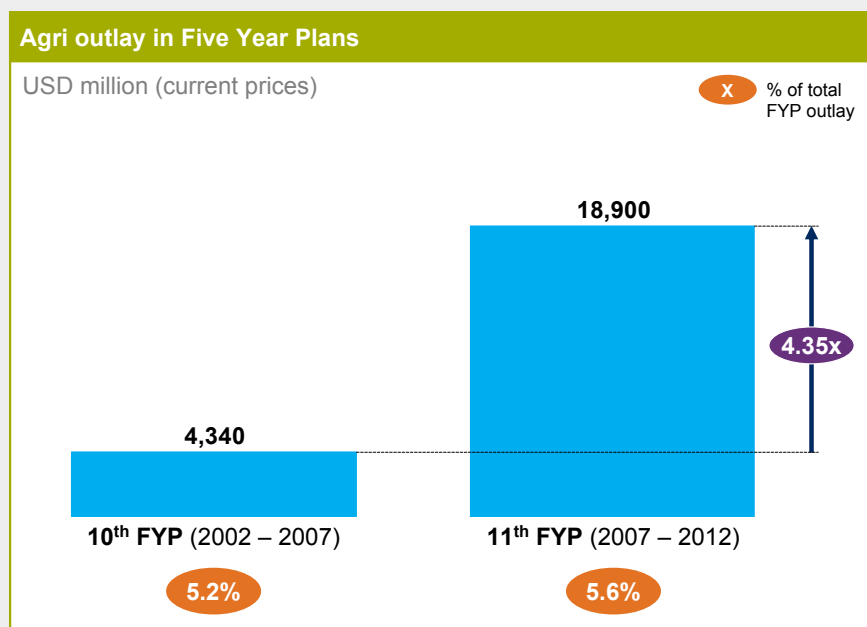
Increased policy focus and public funding

A renewed policy thrust since the mid-2000s helped reverse the decline in agricultural growth of the 1990s. There was a 4.35 times increase in total agriculture outlay from the 10th Five Year Plan to the 11th Five Year Plan. The percentage

outlay for agriculture increased from 5.2 per cent in the 10th FYP to 5.6 per cent in the 11th FYP (Exhibit 1.8). This was the highest proportion allocated to agriculture in the last 20 years.

Exhibit 1.8

Outlay for agriculture rose sharply in 11th Five Year Plan



SOURCE: Five Year Plan Reports

Several landmark schemes have been introduced by the government in the agriculture sector since 2000, for example, the Rashtriya Krishi Vikas Yojana (RKVY), the National Food Security Mission, the Pulses Development Programme and the interest subvention scheme on crop loans. The RKVY scheme was a landmark scheme launched in 2007, which aims at achieving 4 per cent annual growth in the agriculture and allied sectors by calling upon central and state governments to evolve a comprehensive strategy to rejuvenate agriculture.

CHALLENGES AND MISSED OPPORTUNITIES

While the last decade saw several positive trends, Indian agriculture also missed several opportunities to bolster growth. Low yields, unrealised potential in processing, lack of organised play, and exports were the most important ones.

Slowing down of yield improvement

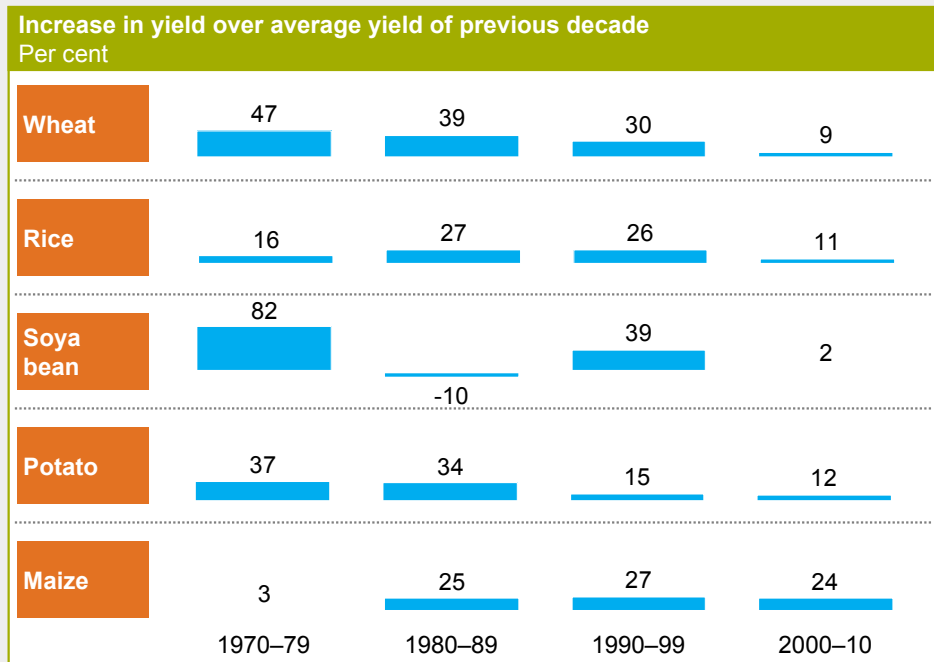
While the overall yield continues to improve, there has been no scalable success story of substantial yield improvement. The few successes have been small, sporadic and led by the private sector. In fact, yield increase has actually slowed down across crops over the past few decades (Exhibit 1.9), which is a cause for concern since yields for these crops have still not attained their optimum.

There are several possible reasons for this lacklustre yield performance. First, the quality of research was inadequate. Second, insufficient technology was used. Third, extension services to the farmers were not entirely effective. These translated into a lack of awareness and adoption of best practice methods among farmers, and low adoption of the latest technology, adversely affecting yields. For example, a recent Planning Commission report estimated that of the one million extension workers required, India has an extension workforce of just 100,000 (10 per cent).

The other main cause is the use of outdated practices and inputs. A large number of Indian farmers still depend on the monsoon season for irrigation. Only 35 to 40 per cent of cultivated land in India is irrigated and there is minimal penetration of new water saving technologies like drip irrigation. Outdated chemicals continue to be used for fertilisers and pesticides. A paucity of investment in seed technology affects the supply of good quality seeds.

Exhibit 1.9

Yield increases across crops have slowed over the last 4 decades



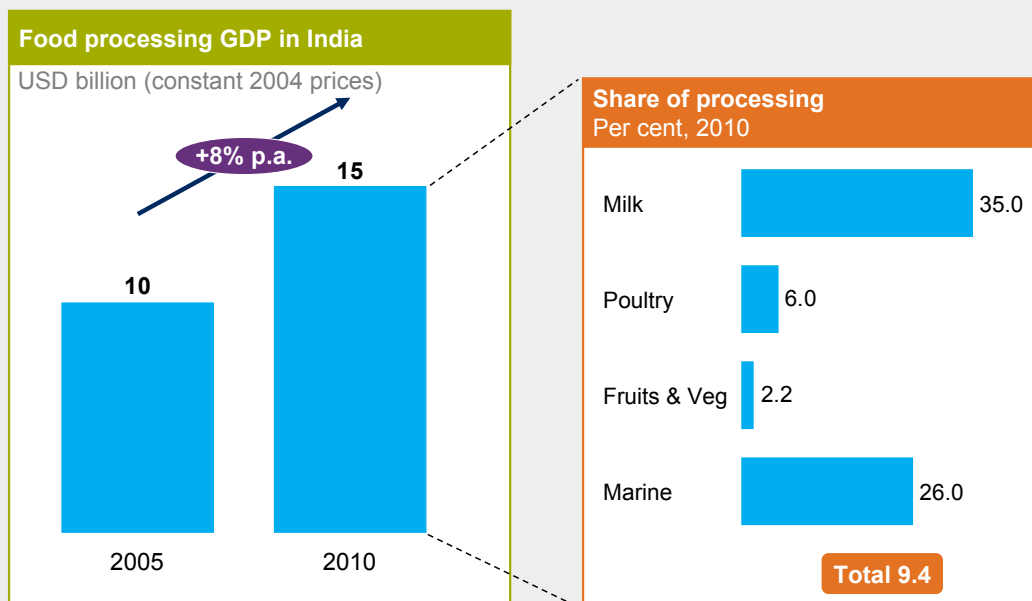
SOURCE: Directorate of Economics and Statistics

Unrealised potential in food processing

Valued at USD 14,520 million in 2010 (at constant 2004 prices), the food and processing industry GDP in India is 10 per cent of the agricultural GDP. Developed countries such as the United States consume over 60 per cent of food across categories in the processed form. In India less than 10 per cent of most food categories consumed is processed (Exhibit 1.10).

Exhibit 1.10

Less than 10% of agri produce underwent processing in India



SOURCE: MoFPI 2011 report

The first FAIDA report envisaged that the processing sector would likely become an USD 47,300 million to USD 49,500 million sector in 2005 (at 2004 prices). However, India has realised the opportunity partially—the size of the processing sector in 2010 was just USD 14,520 million (at 2004 prices). This under-performance in processing is due to multiple reasons. Lower demand created for processed food and poor investment in infrastructure are the crucial ones.

Low involvement of organised sector

So far, the level of participation of private players in the food and agriculture sector has been very low. Despite shifting consumer preferences, the organised sector is hardly present in high value categories. Overall industry participation in the sector remains low, with few large companies and limited participation from international players.

The few instances of corporate participation have shown their ability to create win-win solutions for all stakeholders by transforming value chains, improving yields and reducing wastage. However, these successful pilots have failed to achieve scale. The lack of scale is primarily due to structural barriers in farm gate access and the lack of infrastructure to link the benefits of value addition to the consumer. Systemic difficulties in farm gate access stem from three reasons—lack of adequate farm gate infrastructure (such as storage centres and primary processing centres), fragmented land holdings which makes it difficult for companies to source enough produce of consistent quality, and restrictive policies that limit farm gate access. The lack of adequate infrastructure for processing, cold storage, etc., limit the benefits of organised play from reaching the consumer.

Unfulfilled export potential

India has made good progress in exports, going from USD 20 billion in 2010 to USD 26 billion in 2012. However, import dependency on critical items such as pulses and edible oil remains high. This is despite the fact that India is the third largest producer of food (Exhibit 1.11) and has a sizable presence in several crops that are relevant to both the export market and industry. It is also close to some of the largest food importing regions, e.g., the Middle East, China and South East Asia. The share of exports is about 12 to 14 per cent of production. Low yields and poor infrastructure limit competitiveness, particularly from farm gate to markets and ports. Exports have suffered due to the lack of active support and sponsorship. Poor infrastructure for primary processing, packing, grading and inadequate cold chain storage have further held back Indian exports.

Exhibit 1.11



* * *

The agricultural sector is at yet another cusp of change, which could play out over the next two decades. The past few decades have shown the resilience of India's farmers in satisfying the nation's food requirements. India is no longer a calorie-deficit nation and must broaden its horizons and start thinking like a global agricultural powerhouse.



Chapter 2

Aspirations for 2030

The pessimism surrounding India's self-sufficiency in the future underestimates the potential of both the Indian consumer and the Indian farmer. Not only is India more than capable of fulfilling its own food demand, it is also poised to become a top five exporter of food over the next two decades. It will also make the Indian food business an exciting investment destination for global private capital.

What India eats, how it is grown and the policies that govern the industry can be the three pillars on which the future of Indian agriculture is likely to rest. Both quantity and quality are expected to drive the India story. People can demand higher value food items. More importantly, the supply of premium food items is expected to increase demand, just as it did in the areas of mobile telephony and cable television.

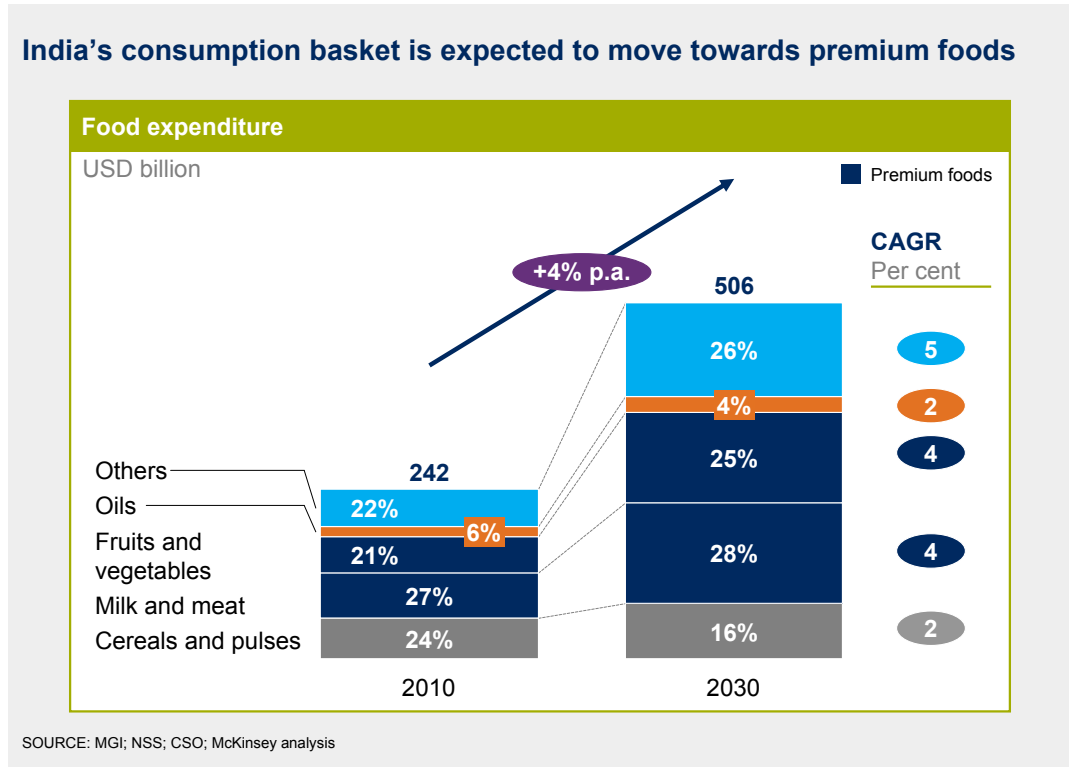
India's growing tribe of new-gen tech entrepreneurs could help create solutions to overcome information and logistical challenges. Greater use of internet and mobile technology can ease outreach and make pricing transparent. Such transparency will benefit not just the farmers but the consumers as well.

CONSUMPTION SHIFT TO PREMIUM PRODUCE, INCREASED TECHNOLOGY

India's population is expected to rise from 1.18 billion in 2010 to 1.5 billion in 2030, at an annual growth rate of 1.1 per cent. By 2030, more than 43 per cent of India's population is likely to reside in cities, compared to 31 per cent in 2010. Both these factors could influence consumption as India demands more food and higher quality with every passing year.

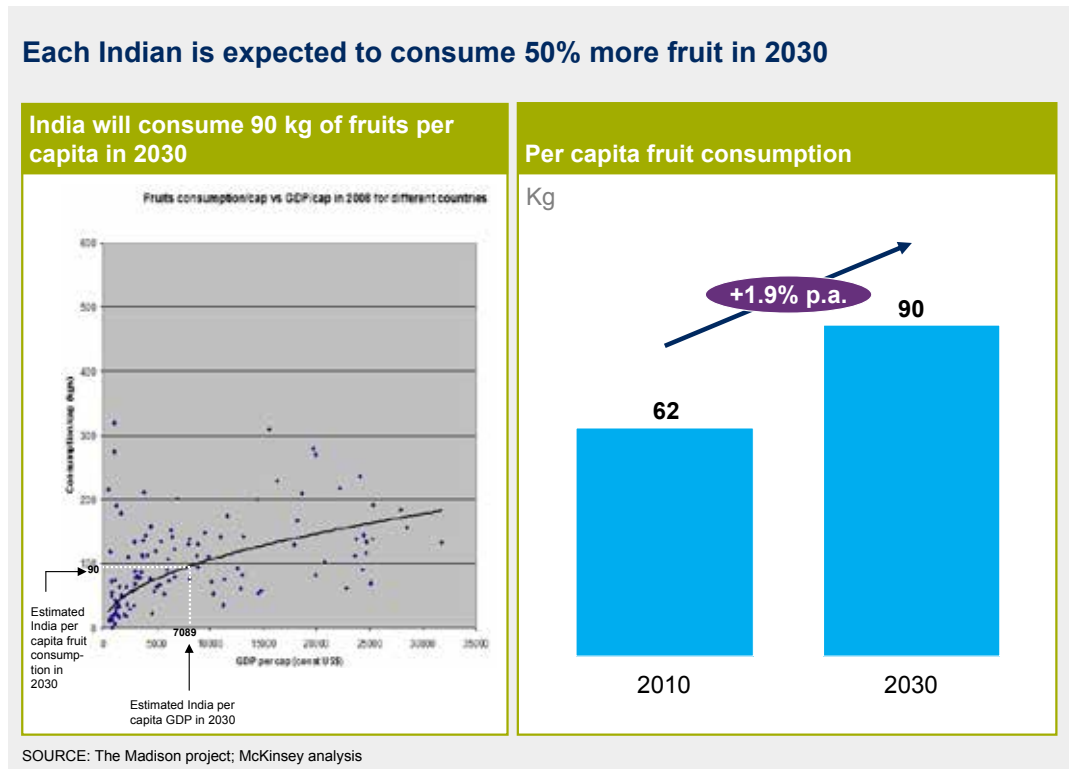
Overall food consumption will rise by 4 per cent per annum to reach USD 483 billion in 2030 (Exhibit 2.1). In urban India, consumption will grow by 5 per cent, while in rural India it will grow by 2.5 to 3 per cent. Per capita consumption is expected to increase from USD 206 to USD 346 at current prices (an increase of 3 per cent per annum). This represents a huge investment opportunity across the food value chain.

Exhibit 2.1



With increased affluence, both rural and urban India are likely to shift from subsistence foods to better quality food items and demand more premium products (Exhibit 2.1). Cereals are expected to form a smaller part of the diet, while the greater proportion would comprise proteins such as dairy and meat. Cereals and pulses are likely to grow at 2 per cent per annum, lower than the overall growth, while milk (3 per cent per annum), meat (including seafood, at 5 per cent per annum), and fruits and vegetables (4 per cent per annum) will contribute to the overall agricultural growth. Indians are expected to consume 90 kg of fruit in 2030 as compared to 62 kg in 2010 (Exhibit 2.2).

Exhibit 2.2



However, the adoption of these products depends on the supply side keeping pace. An example of responsive supply that made an industry successful is India's poultry sector, one of the fastest growing animal protein categories in the world. This growth was due to a 12 per cent annual increase in broiler meat production in the past decade, from increased processing capacity in Andhra Pradesh, Maharashtra and Tamil Nadu. High availability helped maintain low prices, expanded the consumer base and absorbed consumers who shifted to poultry from more expensive meats such as lamb (Exhibit 2.3).

Exhibit 2.3

Poultry is the cheapest source of animal protein

	Protein content Per cent	USD/100 Gms of protein
Pulses	18	1
Poultry (Broiler)	20	1
Lamb	22	2
Beef	24	2
Fish	13	4

SOURCE: World Bank; USDA; WHO; McKinsey analysis

Increased access to technology will also remove barriers. India's mobile phone penetration is expected to go up from 75 per cent in 2010 to about 90 per cent by 2030. Internet penetration is also expected to increase from 10 per cent in 2010 to about 60 per cent in 2030. Stakeholders across the food and agriculture value chains could, therefore, be better connected. This would enhance price transparency and information symmetry while adding backward and forward linkages.

Current solutions such as the Department of Agriculture's Kisan Call Centre could be promoted and scaled up. India's new tech entrepreneurs could create more solutions to overcome information and logistical challenges. By 2030, there is likely to be greater price transparency enabled by technology and internet connectivity.

FOOD AND AGRICULTURE VISION FOR 2030

India in 2030 could present a different picture from today's reality. We have already discussed how trends such as rising income, and increase in quantity demanded coupled with the demand for quality and premium produce could steer the way forward for the agriculture and food sector. Other catalysts that could enable the sector to work towards that enhanced reality include a more participative governance model that will further empower states in agriculture; a changed taxation regime due to the Goods and Services Tax; progressive infrastructure such as ports, special zones and cold chains; lesser restrictions on farm gate access; and more farmer–industry interaction.

Keeping these factors in mind, we have envisioned India as an agricultural powerhouse by 2030—a self-sufficient food producer and leading food exporter. Three levers that could drive the future of

India's agriculture growth are improved production yields, enhanced export opportunities and increased scope of the processing industry.

Accelerate agricultural production to achieve potential

Given India's potential to better yield and efficiency, we estimate that for most cereals and pulses, improvement ranging between 20 and 50 per cent is possible. For most fruits and vegetables, the range stands at 30 to 200 per cent of current yield; for most oilseeds, it is possible to improve yield by 80 per cent and even over 100 per cent in some cases such as soya bean.

Increasing yield and creating demand can increase the worth of India's agricultural produce from USD 266 billion in 2011 to USD 615 billion by 2030 (Exhibit 2.4). Analysis suggests that for most cereals and pulses, improvement ranging between 20 and 50 per cent is possible. For most fruits and vegetables, the range stands at 30 to 200 per cent of current yield; and for most oilseeds, it is possible to improve yield by 80 per cent, and even over 100 per cent in some cases such as soya bean.

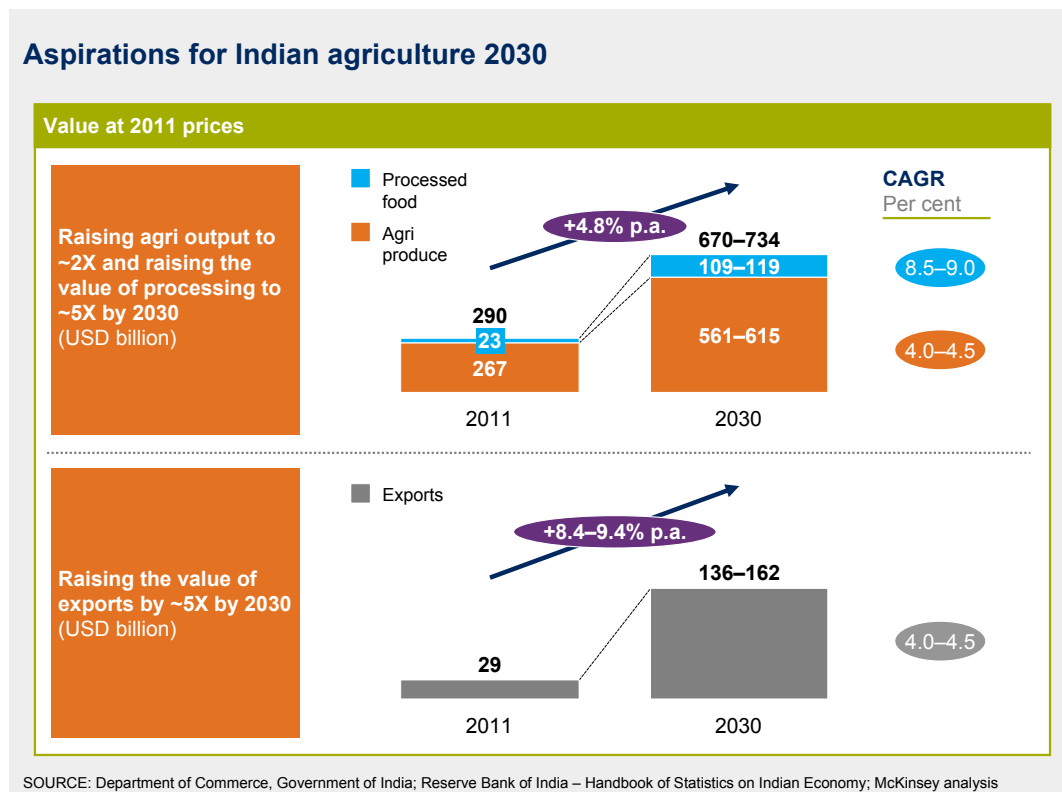
Increase processing in the agricultural value chain

The full potential of processing is yet to be tapped, making this a big opportunity for the sector. With the correct investments, processing in India can move from 10 per cent of produce to 25 to 30 per cent of produce. As an outcome, food processing GDP could grow from USD 24 billion in 2010 to USD 124 billion by 2030 (Exhibit 2.4).

Increase agricultural exports

As the second largest producer of agricultural products globally, India has the potential to increase exports by five to six times from USD 29 billion in 2011 to USD 162 billion by 2030. Agriculture could then contribute 15 per cent to total exports and India could become a top five exporter of food in the world (Exhibit 2.4).

Exhibit 2.4

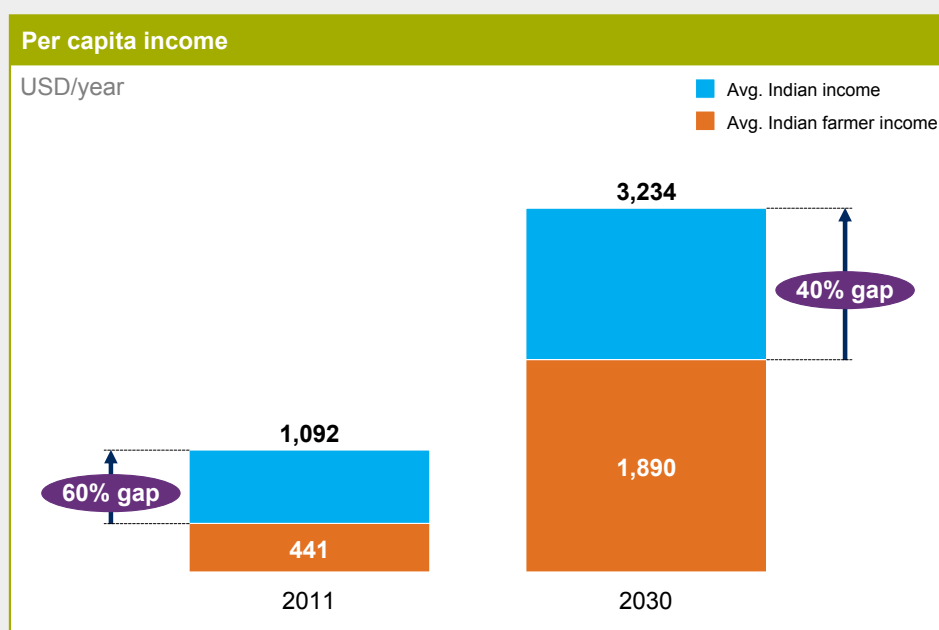


Achieving these aspirations could triple output, multiply farmer income, and provide better quality to consumers.

Almost 55 per cent of India's rural population depends on agriculture as their primary source of income. But the average annual income for an Indian farmer is USD 462 compared to USD 1,134 for the average Indian. If India achieves the aspirations outlined above, the annual income for a farmer could rise to around USD 1,890 in 2030. This would decrease the income gap between a farmer and a non-farmer from 60 to 40 per cent (Exhibit 2.5). Such an economic development model is likely to be more sustainable and inclusive. It addresses the needs of the small marginal farmers who have been more or less excluded from the services-led model of growth.

Exhibit 2.5

Gap between farmer's income and India's average income could be reduced from 60% to 40%



SOURCE: Interviews; McKinsey analysis

REALISING INDIAN AGRICULTURE'S TRUE POTENTIAL

For years, the key focus for Indian agriculture was to ensure food security. This was done by ensuring the supply of sustenance crops like rice and wheat and keeping prices at affordable levels. The Green Revolution brought in a host of changes, including the large-scale use of fertilisers and pesticides and irrigation. Having successfully achieved this primary goal, India now needs to focus on the next horizon, which is high value produce.

The following five themes could develop and make the sector prosper in the coming decades.

Accelerate sustainable yield improvements

Yields can grow by improving the quality of inputs, extending the reach of irrigation facilities, improving farm mechanisation, and enhancing the quality of practices followed during sowing, farming and harvesting.

Various islands of excellence have shown that good quality inputs can enhance yields from anything between 33 per cent (in the case of bananas) to 150 per cent (in the case of cotton). Drip irrigation mechanisms in Andhra Pradesh improved yields by 85 per cent through consistent and controlled flow of water. Groundnut plantations in Tamil Nadu modified mechanisation to suit the farm size and increased yield by 55 per cent. Mango orchards in Maharashtra followed best practices along with sufficient extension work to increase yield by almost 300 per cent.

