

BCG

REPORT

Indian Agribusiness

Cultivating Future Opportunities



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INDIAN AGRIBUSINESS

CULTIVATING FUTURE OPPORTUNITIES

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EXECUTIVE SUMMARY

DESPITE INDIA EARNING GLOBAL acclaim for its manufacturing and services sector, agriculture, which has been critical to the domestic economy, continues to be affected by many challenges that are hindering the sector from realizing its true potential.

Agribusinesses are estimated to contribute about 30 percent to India's gross domestic product, with the agriculture sector employing the largest proportion of the workforce (approximately 45.5 percent, according to a recent survey by the Labor Bureau). Agribusinesses continue to be a strong lever of growth for the Indian economy.

In fact, for thousands of years, agriculture and related businesses have played a crucial role in the socioeconomic development of the country. And even in the new millennium, when technology has touched every aspect of our lives, a majority of Indian farmers continue to deploy antiquated agrarian practices.

These practices, along with issues like spiraling inflation, burgeoning imports, and a multitude of challenges faced by the agricultural sector, pose a serious threat to the country's aspiration to emerge as an economic superpower.

The Boston Consulting Group (BCG) realized the need to highlight agribusiness opportunities for each element of the agriculture value chain — be it within products (such as food grains,

dairy, meat, and fruits and vegetables), inputs (like fertilizers, credit or crop insurance), farming practices, warehousing, logistics, food processing, or food retail.

The purpose of this report is to highlight a gamut of agribusiness opportunities in the Indian context. It showcases emerging business models for each of these opportunities, including models that have worked successfully in other economies as well as innovative models being launched by players in India. The aim is to learn from global best practices and adapt them to the Indian environment. The report aims to build on the various efforts undertaken in the past to resolve issues plaguing Indian agriculture. While it does not aim to be the last word on potential solutions to these issues, it does hope to start a discussion on them.

Unlocking the Potential for Agribusinesses in India

Agribusinesses are important to India for multiple reasons — such as, their contribution to the economy, the number of people they employ, strategic reasons of food security, providing raw material to other industries, generating demand for other industries, and in more recent times for inflation.

Agribusiness is the largest business in the country — significantly larger than other

businesses — and is growing rapidly. However, the potential to grow is even more significant.

There is a pressing need to focus on agriculture and develop agribusinesses. India has failed to sustain the momentum generated in the early years after Independence. The production growth of principal crops has declined over the past few years — from 3.2 percent p.a. over 1980–89 to 1.8 percent p.a. over 2000–09.

Food security is a major concern. Compared to global peers, India's productivity across crops is low. Growth in productivity has also been slower. This has stoked food inflation which could snowball into a crisis not very different from the one experienced in the mid-1960s.

Businesses and related infrastructure across the agriculture value chain are underdeveloped. The sector is unable to attract investment due to structural inefficiencies and lack of economically remunerative business models.

Product Landscape

The Indian agriculture industry can be classified into four major product groups — food grains, fruits and vegetables, dairy, and meat. Together, these product groups account for approximately 85 percent of private consumption expenditure on food. Amongst these, food grains have the largest share.

This report looks at different product segments and the opportunities therein. Each of these product categories has a different value chain applicable to them. Our report analyzes the value chain of these product segments to understand the nature of their inherent challenges and opportunities. It also examines the successful business models to have emerged within each of these product categories in India, as well as globally.

CEREALS AND PULSES — A HUGE BUSINESS OPPORTUNITY IN INDIA

India is the world's largest consumer of pulses, which are a major source of protein for the domestic population. Being a large country, India presents a sizable business opportunity in cereals and pulses; both categories that constitute a significant portion of local food consumption.

Cereals: The cereals market in India is worth approximately Rs. 3,000 billion and has been growing at an annualized rate of 3 percent for the last five years. Among cereals, rice and wheat account for almost 85 to 90 percent of the overall market — both in terms of value and volumes. Since the advent of the Green Revolution, India has achieved food sufficiency in cereals, and has had negligible imports.

Pulses: A variety of pulses are a major source of protein for a large proportion of the population. The pulses market in India is estimated to be worth approximately Rs. 550 billion and has been growing at an annualized rate of 4 percent since 2007. Bengal gram and tur are the most consumed pulses and have grown at a rate of 8 percent, and 1 percent, respectively, for the last five years.

Opportunities in food grains

There are four key dimensions where opportunities exist:

1. **Value chain reorganization:** This dimension primarily relates to inefficiencies on account of a large number of intermediaries in the value chain, resulting in escalations of retail prices. For some food grains, this spike can be as high as 18 to 22 percent of the retail price.
2. **Post-harvest management:** This aspect pertains to opportunities in reducing wastages through improved storage and integrated pest management. For example, some pulses have up to 10 percent wastages due to poor post-harvest management.
3. **Branding of food grains:** Opportunities related to branding across food grains need to be explored.
4. **Processed foods branding:** This dimension explores opportunities for branded retailing of secondary/tertiary processed products.

DAIRY — A LARGE AND ROBUST INDUSTRY

India is the world's largest milk producer (approximately 120 million tonnes in 2011). **The size of the dairy industry was estimated to be about Rs. 1,600 billion in 2009.** It is twice the size of the BPO sector, and is a source of income for millions of farmers.

Unorganized players account for nearly 75 percent of the entire dairy industry and dominate key segments like liquid milk, ethnic products, ghee, and yoghurt. A majority of the marketable surplus (about 70 percent) continues to be handled by the unorganized players, while cooperatives and private dairies handle only about 20 percent, and 10 percent, respectively.

The organized dairy industry is expected to grow at a compounded annual growth rate of 17 percent, from approximately Rs. 350 billion to Rs. 750 billion, through 2015. Select product segments like liquid milk, yoghurt and cheese are expected to register higher growth rates. Rising incomes and changing consumer preferences for processed dairy are expected to be the key growth drivers for organized dairy.

Key imperatives to succeed in the dairy industry:

- **Setting up backward linkages and managing procurement costs:** It is critical to provide sustainable dairy farming (breeding services, health care, etc.) and improve accessibility to feed and credit in order to increase productivity and reduce costs. Distribution of products (both fresh and chilled/frozen) remains a challenge, given India's geographic expanse and poor infrastructure. Fresh products typically require distributed manufacturing (own or contracted) as distribution costs become prohibitive. Moreover, distribution becomes unviable if products are manufactured centrally. A robust distribution network is also required for retailing or home delivery.
- **Manufacturing excellence to control costs and to produce ethnic products/variants:** Players need to increasingly focus on product innovation to cater to trends like the ongoing shift toward processed dairy products (including functional foods like fortified or pro-biotic dairy, ethnic products like *raita*, flavored cheese spreads, etc.). Innovations would also be required in packaging to effectively tackle poor storage infrastructure, Indian conditions, and buyer preferences for quantity.

MEAT — HIGHLY UNORGANIZED BUT PROMISING INDUSTRY

The Indian meat industry is estimated at about Rs. 500 billion, and is dominated by

bovine meat (approximately Rs.190 billion), followed by chicken (about Rs. 185 billion) and ovine meat (nearly Rs. 130 billion). The total meat production in India is estimated at about 6 million tonnes per annum.

The domestic meat market is dominated by the unorganized sector or the 'wet market', with a share of 80 to 90 percent. This is due to multiple factors including a higher preference for fresh meat, low penetration of organized retail (especially in the food segment), weak food safety norms, and high cost of cold chain infrastructure.

India is one of the key players in the buffalo meat export market. India's share in the global meat trade has been limited and is dominated by beef (8.3 percent share of global exports), while chicken exports are negligible. Buffalo meat has the highest organized presence, of approximately 22 percent, mainly on account of exports.

Empirical evidence indicates an increasing proportion of non-vegetarians in the Indian population. This trend is primarily being attributed to a rise in income levels being seen by the populace and relaxing social considerations associated with meat consumption.

Poultry has strong growth potential: Chicken is a low-cost, high-quality source of protein and holds the potential to bridge the 'protein gap' currently witnessed in the country. Poultry has strong export potential, too.

However, the key impediments to realizing this potential have been price competitiveness and quality issues which can be addressed through appropriate policy initiatives and private investments.

The overall meat industry is expected to grow at a CAGR of approximately 12 percent through FY 2015 and chicken is likely to overtake beef as the largest meat segment in India.

The organized segment is expected to grow at over 15 percent through FY 2015, to about Rs. 120 billion, due to increasing demand for processed meat.

Key imperatives for meat players to succeed:

- **Broader value chain integration** through feed manufacturing, contract farming, and veterinary care services holds the key to greater cost efficiencies and standardizing quality.
- **Scale and diversification in order to tap local and export markets effectively:** Apart from delivering economies of scale, larger operations reduce compliance costs on a per unit basis. Due to the steadily increasing Sanitary and Phytosanitary (SPS) standards, there has been an increase in compliance costs which can only be justified by large-scale operations.

FRUITS AND VEGETABLES — A LARGE AND GROWING MARKET

India is the second-largest market for Fruits and Vegetables (F&Vs), estimated to be approximately Rs. 3,100 billion in 2010. The share of fruits in the production has been in the range of 33 to 35 percent, with vegetables accounting for 65 to 67 percent.

Although the second largest market overall, India's per capita consumption of F&Vs lags behind other countries (On fruit, it is almost half that of China and a third of the US). Therefore as India's per capita consumption of fruits and vegetables increases, it bolsters India's importance as an F&V consumer.

The share of F&Vs in India's private final consumption expenditure on food has ranged from 26 to 28 percent in the past five years (FY 2005 to 2010). However, India is a marginal player in the global trade, as far as F&Vs are concerned.

Key imperatives for F&V players to succeed:

- **Improve farming output:** By closely working with the farmer, assisting him, and treating him as a partner, private players can help bring about better yields and quality of produce. Contract farming is an arrangement that has gained moderate acceptance but can be an example of more tight knit arrangements between farmers and corporations.
- **Create efficient supply chains, achieve scale and integrate:** Private players will benefit

by building efficiencies and reducing costs. This can be achieved by various means, such as bypassing the traditional intermediaries, which will help in reducing their sourcing costs and wastage levels, thereby bringing down the cost to the consumer. Private players also need to make substantial investments in cold storage, warehousing, ripening facilities, etc. in order to improve various supply chain elements.

- **Meeting quality standards for exports:** Indian F&V exports suffer because of their inability to meet international quality standards. Players in this space will have to overcome this challenge by partnering with farmers, making investments in infrastructure (such as port facilities, testing, and packaging), and by helping farmers achieve the requisite international certifications (typically, a precondition to export).
- **Increase processing levels:** F&V processing is a high-growth sub-segment. However, in order to realize its potential and succeed in this space, players will need to focus on critical areas such as tie-ups with large number of farmers, establishing processing facilities adjacent to farms, and tightly managing the entire chain to ensure strict control over costs.

Inputs

Agricultural inputs like seeds, fertilizer, pesticides play a critical role in extracting higher agricultural yield. The growth of Indian agriculture heavily depends on improving the quality and availability of inputs for the farmers. This report covers six key inputs—seeds, fertilizers, pesticides, credit, insurance and information.

SEEDS

The use of the right variety of seeds is essential to ensure high yield. The Indian seed industry has seen tremendous growth in the past and has become the sixth-largest seed industry in the world — it was estimated at about Rs. 70 billion in FY 2009 and is expected to grow to approximately Rs. 125 billion in FY 2015.

The industry is divided into varieties and hybrids. The public sector players are present mainly in varieties, with their private sector counterparts operating only in hybrids. Despite the success of hybrid seeds in cash crops, the penetration of hybrid seeds is limited and is currently estimated at about 25 percent of the total seed market in India.

There are stringent regulations preventing the introduction of Genetically Modified (GM) seeds. All non-varietal seeds need to be certified by the government prior to sale. Further, the sale of all GM seeds, except for cotton, is prohibited. As a result, the adoption of current hybrids is low.

Certain critical strategy enhancements would stand seed players in good stead. These include product development for a wider product portfolio and creation of an effective distribution network to increase adoption. Both these efforts would confer a stronger competitive advantage for the longer term.

FERTILIZERS

During the Green Revolution, chemical fertilizers were credited with significantly increasing wheat productivity by providing effective and balanced crop nutrition. Today, as stagnating agricultural productivity is impairing growth in food production, it is essential to take cues from the Green Revolution to resolve this issue in order to meet growing demand.

India's estimated fertilizer consumption in 2011 was about 28 million tonnes, with the figure expected to grow at about 8 to 10 percent per annum through FY 2015.

There is significant demand-supply gap, resulting in low usage of fertilizers. Even after nearly 65 years of Independence, availability remains the biggest challenge, impeding balanced and adequate use of fertilizers in India.

The usage of fertilizers in India is highly skewed in favor of nitrogen on account of high usage of urea. The higher usage of nitrogen-based fertilizers has led to the depletion of other soil nutrients and has impacted crop productivity.

The reliance on imports has grown considerably — at 24 percent CAGR. This is the result of lack of raw material supplies within the country for production. The new subsidy scheme is only a step toward improvement.

The country needs significant changes in the fertilizer industry. Fertilizer companies have long relied on subsidies to make profits. However, given the receivables challenges posed in any subsidy based model, it is imperative for companies to look beyond subsidies in order to build sustainable and profitable business models.

Going forward, in the new pricing regime, successful business models will be built on two critical factors — cost optimization through operating efficiencies, and effective sales models based on reduced cost-to-serve.

PESTICIDES

The use of pesticides is essential in protecting the crop from yield losses due to pest attacks, weed growth and diseases. It is estimated that approximately 40 percent of crop yield losses occur due to pest attacks, weeds and diseases.

The Indian pesticide industry is still fledgling compared to its potential as Indian farmers use low amounts of pesticides as compared to their peers in other countries. The use of pesticides is restricted to few crops. Consequently, the usage of pesticides is concentrated in the states that sow these crops. As a result, **pesticides are a highly fragmented industry.**

Research and development into GM seeds present a significant challenge for pesticides since GM seeds are resistant to key pests. Research into hybrids is also focusing on resistance to pests, in addition to yield enhancement.

The emergence of bio-pesticides as an alternative is also expected to impact the growth of the pesticide industry. In the future, factors like access to a wider production portfolio and a bigger distribution network will be critical to the industry's success. While a wider product portfolio is essential for better product lifecycle management, since pests develop resistance to specific pesticides over a period of time, a wider

distribution reach will ensure wider penetration of pesticides across the country.

CREDIT

Most Indian farmers have limited resources at their disposal and also have little or no disposable income for re-investment in their farms. Credit, therefore, is indispensable to the farmer in meeting the crop-cycle expenses. And the availability of credit is a key factor that will drive adoption of all other inputs. However, **only a third of Indian farmers presently have access to institutional credit.**

The disbursement of credit to farmers in FY 2011 stood at an estimated Rs. 3,750 billion. Agricultural credit in India is marked by low penetration and imbalances, based on the types of farmers and type of credit.

Small and marginal farmers, who are in the greatest need of credit, have the lowest coverage within the farmer base. The industry faces several challenges due to high risk, high transaction costs and low end-use monitoring.

Innovation in outreach and risk management is essential to propel growth in rural credit, and consequently, catalyze the adoption of quality inputs in agriculture. Spreading the risks across the system (such as by focusing on group lending, instead of lending only to individual farmers), expanding reach (through steps such as appointing business correspondents), and ensuring appropriate lending and usage (e.g. through in-kind lending models) are critical to break the sub-optimal credit cycle and drive credit growth.

INSURANCE

There are several risks associated with agriculture that make farmers even more financially vulnerable. Some of these risks, such as weather, are beyond anyone's control. Therefore, insurance is a key input required to help manage the fallout of these uncontrollable risks in order to reduce the risk profile of the farmer.

Insurance would also enable better access to low-cost credit and catalyze the adoption of other inputs. The penetration of insurance in

Indian agriculture is significantly low. But there is tremendous potential for growth.

The gross premiums in agri-insurance stood at about Rs. 7.5 billion in FY 2009 and can grow to almost Rs. 63 billion by FY 2014, if appropriate reforms are undertaken.

Indian products are designed as yield insurance as opposed to weather-linked insurance. Under yield insurance, farmers are compensated based on yield shortages, as opposed to occurrence of events-leading to moral hazard among farmers.

Poor weather data impedes design of insurance products often resulting in unviable pricing, resulting in losses and burden on the exchequer. Redesigning the existing products (by replacing yield insurance with weather insurance) and improving the pricing structure (moving insurance products to market-linked rates) are essential to ensure adoption of insurance.

INFORMATION

A farmer's decision to sow a particular crop or use a particular input is based on the limited information available to him. Access to quality information can assist the farmer in taking more informed and timely decisions. Similarly, they can use timely information to improve yield and realization.

There are three levers through which information can impact farmers' realization:

1. Richness and reach trade-off: Providing customized guidance, while maximizing the reach of such valuable information to farmers.
2. Providing information at the right time, especially with regard to precautions against unforeseen events.
3. Actionable and relevant content, as well as easy-to-use solutions.

It's important to develop revenue models beyond subscription revenues. Business models need to be driven by identifying cross- / up-selling opportunities rather than those based on charging significant amounts for providing the information.

CONVERGENCE PLAY

A key barrier across all inputs, low usage/adoption impacts not just the quality of the produce but also the yield per acre and the overall income generation for the farmer. However, there is a significant cost of outreach for distribution of these inputs. There is also the challenge of appropriate and timely advice on the usage of inputs. And that's why there exists a strong basis for a convergence play in agricultural inputs.

Convergence in input distribution would essentially entail expansion on the part of any of the other three players in the value chain, namely, input providers, distributors and output buyers.

A business model for convergence, which may be led by any of the afore-mentioned trio, can create a win-win scenario for all the stakeholders—the input providers, farmers, and the end-consumer. Convergence in inputs would also enable better understanding of the needs of the farmers.

The opportunity to leverage existing networks presents a rationale for distributors, whereas the ability to influence output quality and ensure consistent supply presents a rationale for buyers.

The report identifies four specific convergence business models—input provider as distributor, input provider as end-buyer, distributor-led model, and buyer-led model.