India could aspire to enhance overall yield to its true agro-climatic potential. The improvement potential could be 200 per cent of the current yield for oilseeds, 150 per cent for most cereals and pulses, and between 200 and 400 per cent for high value added crops, fruits, vegetables, etc.

Promote win-win farmer—industry interaction

Farmer—industry interaction in India rests on three levers. The first is aggregation, currently considered a challenge. However, FPOs that bring farmers together to create a conducive interaction interface could strengthen the sector. The second is the interest and investment of the private sector. It has currently explored various models of interaction with farmers through pilots. Scaling up such models can remove the challenges of policy and governance and create a win-win situation for both farmers and the industry. Third, the industry players could ensure that the best expertise and knowledge with regard to inputs and practices reaches the farmers. Effective extension services and dissemination will ensure the success of their farmer-involvement models.

India could establish several scale FPOs and multiple aggregator companies, and several successful PPPs in all large agricultural states, that will work to bring together various stakeholders of the value chain by 2030.

Scale processing and exports

Food consumption in India is set to rise by 4 per cent per annum till 2030. With increasing urbanisation and disposable incomes, the population will demand higher quality food products, which makes the branding and processing industries important. This could both increase the total value of the Indian food produce and tap an emerging market.

India's current export basket continues to remain limited to primary/low value products like oil meal, marine products, rice and raw cotton. Limited progress has been made in the export of either high value fruits and vegetables or processed/value added foods. Focussing on the high value categories will unlock transformational opportunities for the sector.

India could aim to increase exports by five to six times from USD 29 billion in 2011 to USD 162 billion by 2030. This could place India amongst the top five exporters of the world in 2030. The total processed food market in India is likely to grow from USD 23 billion in 2011 to USD 119 billion by 2030.

Invest selectively in infrastructure with private participation

Agricultural infrastructure is the key enabler for all initiatives that must be undertaken to transform the sector. Currently, the warehousing, sorting and packaging infrastructure functions are in poor condition, at non-optimal locations and suffer from inefficient management. India's national infrastructure backbone needs to be created to support the sector. This role could be fulfilled by the NFMIA. The body could either create this infrastructure themselves or oversee the creation of this infrastructure with private partnership. India could build several (5 to 10) fully functional mega demand zones with forward and backward linkages and crucial anchor tenants by 2030.

Nurture the next generation of agri-business technocrats and entrepreneurs

India ranks poorly in terms of quality and quantity of agricultural research and development vis-à-vis the rest of the world. India also has very few agricultural entrepreneurs, a result of it lacking the latest R&D and funds to make such enterprises viable. India has one-third the number of globally acknowledged scientific research institutes, and publishes less than one-fifth the number of research papers than the developed agricultural nations. Quality, quantity, commercial viability and private participation all lack in the agri-R&D and agri-entrepreneurship space.

However, investment in three areas can change this landscape with private sector participation. First, extension workers and farmers need specific training and implementation facilities so they can adhere to good farming practices. The number of extension workers needs to increase by five times, from 100,000 to 500,000. Second, the sector requires four to five world class agricultural universities that can mould and nurture talent and attract industry grants for research. Around five Indian Institutes of Agriculture and Technology (IIATs) in line with the Indian Institute of Science (IISc) model could be built. Third, industry participation must be linked to agricultural researchers and entrepreneurs so that venture capital funding is available for early stage agricultural enterprises to grow. India could

work to attract capital and create a support system for several new early stage companies in food and agriculture.

* * *

The aspirations outlined in this report are founded on insights developed from empirical research and based on the vision shared by farmers and industry participants interviewed during the course of the study. These suggestions are intended to provide a starting point to develop an agenda for India's agriculture sector to 2030.



Chapter 3

Sustainable yield improvements

In its quest to maintain self-sufficiency for coming generations, India has to address two concerns. The first is that, despite the Indian farmer having successfully kept pace with rising demand, the improvements have tapered over the last decade. Yields in India are below their attainable potential and global benchmarks. The second is that improvement in yield must be sustainable, that is, it should be driven without endangering the resource base for future generations.

Currently, India's dependence on natural resources is high. It supports around 16.7 per cent of the world's population and over 17.2 per cent of the world's livestock on 2.4 per cent of the world's geographical area. The per capita land availability is less than one-sixth of the global average and this will fall by over 25 per cent over the next 20 years. This overstraining of land resources is the cause of widespread land degradation and threatens the sustainability of the agro-ecosystem. Agriculture consumes more than two-thirds of India's total available freshwater through irrigation. Depletion of water reserves could cause a massive supply gap in the future.

Nearly 60 per cent of India's agricultural land is rain-fed and about 30 per cent of the country's area, spread over 99 districts, is drought-prone. More than half of India's total geographical area suffers from soil erosion, water logging, and other problems for cultivation. This results in lower yields and farmer incomes and, importantly, unsustainable agriculture, which endangers India's food security and natural resources for future generations.

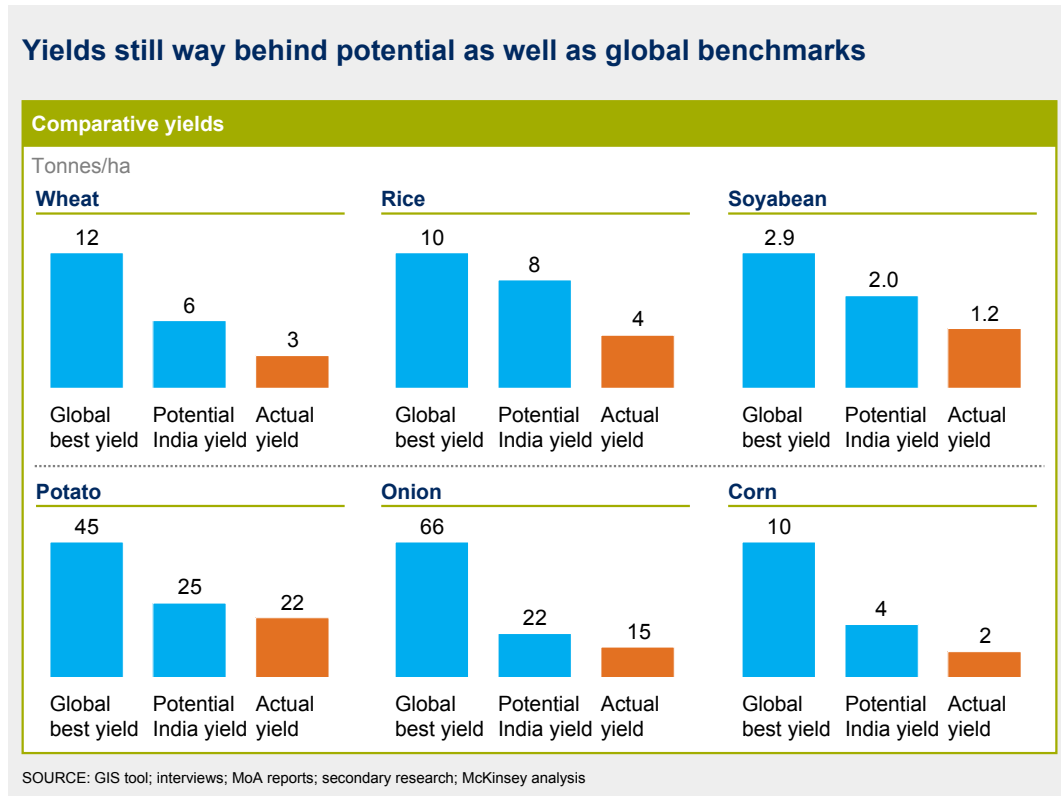
In a developing country like India, sustainability is often the last item on the agenda because immediate improvements in yield and smallholder incomes take precedence over long-term consequences. But it is imperative that India adopt and practise sustainable systems that are resource-conserving, socially supportive, commercially competitive and environmentally sound.

YIELD IN INDIA IS BELOW POTENTIAL

From 1980 to 2010, yield increase kept up with demand. It made India the third largest agricultural producer by value in the world. It also enabled building up stocks of critical foodgrains.

Despite this, yields in India are below their own potential and are about 40 per cent of the global best practice on an average, as can be seen in Exhibit 3.1. Low-yielding farms and lack of infrastructure are keeping Indian agriculture from realising its true potential. India's future food security will depend on how effectively we address these issues. A rising population, the corresponding food demand, increasing incomes from the middle class who aspire for "high-value foods", the opportunity of becoming a major source of food for the world, and finally, rise in farmer incomes are compelling reasons to focus on yield improvement.

Exhibit 3.1



Over the next two decades, India's population is expected to grow at 1.5 per cent¹ per annum to reach 1.5 billion. The growing middle class will constitute 75 per cent of this and there will be a 400 per cent increase in urbanisation. It is quite impossible to expand the land used for agriculture alone to meet the consumption requirements. Sustainable yield improvement is likely to be the only route to fulfil this demand. It will also play a critical role in expanding agriculture's share in India's exports, which could benefit farmers, consumers, and the industry.

INDIA FACES SUSTAINABILITY CHALLENGES

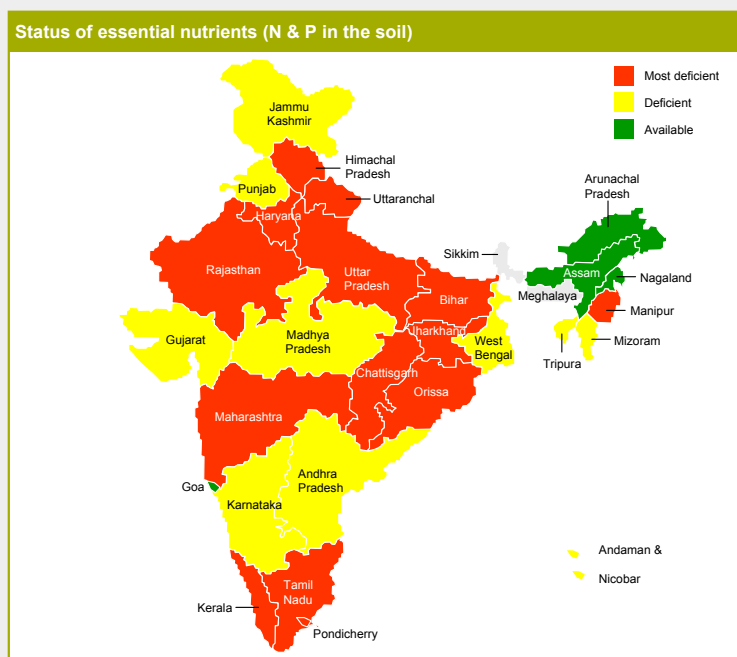
Amongst the many challenges, two have especially high relevance for India—land degradation and water depletion.

Water erosion and other land degradation issues have depleted nutrients from the soil, thus reducing its quality. A majority of the states have soils deficient in macro nutrients such as NPK (nitrogen, phosphorous, potassium) and essential micro nutrients such as zinc (Exhibit 3.2). This causes crop yields to suffer and necessitates higher artificial fertiliser use. The total economic losses to the country at current prices are estimated to be a staggering sum of over USD 5,415 million. This is an approximate 12 per cent loss as per the total productivity value of these lands.

1 UN Population Fund.

Exhibit 3.2

Land degradation due to erosion has caused nutrient depletion



SOURCE: GOI report State of Indian Agriculture 2011–12

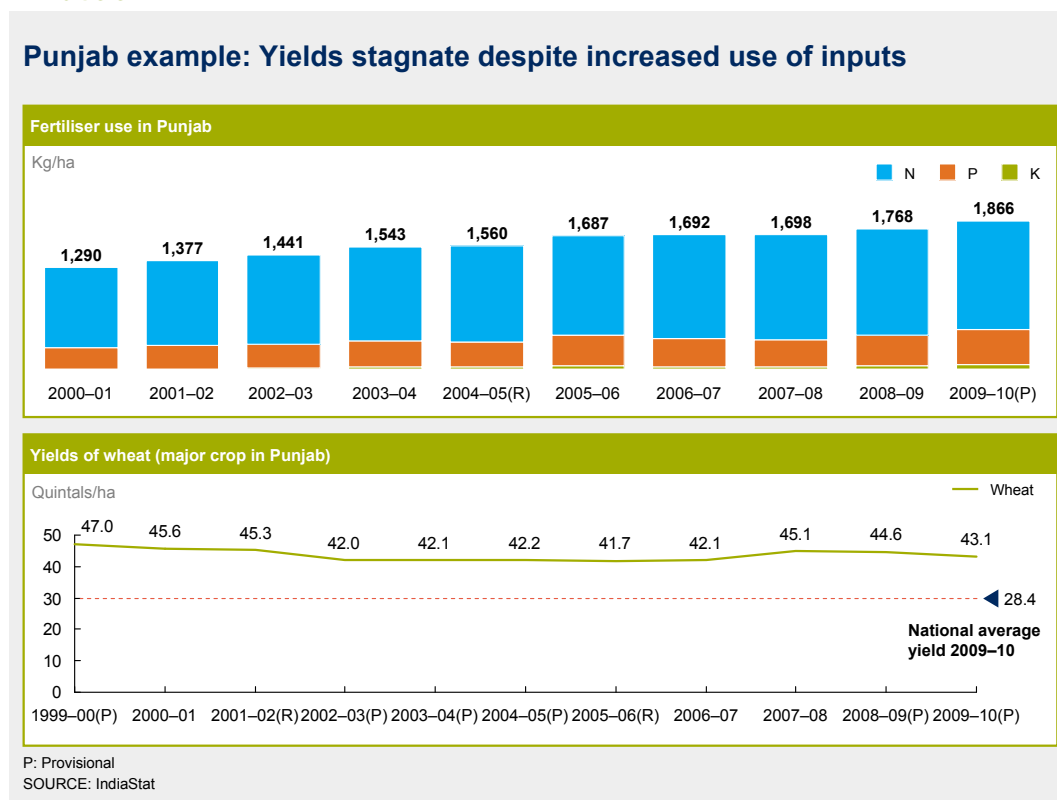
Water depletion is the other area of environmental concern. Groundwater levels in northern India have been declining at an average of one foot per year despite above normal rainfall. More than 109 cubic km² (26 cubic miles) of groundwater disappeared between 2002 and 2008. This is double the capacity of India's largest surface water reservoir, the Upper Wainganga in Madhya Pradesh.

Both these environmental challenges have a direct bearing on the tapering of the yield in India over the last decade. As can be seen in the example of Punjab (Exhibit 3.3), increasing inputs alone cannot be a substitute to sustainable yield improvement.

In fact, falling water tables are a big concern for Punjab's agriculture. The profitability in agriculture declines with falling water tables and the cost of depletion is disproportionately borne by resource-poor farmers as they fail to invest in changing technology and well deepening. The existing inequality in landholdings leads to an inequity in access to groundwater, which in turn widens the gap in assets and income distribution.

To tackle this, the Punjab government has taken some measures. It has, for example, banned early sowing of paddy to decrease the amount of irrigation used by the crop in a bid to tackle depleting groundwater resources. It has also made efficient farm equipments available (on loan) in large areas of the state. However, a central integrated approach, which brings in the best available and applicable methods and implements them on a large scale, could be a more holistic approach to tackling the problem.

Exhibit 3.3



AN INTEGRATED CHANGE AGENDA

The mandate for sustainable yield increase requires a two-fold agenda. The first is to focus on developing and disseminating cutting edge technology for key crops. Currently, farmers in India struggle due to low quality inputs (seeds/planting material), inadequate irrigation infrastructure, unviable cost of mechanisation and low awareness of superior farming practices.

The second intervention required is to create the right market linkages for the technology to be feasible for adoption and attaining scale. For this to succeed, the private sector could be involved to cater to markets, farmer access and awareness should be increased, and the state should provide tactical incentives. For example, subsidies in drip irrigation in Gujarat and Andhra Pradesh doubled the adoption of this technology by farmers.

Increasing the overall quality of inputs

India is a land of extremes. The high variance of the quality of inputs used in agriculture reflects this state of being as well. While some farms make do with less productive indigenous seeds and manure, others utilise high-yield seed varieties, tissue culture and high quality fertilisers.

On average, switching from indigenous to regular, high-yield seed variety inputs can increase yield by up to 50 per cent. By using highly developed seed varieties, it is possible to increase yield up to 200 to 300 per cent. Using hybrid seeds could be a step in the right direction. Yield improvement through improved inputs in Golden Rice in China and Rainbow Papaya in Hawaii are some examples. India too has witnessed such results in banana cultivation in Theni, Tamil Nadu, where tissue culture has improved yields by 33 per cent, and consequently, farmer income by 400 per cent.

While fertilisers, pesticides, and other inputs are accessible in India, the focus should be on using the right chemicals. Higher quality seeds, better crop protection and better agriculture practices can have a significantly stronger impact for increasing yields and improving quality without adversely affecting resources like soil. The focus should be to use fertilisers and pesticides in a balanced and scientific manner. Currently, due to the changes in the subsidy regime, fertiliser usage of urea is distorted as its price is lower. The government could revisit the fertiliser subsidy to correct this imbalance. The government could also consider introducing policies that encourage the development of indigenous

technologies and products like customised fertilisers, as well as those that allow quicker introduction of new molecules so that more efficient and environment friendly fertilisers may be developed and used.

Using the latest irrigation methods

Irrigation in India needs to improve on two fronts. The first is to correctly map and study regions and crops so as to ascertain the specific level of artificial or additional irrigation required. The second is to implement this research and increase accessibility and affordability of modern irrigation methods such as drip irrigation and fertigation to farmers in select regions. In specific crops such as soya bean, simply improving irrigation can increase yields by 40 to 50 per cent.

Netafim's palm oil initiative in Andhra Pradesh is an example of artificial irrigation best practice in India. Through drip irrigation, it increased yields by 25 per cent and saved water by 32 per cent, and the entire artificial irrigation system had an internal rate of return (IRR) of 74 per cent with a payback of 4 years. In a similar global example, sugarcane irrigation in the Philippines has shown a 90 per cent increase in yields with 70 per cent savings in water.

According to experts, similar focussed attention to shift to Direct Seeded Rice cultivation from transplanted can save up to 2,500 litres of water per kg of rice.

Making mechanisation relevant and affordable

Mechanisation is the third key intervention that can improve yield significantly. With increasing urbanisation and migration from the villages to the cities, finding farm labour is becoming difficult. Also, smallholder farmers find mechanisation economically unviable. This is further compounded by the lack of adequate financial support. It is imperative that mechanisation be made affordable by manufacturing scaled down versions of big harvesters and other machines that can be used on small farms. This would be akin to products like smaller pumps and diesel generator sets, which are available in multiple sizes and capacities to suit different needs. Domestic manufacturing holds the key to customising and scaling down mechanisation. Entrepreneurs and industry could be encouraged to invest in manufacturing and even offer mechanisation as a service or on wet lease to farmers.

Mechanised sowing and harvesting alone can reduce wastage. Our analysis shows that, overall, mechanisation can enhance yields by 14 per cent and farmer profits by 20 per cent. In the North Arcot region of Tamil Nadu, for example, mechanisation has increased paddy and sugarcane yields by about 30 per cent, while groundnut yield has increased by 55 per cent.

Potato cultivation in India too has benefitted immensely from mechanisation. Around 150,000 hectares of area under mechanisation has enabled India to produce USD 46 million worth of extra potatoes because of timely field operations, thereby bringing economic benefits to these farmers.

It is, therefore, imperative to address these two issues simultaneously to create an environment conducive for adopting mechanisation in agriculture. The first is to support cooperatives and farmers to collaborate and prevent further fragmentation. The second is to develop newer technologies that can service small holdings efficiently while giving economical returns to the farmer.

Promote awareness of latest farming techniques and practices

Promoting awareness of farming practices (sowing, farming and harvesting) that can optimise the existing potential of inputs manifold is the fourth and final intervention required to increase yield. In addition, it is important to simultaneously promote extension and dissemination facilities.

Many pilot projects in India have proven that well monitored farms meet global yield, given the same quality of inputs. An example is that of Project Unnati, a Coca Cola—Jain Irrigation joint venture to promote Ultra High Density Plantations (UHDP) in the Chittoor district of Andhra Pradesh. It has helped increase the number of plants per hectare from 100 to 1,600 while using the same amount of water. This is further linked with the market through a focus on the "Totapuri" variety, a key ingredient in Mazaa (a fruit drink). About 600 farmers working across 100 acres of demo farms have benefitted from it. The training and extension target for this project is likely to positively impact the lives of 50,000 farmers in 5 years.

Currently, extension in India suffers from a lack of coordination between the multiple private and public agents involved. There are also severe resource constraints in terms of financing and manpower in critical public extension institutions. This leads to structural and implementation issues in the public extension system.

Also, given that private extension is seen to be more effective and is on the rise, public extension could focus on the most remote areas, where farmers lack any knowhow on agricultural best practices, so as to attract the private sector there.

Finally, at the lowest level, the model of farmer education needs to change so that the farmer can play a direct, participatory role to disseminate information, e.g., through farmer field schools.

INSTITUTING A NATIONAL AGRICULTURAL TECHNOLOGY MISSION

The government could consider instituting a “National Agricultural Technology Mission”. The criticality of inputs and technology to the overall agriculture landscape of India is the reason we recommend going into mission mode. Unless the government takes up this cause with a missionary zeal and puts in place national level programmes, agricultural production in India in the future could face severe challenges.

Low quality seeds are the biggest deterrent to accelerating yield. For example, the use of high quality seeds for potato crops can increase yield by up to 40 per cent.

Lack of proper irrigation, adequate mechanisation, and poor farming practices impede yield improvement in several states. To close this gap, India needs a focussed programme to create high-yield varieties of seeds across crops (based on what is suitable for different agro-climatic conditions) and a targeted “farmer education” and distribution programme (with adequate marketing and promotion) to encourage farmers to adopt high-quality seeds while de-risking the trial phase.

The Mission could focus on the promotion of modern irrigation practices, refresh farming practices (including scientific use of fertilisers, pesticides), deploy customised mechanisation and relevant extension services.

- State governments could plan to provide viability gap funding to farmers to promote the use of sprinkler and drip irrigation. For example, the Gujarat government has a scheme to incentivise farmers to take up drip irrigation, in which 50 per cent of the cost of equipment is subsidised, 45 per cent is loaned at low interest rates, and farmers only have to pay 5 per cent of the cost. This, coupled with priced electricity for water, has resulted in high rates of adoption of water saving and yield-enhancing technologies.
- The governments could promote farmer–industry collaboration where the industry brings in water saving technologies. Techniques such as laser levelling of fields for efficient use of water, use of tensiometers and other such technologically advanced water conserving equipments need to be studied, modified and adopted to the Indian setting, keeping farmer interests in mind.
- Farmer education is important to ensure adoption of new yield varieties and for optimal use of technology. Farmers will only be encouraged to adopt high-quality seeds if they are de-risked in the trial phase. Teaching them how to use fertilisers scientifically will also add value.
- Deploying customised mechanisation is another important tool that may be used to strengthen the farmer. Currently, most mechanisation is aimed at large farms. Using these on smallholdings is economically unviable. However, if customising technologies to convert them into smaller and affordable machines, while maintaining the same impact, will be of immense benefit to the small farmers across the country.

INSTITUTING THE NATIONAL AGRICULTURAL SUSTAINABILITY MISSION

The government could also consider creating the “National Agricultural Sustainability Mission”. Currently, farmers in India lack the knowledge of best practices to utilise soil and water resources, and fertigation techniques. To get started, India must create a national map of soil type and water availability, and identify areas that need replenishment.

In partnership with state governments and enabled by the necessary Planning Commission budgetary support, focussed flagship initiatives could be launched to address areas of greatest opportunity and risk—starting off as pilot projects and scaled up once proof of concept is established. This would facilitate better management of India’s resources (identifying areas prone to constraints, preventing misuse of resources).

The Mission could have a three-fold mandate. The first, to clear budgetary provisions at the central and state levels to pilot and implement sustainability solutions. The second, to avoid exploitation of resources through careful incentive planning, metering and allocation of quotas in selected areas. And third, move towards an optimised crop portfolio that maximises yield without excessive exploitation of resources. Several initiatives could be undertaken, such as:

- A central body such as the National Resource Management Division of the Indian Council of Agricultural Research (ICAR) could prepare a detailed land inventory. It can use technology such as the geographic information system (GIS) to monitor various land use activities, such as watershed projects development.

An international example is Canada, where the Ministry of Agriculture worked with local governments to undertake land use inventory projects in their farming areas. They developed tools such as a database, coding system and a land use inventory guidebook, which could be used to monitor and scientifically plan agricultural land use.

- The concept of water and soil testing laboratories may be universalised and the issuance of soil health cards could be made robust.
- ICAR could emphasise research on cropping practices that promote sustainability. This includes input conserving genetic varieties, methods of irrigation, sowing and other agronomic practices. An example is the promotion of no tillage farming to increase the organic matter content in the soil, and disincentivising the burning of crops by farmers.
- Central or state governments could promote collaboration—where the industry brings in nutrient and soil conserving technologies—by incentivising such sustainability promoting companies, and providing the enabling environment to facilitate their interaction with the farmers. Integrated nutrient management is critical, and the use of organic manure and micro nutrients must be promoted through a suitable incentive scheme.
- Extension services are imperative and the state and development agencies could find ways to make it attractive for agencies to work with smallholders. This could be done by extending lower interest credit and free training and extension to such growers. This was done in Thailand where the state bank (Bank for Agriculture and Agricultural Co-operatives) provided such loans and the Department of Agricultural Extension (DOAE) provided extension support to contract growers and their groups.
- State governments could also consider adopting a usage linked agricultural tariff system, as flat tariffs do not incentivise farmers to save water and increase precious groundwater wastage.

Uttar Pradesh’s “Apni Mitti Pahachane Abhiyan”

In Uttar Pradesh, the initiative to collect soil samples is called “Apni Mitti Pahachane Abhiyan” and is organised separately in the Kharif and Rabi seasons. More than 27 lakh soil samples have been collected and more than 21 lakh soil samples analysed. A total of 18.25 lakh soil health cards have been distributed amongst farmers. Other states too could consider running such quality control programmes.

- Finally, there is scope to adapt best practices from within and outside India to tackle the land and water challenges. Examples such as Gujarat's innovative intervention to govern groundwater use through electricity supply management, and Australia's training programmes on efficient water use, offer interesting insights on managing these natural resources.

A good example of research and extension to promote sustainability is in Queensland, Australia, where the government emphasised awareness and training on irrigation techniques to improve water efficiency. Four on-farm demonstration sites were set up, with both hardware and irrigation management, and groundwater monitoring techniques were showcased. The programme achieved 10 per cent target efficiency gains with about 80 per cent farmers involved. Thus, they met the sustainability targets with high farmer involvement.

* * *

A lot has already been said about sustainability and yield improvement, and more analysis will always follow. However, it is time to act. As is evident from the various examples in this chapter, several states have already risen to the challenge and initiated programmes. The centre could adopt these and ensure mass rollout through national level funding, so that other states too benefit from these. It is imperative for future food security that India cuts through the politics and vested interests and comes out with a breakthrough governance and last mile delivery approach.



Chapter 4

Farmer–industry interactions

Partnerships are of considerable interest in the search for effective mechanisms in an age of opportunities and threats. A range of factors determine whether industry and farmers can strike up an equation. For industry, economic considerations such as the potential to cut costs, share risks or gain access to resources are the main reasons to engage with the farmer. For the farmer, engaging with industry could mean having a dedicated buyer for his produce, and an access point for new skills and technology that would otherwise be out of his reach.

For years, the scientific knowledge and intelligence required for farming has been provided to farmers through government supported agencies or through farmer communities themselves. The private sector either did not have access to the farmers or used the access for procurement alone. Even today, farmer–industry interactions are hampered due to restrictive policies and the general hesitance of companies to engage with the farmers. However, several pockets of excellence have emerged where the corporate–farmer collaborations have led to win-win situations. In the correctly practised models, farmers realise higher incomes through better yields and companies obtain better quality produce.