Farming

India has the world's largest agricultural land bank—at approximately 140 million ha — which is next only to that of the United States. However, India's average land holding is significantly lower, at only approximately 1.3 ha (compared to about 40 ha in the US). Moreover, its productivity is also much lower than that of its peers. This has serious implications for a country that has nearly 10 percent of the world's arable land but supports almost 17 percent of the global population.

This report identifies three key issues related to farming in India:

1. **Choice of crop:** A significant number of farmers in India engage in subsistence farming and do not grow crops that could fetch them higher monetary gains. They also rely on low-value crops like cereals.
2. **Cropping patterns:** Only 30 percent of land is sown more than once. Farm realizations improve significantly with increase in cropping intensity.
3. **Landholding:** The average size of land holdings has halved, from 2.3 ha in 1971 to almost 1.3 ha by 2009. This limits the farmers' income as well as the availability of funds, which in turn affect cropping patterns and agri-practices.

The report has identified three levers that can address the issues plaguing farming in India. These are:

- **Farmer aggregation:** This is a crucial means of addressing the issue of fragmented land holdings, and can help facilitate technology adoption, build scale and improve the bargaining power of farmers. There are multiple options available to aggregate farmers. These include producer cooperatives, producer companies and public limited companies. Amongst these, the producer companies offer greater farmer control and higher flexibility. There are strong incentives for both private companies and the government to organize producer companies.
- **Technology adoption:** Farming in India is marked by low mechanization, primarily due to fragmented landholdings that make automation unviable. For instance, tractor penetration in India stands at about 17 per 1,000 ha (compared to about 29 per 1,000 ha in the US).
- **Better irrigation coverage:** The steady increase in irrigation coverage over the last few decades notwithstanding, there is substantial scope for improvement. There are multiple approaches to increasing irrigation coverage, such as building water resources, implementing participatory irrigation management and adopting micro irrigation systems.

WASTELAND FARMING

Apart from approximately 140 million ha of arable land, **India has about 13 million ha of culturable wasteland**. If made culturable, wastelands can substantially increase agricultural production, generate rural employment, and create centers of excellence.

Three states — Rajasthan, Gujarat, and Madhya Pradesh — account for over 50 percent of these culturable wastelands. The concentration of such wastelands in three states should make it easier to bring them under cultivation.

The government can generate interest amongst private players through a long-term, lease-based model with policy support, by way of investment credit, tax exemptions and permission for direct farm sourcing. The land may be leased to both corporates and individual farmers, and a limit could be imposed on the usage of wastelands for non-farm activities such as for setting up processing units, roads, offices, etc.

Post-harvest Supply Chain

India's post-harvest supply chain is characterized by poor infrastructure, inefficiencies and high level of wastages. The estimated loss of agricultural produce due to these factors is about Rs. 500 billion to Rs. 600 billion every year.

WAREHOUSING INDUSTRY

India is faced with an acute shortage of warehousing capacity. With increasing demand for warehousing space, the shortfall is expected to rise to about 70 million to 80 million MT by 2015.

The warehousing industry in India is dominated by several unorganized players with low capacities and poor deploying, handling, stacking and monitoring facilities. Lack of power and specialized transportation to carry goods to and from warehouses leads to increased operating costs, making a stand-alone warehousing business economically unviable for the warehousing company.

The report recommends a three-stage expansion strategy for a new entrant in the warehousing industry:

- **Stage 1: Build a strong presence in a select geography.** A focused geographic approach will help the entrant build partnerships with banks and spot exchanges faster in order to ensure better profitability through allied services.
- **Stage 2: Expand footprint and offerings.** The player should expand its footprint to at least five to six states, and also leverage its assets to forward integrate into logistics, food processing, branding or retailing.
- **Stage 3: Build a strong pan-India integrated play.** The player must also target corporate customers and expand to other adjacent industries.

The success of a warehousing business is dependent on factors such as having multiple revenue streams (through a bouquet of services like collateral management, procurement, testing, etc.); developing deep understanding of the local ecosystem; getting into strategic tie-ups to ensure better asset utilization; and leveraging assets to exploit adjacent synergies.

LOGISTICS INDUSTRY

India's logistics industry is at an inflexion point. Strong overall economic growth, coupled with high growth in manufacturing, have thrown up a plethora of opportunities for the logistics sector which is **currently pegged at about Rs. 6,300 billion and** growing at around 12 percent for the last five years.

Third Party Logistics (3PL) is a concept where a single logistics provider manages end-to-end logistics for a firm. Confined presently to basic offerings, the 3PL industry in India is still nascent, with an estimated market size of around Rs. 40 billion to Rs. 50 billion. The sector is expected to grow at between 15 to 25 percent in the next five years.

A focused agri-based logistics business model will take time to evolve. Multiple companies are trying to capture the 3PL opportunity. Vendors like TCI and Safexpress, with huge warehousing and logistics assets, are attempting to enter the 3PL space in order to ensure improved margins and better asset utilization.

Food Processing, Branding and Retailing

For an agrarian economy like India, food processing is an important sector as it provides a strong link between agriculture and the end-consumer. **Food processing is a Rs. 5,500 billion industry** in India and has been growing at the rate of 10 percent for the last seven years.

At a global scale, food processing is a large industry with high levels of processing. In developed countries like the US, almost 60 percent of the food consumed is processed food. Several companies like Dole and Cargill have built large and profitable businesses in food processing.

The level of processing in each food category is very low in India, as compared to other developed nations. India accounts for just around 1.5 percent of the global processed food trade. **The Indian food processing industry is highly fragmented**, with 25 percent unorganized players, 42 percent Small-Scale Industries (SSI), and 33 percent organized players

The industry faces several challenges such as uncertainty related to availability, price and quality of raw material, inadequate infrastructure, preference for regional tastes, etc.

At present, **a large part of food processing comprises primary processing** of commodities with limited value addition. Most of these businesses are operating at cost-plus basis with small margins. In order to bolster margins, it is important to forward or backward integrate businesses. Also, there is a need to move toward secondary processing with a unique value addition in order to differentiate the product and to charge a premium.

Profitability of value-added processing players varies widely, depending on the level of processing. Commodity players (like those that produce F&Vs, mushrooms and herbs) primarily focus on volumes with lower margins, whereas value-added products like edible oil and cereals attract higher margins, but lower volumes.

Many Indian players are making inroads to tap the opportunity. Large players like ITC have forayed into the processing of multiple commodities such as spices, grains, coffee, marine products. Players like Ruchi Soya have built a large-scale, oil processing set-up with complete backward integration.

Different food processing companies follow different business models. The choice of value chain segment plays a critical role in determining the success of a food processing business. For instance, ITC has invested heavily in setting up e-chaupals for direct procurement of raw material for its atta and spices business. ITC has presence in different parts of the value chain.

Similarly, Pepsi is involved in contract farming for potatoes to procure a particular quality input for its chips. Through contract farming, Pepsi is providing the required seeds, fertilizers and other inputs to farmers so that it sources the desired quality of produce.

Crop selection is the most important criterion in deciding the level of forward or backward integration. The success of a food processing business is dependent on several factors — proximity of the food processing industry to raw material inputs; a low-cost structure (especially in primary processing for commodities, which is typically a low-margin, high-volume game); differentiability of finished products (specific and more value-added products command premium); and assured consumption centers (such as downstream linkages to wholesale, retail or export markets that assure revenue).

Synthesis and Implementation

India needs to focus more on agriculture and agribusinesses in order to achieve inclusive growth. Significant gains can be made by removing the current inefficiencies that are present in our agri-sector.

The report lays out a vision for the year 2020 for Indian agriculture. The sector needs to be transformed by an era of robust growth that is driven by:

- **Strong growth in Indian yield levels, and hence overall output:** The increase in output

should be as much as 30 to 40 percent for cereals and fruits and vegetables, and 100 percent for meat, oilseeds and pulses.

- **Greater share of commercial crops:** Land under commercial crops should rise to 35 to 40 percent from the current level of 32 percent, increasing share of high value crops.
- **Higher food processing levels:** Quantum leap in the levels of processing (for example, 20 to 30 percent in fruits and vegetables, and 40 to 50 percent in dairy).

Currently, the agricultural yields in India are woefully behind global levels due to poor crop variety, lack of modern technology and farming practices, as well as dearth of irrigation. There is substantial potential to raise yields and output. For instance, the scope to increase output is approximately 20 to 30 percent in cereals and over 100 percent in pulses and oilseeds.

Increase in yield will free up land, making it available for high-value crops (such as horticulture and cash crops like cotton and tobacco). Today, 32 percent of the land is available for cash crops. There is scope to increase this to 35 to 36 percent. The consequent increases in production of high-value crops will supplement the existing incomes of farmers.

VISION FOR FOOD PROCESSING

While the food processing industry in India is far behind its global counterparts, this report outlines a vision for it to go through a sea change by 2020. This change will be underpinned by:

- Higher government support
- Establishment of infrastructure
- Entry of private and organized players
- Greater demand for convenience foods

The step change in the agri-sector will be the primary driver behind the growth of our agri-GDP, which will expand at a sustained rate of 5 to 6 percent to reach about Rs.17,000 billion in size by 2020. This would also have a spillover effect on the entire agri-business industry,

which will contribute about Rs. 36,000 billion to the overall GDP by the end of this decade and help India register an economic growth rate of about 8 percent by 2020.