OVERCOMING TRUST BARRIERS

As is the case in any relationship, mutual trust between the parties entering into an agreement and an adequate enabling environment are necessary pre-requisites for successful farmer–industry interaction. Interviews with farmer and industry stakeholders revealed that there is a significant mutual lack of trust.

A dichotomy exists in the relationship between industry and farmers in India. From the outside it certainly is difficult to understand how farmers can realise higher incomes, while the industry engages with them to procure raw material at costs lower than the market rate. In the absence of strong evidence or any follow through, farmers who were interviewed said they did not believe in the promise of income augmentation, while the industry said they believed that the farmer was not a reliable source to procure from. This lack of clarity of intention on either side has historically made it difficult for both stakeholders to see themselves as natural partners in prosperity.

The biggest challenges in scaling up farmer–industry interaction are restrictive legal policies, lack of land aggregation, poor infrastructure and farmers' limited risk taking ability. Defaulting on the contract arrangements by either parties and destabilising interventions by intermediaries in the value chain are the other major obstacles in forming and maintaining trust-based relationships.

The Indian farmer's risk taking ability is limited. Considering that chances of crop or market failure are unknown, farmers are not keen to try new varieties. It does not make business sense for them to invest without a safety net in place. It is important for industry to understand such fears before engaging with the farmers to try out new varieties/inputs.

Interviews with farmers further revealed that they perceive themselves at the receiving end of a system that is trying to take over their land. This fear of losing land is further amplified by the lack of recognition of contracts by the Indian legal system.

Like the farmer, the industry too suffers from a lack of trust. Interviews revealed that they felt cheated if the farmer does not honour the contract and sells in the mandi (a spot market for trading agricultural produce) for a better price. However, the industry too is guilty of such defaults based on business and consumption cycles. It has also been observed that many intermediaries also use their influential

position to act as disruptors. These intermediaries view farmer–industry interactions gravely and believe they will lose their importance from direct partnerships.

It is evident that an enhanced trust equation could be mutually beneficial.

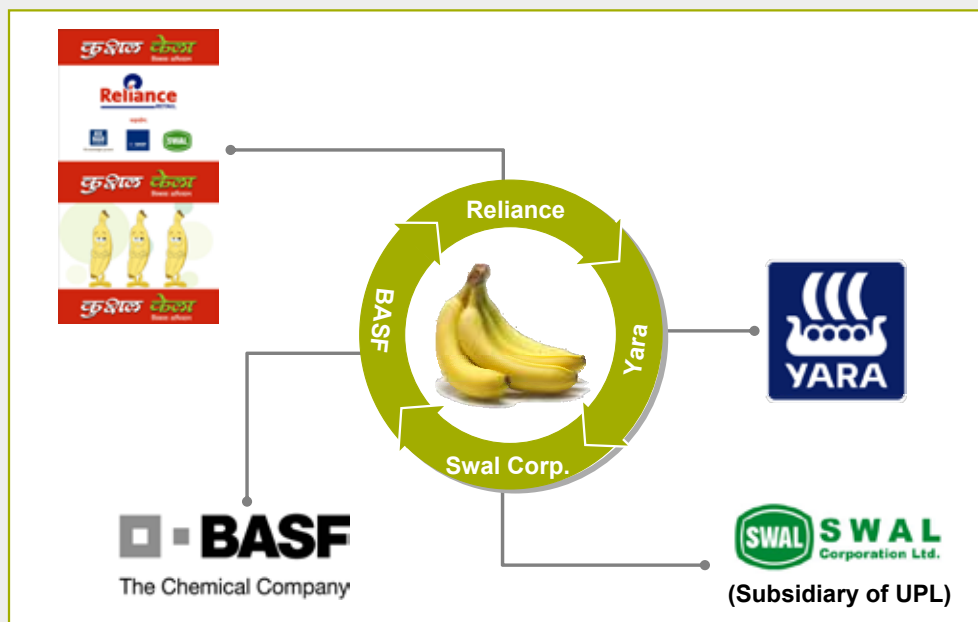
ISLANDS OF EXCELLENCE

Despite the structural and operational challenges, there are substantial examples of win-win partnerships between farmers and industry in India.

Reliance Retail, for example, has acted as a key integrator bringing together the best input companies to provide the farmer with a best-in-class “banana kit”, and started a movement called “Kushal Kela Vikas Abhiyaan” in Maharashtra. The kit includes fungicide from BASF, fertiliser from Yara, pesticide and organic manure from UPL’s subsidiary company SWAL and bunch cover bags from Reliance (Exhibit 4.1). These companies, apart from providing the inputs, also engage and educate the farmer through farmer meetings, field demonstrations, film shows, road shows, roundtable charts, etc. This has enabled a comprehensive coordinated transfer of extension knowledge to the farmer unlike before, when different input companies would engage independently with the farmer resulting in a distorted message. This effort has helped increase farmer profits by over 80 per cent (Exhibit 4.2).

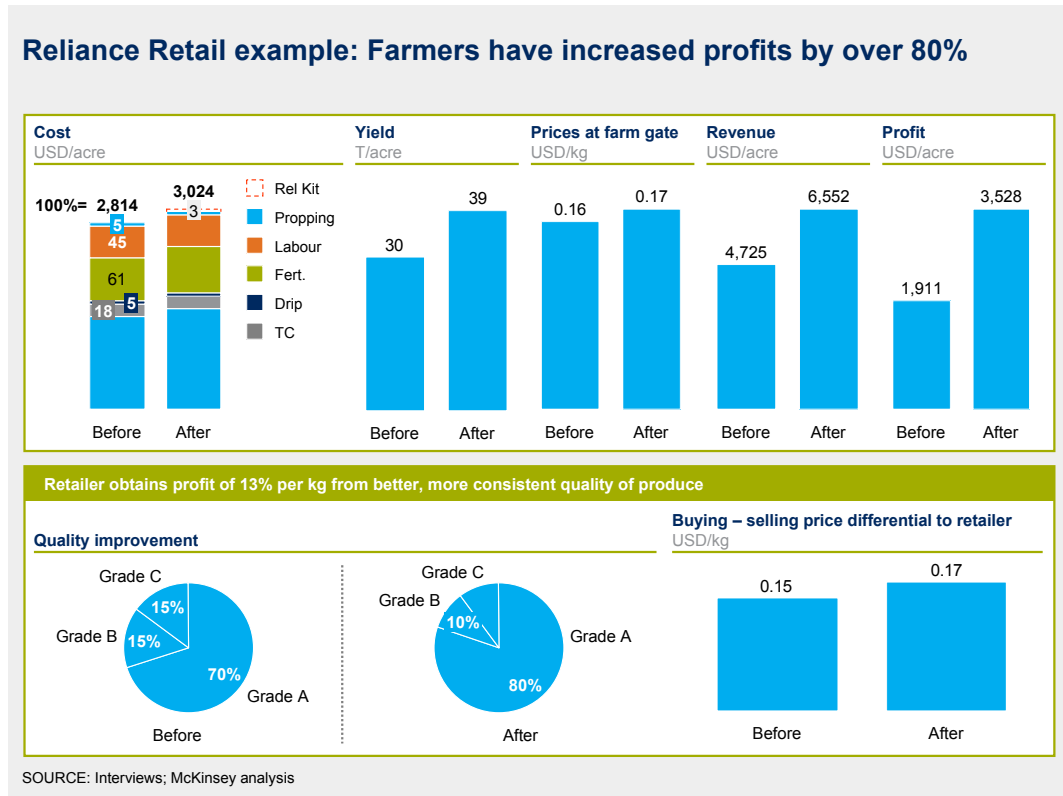
Exhibit 4.1

Reliance Retail example: Holistic consortium created to provide best in class inputs to banana growers



SOURCE: Interviews; McKinsey analysis

Exhibit 4.2



McCain’s example, though well known, is still worth repeating. The company demonstrated better incomes with some farmers in Gujarat who started exclusive farming for the processing grade potatoes used to make French Fries. Through this pilot with progressive farmers, McCain was able to expand the area under cultivation of specific grade potatoes.

Companies like Hindustan Unilever Limited have successfully adopted pull-based models to partner with the farmers. The company procures tomato paste from the processing unit Varun Agro, which controls the procurement of tomatoes by regulating the number of seeds supplied to a fixed number of farmers under the PPP model promoted by the government of Maharashtra.

HUL has also taken the consortia route to interact with farmers, partnering with Rallis and ICICI to procure cereals. Rallis Kisan Kendras provide agri-inputs such as seeds, fertilisers and phytosanitary products and extension to the farmers through their wide distribution networks. ICICI helps with finance through their rural networks and HUL procures the produce for their operations.

Others like ITC have successfully managed to mitigate the threat from intermediaries by making them an integral part of their partnership with the farmers. ITC co-opted the traditional adathiyas (commission agents) in its e-choupal operations as samyojaks (cooperating commission agents) who provide a range of services for a fee.

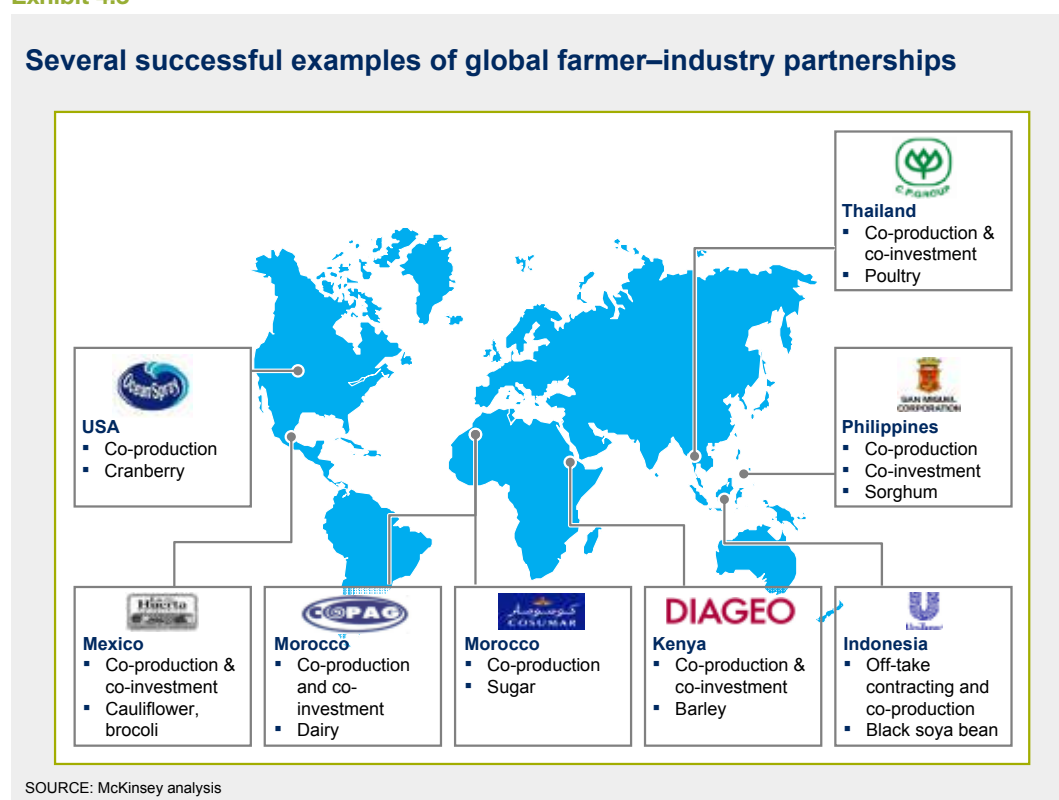
FieldFresh Foods started a baby corn growing programme at its Agri Centre of Excellence in Ludhiana, Punjab. FieldFresh works with farmers who cultivate over 300 acres of land. It has also set up a world class pack house and cold storage facilities in the vicinity.

- FieldFresh partners with over 5,000 farmers in Punjab, to whom it offers a price and pick up guarantee, shielding them from market risks. It also offers them comprehensive extension services.
- It complies with global standards of farming (Global GAP) and packaging (ISO 22000, BRC) and adheres to ETI standards for all its operations.
- It proactively promotes sustainable agriculture.
- FieldFresh is currently the largest exporter of fresh baby corn and sweet corn to the United Kingdom.

Some companies like ADM have adopted a unique “collaborative farming” model with farmers. They currently partner with 60,000 soya bean farmers in Maharashtra, and their programme, identified by the Government of Maharashtra as a project for value chain development under the PPP for Integrated Agricultural Development, works at improving the value chain at all points, “from soil to oil”.

Companies like Coromandel have ventured into rural retail. Currently, they operate 650 rural retail outlets in Andhra Pradesh and Karnataka and will expand to 1,000 stores within the next two years in a bid to reach more farmers directly. These retail outlets provide the required inputs with an assurance of quality and right price to the farmer. They also provide crop husbandry services. As shown in Exhibit 4.3, there are various such examples globally as well where industry–farmer interaction has benefited both stakeholders.

Exhibit 4.3



TWO PROGRAMMES TO SCALE UP INTERACTION

Based on the findings from this study, and multiple interactions with stakeholders, the following two models could help scale up interaction models rapidly.

1. Encourage scalable farmer–industry partnership

There are three models of interaction that could be used to build farmer–industry relationships. The first is to set up Farmer Producer Organisations and Farmer Producer Companies. This will allow smaller farmers to use their collective strength and technology, reduce costs of distribution and provide greater marketing power and negotiating capacity. The government could consider scaling up equity participation in FPOs/FPCs through focussed grants (up to USD 1 million to USD 2 million), provide cheaper access to credit and facilitate linkages with the private sector.

The government could also consider promoting domestic companies that have direct contact with farmers, through a combination of selective incentives and policy and infrastructure support. These local aggregators have an element of trust with the farmers through their sustained involvement with farmer communities. They can become the “connective tissue” of a globally competitive food and agriculture sector, linking supply and demand and bridging a major missing link in the current ecosystem.

The government may also consider long-term leases and adopting the open PPP model. Steps could also be taken to make it attractive for private players to work with smallholders. Smallholder inclusive incentives, such as tax rebates, could be given to companies, which will encourage them to be inclusive in the choice of farmers they work with. This could better the lot of the small and marginal farmers as well. The government could also encourage corporate farming in select high value agriculture areas, particularly for exports.

Companies will also benefit from wisely choosing their model to interact with farmers. The company's expertise in agronomy (technical agricultural practices), the specificity and uniqueness of the raw material/input required and the investment and risk appetite of the investors should form the bedrock for choosing the appropriate model.

Industries have to take decisions based on cost–benefit assessments with a long-term perspective in mind. The models with the highest impact usually require higher investments and building up significant expertise and long-term relationships as shown in Exhibit 4.4.

Exhibit 4.4

Models of farmer–industry interaction			Relevant for India	Low	High
Model	Requirements	Description	Industry benefit	Farmer benefit	
1 Direct Procurement	<ul style="list-style-type: none"> Infrastructure for procurement Good farmer relations 	<ul style="list-style-type: none"> Procurement centres are made available to the farmer where the farmer can sell the produce 			
2 Partnerships/ Consortia	<ul style="list-style-type: none"> Partnership with input companies Good procurement network and supply chain 	<ul style="list-style-type: none"> Buyers partner with "integrated farming solution" providers that provide inputs, technical support and finance to registered growers for a fee – no assured buy-back, volume guarantee or fixed price 			
3 Contract farming	<ul style="list-style-type: none"> R&D capabilities Strong supply chain Risk management capabilities 	<ul style="list-style-type: none"> Provision of seeds, other inputs and technical support Assured buy back of produce at a pre-agreed fixed price and volume commitment 			
4 Direct corporate farming	<ul style="list-style-type: none"> Agricultural expertise Prior experience in farming 	<ul style="list-style-type: none"> Companies farming on owned or leased land 			

SOURCE: Interviews; reports; McKinsey analysis

The study revealed that the direct procurement and partnership/consortia models are most widely used in India. Contract farming, in the absence of a legal framework that protects all stakeholders, will be difficult to scale up. Corporate farming is also one major model that has not worked in India and could be considered only for high-value export-oriented produce enabled by a modified land ceiling policy.

The ideal end state is to reach an open partnership model with multiple farmers and multiple aggregators. Such an open PPP model already exists in Maharashtra. More than 25 companies are working with farmers across 10 crops. These include maize, soya bean, pulses, sugarcane, onion, tomato, potato, cotton, grapes and pomegranate. In the case of sugarcane alone, there are 12 factories that are part of a PPP. This open PPP model could be loosely governed or overseen by the government and would allow for transparency, flexibility and dynamic interaction, which will only strengthen the relationship between the industry and farmers.

2. Develop a favourable policy regime that improves agricultural marketing mechanisms

Closely reviewing and amending existing policies, such as the APMC Act, could reveal new opportunities for farmer–industry interactions. A detailed study examining the effectiveness of policy reforms in states that have either amended the APMC or abolished it completely could throw up new learnings. For perishables, farmers could be given the freedom to sell directly to processors, aggregators and traders outside the mandi. The government could consider delisting perishables from APMC. Policies related to caps on subsidies for essential agricultural investments, like drip irrigation and greenhouses, could be removed.

The government could also look to review taxation structures so that priority initiatives are incentivised, while also considering modifying policies which dis-incentivise large farms so that the private sector can play a role. For instance, tax on processed agri-products could be reconsidered given that the introduction of the GST is imminent.

The government could also promote and fund the scaling up of technology solutions to ensure complete price transparency for the farmer. A simple way of doing this is by using a mobile phone solution that has access to information on all farmers and their relevant crops. Information on prices across markets can then be delivered to their hand-helds in their local language. The government could consider a uniform regulatory regime for organised input retail, and could even promote aggregation of land through long tenure leases, such as for a period of 10 years, while protecting ownership rights. The government could also consider amendments to the Land Ceiling Act.

In many states, the industry must buy from the mandi. This makes it difficult for industry to engage with the farmer. If the industry or a marketer wants something different, it should have recourse to mechanisms that will allow it to meet its needs. This could fundamentally augment income for the farmers.

* * *

Successful farmer-industry interactions could bring benefits to both stakeholders. It is imperative to allow the farmer to be able to sell his produce to the buyer of his choice. This will help augment his income, while giving industry direct access to the quality of produce it wants to source. The government could facilitate this interaction by implementing a uniform policy and by facilitating mechanisms that could make prices across markets more transparent.



Chapter 5

Processing and exports growth

Despite the fact that India is the world's third largest agricultural producer by value, the commercial potential of the sector has not been fully realised so far. To truly appreciate the efforts at improving yield in a sustainable manner, creating agricultural infrastructure, etc., Indian agriculture needs to have the right market linkages. While production itself can be increased by bridging yield gaps, it is time to focus on the commercial potential of the sector and take it to the next level.

The domestic demand itself will grow at 4 per cent per annum in the next 15 to 20 years. This growth will be much higher (5 to 6 per cent) across high value food items, such as animal products and fruits and vegetables (6 to 8 per cent). With consumption growth at an average of 6 per cent, branding food could accelerate processing to achieve 8 to 9 per cent growth per annum. This growth is primarily going to be supply led. India's consumption pattern across products is testimony to the fact that supply in India creates demand. The classic example is that of mobile telephony and cable television. A similar trend could be visible if high value, cleaner and healthier food is made available to the Indian consumer.

The main challenge is that the processing industry itself is sub-scale and unorganised. There are also certain other challenges that have to be addressed. Currently, most processed food categories are viewed as junk food and are, therefore, taxed heavily. Even though food processing units get subsidies from the government, the subsidies are capped, thereby affecting the scale and efficiency of operations.

The industry must also undertake efforts to understand the needs of the consumer and build a unique proposition for them. This must be backed with a tangible consumer promise around convenience, cost and superior quality assurance. With people willing to pay for high value products, demand is dependent on industry being consistent with the attributes. Revenue generation will automatically make infrastructure and other investments more viable. India has distinct resources and supply side advantages. Managed efficiently, processing and exports could bring increased income for the farmer, consumer welfare and greater agricultural growth.

CAPITALISE ON INDIA'S AFFINITY TOWARDS BRANDS

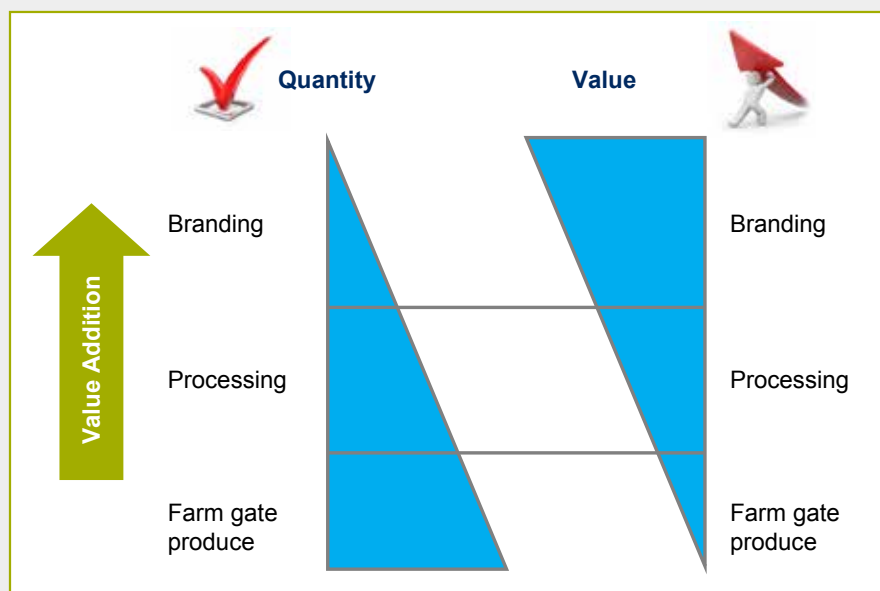
The emerging economies of the world are experiencing the rise of the "brand conscious" consumer. A burgeoning middle class, rising incomes and urbanisation, greater awareness about quality and growth in organised retail continue to fuel this trend.

In India, the move towards brands has picked up vigour in the last decade. In spaces like apparel and consumer electronics, the extent of branded goods (as a percentage of the total) has nearly doubled and grown at twice the rate of the overall market growth. In pharmaceuticals, the presence of branded drugs is nearly universal.

All stakeholders can benefit from branding. It brings the consumer consistent and assured quality at their convenience. It gives the producer the ability to charge premiums and tap the willingness of different segments to pay. And for the overall market, there is greater competition through an assortment private labels and international brands that guarantee quality and efficiency (Exhibit 5.1).

Exhibit 5.1

Branding offers the most value addition



In food too, this preference for branded food is clearly evident. According to the McKinsey's How the World Shops survey,¹ the Indian consumer's tastes and preferences were in line with global trends, with an overwhelming 84 per cent responding in the affirmative to the statement "I buy good brands and high quality food to make sure my family and I have the best of everything", as compared to the global figure of 85 per cent. An increasingly globalised consumption pattern makes a strong case for a large opportunity for branding in various fresh and processed categories.

Branding could drive the next processing growth wave

The food processing industry is large but remains plagued by several issues. The top among these (as identified by an industry survey in 2010 of 125 players in the food processing industry) are the lack of appropriate infrastructure, an integrated policy and vision for food processing in the country, emerging food safety regulations and an inconsistent policy stance, among others (capped subsidies, taxation). While the MoFPI has addressed some of these concerns, infrastructural and other policy challenges remain.

There are a few large packaged atta (flour), rice and milk players. But largely cleaning, grading, powdering and refining of agricultural produce, e.g., grinding wheat into flour, remains an informal and unorganised business. The extent of processing by basic value addition to fruits, vegetables, ground coffee, etc., is also low and fragmented. Usually, large players source these from small intermediate processors. The only category of processed foods which boasts of large organised play is the high value addition products like jams, sauces, biscuits and other bakery products. But despite the organised play, the industry continues to be fragmented and sees intense price competition in the high growth market.

The extent of branding in packaged and processed food in India remains mixed. This is due to a combination of issues. Lack of safety standards, completely undifferentiated products and sub-scale units currently shackle the branded foods business. There are also some product categories where investments in branding are yet to pay off because, despite the quality, they are not perceived to be of high value. However, branded play has emerged in various food categories like edible oil (40 per cent), flour (10 per cent), rice (about 10 per cent), sugar (less than 2 per cent) and dairy (about 20 per cent).

¹ Survey conducted in 2008.

These lag the higher levels attained in comparable countries where quality concerns and disease outbreaks (e.g., dairy in China) have propelled a strong organised and branded play.

The road ahead, however, could look promising. Packaged food is likely to grow by 9 per cent annually to become an USD 126 billion industry by 2030. An item wise growth estimate is shown in Exhibit 5.2. The study revealed that branding could drive enhanced price realisation of packaged foods by up to 30 per cent. Modern format retailing in particular could play a positive role by providing multiple organised touch points to the consumer. This front end transformation could boost the food processing sector.

Exhibit 5.2

Packaged food is a fast growing industry with significant potential for branding

Food item	Market size USD million		Percentage growth rate per annum (2010–30)	Branded product as a percentage of total category	
	2010	2030		2010	2030
▪ Milk	7,767	32,900	8	31	73
▪ Cheese	144	1,958	14	NA	NA
▪ Butter	254	1,340	9	6	19
▪ Vegetable & edible oils	3,931	10,331	4	32	59
▪ Sweet & savoury snacks	1,286	16,399	13	42	66
▪ Atta	574	8,158	13	4	44
▪ Processed poultry	398	8,340	17	6	49
▪ Fruit beverages	720	12,204	15	NA	NA
▪ Biscuits	2,753	13,145	8	NA	NA

SOURCE: Euromonitor; Edewise; Business Standard; company websites; McKinsey analysis

Branding as a concept can be extended to fresh food as well. There are some strong examples of successful branding of fresh food globally. Even in India, some companies have started to do this, especially in the organic food category.

Branding fresh foods

- In fresh fruits, Chiquita and Dole dominate the branded banana and pineapple space in the US. Sunkist (a cooperative in the US), with a revenue of USD 1 billion (INR 4,500 crore) bases 90 per cent of its business in branding fresh oranges. It has other value add products under its name as well.
- Fresh vegetables too are hot on the branding scene. Bottlehouse farms started packaging and marketing baby carrots like junk food, which helped create a vegetable-based brand. Greenvale launched farm fresh branded potatoes in 30 Tesco stores with its USP being better and consistent taste and freshness. These sell across the UK now.
- Such branding is also seen in the fresh poultry and broiler category as well. For example, Foster Farms in the US sells premium priced poultry. In response to private label threat, they created the “No Plumping” campaign. They increased consumer awareness about the harms caused by using saltwater to breed chicken and increased their own sales.

Branding organic foods

- Closer home, major players like ITC have ventured into organic spices, and retailers like Fab India into organic tea and coffee. The organic food market is estimated to be doubling every year in India, although it occupies 2 to 3 per cent of the food retail space. This is likely to grow to 10 per cent in the metros. Organic products are also priced about 50 to 100 per cent higher than traditional products.

VALUE IN BRANDING PROCESSED FOODS

Branding processed foods has a tremendous value proposition for all stakeholders.

- **For retailers:** Branded processed foods are purchased at a premium, and can attract new consumer segments. For example, certain fruit and vegetable juices can also be positioned to appeal to the health conscious consumer segment. Further, a stronger brand will allow retailers to escape price competition by taking it to the premium priced consumer goods bracket.
- **For exporters:** India could climb up the export ladder through branding. India can use its wide variety of fruit preserves, ready to eat meals, etc., to target different markets based on local tastes. Exporters can also tap the organic export market, given India's low fertiliser and pesticide use per acre compared to world standards. Further, the traceability of branded produce back to the farm gate would add more credibility to quality assurances of Indian brands.
- **For consumers:** Branded processed foods offer consumers the benefit of high quality, health and value for money. For the socially conscious customer, greater returns to the farmer would also be an incentive.
- **For farmers:** Branding will also assure greater returns to the farmer as there will be demand for a particular quality of produce. This would be coupled with better access to extension and financial services through forward integration with the industry.

Imperatives for industry

Industry has much to gain by focussing on a three-pronged approach.

1. Finding innovative processed products

Processing and branding succeed with backward integration. This is best established through exclusive farming, where the variety being cultivated is specific, and the quantity and quality of production can be regulated. Buy-back guarantees, input support, etc., can help achieve this. The private sector could also bridge the gap by bringing innovative technology and varieties to India through relevant investments and foreign tie-ups.

2. Enforcing quality and safety norms

The small-to-medium scale processors could be trained to adopt better practices, and invest in marketing and supply chain management. They could also act as key suppliers to the large consumer companies. This could be facilitated through private sector consortiums.

3. Exploring food branding

This may be achieved by spreading quality related awareness among consumers, investing in back end systems, creatively marketing the produce and supplementing the unorganised sector. This could be more effective in fresh and high value fruits and in poultry.

TAPPING INDIA'S EXPORT POTENTIAL

Despite a huge footprint in the food and agriculture space, India's presence in the exports market remains inadequate. India has a marginal 2 per cent share in the USD 1,890 billion market and exports only 8 per cent (average of 2006 to 2010) of the food it produces. This figure stands at 12 to 13 per cent for 2012. With a dwindling current account deficit, a huge potential to improve production levels and an ever increasing need to find the right market linkages for farmers, exports present the right opportunity for a country like India to tap.

Exports in India have been growing twice as fast as the global exports over the past two decades—primarily owing to its low base. Even with this, the share of agriculture in India's export basket has fallen from 15 per cent to 8 per cent in the last 10 years. Furthermore, our export basket continues to remain limited to primary/low value add products like oil meal, marine products, rice and raw cotton, with no progress made in the export of either high value fruits and vegetables or processed/value added foods.

There are four tangible trickle down effects of agricultural exports. The first is overall increase in produce quality due to the focus on safety and traceability of the product. The second is improved infrastructural linkages like cold storages, as export industries will make these necessary and viable. The third is yield improvement, as this is the only way to attain higher competitiveness in the export market. And, finally, it will ensure higher farmer incomes as export opens up an additional source of domestic demand.

Robust participation in exports will thus not only drive growth in domestic supply, it will also make better quality products available to the Indian consumer—a fact seen in other major agricultural economies like Brazil and Malaysia.

Where and what to export

- India, a global heavyweight in banana production, can export to geographically close countries like Japan, Russia and China, which are major consumers of the fruit.
- India, the second largest producer of potato in the world, produces potato of competitive quality that can be exported to the Middle East and South East Asia.
- India can export mango to markets like Japan, Korea and the US where it currently has less than 10 per cent share.

Export constraints need to be solved

- India loses out on cost competitiveness with other producers in the export market. In 10 of the top crops where India is a major producer, yields are 50 per cent lower than their potential levels. Yield improvement is most critical to make India competitive in the export market. Backward integration, either through private players or through cooperatives can help optimise India's underefficient supply chains for most crops. India could also make efforts to proactively divert agricultural surplus to the export markets.
- There is the absence of powerful branding and marketing of the “Indian” label of produce—especially in fresh food categories—akin to Kensington Mangoes or Florida Oranges, etc. This is necessary for the development and promotion of other value add/processed products associated with the fresh produce.
- Policy distortions have also hurt Indian exports. In the last 10 years there have been bans on the export of non-essential items such as cotton, onion and sugar, which have compromised India's image as a reputable trade partner in agriculture. Several nations continue to levy exclusive import duties on Indian products (e.g., mangoes in the UK) and strict import norms and certifications are difficult to manage in the Indian context.
- India has not consistently provided quality and traceability, thereby losing out on building a strong base of buyers in other nations. Indian produce has a comparatively weaker reputation, exacerbated by poor dissemination and implementation of the relevant quality mechanisms and global norms.
- Lack of linkages to the right export markets, superior port and cargo facilities, cold storage and other infrastructure has made the export of Indian agricultural products difficult.

WAY FORWARD: STIMULATING PROCESSING AND EXPORTS

Three interventions could help boost both domestic demand for processed food and exports. Branding in food will bring with it a certain assurance of quality. The industry could further illustrate customer benefits through promotions and campaigns. The government could also consider actively promoting the export of select crops, such as banana and mango. Attracting global agriculture companies, with prior experience of working in enabling emerging country agriculture, could help India get access to expertise and latest technologies.

● **Stimulate processed and branded food market creation**

The industry sector needs to invest in demand generation through promotions, campaigns and advertisements to illustrate the unique value proposition for consumers.

Once this is achieved the enablers need to be put in place, including (a) implementing back end procurement mechanisms to work directly with farmers; (b) setting up post-harvest infrastructure; and (c) working with the evolving modern retail formats to promote and sell.

The brand promise to customers could be delivered through a set of norms to assure freshness, healthiness, quality and traceability. However, this must be industry-led and voluntary. For example, Chiquita, Pacific Bananas and other leading branded players have successfully differentiated their produce through the “Chiquita sticker” or the “Pacific Wax Mark” respectively. Even in India, Woolmark, for example, has succeeded in assuring quality for customers buying woolen garments.

The creation of the Food Safety and Standards Authority of India (FSSAI) is a step in the right direction to promote focus on quality, safety, and innovation in food products.

The government could review the taxation structure for the food processing industry to align it with global practices. At the same time, to encourage investment in food processing infrastructure, the principle of capped subsidies could be revisited.

How to brand

Concerted efforts need to be made to take branding to the next level. This is an important imperative to make the customer experience value in the product. There are four factors that can build a successful food brand.

1. Distinct value proposition for the customer

Key sources of distinction can be made on the basis of several different parameters. These are availability, superior quality, marked difference in look and taste, ease of consumption, additional nutrient benefits, and specific target based use (healthy for children).

2. Sourcing and supply chain advantage

Food products, especially fresh foods, can be branded if there is a clear sourcing advantage or a supply chain that assures consistent and quality supply. Efficiency in procurement and minimisation of on-farm and post-harvest losses is a key source of attaining a cost advantage as product categories will not change and the customer will see lesser value. Companies with farmer access through their various initiatives like service centres, rural retail outlets, etc., can play a vital role as the sourcing partner for urban retail players, exporters and processors.

3. Powerful marketing and brand communication

Currently, aggressive marketing and focussed campaigns are unseen in the fruit and vegetable market in India. India can learn from Chiquita, Pacific Bananas and other leading branded players who have succeeded by visibly differentiating their produce.

4. Explore additional related products

Coming up with variants and varieties of the same product and introducing basic value add products of the same goods can help the customer see better value. The differentiated varieties could include organic, eco-friendly or sustainable variants. Examples like multigrain flour and breads already exist in the market.

● Launch a “National Agriculture and Food Export Mission” in select categories

The government needs to take an active part in promoting exports of select crops, in association with the private players.

The Mission would enable (a) identification of right products and markets (e.g., fruits like banana, mango; markets like Middle East and South Asia); (b) investments in market creation; (c) updating evacuation and access infrastructure such cold chains and ports as required; and (d) adhering to internationally acclaimed benchmarks for quality and traceability.

The initiative to open this market lies on the government and the industry. Various successful examples like Florida Oranges exist where the government invested in creating a market and

demand for its food produce. In fact, the government's Agricultural and Processed Food Products Export Development Authority (APEDA) and the National Horticulture Board (NHB) could be further strengthened by partnering with the National Agriculture and Food Export Mission to accelerate food exports.

Stimulating domestic growth by focussing on exports has also been observed in countries like Malaysia and Brazil where domestic production capacity was ramped up by strong participation in exports.

- **Attract and develop private investments and world class expertise**

State governments, along with the necessary support from the central government, could attract global agriculture companies. This would ensure global expertise and access to latest technologies in all parts of the agriculture and food value chain. Global food and agriculture companies, with experience in emerging countries, could provide their expertise in processing, branding and exports and bring the requisite long-term private capital into the food agriculture sector needed to achieve India's potential.

These companies could be attracted through outreach programmes like road shows and international events. Branding campaigns, like the Ministry of Tourism's "Incredible India", could be undertaken to showcase India's food diversity and thereby the corresponding potential of the market. The government must also provide for investor support through a single window accelerated clearance, while asking these companies to create centres of excellence and serving their global stakeholders from India.

Food companies have catalysed huge growths in yield in countries like the US and Brazil, and their involvement could give the Indian sector a big boost.

Accelerate exports

There are five success factors that India must consider to decide which crops can help boost its exports and the markets it could target.

1. Comparative advantage in production

There are numerous crops, such as, banana, mango, potato, onion, cotton and sugar, where India is amongst the leading producers. This is due to favourable agro-climatic conditions and the historical pattern of cultivation. This gives India the comparative advantage to export these crops.

2. Ability to produce agricultural surplus

India has the advantage of producing more than the domestic consumption requirement. Some of the crops where India has a surplus are banana, mango, potato, milk, fisheries, sugar, cotton, and cereals, etc. India could capitalise on this surplus by diverting it proactively to the export market

3. High competitiveness

It is also possible for India to be cost competitive in crops, such as, soya bean, banana, tomato, citrus and mango with higher yields and an efficient supply chain. There is demand for these crops, both as fresh food, as well as, for packaged categories in large export markets, such as, Europe and the Middle East.

Building a state-grape brand: Mahagrapes

The Focus

Improve quality for export and upgrade value chain to tap export market through a PPP with Maharashtra State Grape Growers' Association and the state government

What was done?

- Formation of an agri-export zone, extension of loans from State Marketing and Cooperative boards
- All grapes marketed under one single brand of "Mahagrapes"
- Free dissemination of information on global certification (GLOBALGAP) standards for the export market
- Setting up of a residue monitoring plan and credit support for capital intensive infrastructure investments — pre-cooling/cold storage facilities

The Impact

- Rejection rate lowered from 10 per cent (1995) to less than 1 per cent (2001)
- Maharashtra contributes to about 95 per cent of exports from India
- Exports from India have grown at about 20 per cent per annum in last 10 years

4. Demand in the export market

There is growing demand in the export market for meat, dairy, canned and processed fruits and vegetables. Based on the size and growth of the market, India will have to evaluate the countries where it can exports these crops and foods.

5. Dynamics of importing/exporting

India could capitalise on proximity by exporting to neighbouring countries, taking into account the country's trade relationship and the food safety laws there.

* * *

India is no longer about price, the equation has moved to value. Modern day India's consumers are seeking products that align with their aspirations. And this is where brands created for the global market will doubly benefit from India's affinity for brands. As long as the branded food industry ensures quality, consistency and convenience, they will be able to charge premiums and tap both the international and domestic market, making it a win-win situation for both themselves as well as the consumers.



Chapter 6

Robust infrastructure

Infrastructure is the foundation for development. A strong infrastructure backbone and demand servicing (storage and evacuation) points are critical to realise India's vision of making food accessible and affordable for the masses, while also improving farmer incomes.

In the absence of a national plan, both the government and the private sector have individually made efforts to create infrastructure, thereby resulting in incremental but not scalable infrastructure. While the government certainly should build infrastructure like roads and ports for public good, the private sector should consider coming forward and investing in scale infrastructure. Of course there will be places where the government can provide for viability gap funding and seed capital. However, its role should primarily be that of an enabler and of one which designs and facilitates implementation of an end-to-end blueprint.

For the purpose of the study, which deals with the high value foods industry, cold storage and food parks have been considered as flagship examples to distil the learning.

TWO EXAMPLES OF FLAGSHIP INITIATIVES

Both the mega food park and cold storage infrastructure have been periodic demands in India. The government too has underlined their importance by providing capital subsidy for both. India's agricultural infrastructure story could be built on the foundation laid by these two flagship initiatives.

Mega food parks still nascent

The government came up with the scheme of the mega food parks to bring state-of-the-art food processing infrastructure under one roof. It was expected that they would add value to agricultural commodities, facilitate induction of the latest technologies for processing, provide quality through better process control and capacity building, and marketing.

So far, all approved projects have been centred around pre-existing production clusters of key crops, particularly fruits and vegetables. The identification has been supply led and not demand led, paying less heed to connection with the right markets/ports.

The design envisaged has also not been completely implemented in the currently functional food parks because of a combination of reasons. The lack of two to three anchor tenants with a strong existing demand base and limited engagement in marketing the scheme to get large or medium/small processors on board is a primary concern. While there is adequate investment in setting up food parks, the investments of cold chain and export zones could also be better integrated with the food parks to enhance overall viability.

Srini: India's first mega food park

Opened in July 2012 in the Chittoor district of Andhra Pradesh, the initial response to Srini Food Park has been a mixed one. Even though it was set up with all the value propositions in place, there is a lack of interest from buyers and processors. This is due to inadequacies like constrained power supply, no systematic structure to rope in large anchor tenants or processors like ITC, HUL, Parle, Vadilal, and Tropicana. It has also suffered due to the limited proposed linkage with farmers as 50 per cent procurement is through mandis.

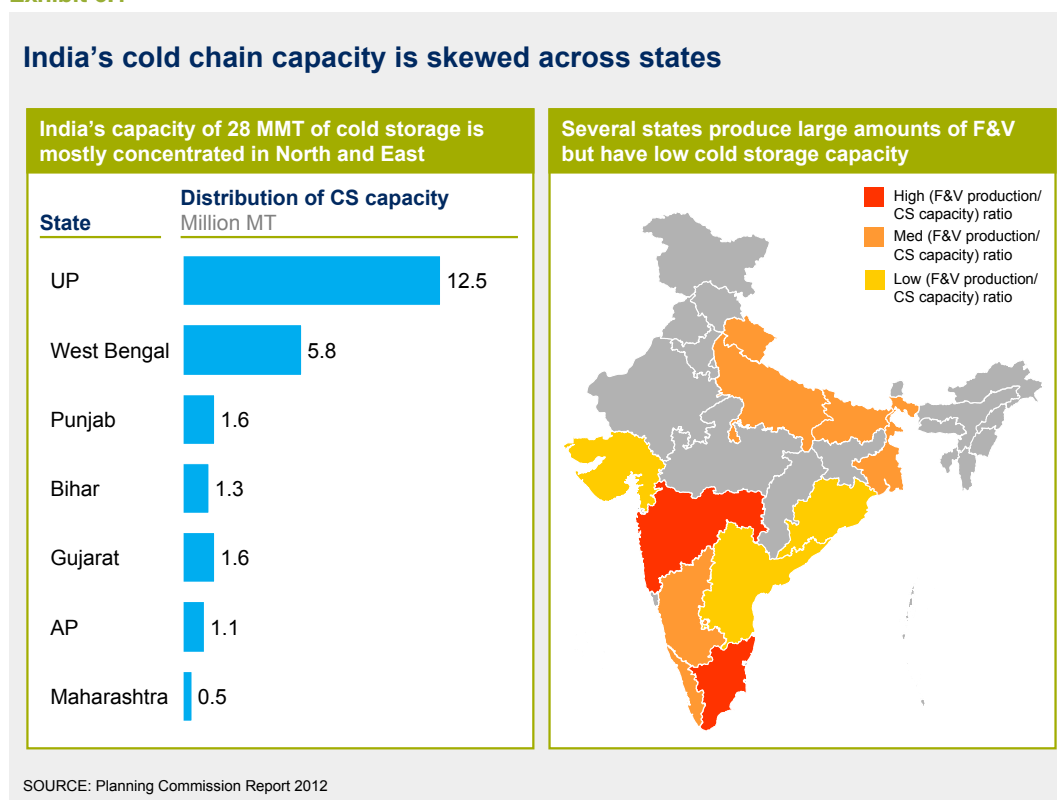
Cold chain infrastructure is yet to take off

Inadequate cold chain infrastructure in India results in the loss of food that is enough to feed millions of people. India produces 161 million tonnes of fruits and vegetables, 10 to 12 per cent of which is lost to weight wastage. If one factors in value wastage, the number shoots up to 20 per cent. Improper post-harvest handling and lack of cold storage facilities result in value losses of several thousand crore to all stakeholders from farmer to consumer (due to quantity and quality).

India's cold storage capacity is 29.3 million tonnes, of which 75 per cent is utilised for potato alone. Reefer (cold truck) transport accounts for only 4 per cent of India's inter-city perishable transport and 80 per cent of the reefers are used for milk. In the last 5 years, from 2007 to 2012, cold storage capacity has grown by just 5 per cent. Poor infrastructure reflects in India's low per capita refrigerated warehouse capacity as well—it is only 0.09m³/person, less than 33 per cent of the capacity in countries like Brazil and the US.

The distribution of cold storage capacity in the country is also geographically skewed at present, as can be seen in Exhibit 6.1. Uttar Pradesh and West Bengal together account for 60 per cent of total capacity, while states like Tamil Nadu and Maharashtra, which produce almost 25 per cent of India's fruits and vegetables, severely lack these facilities.

Exhibit 6.1



Cold chain could alleviate geographical price disparity by allowing long distance transport from production centres to markets across India, cutting the wastage levels by half. It can also reduce seasonal price disparity by allowing storage during the peak season and selling during off season. Ramping up cold storage infrastructure would help prevent wastages, offer farmers and traders better returns and consumers, better quality.

Currently, cold storage economics show a return on investment (ROI) of about minus 30 per cent, making it commercially infeasible. Cost of power is one of the drivers of high cost, which is driven by unreliable and infrequent power supply, requiring investment in auxiliary power units (especially diesel generator sets) which raise the expenses by 10 per cent. The government could consider ensuring

uninterrupted power supply, which will reduce operating costs. Cold chain also suffers due to high interest costs. The government could consider providing 50 per cent subsidy on interest rates.

The rationale for doing so is that interest contributes 25 per cent of operating costs. Gujarat, for example, offers interest rate subsidy. This could be considered by other states too.

Most cold storages in India cater to a single commodity, which results in low utilisation of the infrastructure. It is imperative that cold storage operators diversify and store varieties of crops, thereby driving up utilisation and increasing revenue realisation. Cold chain operators could also install value add services, such as pre-cooling and ripening facility at low additional costs, further driving up profitability.

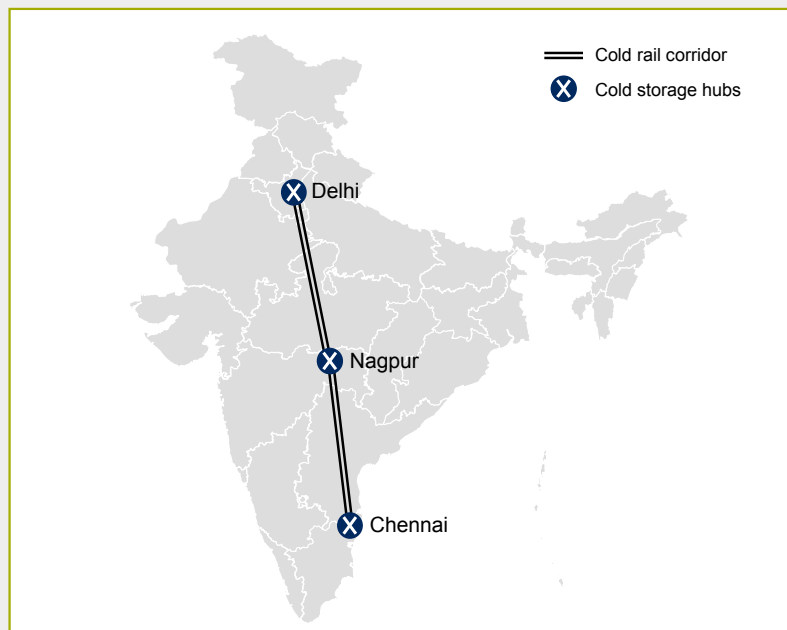
THE NATIONAL FARM GATE TO MARKET INFRASTRUCTURE AUTHORITY MODEL

In light of the two flagship examples, it is evident that there is need for a radical new approach to create agricultural infrastructure. Several bodies have looked at creating this infrastructure, but have been unable to take a holistic view, and therefore, implement the scale at which it is required to ensure viability. To be fair, interviews suggest that existing efforts have been handicapped by fragmented responsibilities and accountabilities. Setting up of the National Farm Gate to Market Infrastructure Authority (NFMIA) as a nodal agency to drive agricultural infrastructure creation could be a potential option for consideration. NFMIA could be a national authority created by an act of Parliament (similar to the National Highways Authority of India), and be the singular body with the mandate of strategically linking demand and supply by creating the necessary back-bone of agricultural infrastructure.

The NFMIA could, for example, create India's unbroken national cold chain network for sorting, post-harvesting, storage, and specialised transport. This would involve establishing cold storage hubs at major fruit and vegetable production centres in the North, South and West (say Delhi, Nagpur and Chennai). These would have capacity exceeding 20,000 tonnes and could be connected by a cold rail network (Exhibit 6.2). This could increase price realisation of produce by up to 30 per cent through reduced transportation cost and less wastage.

Exhibit 6.2

Three national cold storage hubs should be set up at Delhi, Nagpur and Chennai and be connected by a dedicated cold rail corridor

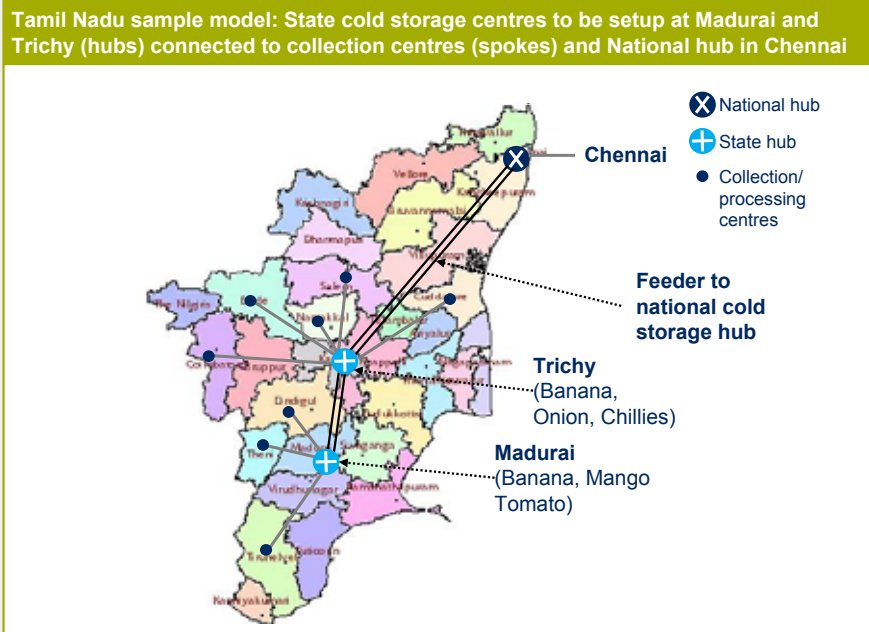


SOURCE: Interviews; McKinsey analysis

These hubs would, in turn, be fed by smaller cold storage facilities close to farm gates at the district level through a hub and spoke model. Transport of perishables from cold storage centre to hub would be via reefer vans, thus providing an unbroken chain for transportation of produce. The government could invest in the national cold rail and the national hubs, while smaller traders and farmers could invest in cold storages at the district level, as is illustrated in Exhibit 6.3.

Exhibit 6.3

National hubs could be fed by state centres through hub and spoke model



SOURCE: McKinsey analysis

To create this infrastructure and make this viable, NFMIA itself could build the infrastructure or oversee its creation through the appropriate contracting and Special Purpose Vehicle (SPV) models.

The NFMIA could collaborate with state-level institutions to enable linkages of the national backbone with the state level infrastructure in a similar manner in which NHAI collaborates with state road development institutions.

SCALE DEMAND SERVICING AND EXPORT HUBS

The government could consider setting up mega hubs that will allow companies to procure, store, process and export from one location. These could either be set up near production centres of major crops or near a port to facilitate exports, or even near big consumption centres. Such hubs will help put in place the necessary forward and backward linkages and provide for end-to-end facilities across the value chain.

These scale hubs should be strategically located, either near the top 20 cities or near ports. These could be modelled on the lines of the special economic zone (SEZ) framework of cooperation between centre, state and private investors. The centre could provide budgetary allocation in case access infrastructure needs to be built. Otherwise it could help the scale hubs by providing tax holidays and capital subsidies. The state government could provide the land and a turnkey developer could be asked to build the scale hubs.

The master plan for these scale hubs could be created by taking into account the agro-climatic conditions and the crops that grow there. For example, there could be a scale hub for mango near Mumbai, which can service the local demand as well as be connected with the port in Gujarat for export.

Mango grown in Maharashtra could be sent to this scale hub for further processing and export. States could consider playing an active role by making the anchor tenants financial stakeholders with clear responsibilities and involvement in identifying the right clusters, land area and supporting marketing/generation of awareness about the benefits of these scale hubs park among small/medium-scale processors. Setting up decentralised infrastructure for procurement (collection centres, public procurement centres, etc.) can only succeed if these offer clear benefits (over markets) to farmers like associated services of input, information and extension related support. The government could consider playing a more active role in building enabling infrastructure and providing viability gap funding through SPVs or the appropriate PPP models.

The shortage of agri-warehousing is another major challenge for India. This could be transformed by encouraging private sector participation. Current schemes to support agri-warehousing like “Gramin Bhandaran Yojana”, FCI scheme and NABARD scheme have had limited successes. More incentives are required to attract the private sector investment to warehousing. The government could consider linking these subsidies to the scale demand servicing and export hub master-plan.

The government has made several investments in agricultural infrastructure. To realise the true potential, the government could adopt a holistic approach to thoughtfully link demand and supply. The Ministry of Food Processing Industries, for example, has set out over USD 570 million for the development of infrastructure in the form of food parks over the course of the 12th Five Year Plan. The government could consider utilising this funding for building select pilot hubs, and scaling up the successful ones. The focus could be on building several successful hubs over the next 15 years.

* * *

The development of agricultural infrastructure in India is critical to ensure that India stays on track to become a global powerhouse. Better infrastructure is important, not just for ensuring better produce to the domestic consumer, but also to enable timely movement of produce for exports. It will ensure better quality, cleaner produce and less wastage, all of which have a role to play in branding, processing and export, thereby meeting global standards. Infrastructure would also make India cost competitive and bring greater prosperity to its farmers.



Chapter 7

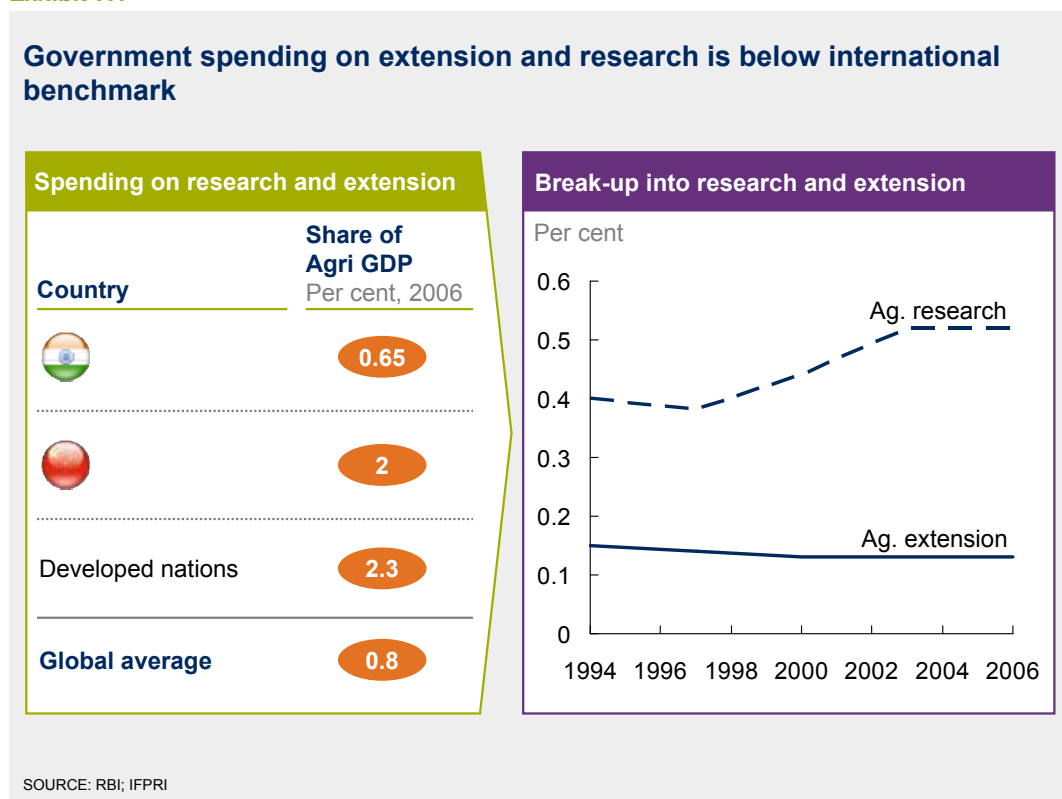
Research and extension excellence

There has been no dearth of quality entrepreneurs in Indian agriculture. Be it the Punjab farmer who designed his own potato harvesting machine or a Tamil Nadu exporter who set up a best-in-class banana cultivation ecosystem, there have been several pockets of excellence.