GOVERNMENT SUPPORT IS REQUIRED IN MAKING THIS HAPPEN

Political will and cooperation have been a critical component of all agricultural 'revolutions', and will play a key role even now, in order to bring about the next revolution. Here are some imperatives for the government.

Liberalize procurement for standardization; allow free interstate movement of agri-commodities: There is an urgent need to standardize and ensure the implementation of the Agricultural Produce Market Committees (APMC) Act. The Essential Commodities Act should also be scrapped to allow free interstate movement of commodities.

Reform Minimum Support Price (MSP) norms to provide fair remunerative incomes. Procurement at MSP should be done only when prices go below the MSP. Also, quantities enough for buffer stocks and social schemes should be procured—and that too, at market prices. A fair and remunerative price will encourage farmers to shift to pulses and also invest in irrigation.

Redesign subsidies to ensure sustainable use of inputs: The current subsidy schemes encourage indiscriminate use of inputs like power, water and fertilizers. These could be redesigned to encourage judicious usage without impacting productivity or costs.

Link agri-credit to crop insurance to manage default risks: Cost-effective and efficient insurance schemes can encourage banks to provide credit which allows farmers to invest in farm productivity, thereby creating a virtuous cycle. Reforms are also required in agriculture lending practices to ensure that small and marginal farmers have access to credit.

Promote edible oil production: India imports approximately 50 percent of its edible oil requirements, with palm oil constituting the majority (about 80 percent). With stagnating oilseed production, the deficit (in edible oil)

is likely to be met by palm oil, which in turn will result in a burgeoning import bill. Therefore, the government needs to take the following steps:

- **Provide plantation crop status to palm oil:** This will allow private players to make the required investments in irrigation and processing infrastructure, thereby increasing yields.
- **Encourage extraction of edible oil from non-edible sources** such as rice bran.

Launch a National Awareness program to promote best practices: A cohesive national awareness drive involving research institutions, state administration and the private sector is required to increase awareness of best practices in farming. Practices like Systems of Rice Intensification (SRI) have already delivered a 20 to 50 percent increase in yields, and should be encouraged.

Promote land aggregation measures: Fragmented land holdings in India are an impediment to agricultural extension. This can be overcome through land aggregation via lease-based models that zealously safeguard the land ownership rights of farmers. The government must also take steps to encourage contract farming and producer companies. Moreover, wasteland development should be used to pilot commercial farming (more than 500 ha) in order to leverage India's cultivable wasteland. Towards this, business models with greater farmer participation are likely to be more successful.

Promote R&D investments in hybrids and develop a process for GM seeds: The government needs to focus on local development of hybrids suited for Indian conditions, by setting up a dedicated fund to promote R&D and by introducing R&D cost subsidies to encourage private participation in the process. A world-class safety standard and approval process should also be put in place to fairly test GM seeds.

IMPERATIVES FOR THE PRIVATE SECTOR:

Private players have as much a role to play to ensure growth in the agri-sector as the government. Outlined below are some

initiatives that the private sector needs to take:

Develop innovative models such as those based on convergence of agri-inputs: Large white spaces exist across the agriculture value chain. Therefore, business model innovations will play a key role in bringing about the next revolution in agriculture.

Customize and transfer best-in-class practices from other nations: Relatively smaller countries like Egypt and Israel have developed agri-practices that have enabled them to enjoy world-class yields in many crops. India has a lot to learn from other countries and the private sector can play an important role in customizing and transferring such best-in-class practices to India.

Undertake joint R&D with government bodies: Private players would do well to seek out opportunities for joint efforts with state agricultural universities and research institutes.

Public Private Partnership model: Both the government and the private sector can join hands to provide the much needed growth platform to Indian agriculture. This can be done through the following PPPs:

- **Agri-parks:** Establishing agri-parks through PPPs could stimulate agricultural productivity and address key inefficiencies. The government should focus on ensuring the availability of critical inputs and access to information and best practices in these agri-parks. The private sector would make investments in storage, processing infrastructure and provide forward marketing linkages (for example, exports). It is important to note that agri-parks would not result in transfer of land ownership.
- **Agri-zones:** These will be geographically demarcated zones comprising key producer states of a certain crop. Such zones will have two objectives: (a) Improving production by offering an enabling infrastructure, agricultural extension, and focused R&D support; and (b) Addressing market failures by enabling private investments and improving the regulatory framework.

IN conclusion, the extent of food shortages projected in 2020, mass social unrest, spiralling inflation and burgeoning imports pose a very real threat to the economy. However with some changes, Agribusinesses could become a strong growth engine for the Indian economy. Majority of the changes required to avert this situation are institutional in nature and will not happen overnight. Through the adoption of new and emerging

business models in almost each element of the agribusiness landscape, stronger partnerships across the value chain as well as use of technologies, India will be much better placed in terms of the capabilities required to change its course. This report should thus be viewed as a call for action to all stakeholders. Agribusinesses represent a unique business opportunity and should become a priority focus area for them over the next decade.

NEED FOR AGRICULTURAL REFORMS

India and Agriculture

Agriculture has played a critical role in the Indian economy and society for thousands of years. We can find evidence of its importance even in 3000 BC, during the Indus Valley Civilization, when sophisticated irrigation and water storage structures were built. The Kallanai, an ancient dam built on the Kaveri River, around the first century AD, is considered the oldest in-use water regulating structure in the world.

In fact, agriculture is deeply ingrained in the Indian cultural ethos. Several rituals and festivals, and many beliefs and traditions revolve around agriculture and farming patterns. For centuries, India has been known for its variety of food and non-food produce that ranges from wheat, rice, pulses, fresh fruits, vegetables, spices, oilseeds and tea to rubber, tobacco, coconut, and cashews.

Since medieval times, agriculture has remained the predominant occupation of the populace. It satisfied a village's food requirements, besides providing raw materials for industries like textile, food processing, and crafts.

During the late middle ages, till the start of colonial rule, construction of water works and improvement in irrigation techniques brought about economic growth. The colonial era was not particularly good for agriculture. It saw frequent famines. The growth rate in food

production during 1900 to 1947 was hardly 0.1 percent per annum. The country gained Independence a few years after the Great Bengal Famine (1942 to 1943), so the agricultural scenario, post-Independence, was quite challenging.

Decades after Independence, agriculture has remained the mainstay of the Indian economy. Post-Independence, the government launched special programs to improve the supply of both food and cash crops. The Grow More Food Campaign (1940s) and the Integrated Production Program (1950s) focused on the supply of food and cash crops, respectively. These initiatives were followed by five-year plans that focused on agricultural development.

The agricultural history of India, post-Independence, can be divided into four phases: 1947 to 1964, 1965 to 1985, 1985 to 2000, and 2000 till date.

During the first phase, emphasis was on the development of infrastructure for scientific agriculture. Major developments during this period included the establishment of fertilizer and pesticide factories, and construction of large multipurpose irrigation-cum-power projects. During this period, India's population grew at the rate of over 3 percent per annum. The growth in food production was inadequate to meet the consumption needs of the growing population and food imports became essential. The food

situation in India during the mid-1960s had become precarious. About 10 million tonnes of wheat was imported annually — against a production of 12 million tonnes — from the United States. William and Paul Paddock, in their book *Famine 1975*, predicted a famine in India in 1975 that would wipe out millions.

India responded to the challenge by reorganizing research and undertaking agricultural activities on a large scale (by setting up of over a thousand demonstration farms). This second phase saw the creation of institutions to provide farmers with assured marketing opportunities and remunerative prices for their produce. All these steps led to a quantum jump in the productivity of crops such as wheat and rice, a phenomenon christened the Green Revolution in 1968.

The Green Revolution generated a sense of self-confidence in India's agricultural capability. The country's food grain production had steadily increased by 1975, and the famine (predicted by the Paddock Brothers) never occurred. It was the political will and execution that enabled this transformation. The efforts continue to bear fruit today (see Exhibit 1.1).

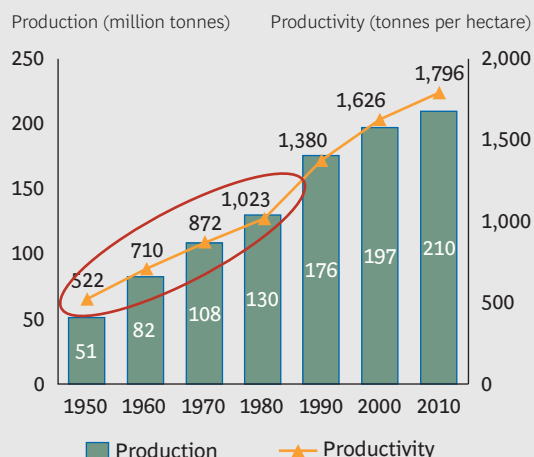
To put the progress since 1950 in perspective — food grain production has increased four times; horticulture¹, and oilseed and milk production is up six times.

The third phase (1986 to 2000) was characterized by greater emphasis on the production of pulses and oilseeds, and of vegetables, fruits, and milk. Organizational initiatives like Technology Missions were introduced, resulting in a rapid rise in oilseed production. Rain-fed areas and wastelands received greater attention. This period ended with large grain reserves with the government, and the media highlighting the co-existence of “grain mountains and hungry millions”. This phase also witnessed a gradual decline in public investment in irrigation and infrastructure, essential for agricultural progress, as well as a gradual decline of the cooperative credit system.

The fourth and current phase (2000 till date) has been a challenging one for the Indian agricultural sector. This period has seen a virtual stagnation in food grain production. The average productivity of wheat and rice has grown at less than one percent per annum.

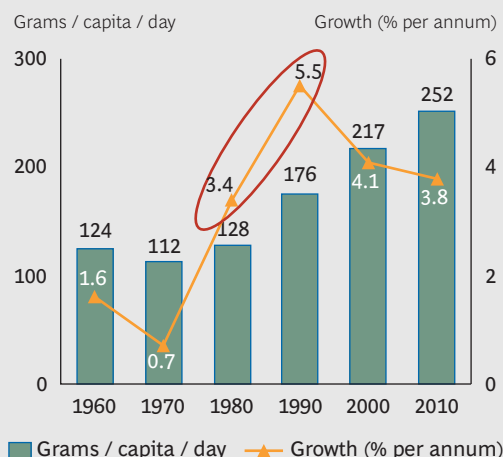
EXHIBIT 1.1 | Snapshots of progress in Indian agriculture

Green Revolution created sufficiency in food grains



Resulted in ~4x growth in production and productivity of food grains

Operation Flood gave India a pole position in milk



India world's largest milk producer, availability close to global average (~280 grams)

Sources: Ministry of Water Resources, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture.

From farmers' perspective, the situation is even more challenging — forty percent of the farmers would quit farming, given an alternative².

It is difficult to overstate the importance of agriculture in India. After sixty five years of Independence, India continues to be a large agrarian economy, with a majority of the population still dependent on it for their livelihood. Despite liberalization, and the growth in services and manufacturing, the role of agriculture remains vital to the overall development and well-being of the nation.

Accounting for a little over 15 percent of gross domestic product, and employing the largest proportion of the workforce (about 45.5 percent according to a recent survey³ by the Labour Bureau), agriculture remains a strong lever of growth for the Indian economy.

The Need for Immediate Action

India has failed to sustain the momentum generated in the early years after Independence. The period post-2001 has been *“characterized by policy fatigue, resulting in technology extension and production fatigues”*⁴. The growth in production of principal crops has declined over the past — from 3.2 percent per annum over 1980 to 1989 to 1.8 percent per annum over 2000 to 2009. Compared to global peers, India's productivity across crops is low. This has stoked food price inflation.

Food Security: The World Food Summit of 1996 defined food security as existing *“when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life”*.

India is the second most populous nation in the world. From approximately 1.2 billion people today, India's population is expected to grow to nearly 1.3 billion by 2020. Ensuring food security becomes a challenging task, especially with increased nutritional intake, greater urbanization, and stagnant (or declining) cultivable area.

With stagnating production and increasing demand, guaranteeing food security will become challenging. Our estimates suggest that India could face an acute food shortage of

almost 50 million tonnes by 2020 (see Exhibit 1.2), assuming no change in the trajectory of food production. Oilseeds and pulses would be the worst hit with a supply deficit of 67 percent and 55 percent, respectively. The deficit in rice and wheat is expected to be lesser (unless compensated for by increases in imports, or a significant improvement in production levels).

To bridge this deficit, India will need to import food worth about Rs. 4,500 billion — nearly 2 percent of India's estimated GDP in 2020. Food price inflation, already a worry for policy makers, could inflict more damage. Stagnating rural incomes will also create externalities, including migration to urban centers for employment. This will further strain the already-under-stress urban infrastructure. Finally, the widening income disparity between the non-agrarian and agrarian segments could cause social unrest. Status quo in agriculture is definitely not an option.

AGRIBUSINESS

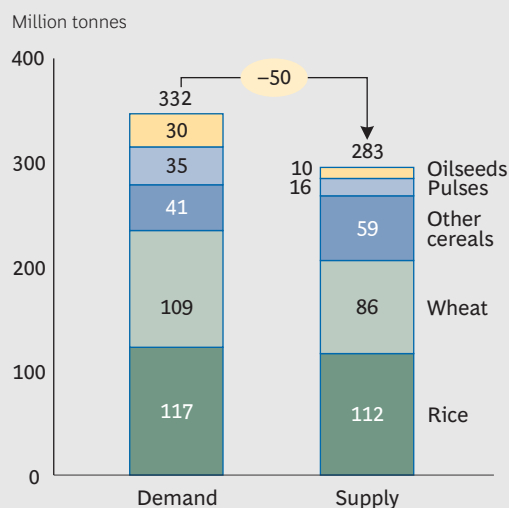
Agribusiness is currently the single largest sector in India, worth nearly Rs. 17,000 billion, nearly 60 percent larger than the next largest industry — financial services (see Exhibit 1.3). With economic development, India needs to focus more on agribusiness — a generic term for the various businesses involved in food production, including farming and contract farming, seed supply, agrichemicals, farm machinery and equipment, wholesale and distribution, processing, marketing, and retail sales. In the future, agribusiness will have a much larger role to play in the growth of this sector.

Agribusinesses are estimated to contribute approximately 25 percent to India's GDP, with the manufacturing and trade components. Agribusiness has grown steadily in the last few years and is expected to sustain the pace over the next five years. The agribusiness segment is expected to nearly double by 2020, driven by growth in per capita consumption and changes in consumer preferences toward value-added and processed foods.

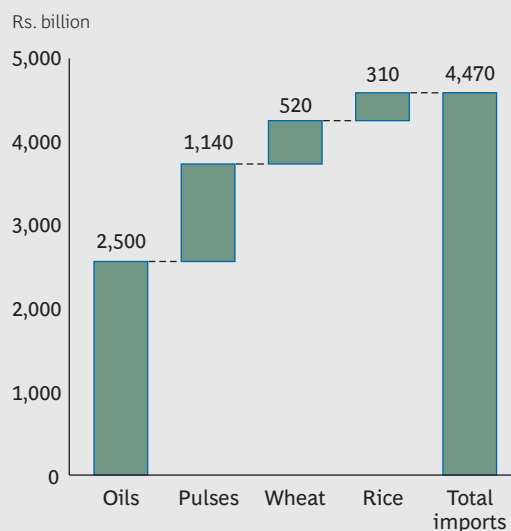
Globally, agribusinesses are much larger than agriculture. For instance, the ratio of agribusiness to agriculture segments in the United States and Brazil is approximately ten, and four, respectively. The corresponding ratio

EXHIBIT 1.2 | Food crisis in Indian agriculture

Food shortage of ~50 million tonnes in 2020...



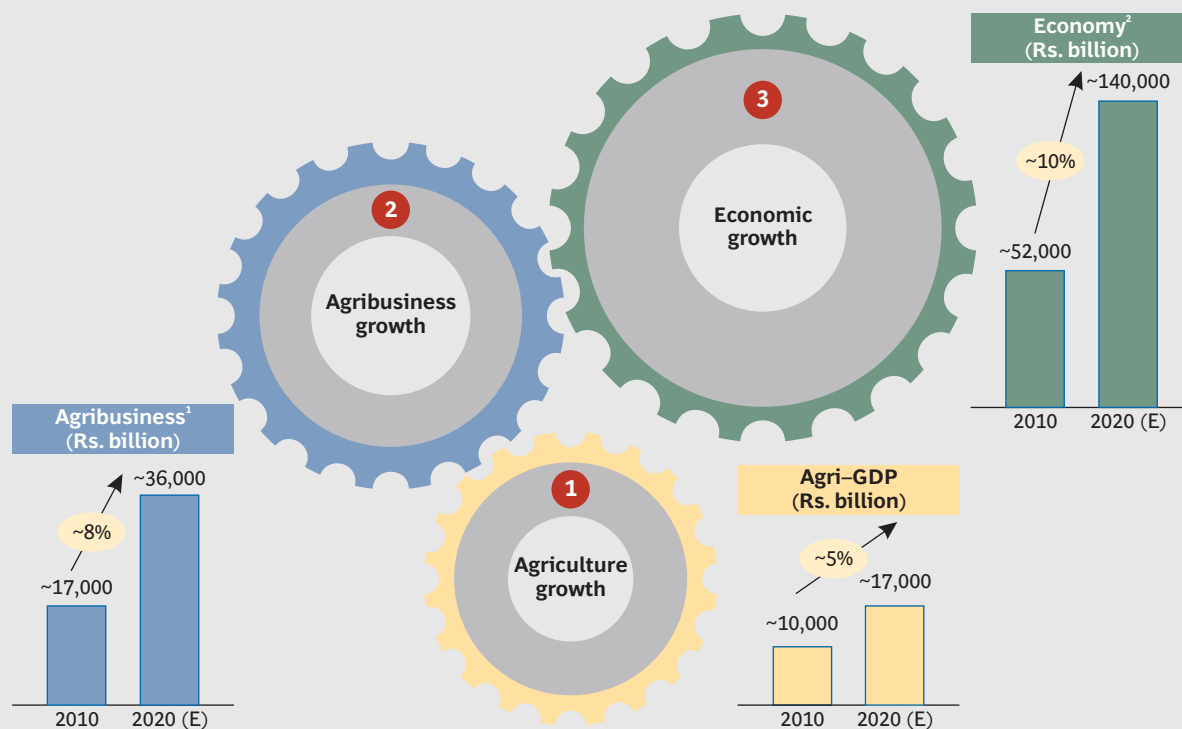
...leading to imports worth ~Rs. 4,500 billion (~2% of GDP)



Sources: Directorate of Economics and Statistics, Ministry of Agriculture, SEA of India, EIU, BCG analysis.