However, outside of government subsidies, entrepreneurs have not received any structured help to scale up their initiatives. The inherent risk in agriculture (output dependent on climate, fluctuating prices, high interest rates by private lenders) have impeded the adoption of newer technologies. At the same time, there is a shortage of agriculture and food technocrats who could shepherd the next wave of growth.

Most countries that have modernised their agriculture and achieved higher production have done so by introducing and integrating science and technology with farming. However, in India the adoption of technology has been low. This is mainly because government spending on agriculture extension is far below international benchmarks, and has not kept pace with spending on agriculture research, as is shown in Exhibit 7.1. Integrating research and extension services and setting up agricultural institutes can help not just agriculture develop, but give rural development in the country an overall fillip.

Exhibit 7.1



BUILDING A WORLD CLASS EXTENSION NETWORK

Extension services are imperative to introduce and integrate science and technology into the farming system. There is scope for the government and the private sector to collaborate and create substantial impact for maximum farmers.

Challenges in extension

The Indian agricultural extension system is plagued by several issues. There is lack of coordination between multiple private (e.g., inputs dealers, processors, organised retailers and other progressive farmers) and public agents (e.g., Agricultural Technology Management Agency, KVKs and agricultural universities) involved in extension. This often leads to duplication of efforts, and inefficient transfer of information to the farmer. For example, both KVKs and state agricultural universities tend to focus on information about pre-sowing of crops leaving aside information dissemination about post-harvest and marketing of produce.

The quantity invested in public extension vis-à-vis agricultural output is inadequate and there are severe resource constraints in terms of financing and manpower in the three major public extension institutions. The Agricultural Technology Management Agency has only 100,000 extension workers, which is 10 per cent of the requirement. The KVKs have a similar story to tell, with only one KVK per district, each with about 20 scientific staff members. Even in the case of state agricultural universities, the funds available for spending on extension work is minimal.

In addition, there are structural and implementation issues in public extension systems. It is a low incentive job and there is lack of accountability on part of the extension workers. The weak links that exist between various extension bodies as well as research and extension institutions leads to the lack of an overall cohesive effort, thereby making it difficult to attribute impact of extension work.

Private involvement in extension could be encouraged

There are stark differences between the working styles of the public and private extension worker, which directly translates into success or the lack of it on ground. While a public extension worker is paid based on the number of farmers he meets, the private extension worker's payment is linked to yield improvement.

The public extension worker is generally a matriculate and is provided with basic training, while the private extension worker has an undergraduate degree and is provided with focussed training.

The private extension worker also has better laid down procedures to follow, thereby making him efficient. Companies ensure that extension workers follow standard operating procedures, diligently fill out worksheets and their actions are focussed and linked to the internal research in line with the overall commercial objectives of improving productivity and quality. Exhibit 7.2 illustrates just how private extension is more effective.

The government has realised the effectiveness of private extension. In a bid to incentivise it, the government has already announced a 150 per cent tax offset for investments made in extension by private companies. The government could further expedite this by issuing the notification so that it can be scaled up.

Exhibit 7.2

Private extension is more effective than public extension

	Organisation	Expenditure on extension Cents/ha	Contact intensity Hours/cultivator per year	Tech man power: Cultivator ratio
Public extension	▪ DOA	92	0.4	1:1332
	▪ Directorate of Extension	2	0.01	1:63500
	▪ KVK	12	0.09	1:54000
	▪ Research Institute	1	NA	NA
Private extension	▪ Farmer assoc.	99	3	1:1080
	▪ Producer coop.	71	1.96	1:928

SOURCE: National Centre for Agricultural Economics and Policy Research Paper

Improving extension services

There are four recommendations to improve extension services in India:

1. Encourage private extension services

A PPP model could be envisaged to implement a comprehensive extension scheme where private players (processors, retailers, etc.) provide information on marketing and public extension agents may provide information on primary production in a systematic manner. Public extension bodies could also partner with NGOs to use the latter's extensive grass-root knowledge to reach out to the smallest farmers and the lowest strata of farm capability.

2. Focussing public extension in remote areas

Given that private sector extension is on the rise, the public sector should play only a subsidiary role and focus on areas where farmers severely lack knowledge on agricultural technology, and which are currently unattractive or unviable for the private sector to engage with. This will in due time raise the adoption of best practices in these areas and ultimately attract the private sector as well.

"mAgriculture" – Opportunity for mobile applications in agricultural extension

Out of India's wireless subscriber base of 921.4 million, 37 per cent is rural. Mobile phone agriculture is more convenient for farmers than "eAgriculture" which requires an internet connected PC and predictable electricity supplies.

"mAgriculture" can be used in extension, service delivery and linking farmers to markets. The information at lower costs and better efficiency will lead to higher productivity. It will also lead to decreased information asymmetry, lower transaction costs and improved agri-business process management.

There could be different types of applications as per the farmer's needs. Messages could range from simple updates on weather forecasts and price information, crop specific disease warnings and soil fertility information to more customised advice, remote diagnostics as well as mobile banking and crop insurance services on the cell phone.

There are already some such services in India. For example, Digital Green, which is funded by the Bill and Melinda Gates Foundation. Launched in 2011, it provides agricultural information to about 42,000 small and marginal farmers via video. Programmes like these could be scaled up to reach maximum number of farmers.

3. Making farmer training schools and KVKs effective

Considering other progressive farmers are the most accessed source of extension information and also the most effective at encouraging adoption, active farmer participation in the development and dissemination of information is essential. Farmer training schools at the district level would allow close collaboration between KVK scientists and farmers, who would become self-teaching experimenters and effective trainers of other farmers. The government could consider defining a clear performance standard and review KVKs and farmer training schools on extension outcomes to drive productivity.

4. Encouraging scale up of farmer cooperatives

Farmer cooperatives are the most efficient providers of extension in terms of quality and quantity of time spent with the farmer. Farmer cooperatives are competent at providing information on marketing, post-harvest methods and financial services. They are also important when there is a systemic shift to high value crops because they can provide crop-specific information. The government, in partnership with the private sector, could encourage skill development and scaling up of established farmer cooperatives, focussed on better quality extension services.

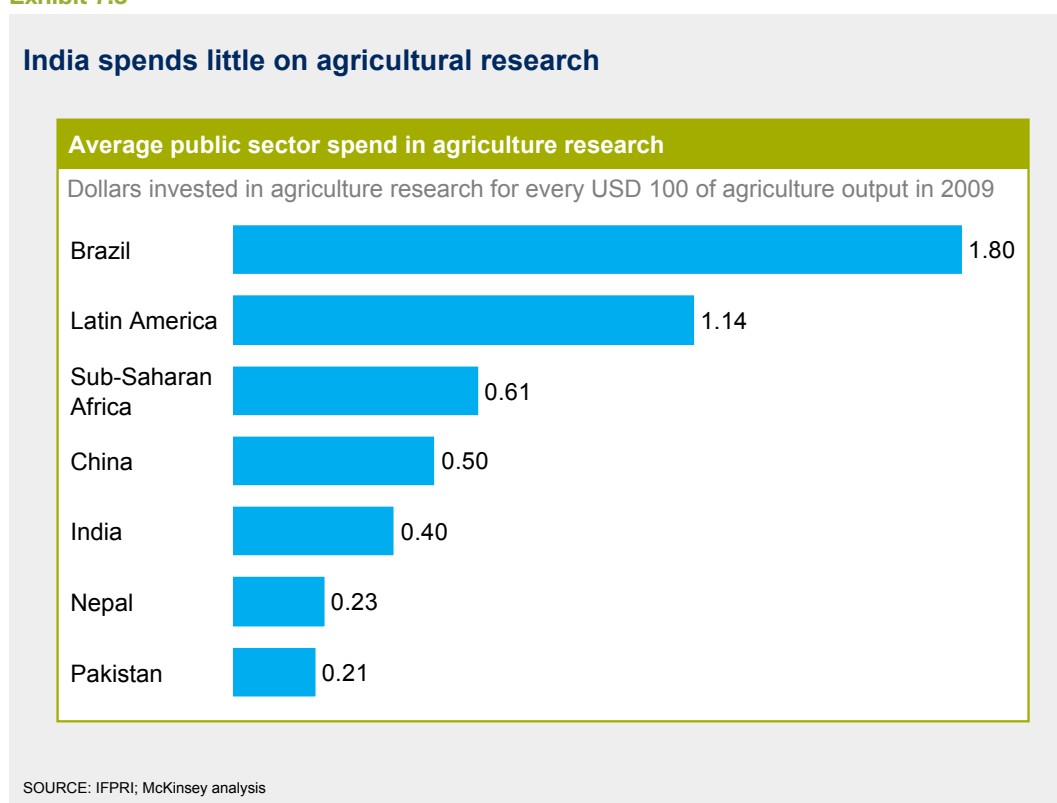
BUILDING WORLD CLASS AGRICULTURAL UNIVERSITIES

Robust agricultural research can help change the landscape of extension work in India. Currently, India ranks poorly in terms of quality and quantity of research vis-à-vis the rest of the world. India has less than one-third the number of scientific research institutes and publishes less than one-fifth the number of research papers than most developed agricultural nations.

Challenges in the agricultural university system

India spends less than 25 per cent of the amount spent by Brazil on agricultural research as can be seen in Exhibit 7.3.

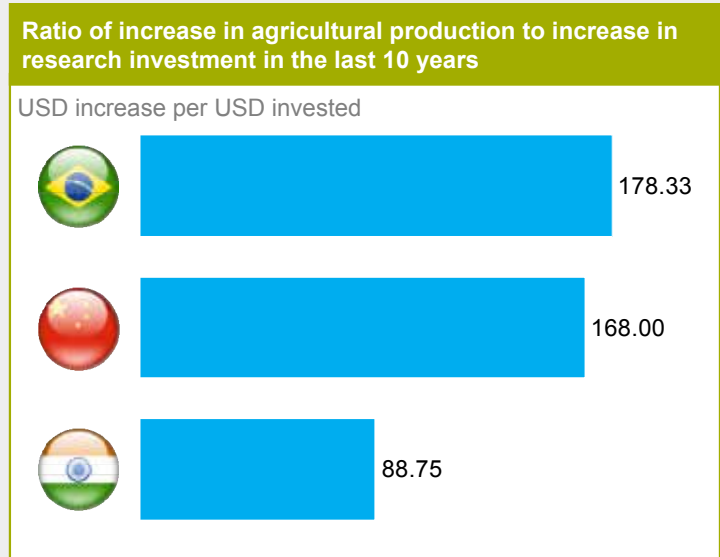
Exhibit 7.3



While investment in research has grown over the years, the output in terms of factor productivity has not kept pace as compared to countries like Brazil and China (Exhibit 7.4).

Exhibit 7.4

Quality of research in India is lower than that of Brazil and China



SOURCE: IFPRI; McKinsey analysis

India’s agricultural research is also geographically skewed. As shown in Exhibit 7.5, it is concentrated in the north and south, leaving the east significantly disadvantaged.

Exhibit 7.5

Regional imbalance exists in agricultural research

Number of research universities

		Decreasing coverage →								
		Livestock & Fisheries (23)	Gen. Agri Research (18)	Region specific (17)	Horti-culture and fruit specific (13)	Seed, soil health, pests and insects (11)	Food grains (8)	Oilseeds (6)	Post Harvest (2)	Dairy (1)
Decreasing coverage ↓	North (43)	9	10	6	7	5	4	0	1	1
	West (26)	3	3	5	5	4	1	4	1	0
	South (21)	7	4	3	1	2	2	2	0	0
	East (9)	4	1	3	0	0	1	0	0	0

SOURCE: ICAR; McKinsey analysis

Interviews with experts during the study suggest that the public agricultural research system has remained ineffective because of two reasons. The first is low investment. The second is the lack of linkages with industry, which could provide feedback on research that could be translated into commercial success. There is repetition of work at different state agricultural universities. In the context of limited resources for research, the research effort is also spread over too many areas. There is no single database or documentation of all agriculture research undertaken so far, which makes essential agricultural information inaccessible.

Even though private sector research and extension has been efficient, it is extremely limited as the sector does not have enough avenues for profitable participation. This is primarily due to three reasons—insufficient market demand for the higher yields or quality that accompany private sector participation in research and dissemination, low return on investment for agricultural R&D and extension, and difficulty in monetisation of research work via patents, etc.

Enabling cutting edge research

There is a compelling case to create four to five world class food and agricultural universities in India. Giving them more autonomy could enable cutting edge research and ensure commercialisation through private investment.

The government too has started thinking on these lines. As part of the 12th Five Year Plan, it has proposed two projects. The National Agricultural Education Project is aimed at improving the quality of education in the state agricultural universities. The National Agriculture Entrepreneurship Project is being envisaged to be able to translate research into commercialisation.

The government could create these universities and research laboratories to stimulate agriculture research in collaboration with private sector players and foreign universities. These universities can potentially be branded as “Indian Institute of Agriculture and Technology” and classified as universities of national importance.

Skill development in this sector is of paramount importance, and must be given priority if India is to achieve its vision of becoming an agricultural powerhouse within the next two decades. An alternative in the short run would be to set up agriculture colleges in current institutes of national importance like the IITs, or upgrade existing agriculture and biotechnology institutes.

What the universities should do

To create a generation of agriculture and food “technocrats”, these universities should attract the best talent through stringent entrance mechanism, screening both technical and qualitative capabilities.

It is important to ensure that the best possible R&D facilities and globally competitive education is provided through these universities. Private grants or investors could help create these facilities. This will also help attract world class faculty, who will have opportunities of research comparable to any other top university in the world.

The universities must also establish strong lab–farm links so that innovative products developed by these universities are picked up for commercialisation in the agro and food processing sectors.

To ensure continued investment from the private sector, these universities could be set up through the PPP model. The alternative is that the government could set up these universities through a central grant, but the corpus could be raised through the PPP route.

RAISING A NEW GENERATION OF AGRI-ENTREPRENEURS

As the agricultural workforce is reducing due to reasons like rapid urbanisation and migration to cities, there is a need to create a generation of agri-entrepreneurs.

These entrepreneurs, through their ability to bring in capital and optimally scaled mechanisation and scientific agricultural methods, will lead the next wave of growth. We have already acknowledged the resilience of the Indian farmer to keep pace with rising demand. But the target of meeting India’s potential will need more capital support and the ability to link it with the market and consumer

aspirations. Food processing and branding will need technocrats who will be able to bridge the gap between the farmer and the consumer.

An agri-business focussed fund (angel and venture capital) as a PPP initiative between central and state governments and private capital providers could be set up. The central and state governments and private players should contribute to this fund. It should be professionally managed and should provide financing for interesting entrepreneurship ideas in agriculture. This fund could also invest in developing small-scale mechanisation by the new agri-entrepreneurs so as to benefit the large number of smallholders.

In addition, it is important to set up “business incubation centres” in regionally contiguous zones (potentially scale demand hubs such as food parks) that help farmers shape their business ideas, and train them on aspects like financial management, marketing and commercialisation and establishing networks with industries.

The initial outlay could be in the range of approximately USD 105 million to USD 210 million (with 50 per cent funding from central/state ministries and 50 per cent from private investors). This should be sufficient to finance 30 to 40 projects related to the food and agriculture sector. For example, best practice cultivation of high value crops, investing in commercialising a new mechanisation system, setting up SME processing and export unit.

The initial fund could be treated as a pilot and once proof of concept is established, private and bank capital will play an increasing role in creating many more agri-business and food focussed funds. The government could oversee and govern this new asset class.

* * *

A combination of training and skill development for farmers and extension service workers, creating world class agricultural universities, and setting up the agri-business focussed fund is important to drive the sector and ensure continued investment in farm, infrastructure and market linkages.



Plating up for 2030

The report so far has established that India can become a food and agricultural powerhouse by 2030. Industry participation, technology oriented productivity growth, food processing and exports are the pillars on which India can build this leadership position. These will further need the requisite support through enabled infrastructure and policies.

Five crops/produce—mango, banana, potato, soya bean and poultry—are likely to play a defining role in changing the landscape of Indian agriculture over the next two decades. Research on these crops and food categories is the bedrock on which this report rests. Materiality (crop size and potential to grow), relevance (for consumers and growers) and crop diversity were the three main criteria used to select these crops. Each of them individually and collectively help piece together both the history of and the vision for Indian agriculture.

The following chapters, which entail the details of each of these crops and food categories, reveal the diversity of needs, opportunities and prospects. Lessons from these could certainly be used as enablers for other crops as well.

Each chapter presents the history of these crops and food categories in India over the last decade, thereby clearly plotting the trends in terms of production and consumption. It then lists out the challenges, the opportunities and the vision for each crop along with the roadmap to achieve it.

The five themes and proposed programmes are reiterated through the crop deep dives. What India plates up in 2030 will be decided by what it sows today.



Chapter 8

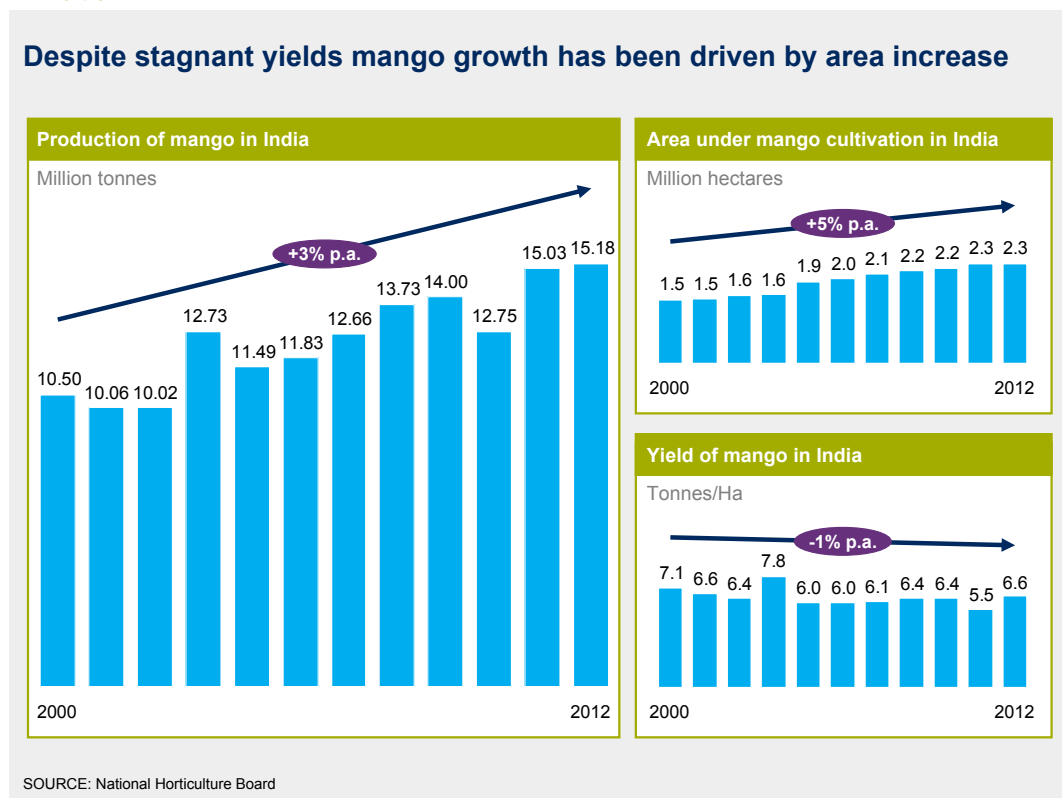
Mango

Mango is the metaphorical king of Indian fruits. It ranks second by weight among fruits grown in India, with over 1,000 varieties. Some of the best varieties sell at multiple times the price of other fruits like apple, banana and oranges (per kilogram retail price). Generations of Indian consumers associate mangoes with luxury. The bulk of the production continues to be consumed domestically. While this domestic demand is growing at a strong 4 per cent annually, better availability and prices could unleash latent domestic demand, and help the industry expand its exports.

India accounts for approximately 40 per cent of the 37 million tonnes produced worldwide. Compared to ubiquitous fruits like oranges, bananas and apples, mangoes are more of a novelty fruit outside their native regions. In India, approximately 36 per cent of the gross cropped area (GCA) for fruits is devoted to mangoes. These are produced across the country, but important clusters have developed over time: the Chittoor belt in Andhra Pradesh, Malda in West Bengal, Uttar Pradesh in the north, and Gujarat and Maharashtra in the west. Production is highly seasonal, lasting 3 to 4 months a year.

Consistent growth in mango production over the past two decades (4 per cent CAGR) has resulted almost exclusively from the increase in area under production as yields have remained stagnant (Exhibit 8.1).

Exhibit 8.1



CHALLENGES

Old and low density plantations, poor farming as well as post-harvest practices are the key issues causing low yield and high wastage. The absence of on-farm sorting/grading, ripening facilities and poor transportation infrastructure are the key issues in the mango value chain.

- **Low yields and limited awareness of better farming practices**—At 6.4 tonnes per hectare (2010), India's yields are 40 per cent lower than the global average, mainly because of ageing plantations and outdated practices. A large chunk of the plantations (20 to 30 per cent) are over 40 years old and low in density of plants per hectare. These are capable of producing only half the yield compared to younger orchards. The government's current rejuvenation scheme that seeks to address this could be a high risk proposition for farmers—it offers USD 315 per hectare whereas farmers lose incomes up to USD 1,050 per hectare for the first 3 years of rejuvenation. Yields take another 2 years to reach their peak thereafter. Further, the interviews with farmers suggest they may remain unsure of the success of these methods.

Adopting several other proven practices can help attain two to three times higher yields. These include drip irrigation, timely pruning and protection, and shifting to high density (about 600 trees) or ultra high density (about 1,500 trees) plantations. Again, awareness and adoption of these methods has gained limited traction.

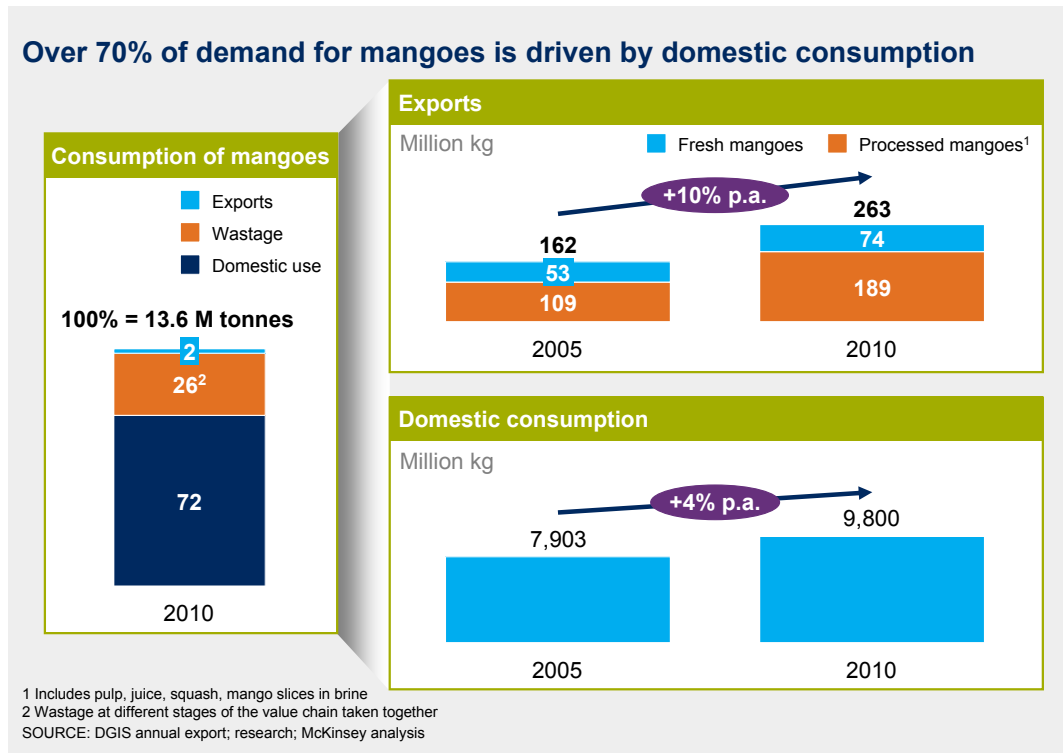
- **High quantity and quality wastages**—Wastages across the value chain, especially on quality, are high. Anecdotal estimates vary anywhere from 10 to 20 per cent depending upon the source. First, there is lack of awareness on harvesting techniques and technology. Premature, unscientific plucking and de-sapping can cause spoilage and blemishes. Limited infrastructure, cold storage transfer, pack houses and poor transportation practices deteriorate the quality further. Quality wastages are critical in the mango value chain as the price differential for the farmer by variety and quality is significant.

The widespread use of several technologies can help solve this. For example, ripening chambers can reduce quantity wastage (by about 3 to 4 per cent) and quality wastage (by ensuring better colour and shape), as can proper packing and transportation from the farms. Developing standard grading and sorting protocols and procuring directly from farms both tighten and monitor quality till the end consumer.

- **Limited branding and exports**—Owing to the increasing number of urban and wealthy consumers, domestic consumption of both fresh mangoes and juice continues to grow consistently. Fresh fruit consumption is likely to grow at 4 to 5 per cent per annum in the coming two decades, as can be seen in Exhibit 8.2. Despite the ability to differentiate fresh produce in mango on the basis of colour, shape, variety and consequently price, there have been limited efforts to explore branding of the fresh fruit. Differentiation can serve as the necessary economic incentive for the farmer to adopt quality improving technology and methods of farming.

Given India's scale of production, exports offer a plum avenue for additional and lucrative demand. Quality of produce remains critical to nail this opportunity, while investments to produce and export highly perishable products of good quality remain severely limited. The overall size of exports in mango (pulp or fresh) is not large. India largely exports processed mango or pulp and, despite exporting a meagre 2 per cent of its total produce, is among the top two to three producers in both processed and fresh mango. However, demand creation, quality control and cost competitive production have not been at the forefront of India's mango export policy.

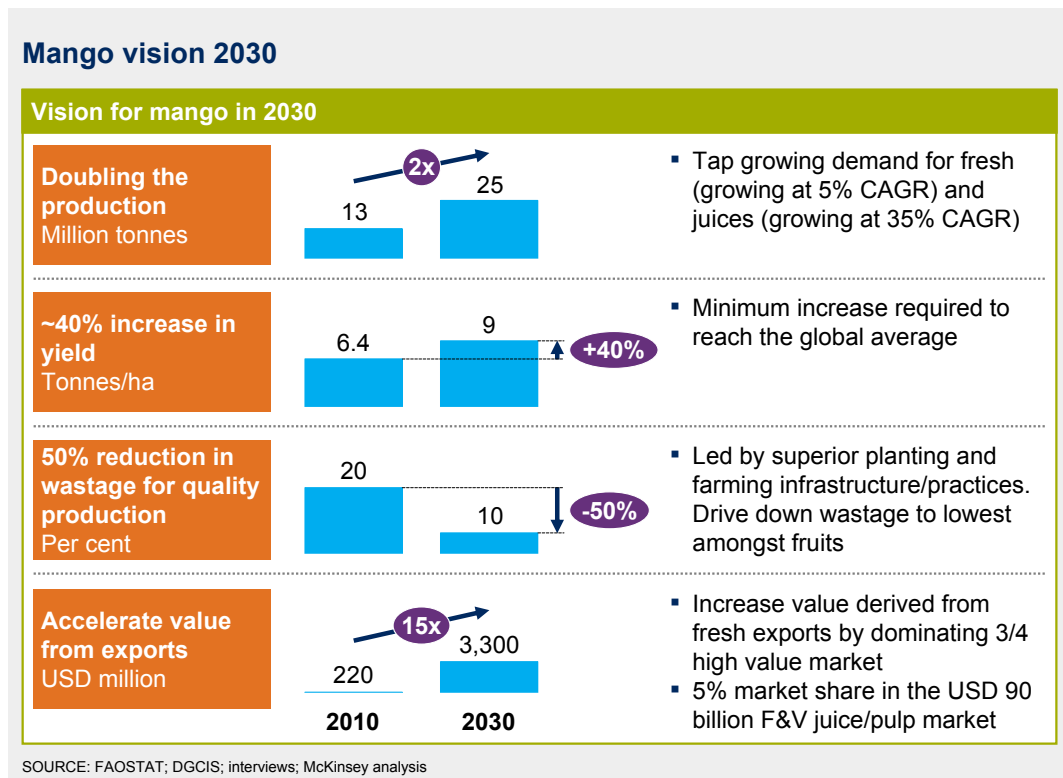
Exhibit 8.2



2030 VISION: IMPROVING YIELD, STRENGTHENING THE SUPPLY CHAIN AND INCREASING BRANDING, PROCESSING AND EXPORTS

There is potential to double production through a 37 per cent increase in yield, boost availability by 50 per cent reduction in wastage, and accelerate export value by 10 times through branding. To achieve this, India must scale up best practice farming methods and improve supply chain management (Exhibit 8.3).

Exhibit 8.3



As with any technological reform in farming, this would require demonstration (through successful pilots), incentivising adoption of these methods in the initial stages and continuous support on learning and implementation. The necessary investments need to be made in infrastructure, e.g., ripening chambers, along with market linkages to tap the willingness to pay for high quality.

Given the potential to increase yields, boosting exports both from a demand creation and marketing perspective could provide the additional economic incentive to facilitate investment in production and supply chain.

INCREASING PRODUCTION, LOWERING WASTAGE

The focus for the mango industry should be to increase production through higher yield and lower wastage to tap the growing export as well as domestic markets.

Disseminate best practices for yield improvement

Pilot examples have demonstrated that adopting scientific practices can meet global yield, given the same quality of inputs. An example is that of Project Unnati, promoting Ultra High Density Plantations (UHDP) in the Chittoor district of Andhra Pradesh. It has helped increase the number of plants per hectare from 100 to 1,600, while using the same amount of water and superior farming practices. About 600 farmers working across 100 acres of demo farms have benefitted from it. The training and extension target for this project is to positively impact the lives of 50,000 farmers in 5 years. The government could consider rolling this out across all mango farmers to meet the 37 per cent yield improvement to double production.

Invest in infrastructure to reduce wastage

Two key initiatives to build the mango industry's infrastructure can help improve the performance of the value chain:

- Increase the use of ripening chambers:** Ripening chambers reduce mango wastage in quantity by about 4 per cent, and help ensure the quality of shape, size and colour. These chambers can be used to ripen other fruits and vegetables when mangoes are not in season to maximise their capacity utilisation. Gujarat offers a 50 per cent subsidy for the project cost for mango processors. Private players could adopt a leasing model that farmers/other processors could use. The breakeven period is 3 years for 1,000 tonnes of ripening chamber capacity.
- Enhance farm gate infrastructure:** Infrastructure to sort, grade and pack mangoes is a sore need. The government could consider setting up mandi attached centres for sorting and grading by farmers. Private players could encourage farming communities to build joint pack houses. For example, Keventers has on-farm collection centres which significantly lower wastages from transportation.

Improve realisation through processing, branding and exports

The export market for fresh mangoes is limited because it is highly perishable and there is limited awareness about the fruit in non-tropical regions. In the fruit juice segment as well, the presence of mango-based drinks remains miniscule compared to other varieties. To tap this market, India needs to work on four fronts:

- Build clusters for concentrated processing:** Production in major producing states (Uttar Pradesh, Andhra Pradesh, Karnataka, Bihar and Gujarat) is highly concentrated in select districts. Processing clusters (tied up cooperatives or through direct procurement) can save on cost and time (about 5 per cent), and prevent transportation spoilage (another 5 per cent) by reducing the number of intermediaries. To achieve the aspirations outlined for 2030, the need for processing will go up by two to three times. In line with future pockets of mango production, the state governments should identify locations for processing clusters and give targeted incentives to encourage private investors to create the processing infrastructure. This could be tied in with the demand servicing scale hubs initiative where mango could be made one of the anchor crops for select hubs.

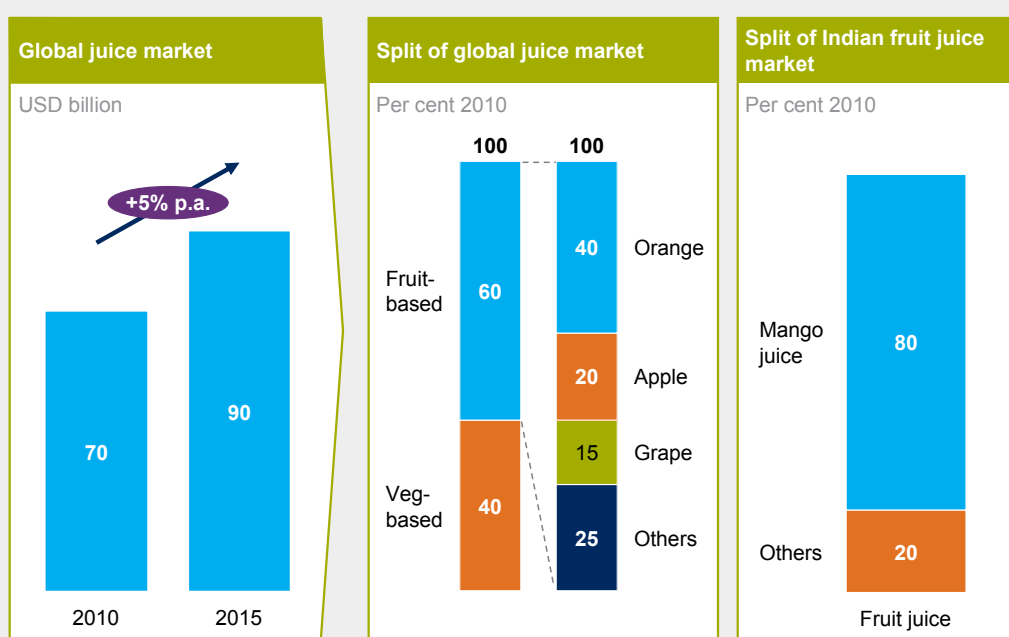
- Build a brand:** The industry can use the exclusivity and history of mangoes to build a unique brand. For starters, India can make its produce traceable. Currently, it is nearly impossible to trace the source of produce due to limited exporter–producer links. Further, the industry needs simple, self-regulated certification mechanisms to build consumer trust and boost the brand. This will benefit both the domestic and export markets.
- Provide impetus to fresh exports:** India could promote the production of varieties that are popular in the export market. Further, global demand is shifting towards organic and certified produce. Existing subsidy programmes on organic farming in mango, supported by the government and NABARD, could consider facilitating right market linkages for these converted farms. On the infrastructure front, India could install more irradiation and Vapour Heat Treatment (VHT) facilities at multiple ports. These are necessary for exports to the US and Japan. Additionally, India’s terminals are ill equipped to handle agriculture and horticulture commodities and there is a need for specialised terminals at both coasts.
- Accelerate export of mango juice:** The brand can be used to increase the demand for mango-based juices and other value added products. Packaged mango juices have been a great success in India. While the market was historically created to a large extent by brands like Frooti, today top multinationals are active participants in this market, which is growing at 25 to 30 per cent annually. However, mango juice makes up a very small share of the global fruit juice market. Indian industry and government could consider taking an active role to promote packaged mango juices across the globe (Exhibit 8.4).

Building brands: Florida Oranges

Within 20 years of the founding of the Florida Citrus Commission, whose aim was to increase the production of fresh and processed juice, Florida Oranges took up 30 per cent of the global fruit beverage market, while dominating the US market. Florida Oranges is a study in the success of branding and marketing fruits. The Commission established a grower led and funded “Citrus Research Board”, which researched different markets to understand demand preferences and possible promotional strategies. Apart from promoting the brand domestically, the Commission managed to collaborate with different countries on pre-shipping clearances. This saved Florida Oranges a significant amount in rejection losses.

Exhibit 8.4

Mango pulp/juice is yet to tap the USD 90 billion global juice market



SOURCE: Euromonitor reports; Economic Times (July 2012)

To succeed in the global juice market, large players could build and promote brands. They could look to create combinations like orange and mango, and other products like smoothies and yogurts to suit the global palate. Consistency and quality supply may be given preference over traceability and organic produce in the case of juices.

* * *

Mango is a fresh fruit with significant branding potential. Furthermore, there is scope for segmentation because of the multiple varieties and the visible difference in quality, look and taste. These can be showcased through roadshows across the country and abroad. A carefully charted path can help mango farmers realise a premium on their product as there is a willingness to pay higher for the “king of fruits”. Mango can be the first crop to build an international brand for Indian agriculture globally.



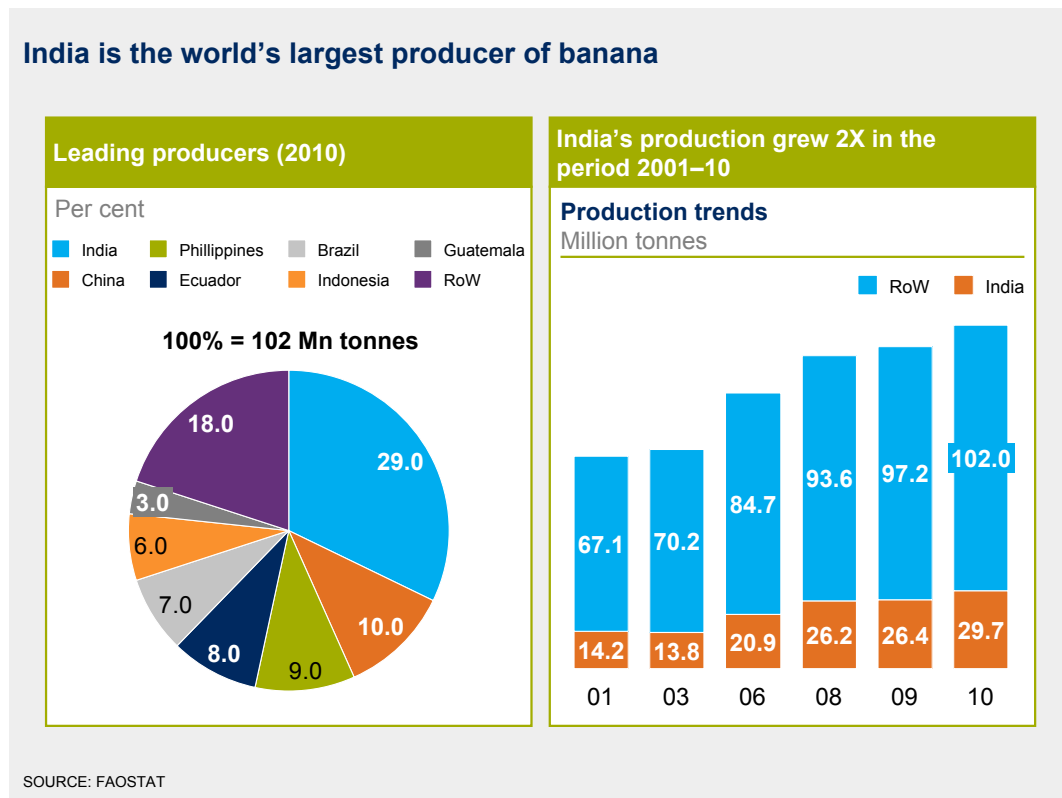
Chapter 9

Banana

Banana is India's favourite fruit. It is one of the few fruits that is affordable and available throughout the year and is a good source of energy and essential nutrients. Banana forms 30 per cent of India's fruit consumption. Indians consume 19 kilograms of banana per capita per year,¹ 50 per cent higher than the world average of 12 kilograms per capita per year. Banana constitutes just 15 per cent of the rest of the world's food consumption per capita.

India is the largest producer of bananas in the world, producing 29 per cent (29.7 million tonnes) of the world's output in 2010 (Exhibit 9.1). Production grew 7.6 per cent in the period 2001 to 2010, and the area under cultivation grew by 7 per cent annually in the same period. India's banana yield is 35 tonnes per hectare, and at par with the top global producers; it grew at 2 per cent per annum between 2001 and 2010.²

Exhibit 9.1



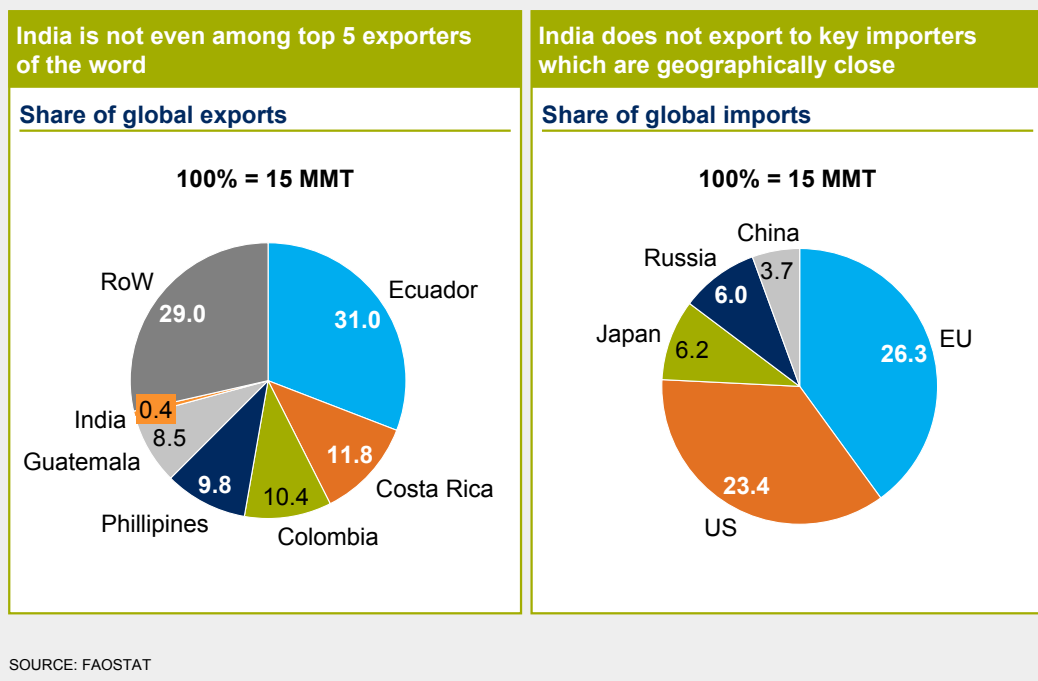
India's banana exports are minimal. It exported only 0.37 per cent of its produce in 2010 (Exhibit 9.2). Further, India did not export any to Japan and Russia and exported just 1 tonne to China in 2010. This is because of high domestic demand and the high quality standards of the export market. In fact, these quality standards and the risk of batch rejection make banana exports an unattractive proposition for the near future.

1 Quick estimate based on production, net trade and wastage (FAOSTAT) and population data (Indian census data).

2 All production numbers sourced from FAOSTAT (latest data available for 2010).

Exhibit 9.2**India produces 30% of the world's banana, but exports only 0.4%**

Per cent, 2010

**CHALLENGES**

The major challenges the banana industry faces are the lack of scientific farming methods, the deficient supply of tissue culture, poor post-harvest and cold chain infrastructure, limited quality consistency, and lack of structured marketing and branding.

- Lack of quality input and scientific methods of farming:** Tissue culture, a vital input for high yielding banana plants, is in very short supply. Currently, Jain Irrigation supplies a large proportion of India's tissue culture plants—100 million plants each year. However, this is barely enough to sow 4 per cent of India's banana plantations. Almost all of the tissue culture plants available are of the Grand Naine variety. Tissue culture inputs for many other varieties of Indian banana are not available in the market. There is also a lack of good inputs and proper field and fruit care operations. This is a result of a combination of factors—lack of farmer awareness and limited access to credit for capital intensive investments.
- Poor post-harvest and cold chain infrastructure:** This results in a weight wastage of 6 to 10 per cent³ and value wastage of up to 15 per cent due to quality deterioration.⁴ Infrastructural deficiencies prevail across the value chain like primary processing (washing, sorting and grading), pack houses, cold storages, and ripening chambers. As a result, there is also inconsistency in the quality of the produce, which is a big impediment to exports.
- Limited awareness of marketing and branding practices:** There is a fundamental disconnect between the consumer needs and the farmers. This is due to the fragmented nature of production. As a result, banana in India is largely commoditised without the economic benefits of marketing and the farmer realising advanced consumer needs.

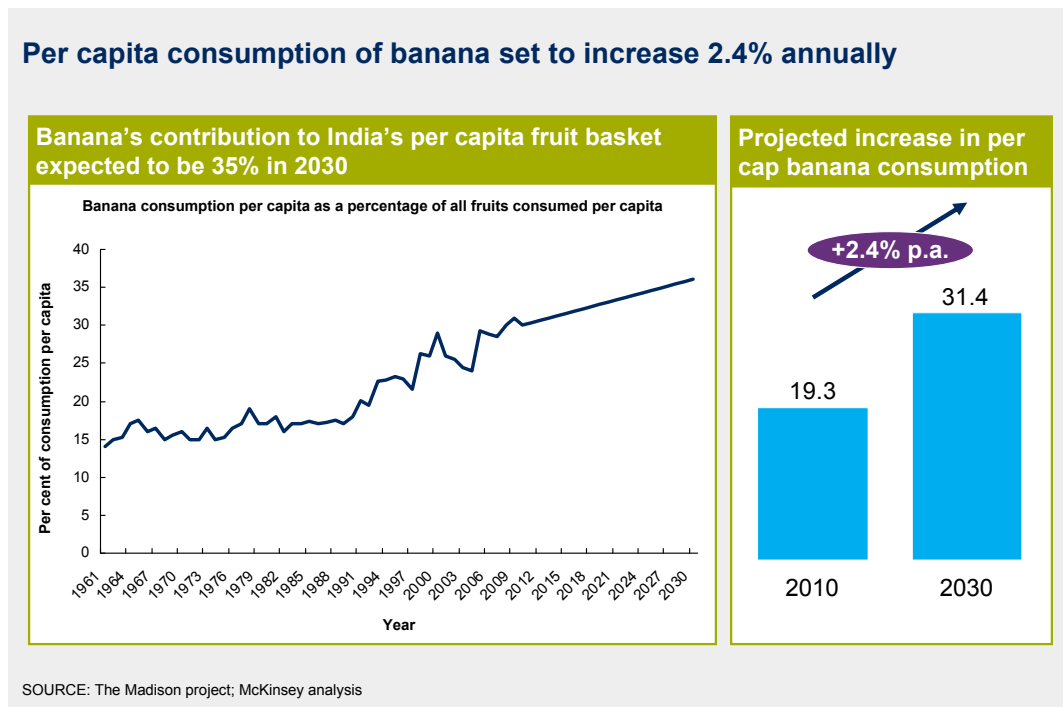
³ CIPHET report on wastage 2012.

⁴ According to some independent banana traders, 10 to 15 per cent lower prices are realised because of post-harvest deterioration in quality.

2030 VISION: BECOMING A BRANDED BANANA POWERHOUSE

Banana could retain its prominence in the Indian diet and the estimated per capita banana consumption could increase to 31 kilograms per year by 2030. This will be driven by Indians consuming more fruit (per capita growth of 2 per cent per year) and the share of banana in India's fruit basket growing from 30 per cent to 35 per cent (Exhibit 9.3). The real potential for banana could lie in branding, both in the domestic and export market.

Exhibit 9.3

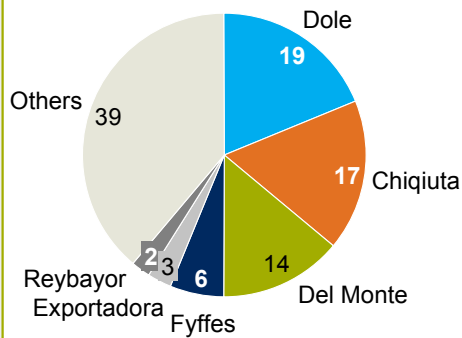


- India could increase total production by 75 per cent to about 50 million tonnes in 2030 to meet rising domestic demand and tap into the export opportunity. To achieve this, India could increase its yield from 35 tonnes per hectare to 45 tonnes per hectare. This could be done by adopting the best practices followed in states like Tamil Nadu and Gujarat (where yields are much higher than the national average) in other banana growing states as well.
- India could aspire to have an efficient, globally competitive supply chain. To achieve this, India needs to bring down its value wastage to under 10 per cent. This would happen by deploying better post-harvest infrastructure, such as the use of plastic crates, ripening chambers and cold storage.
- Branded banana has many benefits for retailers, exporters, consumers and farmers in terms of quality assurance, nutritional value, improved price realisation and greater farmer incomes. India could focus on creating a strong banana brand for domestic demand and aspire to export 1.5 million tonnes by 2030, which is 25 times the current export figure. This would make India the world's third largest banana exporter. Globally, 60 per cent of the banana market is branded, and three companies control 50 per cent of the market, as shown in Exhibit 9.4. This is in stark contrast to the Indian banana market, which is largely unbranded.

Exhibit 9.4**Globally more than 60% of the banana market is branded**

The international fresh banana market is oligopolistic with 3 brands controlling 50% of the market

Market share, per cent



SOURCE: Secondary research; McKinsey analysis

RECOMMENDATIONS



To achieve the vision for banana, India could boost awareness and adoption of farming best practices across the country, improve post-harvest infrastructure, accelerate availability of high quality tissue culture input, and encourage the formation of more FPOs. A combination of these has been seen to boost quality and yields and, consequently, returns to the farmer as well as value to the consumer.

Adopt global best practices to improve yield

- Accelerate the availability of high quality tissue culture:** The government could play an active role in increasing the availability of tissue culture plants, and developing tissue culture for varieties other than the widely available Grand Naine. This can be achieved by encouraging private participation in tissue culture, increasing farmer affordability through targeted subsidies and by enhancing spend on R&D (through both agricultural universities and private players; Exhibit 9.5).

Exhibit 9.5

Tissue culture has enabled adoption of Grand-Naine in Tamil Nadu



	Traditional sucker	Tissue culture
	 <p>Sucker planting</p>	 <p>Tissue culture planting</p>
Costs	<ul style="list-style-type: none"> ▪ Cents 4–6/plant 	<ul style="list-style-type: none"> ▪ Cents 25/plant
Yield	<ul style="list-style-type: none"> ▪ 20–30 kg/plant (highly variable) 	<ul style="list-style-type: none"> ▪ 38–40 kg/plant (predictable yield if proper farming methods followed)
Benefits	<ul style="list-style-type: none"> ▪ Very low initial costs ▪ Easily available 	<ul style="list-style-type: none"> ▪ Diseases/virus resistant ▪ Growth is uniform with bunches to one side, making harvesting easier ▪ Quality of produce is higher – 90% first grade
Problems	<ul style="list-style-type: none"> ▪ Susceptible to pests; costs of plants protection 35% higher 	<ul style="list-style-type: none"> ▪ Expensive (high plant costs) ▪ In short supply

SOURCE: Interviews and secondary research

Increase adoption of drip irrigation: With the envisioned shift to tissue culture for banana, drip irrigation can play an important role not just to save water but also administer nutrients through a method like fertigation (Exhibit 9.6).

Exhibit 9.6

Drip irrigation has been widely adopted by farmers cultivating Grand-Naine

	Flood irrigation	Drip irrigation
		
Costs	<ul style="list-style-type: none"> ▪ USD 525/acre 	<ul style="list-style-type: none"> ▪ USD 840/acre
Benefits	<ul style="list-style-type: none"> ▪ Initial investment lower 	<ul style="list-style-type: none"> ▪ 30% more water saved ▪ Nutrient saving
Issues	<ul style="list-style-type: none"> ▪ Water wastage ▪ Operational costs (labour, plant care, etc.) higher 	<ul style="list-style-type: none"> ▪ Higher initial investment required; unaffordable for many farmers

SOURCE: Interviews

- Educate farmers on scientific cultivation methods:** There are several scientific practices that can benefit banana farmers. Bunch cover, though expensive, allows bananas to be unblemished and of higher quality, while also ensuring early maturity. Bud injection can protect against flower borne pests and diseases, but requires proactive research workers. Removal of flower tips and fingerlings also helps to avoid flower borne pests and diseases, while nylon rope harvesting helps avoid hand injuries. These would require educating the farmers on cultivation and post-harvest best practices. Multiple stakeholders such as researchers and extension officers from agricultural universities, progressive farmers, traders and bank representatives who could educate farmers on methods of obtaining finance, are needed. This could be followed by visits to a model farm in the area so that the benefits of best practices could be observed first hand. The efficiency of these teams could be further enhanced by tying up with field agents of private players, who have been able to educate farmers and effect the adoption of best practices.

Invest in infrastructure to reduce wastage

Increasing storage and banana ripening infrastructure will reduce wastage to under 10 per cent. The NFMIA could be responsible to build the big cold storage hubs, while the progressive farmers and large traders could invest in ripening chambers and primary processing infrastructure (washing, sorting and grading and packing) closer to the farms (Exhibit 9.7).

Exhibit 9.7



Improve realisation through branding and exports

- Encourage the formation of farmer–producer companies and associations:** This will go a long way towards the standardisation and effective marketing of produce. In addition, these could allow the aggregation of land, help reduce the cost of mechanisation, drip irrigation, etc. Farmer companies would also simplify access to credit, providing greater strength to the farmer.
- Build a brand:** The industry could position banana as a health food that contains all essential nutrients, is cheap and easily available all year round. It could be positioned as versatile as it can be had as an on-the-go snack, part of a meal or dessert. It could be branded as a natural energy bar, ideal as a post-exercise snack. Organic bananas could be used to promote a sustainable healthy lifestyle. All these branding strategies will allow the farmers and processing industry to deliver a

superior value proposition to customers and provide an uptake to existing realisations from the produce

- **Provide impetus to exports of fresh bananas:** India can use its wide variety of bananas to target different markets based on local taste. Exporters can also tap the organic export market given India's low fertiliser and pesticide use per acre compared to world standards. Further, the traceability of branded produce back to the farm gate can further add credibility to produce exported from India.

* * *

Banana provides another real opportunity for branding and exports. There is a strong opportunity to build a better consumer proposition and use that as a cornerstone to potentially increase farmer incomes and provide better returns to processors and infrastructure investors.