Note: Demand projected assuming increase in per capita consumption at historic rate. Value of imports calculated assuming import price inflation of 10%; value of imports could increase if inflation levels reach those between 2007 and 2010 (CAGR ~15%).

EXHIBIT 1.3 | Estimated size of agribusiness by 2020



Sources: Datamonitor Agricultural products in India, India Brand Equity Foundation, World Economic forum, NCAER, RBI database on Indian economy, BCG analysis.

Note: Fixed exchange rate of Rs. 45 to 1 US\$ taken.

¹Does not include non-food cash crops such as jute, cotton, tobacco; includes only food crops — cereals, pulses, oilseeds, F&V, sugar, tea, coffee etc.

²Assuming industry and services grow along historical growth rates of 9% and 10% respectively (observed over 2005–10 period).

for India is estimated at approximately two. Thus, a strong agricultural production base is the bedrock for growth of agribusinesses, which can then contribute significantly more to the economy. While India's production of key commodities is high, the marketable surpluses are low. For instance, the proportion of wheat, rice, and milk marketed is approximately 60 percent, 75 percent, and 50 percent, respectively, primarily due to the high prevalence of subsistence farming. This limits the potential of agribusiness, and brings into sharper focus the need to address productivity issues and inefficiencies.

Indian agribusiness has been growing at the rate of 10 percent per annum over the last five years, reaching Rs. 17,000 billion currently. However, it has the potential to become a Rs. 36,000 billion segment by 2020, thereby paving the way for a 'New Revolution'. In addition to economic growth, agribusinesses like food processing will also create rural employment and stem urban migration.

Need for a New Revolution

There is an urgent need to relook at agriculture in India, both from an opportunity, as well as a threat perspective. Current productivity levels in India are significantly lower compared with global standards. For instance, Indian farmers on an average produce 2.9 tonnes of rice per hectare, lower than the global average of 4 tonnes — and significantly lower than the 10 tonnes produced by their peers in Egypt. Similarly, for oilseeds, India's average per hectare yield of 1 tonne pales in comparison with the global average of 1.6 tonnes pales (with Germany enjoying a superior yield of 3.7 tonnes pales).

There are several factors behind this low productivity, ranging from poor agriculture infrastructure and post-harvest supply chain to poor agricultural practices, lack of appropriate finance, poor use of resources, highly fragmented landholdings, etc. Comparisons with other countries underscore the fact that there is ample scope for improvements in productivity.

There is an imminent need to establish an ecosystem conducive to the rapid growth of

Indian agriculture. While acknowledging previous efforts such as the Green Revolution and Operation Flood that were intended to revolutionize Indian agriculture, it must be noted that those revolutions focused on a single crop and on a specific region. The focus now needs to shift toward holistic and sustainable growth of agriculture. This is a daunting task, given the complexity of dealing with multiple crops, sustainability issues, complex value chains, and the need to accommodate legacy issues. Today, however, India has a robust and resourceful private sector. Collaborative efforts with the private sector and political will can address this challenge.

Clearly, the time to act is now. If the country doesn't take the right steps to bring about a 'New Revolution' in agriculture, it may face on one hand, the threat of inadequate food availability, and on the other, miss the opportunity to leverage the potential for agribusiness. In order to mitigate this risk, the country would have to rely on imports and spend precious foreign exchange (amounting to nearly 2 percent of GDP).

One of the challenges in this New Revolution is to set out an appropriate baseline upon which improvements may be carried out and measured. Apart from seeking to provide that baseline, this report analyzes issues and solutions across the agriculture landscape, with a special emphasis on 'getting it done'. There is ample scope for converting agriculture into an opportunity. India has one-tenth of the world's arable land — at 140 million hectares⁵ — more than that belonging to China and second only to the United States. With the advent of the Green Revolution, India attained food self-sufficiency, followed by a growing stock of surplus food grains by the mid-1970s. The Green Revolution preceded the White Revolution, Yellow Revolution, and then the Blue Revolution, which led to an increase in the output of milk, oilseeds, and fish and fish products, respectively. In other words, the task is achievable.

Alongside the challenges in agriculture, India also needs to focus on agribusiness. This will not only help in employment generation but also in the creation of small businesses. A greater focus on agribusiness will also ensure

that the benefits of high growth in the manufacturing and services sectors trickle down at a much faster pace to agriculture.

Purpose and Coverage of the Report

The purpose of this report is to bring together various issues and challenges across agricultural products and value chains, and to highlight opportunities for agricultural businesses in India. This report aims to build on top of other efforts in the past, to resolve issues in Indian agriculture. It aims not to be the last word on the potential solutions to these issues, but to trigger a meaningful discussion about them.

Our report begins with an analysis of key agricultural products such as fruits and vegetables, food grains, and dairy, which constitute the bulk of Indian agricultural sector in value terms. The value chain of each of these products is analyzed in detail to understand issues / challenges, and identify the underlying business opportunities. Following this is an in-depth discussion on each of the value chain

elements of agriculture — inputs, farming or production, post-harvest, food processing and retailing — and the issues there in. We have also highlighted several inherent opportunities within each part of these value chains. Finally, as implementation has been a major roadblock in the past, we identify models for the corporate sector and the government to overcome these hurdles.

We have also highlighted global success stories across the report. While these case studies may not be uniformly implementable in India, they demonstrate the potential impact of business model innovations in the agricultural space.

NOTE:

1. Primarily fruits and vegetables.
2. <http://www.hinduonnet.com/af/india60/stories/2007081550320900.htm>
3. Employment and Unemployment Survey (2009–10), Ministry of Labour and Employment, Government of India.
4. “The Crisis of Indian Agriculture”, M. S. Swaminathan, The Hindu, August 15, 2007.
5. Ministry of Agriculture, Government of India.

PRODUCT LANDSCAPE

SEVERAL OPPORTUNITIES EXIST FOR stakeholders to participate in a range of agricultural products. We believe that the scale of the opportunity will render this to be beneficial not only for the Indian consumer, but also for corporate entities as well as governments. Availing these opportunities requires a deeper understanding of the value chain of each of these products, and diagnosing the inefficiencies that lie within them.

Introduction

The Indian agriculture industry can be classified into four major product groups — food grains, fruits and vegetables, dairy, and meat. These product groups together account for approximately 85 percent of private final consumption expenditure on food (see Exhibit 2.1).

Within these segments, the biggest share is that of food grains, followed by fruits and vegetables, dairy, and the meat and poultry segment. Each of these product categories is quite distinct, with different value chains applicable to each of them. This chapter analyzes the value chain applicable to each product group to understand the nature of related challenges and opportunities. This chapter also analyzes the successful business models existing under each of these product categories within India, and globally. Each product category is presented as a sub-section

within this chapter. Within each category, a detailed analysis is performed based on the following parameters:

1. **Industry landscape:** To understand the characteristics of the market, in terms of size, players, and product sub-segments, and track the key consumption and supply patterns.
2. **Opportunity:** To identify the growth drivers and the future size of the market.
3. **Key challenges / imperatives:** To identify potential challenges, so that both policy makers and private players realize the full potential of the opportunity.

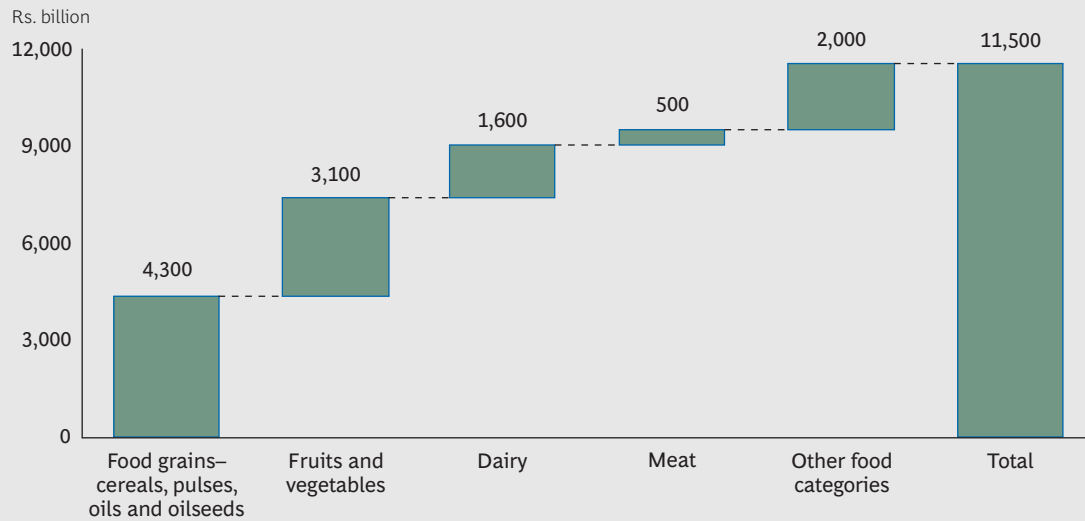
Food Grains Market in India

INDUSTRY LANDSCAPE

Being a large and populous country, India presents a significant business opportunity in cereals and pulses — a category that forms a major portion of domestic food consumption. The country's cereals market is worth approximately Rs. 3,000 billion, and has been growing at an annualized rate of 3 percent for the last five years (see Exhibit 2.2). Among cereals, rice and wheat account for approximately 85 to 90 percent of the overall market, both in terms of value and volume. Since the advent of the Green Revolution, India has achieved food sufficiency in cereals with negligible imports.

EXHIBIT 2.1 | PFCE break up for food categories 2009–10

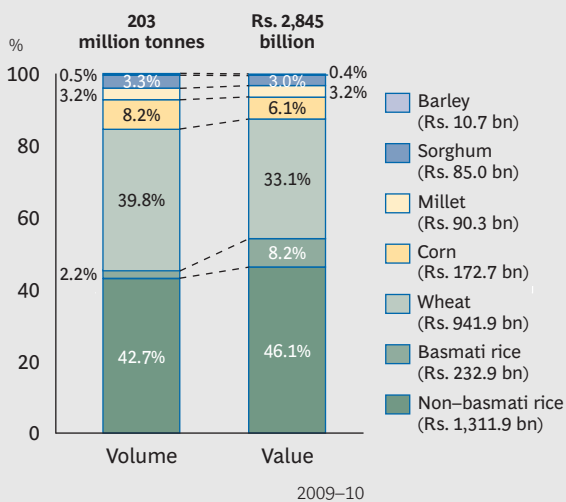
Private final consumption expenditure — 2009–2010 (food category)



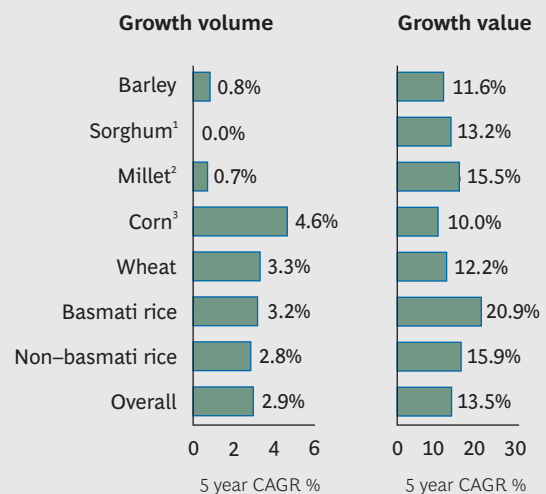
Sources: CSO, MOSPI and GOI.

EXHIBIT 2.2 | Cereals market landscape in India

Rice and wheat most consumed cereals — both in volume and value terms



Consumption of corn, wheat and rice growing at a steady rate



Domestic production satisfies consumption requirements; ~0.01% is imported

Sources: indiaagristat.com, FAO, USDA FAS (PSD online), Way2Health Indian Food Processing Industry Report.

¹Sorghum = Jowar.

²Millet = Bajra & Ragi.

³Corn = Maize.

India is one of the world's major consumers of pulses, with a variety of pulses representing a primary source of protein for the bulk of the domestic population. The pulses market in India is estimated to be worth approximately Rs. 550 billion, growing at an annualized rate of 4 percent for the last five years. As illustrated in Exhibit 2.3, Bengal gram and *tur* are the most consumed pulses, growing at the rate of 8 percent and 1 percent, respectively, for last five years. Although peas and beans currently account for only 15 percent of the overall consumption of pulses, their share has been growing at the rate of 20 percent for the last five years. The supply of peas and beans has not been able to keep up with the steep increase in demand, leading to heavy imports. Almost 99 percent of the peas and beans consumed in India are imported, and account for approximately 60 percent of the total import of pulses.

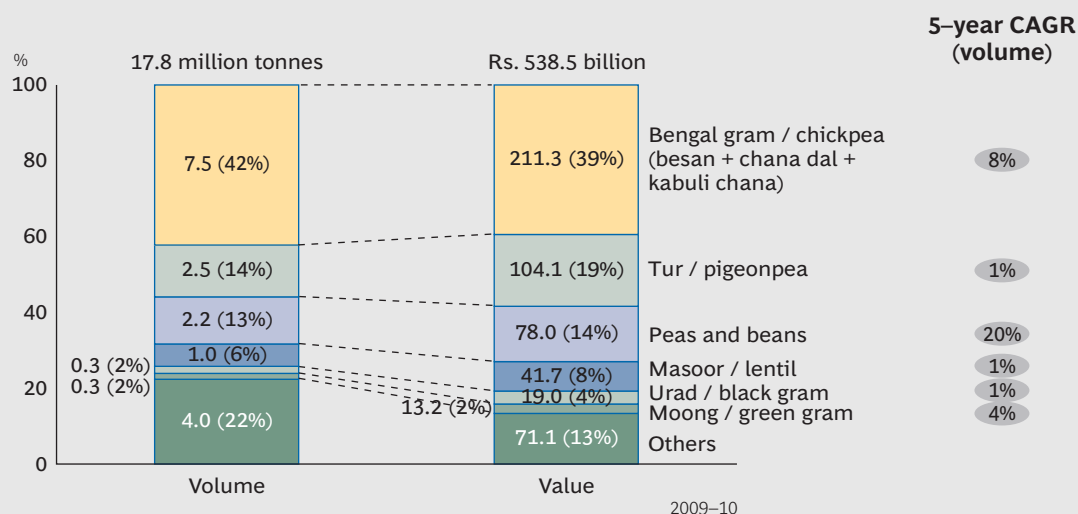
OPPORTUNITIES IN FOOD GRAINS

There are four key dimensions where opportunities exist in the food grains space. The magnitude of the opportunity along each dimension varies for different food grains.

1. **Value chain reorganization:** In the food grains space, multiple intermediaries exist between the farm gate and the end-consumer. Primarily, inefficiencies on account of a large number of intermediaries in the value chain result in retail price escalations. This can be as high as 18 to 22 percent¹ of the retail price for some food grains.
2. **Post-harvest management:** This relates to opportunities in reducing wastages through improved storage and integrated pest management. Some pulses have up to 10 percent wastage on account of poor post-harvest management.
3. **Branding of food grains:** Opportunities pertaining to branding of all food grains need to be explored. Some food grains are more suitable for branding, as they have significant scope for differentiation.
4. **Processed foods branding:** India currently has low levels of processing, compared with global peers. Therefore, opportunities for

EXHIBIT 2.3 | Pulses market landscape in India

Bengal gram and Tur most consumed pulses and growing — both in volume and value terms



Sources: indiaagristat.com, FAO, USDA FAS (PSD online).

Note: Others: 95% of others includes *Khesari* which is low quality pulse mixed with *Masoor* and *Tur* as an adulterant.

branding / retailing of secondary / tertiary processed products are significant.

Value chain reorganization

Farmers typically receive 40 to 50 percent of the consumer price, across most food grains. The value chain from the farm-gate to the consumer in India includes multiple players, resulting in price escalation along the value chain. The regulatory framework outlined by the Agricultural Produce Market Committee (APMC) mandates the presence of an intermediary agency like the *mandi* (a government-designated market yard for trading of specific agricultural commodities), which entail its own set of commissions and fees. While some players perform necessary functions like milling, processing, storage, transport, etc., there is significant potential to generate savings through disintermediation.

Rice dominated food grains with a production of approximately 100 million Metric Tonnes (MT) in 2010, and an estimated value of approximately Rs. 1,500 billion (based on the marketed quantity). An analysis of the paddy

value chain revealed the potential for about 2 to 3 percent savings on value through disintermediation (see Exhibit 2.4).

Amongst pulses, a similar pattern was observed on the value chain of *urad dal*. The value of the marketed quantity of *urad dal* was estimated at approximately Rs. 19 billion in 2010 and the analysis revealed potential for savings on value of up to approximately 11 percent (nearly Rs. 6.6 billion) through direct procurement from the farmer (see Exhibit 2.5).