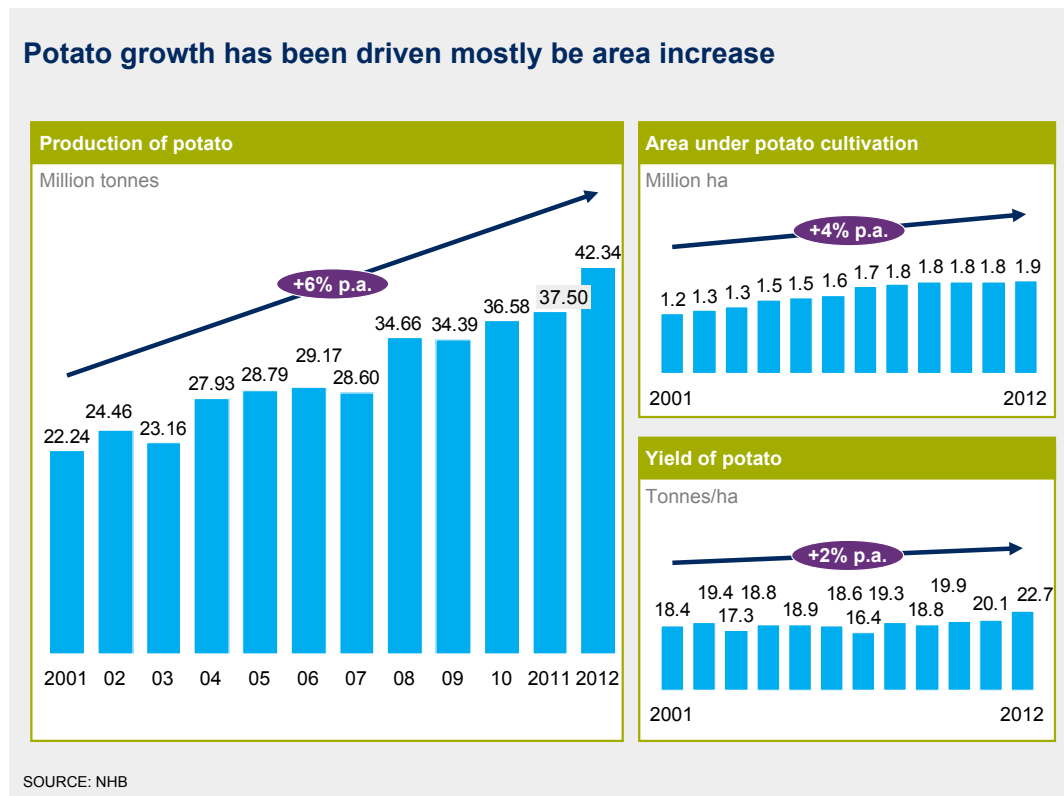
Chapter 10

Potato

Potato is an important agricultural item globally, satisfying a large portion of the world's nutritional energy needs. It is a staple food in many parts of the world with annual consumption in many European countries exceeding 100 kilograms per capita. It has a production value of USD 84 billion (2010), lagging only rice, maize, wheat and tomato. In terms of the quantity of overall production, it is the fifth largest food crop in the world. India is the second largest producer of potatoes in the world with more than 40 million tonnes produced in 2011.

Potato production in India has risen by 60 per cent in the last decade, mostly due to the increase in the area under cultivation by 50 per cent (Exhibit 10.1). However, in the last 4 years, there has not been a significant increase in the area under potato cultivation, which has stabilised at about 1.8 million hectares.

Exhibit 10.1



India's domestic consumption of potatoes has increased by about 5 per cent per year for the past 5 years, though the per capita consumption is still about half of that of China and lags far behind most western countries.

India produced more than 40 million tonnes of potatoes in 2011, with more than 1.8 million hectares of area under cultivation and yields reaching 20 tonnes per hectare. The yields, though higher than many large potato producing countries such as China and Russia, are about half of the global benchmark set by countries such as the USA. The states of Uttar Pradesh, Bihar and West Bengal produce over 75 per

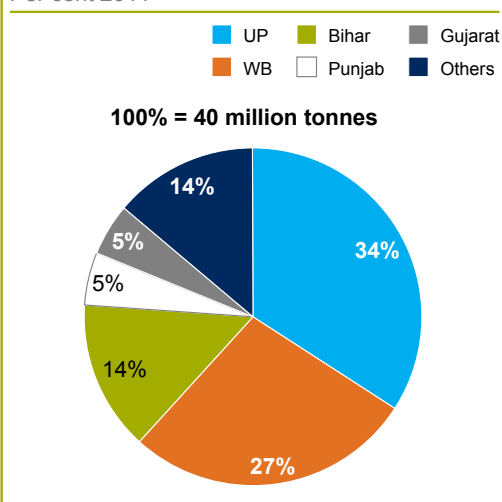
cent of India's potatoes (Exhibit 10.2). However, the yields in these states are lower than what can be achieved by employing best practices as has been done in Gujarat. These include the use of better quality seeds of the right varieties, drip irrigation and optimum fertiliser use, better cold storage conditions and a gamut of prudent scientific practices brought in by private companies such as McCain and PepsiCo.

Exhibit 10.2

Potential to accelerate yield in large potato producing states such as UP and Bihar

UP, WB and Bihar account for over 75% of India's potato production

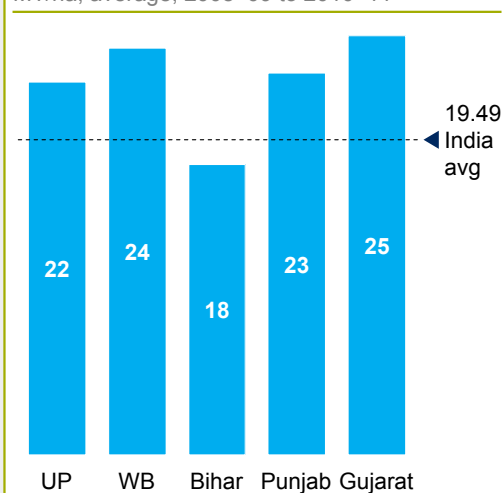
State wise share in India's potato production
Per cent 2011



SOURCE: IndiaStat; NHB

Gujarat has the best performance in terms of yield and farm practices

Yields in major potato producing states
MT/ha, average, 2008–09 to 2010–11



CHALLENGES

Availability and affordability of good quality seeds and other inputs, diminishing returns to the potato farmers due to rising input costs, unavailability of affordable mechanisation solutions with low levels of processing and exports are the major challenges in potato agriculture in India.

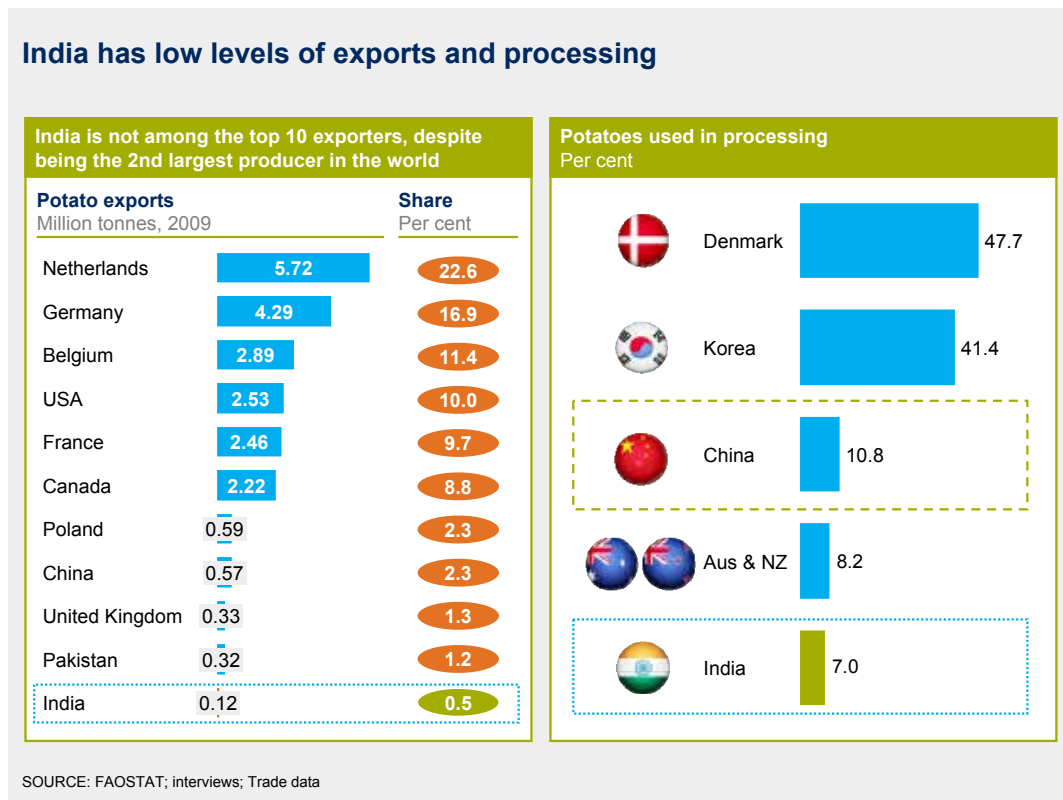
- Low availability and usage of good quality seeds:** Currently, good quality seeds are used in less than 10 per cent of the produce, causing a yield loss of at least 20 to 30 per cent. Good quality seeds are the single most important input in delivering higher yields and thus higher returns to the farmers. Considering the ideal seed replacement ratio of 3:1 (seeds replaced every 3 years), the seed requirement to produce 36 million tonnes of potatoes is estimated to be 1.2 million tonnes. But less than 8 per cent of good quality seeds are produced by state agencies and private players combined.
- Diminishing returns to the farmers due to rising input costs:** Prices realised by the farmer have not kept pace with the spiralling input (e.g., fertilisers) and labour costs. Potato is an input intensive crop, for which input costs per unit area are more than five to six times that of other crops like wheat. The input costs have risen by 2.5 times in the past 5 to 6 years while prices have increased by only 20 per cent. The resultant diminishing income has prompted farmers to shift to less labour and input intensive crops. This is more apparent in the northern seed producing states such as Punjab, and is worrying because Punjab is the seed bowl for potato crops in India. A decrease in production of potato seeds in Punjab will adversely affect the quantity and quality potato production in the whole country.
- Limited adoption of scientific farming and shortage of affordable mechanisation:** There are large gaps in the adoption of scientific farming practices, drip irrigation and farm

mechanisation. A big obstacle in the adoption of better farming practices in potato is the availability of affordable mechanisation options, such as potato harvesters and graders. Customising these machines to suit the smaller Indian landholdings will benefit farmers immensely. It will help cut wastage and labour costs, and increase revenues. Further, while drip irrigation can increase yields by 20 to 30 per cent, adoption has only been a success in parts of Gujarat. This technology needs to be popularised as it both increases yields and conserves water.

- Low levels of processing and exports:** Currently, only 7 per cent of India’s potato produce is processed, compared to countries like China at 11 per cent and developed countries like Korea and Denmark at more than 40 per cent. Despite being the second largest producer, India does not rank in the top 10 countries in terms of exports. However, there is potential as the biggest exporters currently face declining production, while demand in Asia is rising (Exhibit 10.3).

The absence of mechanisms to utilise excess produced also leads to low farmer income. Glut in the market leads to price fall, thereby affecting the crop area for next year. This often leads to a deficit in the next production cycle.

Exhibit 10.3

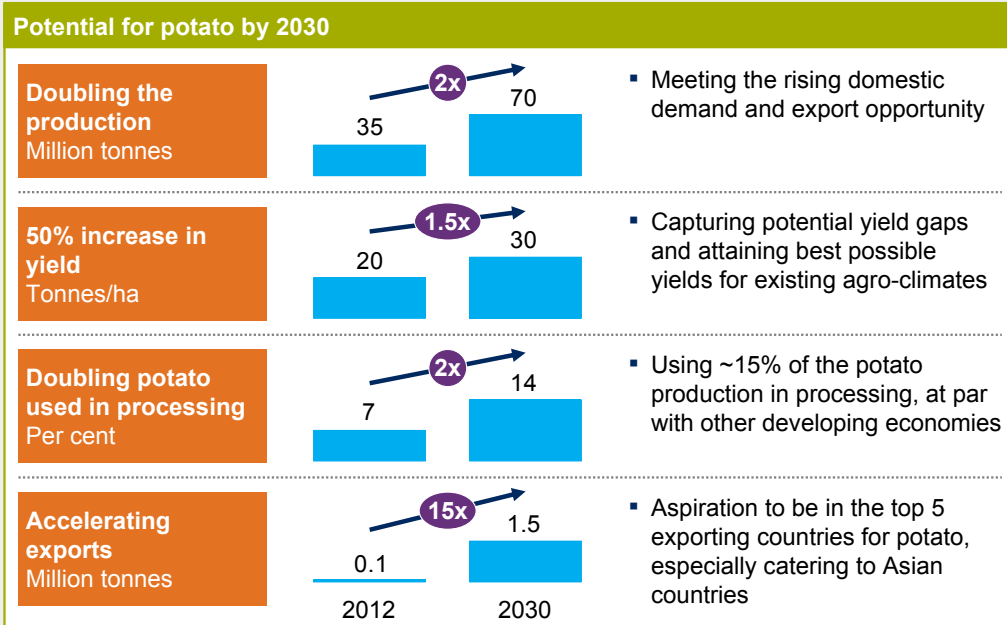


VISION FOR 2030: DOUBLE PROCESSING, BECOME ASIA HUB

India could aspire to double its production by 2030. To meet the rising domestic demand, average yield could be increased by at least 50 per cent to 30 tonnes/ha. There is also abundant opportunity to double the share of potato used in processing from the current 7 per cent to 14 per cent or more. In addition, India could also aspire to export 1.5 million tonnes to 2 million tonnes of potato from the current 1.2 million tonnes, to become one of the top five potato exporters in the world, especially catering to the Asian countries (Exhibit 10.4).

Exhibit 10.4

India should aspire to double its production by 2030 and become a hub in Asia



SOURCE: Approximate figures based on interviews

RECOMMENDATIONS

We suggest four initiatives to make India the potato hub for Asia—improving inputs, enhancing farmer awareness and scaling up processing and branding.

- Increase supply of adequate varieties of good quality seeds:** Seeds are the single most important input for better yields in potato. Farmers in West Bengal and Gujarat have seen yield increases of 20 per cent and more by using Truthfully Labelled Seed. The government and the Central Potato Research Institute (CPRI) could encourage production of more certified seeds by properly maintaining the supply chain. If required, the government could enable import of such seeds. The government may also consider supporting seed growers who can be registered if they procure and produce certified seeds. The seeds could be certified by a Central Potato Board consisting of growers. The National Agricultural Technology Mission could be responsible to fund research and provide grants and incentives to companies producing high quality seeds.
- Enhance farmer awareness on scientific farming practices and provide affordable mechanisation:** The scientific use of fertilisers, use of sprinkler or drip irrigation and adequate mechanisation cut costs, increase yields and often conserve natural resources. For example, costs can be reduced by using prophylactic pesticides which prevent late blight disease in areas with low infestation rates, and cost just USD 4 per kilogram, while treatment pesticides are more than 20 times more expensive. Sprinkler irrigation increases yield by 15 to 25 per cent, and drip irrigation increases yield by 30 to 40 per cent, while saving up to 40 per cent of water. Mechanisation options like deep tillage increase yields and profits by 15 to 20 per cent. Such practices benefit all stakeholders and can help improve the much needed efficiency and sustainability measures.

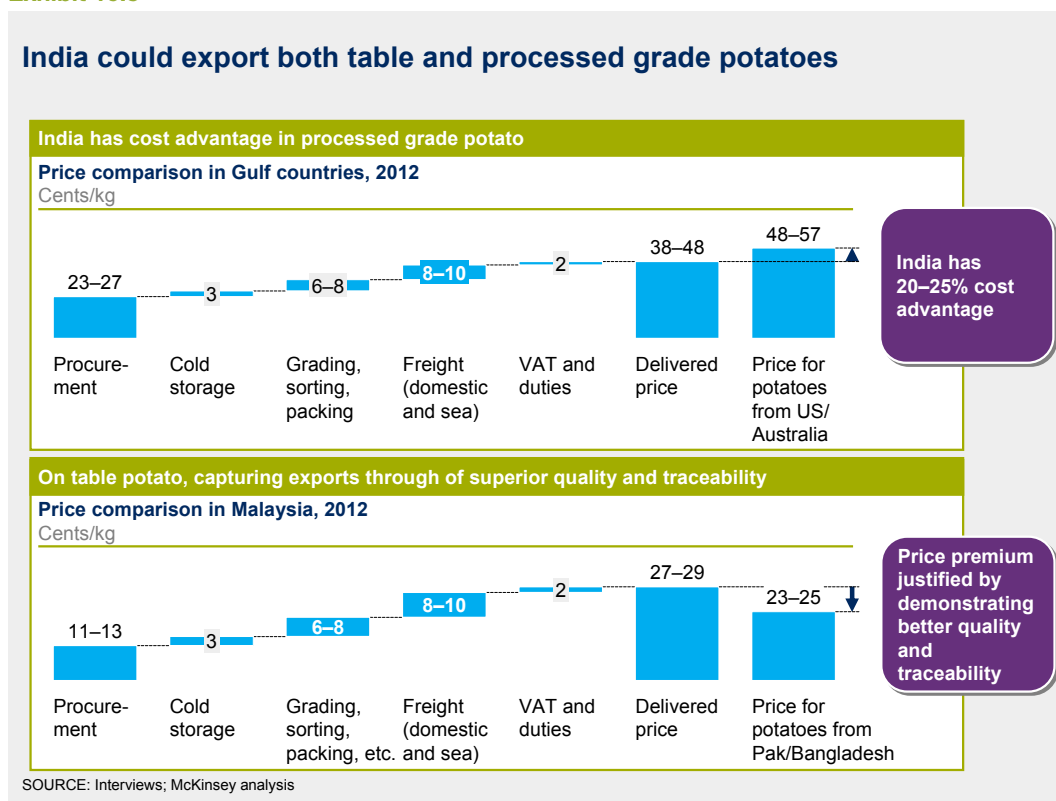
The best way to build awareness is by running sponsored demonstration pilots either by the government or by private enterprise. Industry could develop innovative low cost equipment suitable for small landholdings, especially for grading and harvesting.

- Invest in backward integration to boost processed potato:** Most farmers grow table varieties, while the processing varieties get four to five times the return. The industry could identify, test and promote new high yielding processing varieties from the available international basket to

improve quality and yield to bring down costs. By increasing processing, the alternating pattern of glut and deficit, which leads to fluctuations in crop area, could be resolved. This could make India more competitive and promote consumption and exports. Improving harvesting and storage practices is critical to maintaining quality. At the same time, to support the farmer's move from the table to processing variety, the processing company needs to assure a minimum volume buy back at a base price.

- Brand and create demand for both fresh and processed grade potatoes to increase value realisation across the chain:** India could export both table and processed grade potatoes, as it can deliver on quality and cost competitiveness (Exhibit 10.5). This can be achieved by identifying the markets and the required standards like consistency in quality, size and shape. India could further build brand value for potatoes by establishing traceability and demonstrating superior quality. Organised sector participation, higher mechanisation, strengthening of export infrastructure, and supportive policies and regulatory environment can give India an edge in potato exports.

Exhibit 10.5



A successful example of branding potatoes is that of Greenvale's FarmFresh potatoes in the UK. Launched with the USP of better and consistent taste and freshness, the effort was a success, and Greenvale's potatoes are now available across the UK. Even in India, United Phosphorus started promoting CIPC treated "low sugar" potatoes in and around the National Capital Region and marketed them in convenient bags. They suited the consumer taste and demand for these "branded" potatoes increased. The trend has caught on in the northern parts of India.

* * *

Potato is a promising crop. It will continue to be a staple in the diet of most Indians. The opportunity for India is to capture exports through branding and initiatives to improve yield of both table and processed grade varieties.



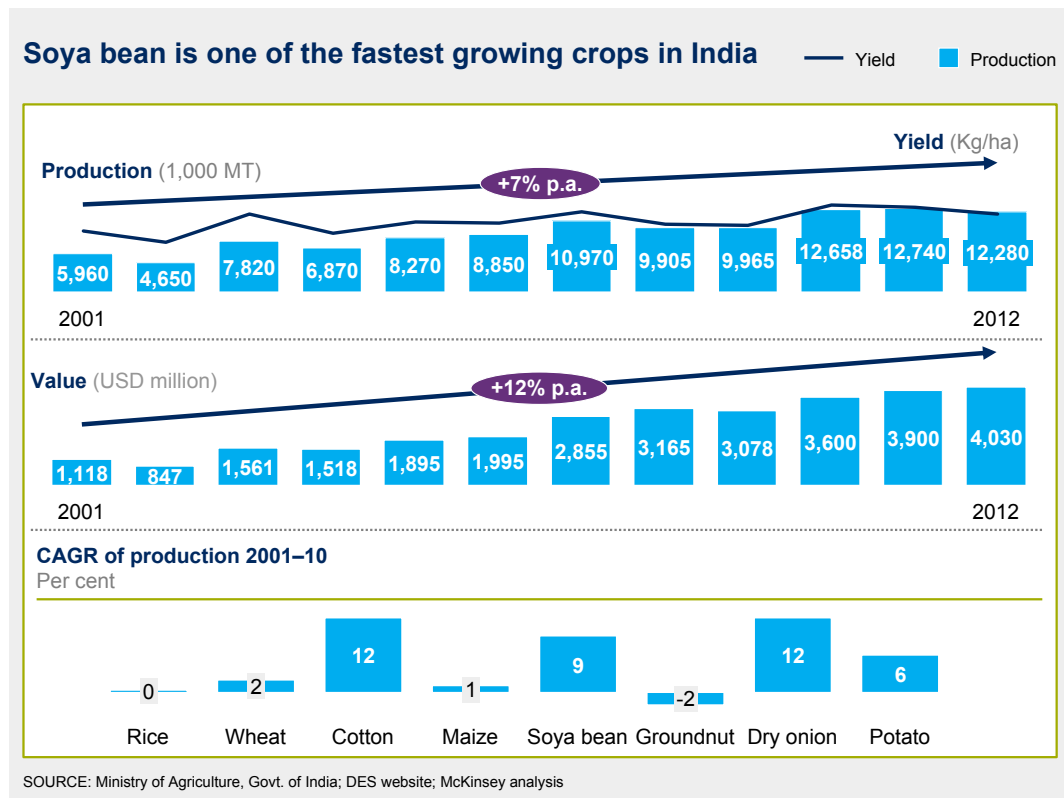
Chapter 11

Soya bean

Soya bean has become a globally important crop in recent years. The bean itself is used to produce soya cake and soya oil and other processed foods like soya milk and tofu. With this rising demand and the corresponding rise in prices, India’s soya farmers and industry are ready to unlock an USD 9,900 million opportunity by 2030.

Soya bean is one of the fastest growing crops in India with exceptional price realisations. Production has more than doubled in the last 10 years due to excess processing capacity, which in turn has resulted in steep raw material prices. This has led to soya’s value going up by four times (Exhibit 11.1). The higher price realisation has prompted more and more farmers to take up the crop, and the area under production has increased by 70 per cent. Soya bean is one of the few crops where the organised industry plays a large role. Companies like ITC and ADM procure soya bean worth thousands of crores. Large processing capacities have been installed to process more oil and animal feed, both of which are expanding markets.

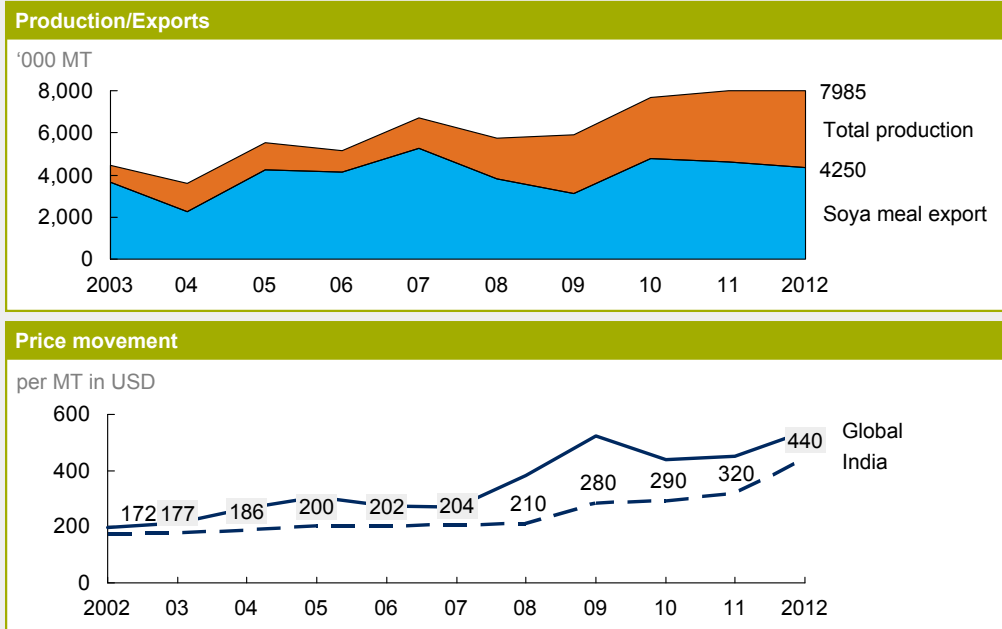
Exhibit 11.1



India currently exports 55 per cent of its soya meal and Indian prices are linked to global prices (Exhibit 11.2).

Exhibit 11.2

55% of the soya meal production is exported and the prices are linked with global pricing



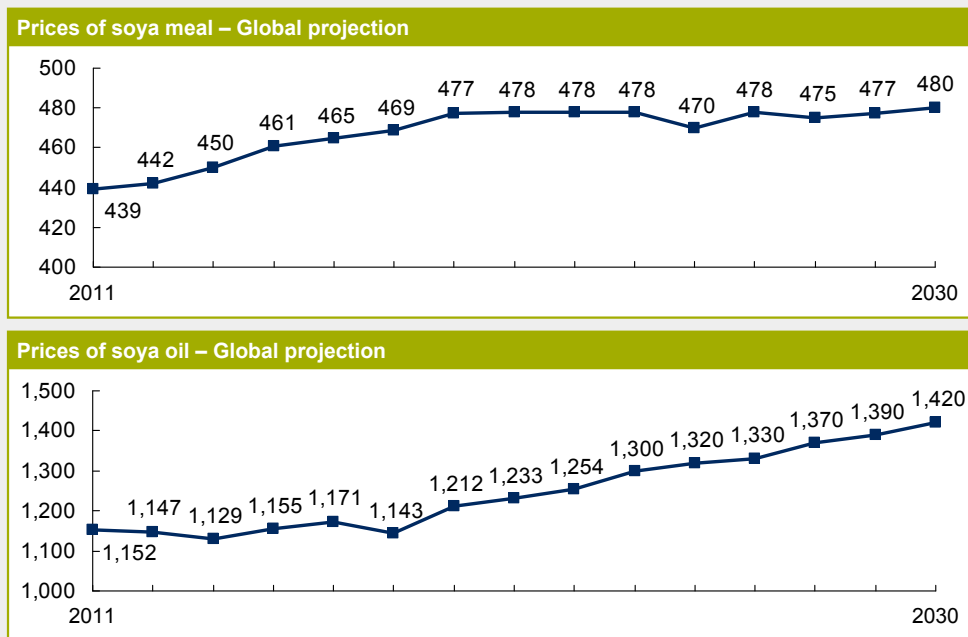
SOURCE: FAOSTAT; World Bank; Indiatat; IMF; DES; McKinsey analysis

Analysts expect global soya prices to moderately increase (Exhibit 11.3), which will continue to provide production impetus to Indian farmers.

Exhibit 11.3

Even the future trends in global markets look positive

USD/MT



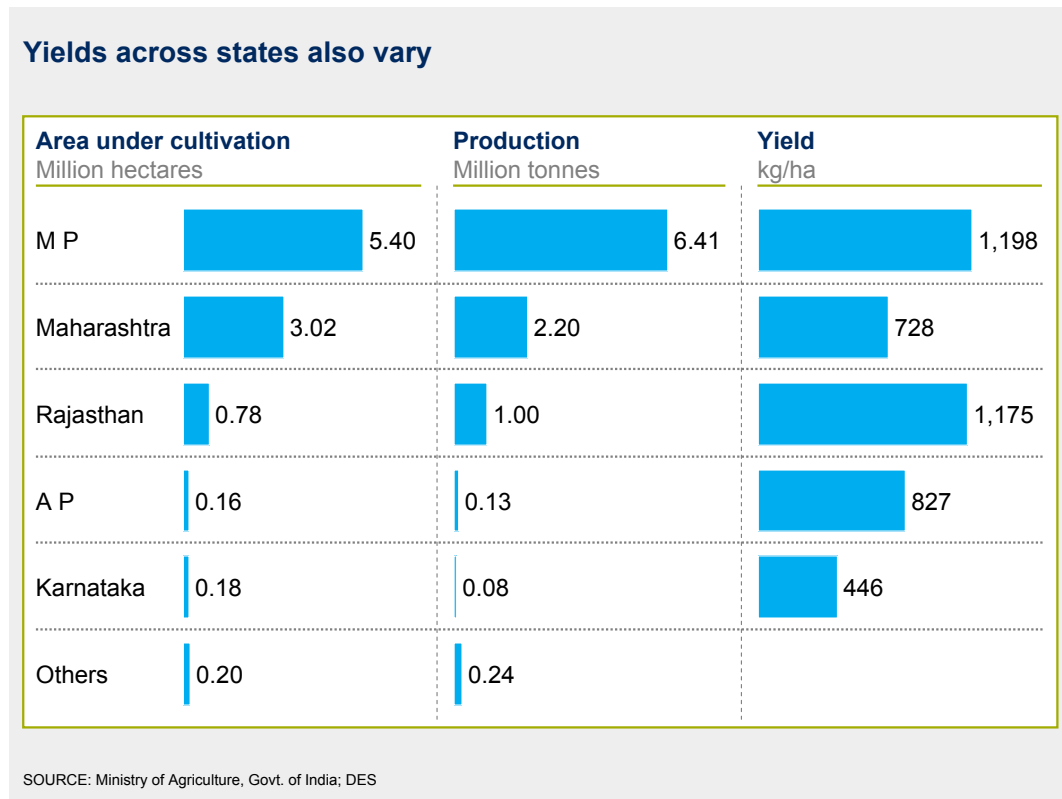
SOURCE: Bloomberg; McKinsey analysis

CHALLENGES

An underdeveloped market, low yields and the lack of investment in farm infrastructure challenge the Indian soya industry.

- India's soya yield is half the global average because of imperfect farm practices:** The advanced seeds that produce high yields in the USA and Brazil are not used in India. In spite of this fact, enhancing the sowing, farming and harvesting practices can significantly improve yield. But irregular and inefficient extension work currently pose challenges to yield improvement. India's yield is 1 tonne per hectare, while countries like the USA and Brazil produce close to 3 tonnes per hectare. Also, as can be seen in Exhibit 11.4, yields across states in India are highly variable. If India meets its true agro-climatic potential, it can achieve a yield of 2.2 tonnes per hectare, which is crucial for the soya industry to grow.

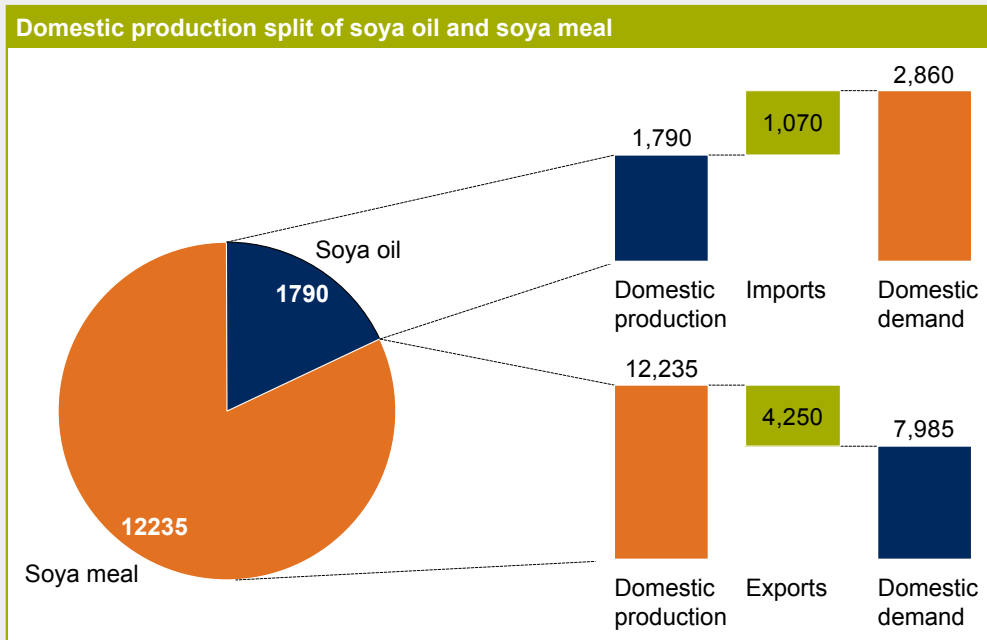
Exhibit 11.4



- Limited domestic demand for soya cake:** About 82 per cent of the soya processed results in soya cake that is used by the animal feed market, which is under-developed in India. Hence, the excess results in less price realisation in both the domestic market as well as through exports. In contrast, only about 18 per cent of the soya processed results in soya oil for which the domestic demand is very high. This demand–supply dynamic is shown in Exhibit 11.5. The challenge going forward is to stimulate the demand for soya cake for the animal feed market.

Exhibit 11.5**There is shortage of domestic demand for soya meal**

'000 MT, 2010



SOURCE: Ministry of Agriculture; Govt. of India; FAOSTAT; DES website; USDA; McKinsey analysis

- **Inadequate micro-irrigation leads to value loss:** High moisture content is an impediment for the farmer to realise value for the soya crop. Most of the soya crop is monsoon fed. When the monsoons are delayed, the crop is cultivated for a shorter period leading to high moisture content which yields a bad quality crop.

VISION 2030: QUADRUPLING INDUSTRY VALUE

Soya is a good example where farmers and processors are enjoying good economic returns on the crop. For example, farmers' realisation (net of input costs) is USD 210 to USD 252 per hectare. The real challenge facing the industry is to continue to grow production, and increase realisation through the better use of cake and stimulus of higher end processed items like soya milk and tofu. In this light, India's vision for soya could be to grow its value from USD 3,600 million in 2010 to USD 9,450 million in 2030. This can be anchored across three dimensions:

- Doubling soya bean production from 12.7 million tonnes in 2010 to 27 million tonnes in 2030, driven by a yield increase from 1 tonne per hectare to 2.2 tonnes per hectare.
- Increasing domestic demand for soya cake, resulting in better realisations for farmers and processors, through feed for animals especially poultry and fisheries.
- Stimulating demand for higher end processed foods like soya milk and tofu, thereby strengthening the consumer's nutrition value.

RECOMMENDATIONS

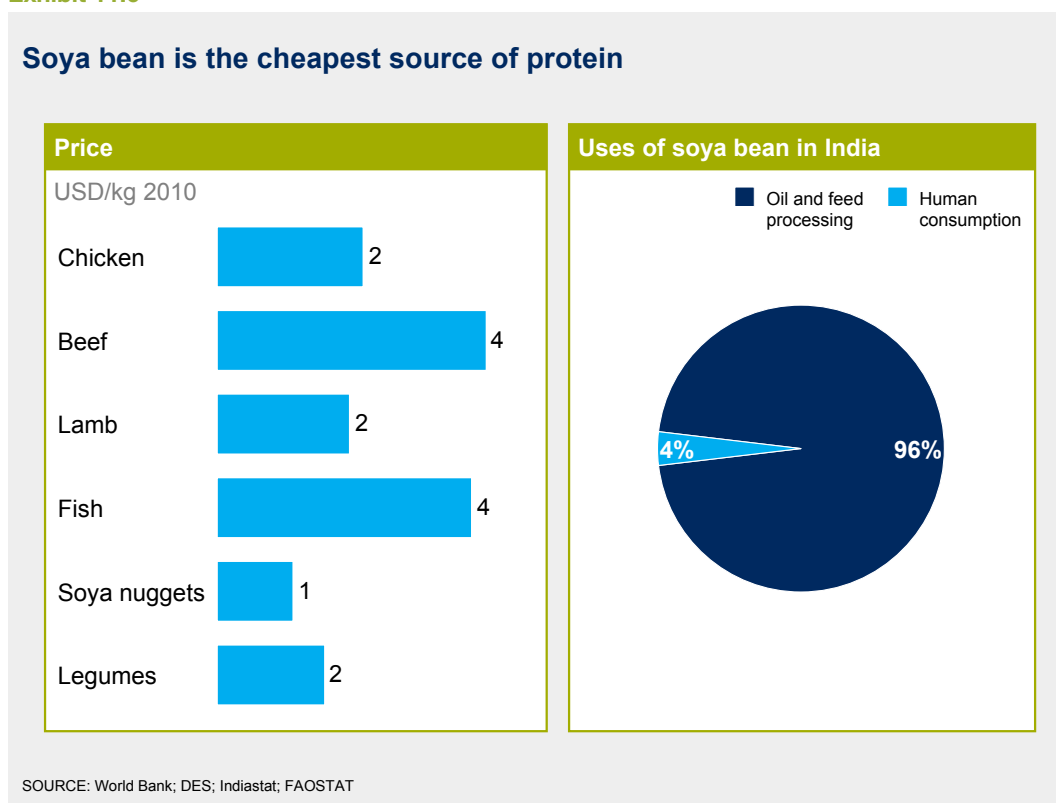
Three initiatives can make India a major export and processing hub for soya bean, meet the growing domestic demand for soya oil, and help India achieve its true potential by 2030.

- **Double yields to improve farmer margins:** Doubling yields can increase farmer margins and bring India closer to global levels of yield and production. Mechanising sowing and harvesting, improving market access for high yielding seed varieties, and using drip irrigation in farms can increase yield. These will also reduce farmer costs and increase revenues. Currently, R&D,

technology invention and implementation operate in three separate silos. The National Agricultural Technology Mission could bridge this gap by providing farmers better access to technology and farm equipment.

- **Scale up the domestic market for animal feed:** India can work to increase private investment in the animal feed market. The rapidly increasing poultry industry in India could become the primary domestic consumer of soya protein. Soya and maize producers, along with players from the livestock industry, can tie up to meet this need and create mutually beneficial avenues that will push growth in both sectors substantially.
- **Promote soya as an integral part of a high protein diet:** As the cheapest source of protein in India at present, soya could be the natural choice of food to tackle malnutrition (Exhibit 11.6). Soya products like tofu, soya nuggets and soya milk, which have the potential to create a large market, could play a significant role to tackle India's nutrient deficiency. The government could consider including soya as a core ingredient in the mid-day meal programme and in the National Food Security Act schemes.
- **Brand soya oil for exports:** Guaranteeing traceability and non-GM usage will ensure that India sustains 20 per cent premium over the GM soya oils supplied by other countries.

Exhibit 11.6



* * *

If the farmers can improve yield, soya bean can potentially add more to their financial gain than most other crops by almost 1.5 times. The fact that soya bean is a high source of protein and has the potential to tackle India's nutrition deficiency is reason enough to encourage its cultivation. Many other consumers can also begin using soya-based foods to address their protein needs. Multiple products derived from soya bean, some of which can also be used as feed in the poultry industry, makes it a valuable waste produce as well.



Chapter 12

Poultry

Poultry is one of the produce categories that realised its potential through increased consumption. The industry also played a significant role in consolidating the upstream value chain by playing a dominant role in breeding and hatching. The consumption of poultry is closely linked to disposable incomes, and both have risen phenomenally in the last decade. This trend is set to continue as India's population becomes more urbanised and its buying power increases. The industry itself is already well integrated with the organised sector playing a major role. This too will increase as the industry works towards higher efficiency and better linkages.

India is currently the third largest producer of eggs (by weight) and the sixth largest producer of chicken meat in the world. India's broiler meat production has grown at a brisk 10 per cent, and egg production at 5 per cent over the last 10 years. As Exhibit 12.1 shows, the Indian market is still far from saturation vis-à-vis current per capita consumption—Indians consume only 2 kilograms of poultry per capita per year, whereas in developed countries like the US, annual per capita consumption is 50 kilograms.

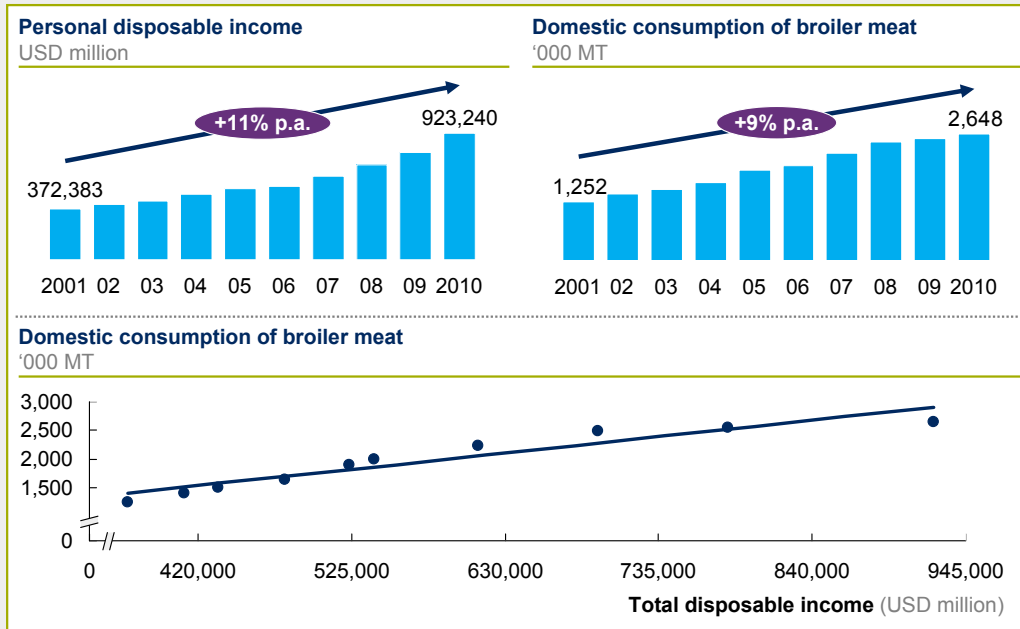
Exhibit 12.1



This robust supply growth is primarily because of growing demand, high availability and integration with the organised sector. The increase in per capita disposable income has led to an overall increase in food consumption, particularly protein in the form of meat and eggs. Exhibit 12.2 shows a strong correlation between domestic consumption of broiler meat and disposable income. In fact, both grew at about 10 per cent per annum over the period 2001 to 2010.

Exhibit 12.2

Broiler meat consumption has been driven by disposable income

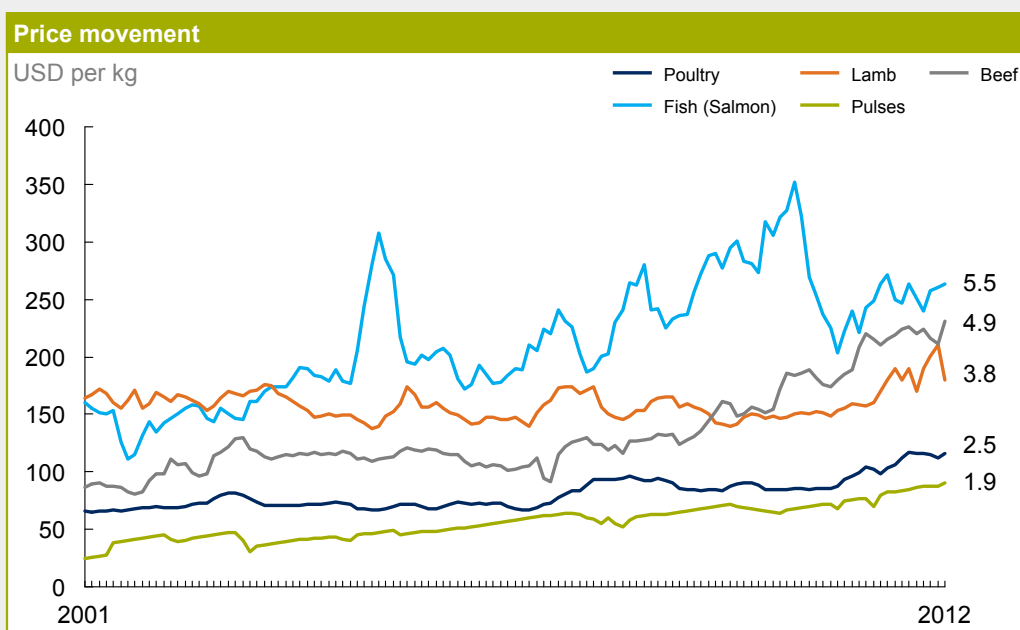


SOURCE: RBI; World Bank; FAOSTAT; McKinsey analysis

Poultry is also more easily available and better priced than other meats. Exhibit 12.3 shows that poultry has consistently been one of the cheapest priced meat per kilo. Also, it has the highest protein content among all alternatives, thereby making it one of the cheapest sources of protein available to Indians.

Exhibit 12.3

Poultry is cheaper than other protein sources per gram of protein

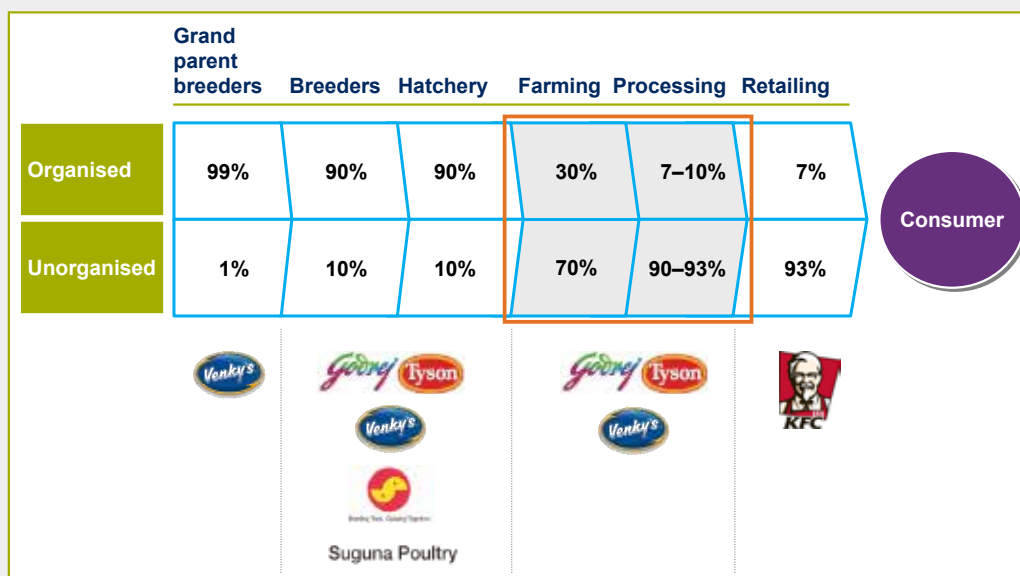


SOURCE: World Bank; USDA; WHO; McKinsey analysis

Players like Venky's, Godrej Tyson and Suguna Poultry control 95 per cent of the market. The value chain is highly integrated with these companies having a major play from the grand parent breeder stage, to breeders and hatcheries, and finally to broiler farms (Exhibit 12.4). Downstream, however, the value chain becomes more fragmented, with the unorganised wet market playing a larger role in retail.

Exhibit 12.4

The poultry industry faces the peculiar problem of lack of forward integration which leads to value loss, wastage and disease risks



SOURCE: Interviews; McKinsey analysis

CHALLENGES

The poultry industry faces challenges to both demand and supply. The threat of disease outbreak and consumer aversion to the frozen market affect demand from time to time. The rising cost of inputs, non-compliance with best breeding and rearing practices, and lack of forward integration in the industry are the other reasons that are holding back the poultry sector.

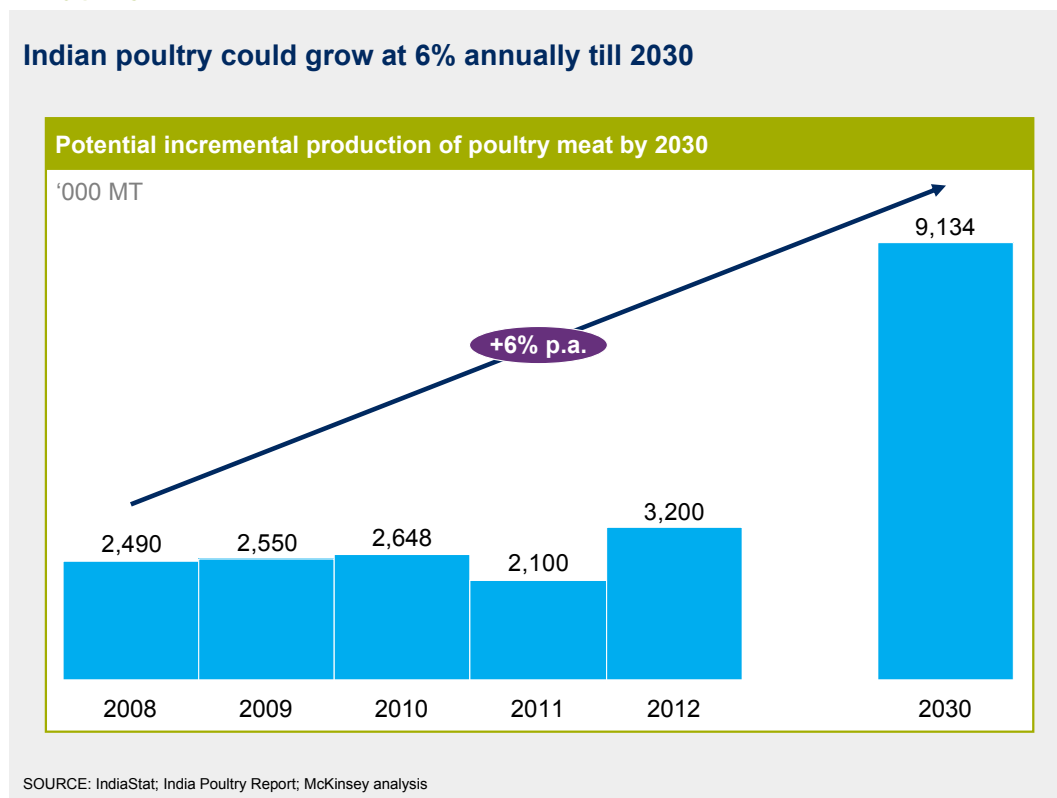
- Disease outbreaks pose the most serious challenge to poultry demand:** Avian influenza and other diseases have hurt poultry sales causing prices to crash. The United Nations' Food and Agriculture Organisation estimated a consumption decline of as high as 25 per cent in India after an outbreak of the virus in 2006. This caused prices to fall by 12 per cent. Toxins in chemicals and injudicious farm practices have also hurt bird health and hence the poultry economics. Quick detection of diseased birds and their isolation/treatment to prevent disease transmission could have avoided these losses.
- Consumer aversion to frozen food impedes rapid growth in the high value processed poultry segment:** Frozen meat is not perceived to be fresh enough. Furthermore, there is a cost difference between the wet market and frozen market. The frozen market constitutes just 5 per cent of the total poultry market in India and this stems from inadequate access. In comparison, over 60 per cent of poultry products are consumed in the processed form in developed countries like the USA. A reason for this is that, while there is better backward integration, there is a lack of forward integration in the industry. This causes value loss, wastage and the risk of contamination.
- The cost of feed is rising consistently:** This forms 70 per cent of input costs. Over the past 2 years, while feed costs have increased by 25 per cent per annum, prices have not kept pace, growing at only 13 per cent per annum. Any further increase in feed costs could affect the future profitability

of the industry and consumer prices. This will directly dilute the consumer proposition of an affordable protein and, in the long term, will impede the ability of the organised sector to invest in upstream capacity.

VISION 2030: ALTERING THE CONSUMER PROPOSITION

Poultry production in India is likely to grow at 6 per cent annually till 2030 (Exhibit 12.5). At this growth rate, production could increase from 2.5 million tonnes to 9 million tonnes in 2030. Higher disposable incomes will enable consumers to spend more on poultry.

Exhibit 12.5



By 2030, over 40 per cent of India's population will be urbanised and the number of working women is likely to double. This could significantly boost the market for frozen foods, including poultry products. With more emphasis on quality, safety, hygiene and with the advent of the modern format retail, the current wet market construct could adversely affect the consumer proposition for poultry. Hence, for poultry to continue as the attractive protein, the downstream value chain needs to be fundamentally restructured. The organised sector needs to play a more active role, moving from less than 10 per cent in processing to 30 to 40 per cent. This could be driven by consumers' increased desire to buy poultry which is processed, moving away from traditional wet market purchase.

ENHANCING RETAILING AND PROCESSING

The industry could forward integrate and make a strong play in retail as well as processing, address the rise of input costs, and increase service to the quick service/out-of-home eating business through targeted initiatives.

Create a compelling consumer proposition

- Quality is of utmost importance in poultry because of the fear of disease outbreak. The industry could institute a self-regulated quality mark, which will boost consumer confidence and help certify cleaner produce. This will help allay consumer fears.

- The industry could consider running focussed education campaigns on the benefits of processed chicken in terms of safety and hygiene.
- There is a need for continued dialogue with the government on open slaughter hygiene standards. The government could consider imposing stricter laws against open waste in order to curtail disease breakouts.

Invest in mega processing hubs for poultry

The government could examine the feasibility of investing in poultry zones with environmentally controlled sheds, which have continuous water and power supply as these could help curtail costs and increase yield. These environmentally controlled sheds could reduce cost by 30 per cent and enhance productivity by three times. In line with the demand servicing hubs initiative, poultry could be made the anchor produce in select hubs.

Enhance profitability

There is an opportunity to integrate the poultry and soya bean/maize industry to minimise input costs for the former and generate revenue sources for the latter. Three initiatives can help achieve this

- Develop a strong backend feed manufacturing technology with global standards to reduce cost and increase scale.
- Encourage investment in this part of the value chain to bridge gaps and enhance linkages in the soya, corn and livestock industries.
- Create a high quality competitive market for other smaller farmers who can purchase quality feed from large, integrated players.

In addition, industry could focus on servicing the fast growing quick service restaurants (QSR) and out-of-home eating business, especially in the Tier II and Tier III cities where the QSR chains have started developing.

* * *

India's move towards urbanisation, higher disposable income and branded frozen foods are set to bring higher returns to poultry farmers and better value food to the consumers. There is a clear opportunity for industry to shape the manner in which poultry is processed and consumed in India. The aspiration envisaged is of a safer, healthier and hygienic produce, which occupies a prominent place in the consumer's basket as a primary protein. There are also clear synergies between crops such as soya bean and a food category such as poultry. The industry would do well to put in place strategic tie-ups that can benefit both.



Conclusion

The recommendations and suggested courses of action in this report are rooted in building a robust agriculture sector that benefits all the stakeholders—from the farmer to the consumer—and puts India on the map as a global exporter of food. The 12-point programme could transform the sector and the welfare of all its stakeholders. Five principles could accelerate implementation. These are initial thought starters and would need further refining from the government, the industry and various other stakeholders.

- **Form enabler mechanisms:** The government could form four enabler organisations to implement mass scale changes—the national technology mission, the national sustainability mission, the mission for export promotion and world class agriculture universities. This can be done in three steps: (a) allocating sufficient funds for their creation in the next financial budget; (b) defining the mandate and infrastructure requirements of these organisations, in collaboration with the government ministries, industries and foreign expert universities; (c) tracking the performance of these organisations based on clear metrics and defined deliverables from the year of establishment.
- **Create enhanced governance for missions:** The proposed missions are critical for the success of the industry. The governance of the missions need to be in line with learnings for success which entails: (a) an empowered “professional or technocrat” leader; (b) adequate budgetary support; (c) freedom to build a world-class delivery team; (d) linkages and state-level sponsors identified upfront; and (e) a clear 5-year roadmap agreed upfront in terms of outcomes and expectations.
- **Empower stakeholders to oversee a national agriculture and food forum:** This could be done with participation from policy makers in the centre, state food and agriculture ministries and selected private invitees including farmer representatives. This group could recommend policy level interventions, reallocate resources and co-ordinate the collective planning required between the various central and state ministries.
- **Set up an empowered industrial food and agricultural council:** Organised with the help of industry bodies, this could include participation from the top 20 food and agriculture companies. This group could meet every quarter to oversee the implementation of initiatives by the participating companies on initiatives like an agriculture focussed fund, working with the various government organisations and creating more farmer linkages.
- **Build food and agriculture action committees in states:** Relevant state secretaries, top agriculture universities, farmer groups in the state and one to two private companies that have a prominent stake in the state could be the members. A representative of these committees could be present in the national committees and fora to ensure allocation of budgets both from the central and state ministries, and could monitor the implementation of the initiatives in the state. The central government could consider budgetary support of these action committees, linking fund committed to tangible outcomes or enabling viability gap funding for hard and soft infrastructure projects.

India’s potential as a global powerhouse of agriculture and food is a journey of two decades that begins now.

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