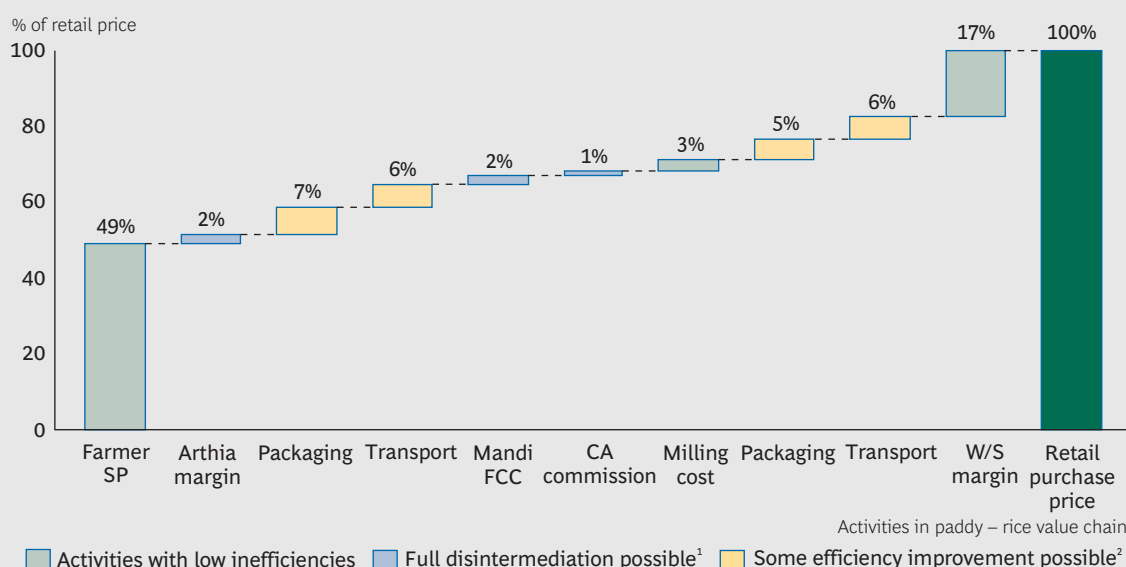
Post-harvest management

Post-harvest management includes multiple functions that are undertaken once the crop has been harvested, including threshing, storage, processing, transport, etc. An evaluation of post-harvest practices followed in select crops revealed significant savings potential. Post-harvest inefficiencies in Bengal gram and *tur* are estimated to be about 10 percent (see Exhibit 2.6), while corresponding figures for other pulses like *masoor* and *moong* stands at almost 2 to 3 percent. Similar losses in paddy and wheat have been estimated at approximately 4 to 5 percent,

EXHIBIT 2.4 | Potential for savings through disintermediation and supply chain control in Paddy

Example: Improving efficiencies by disintermediation and controlling the supply-chain for rice can provide ~2.5% reduction in value

Illustrative

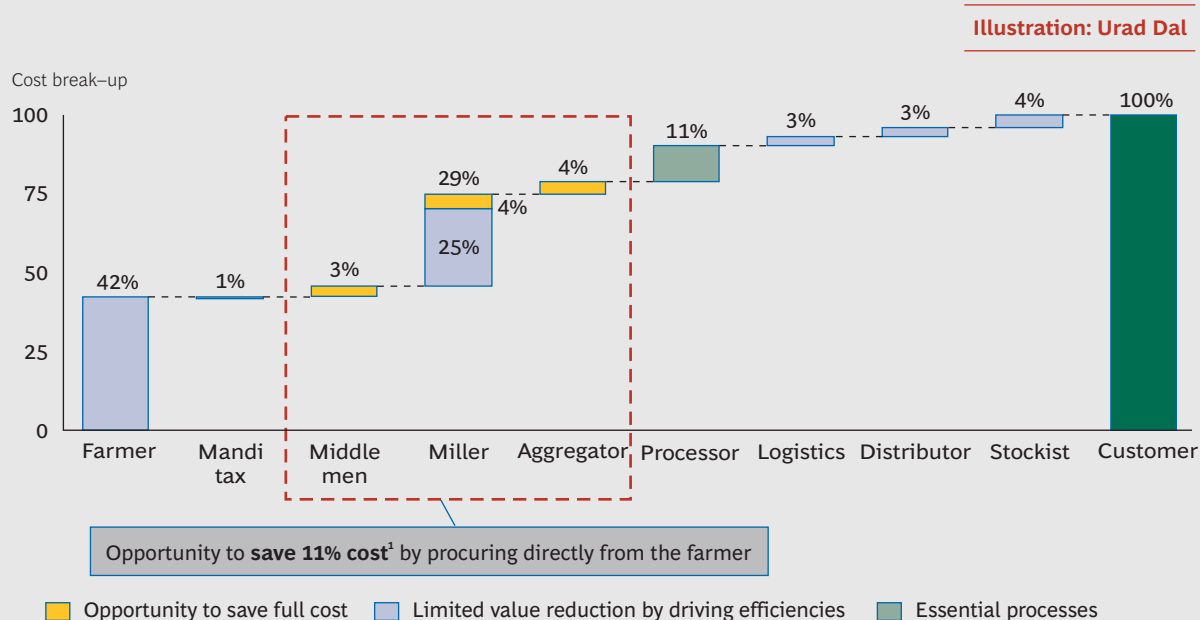


Sources: BCG analysis, market intelligence.

¹Assuming only 25% of the savings will accrue, due to investment costs.

²Assuming a 5% savings on the individual costs.

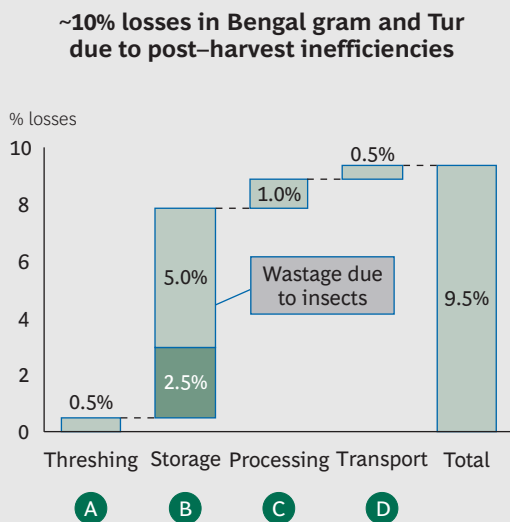
EXHIBIT 2.5 | Potential for savings through disintermediation in Urad



Source: Trade interviews.

¹Not all of the cost savings will accrue due to new costs of direct procurement etc.

EXHIBIT 2.6 | Wastages on account of poor post harvest management in Bengal Gram and Tur



Opportunity to reduce losses at each step

- A Untimely harvest and manual methods of threshing**
 - Modern methods of threshing and winnowing
- B Traditional storage structures used by manufacturers — ~5% loss due to insect attack**
 - Integrated pest control during storage
 - Proper techniques in storage
- C Outdated processing units**
 - Invest in modern processing units
 - Grading at the processing unit to create value addition
- D Loading / unloading wastages**
 - Proper primary (gunny bags)
 - Proper care in handling — for example no use of hooks

Grading according to commercial type of the product will help in creating a differentiating value

Source: www.agrimarket.nic.in.

most of which occur within the farm itself. The cumulative losses from paddy, wheat, and pulses were estimated to be worth about Rs. 100 billion in 2010.

There exists an opportunity to reduce losses across each function of the value chain:

- **Threshing:** Switching from manual methods of threshing and winnowing to modern practices can help reduce loss in yield.
- **Storage:** An improvement in storage quality and integrated pest management can help minimize losses (approximately 1 to 5 percent of food grains are currently wasted due to pest attacks).
- **Processing:** Modernization of processing units, and sorting / grading of grains prior to processing will improve output value.
- **Handling in transport:** Usage of proper gunny bags and proper handling (such as not using hooks for loading / unloading) can help reduce losses to a large extent.

Branding of food grains

Many players have forayed into branding of food grains or secondary processed products (like wheat flour). The market for branded rice is estimated to be worth approximately Rs. 33 billion (about 4 percent of raw rice market) and is dominated by *Basmati* rice. The branded wheat flour market — estimated at approximately Rs. 21 billion — includes established players like ITC, Hindustan Unilever and Godrej–Pillsbury. The market for branded pulses is relatively under-developed, but offers significant potential since unbranded pulses have many quality issues like adulteration, use of low quality oil during milling, and artificial colors, lack of grading, etc. There is also significant potential for product differentiation — based on the health plank — through fortification of pulses. Some companies (see sidebar) have forayed into the market and also cater to institutional demand.

Processed foods branding

Both retail consumers and institutional buyers consume multiple processed variants of food grains. For instance, bread flour, baked foods flour, semolina (*suji*), pasta flour, fortified flours,

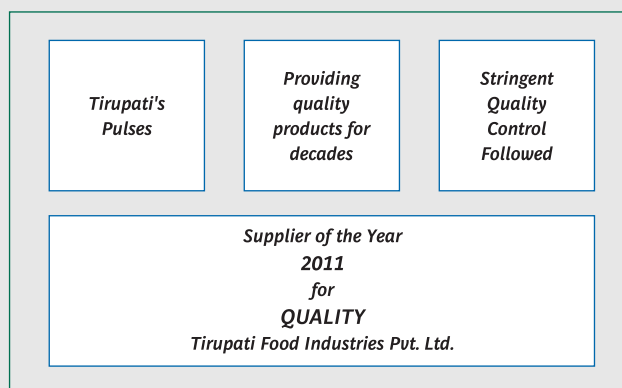
SNAPSHOT OF ILLUSTRATIVE PLAYERS IN THE BRANDED PULSES SEGMENT

Tirupati Food Industries Private Ltd., is a Delhi-based company with an annual production of 60,000 tonnes of pulses and allied products (worth Rs. 2.25 billion). The company is primarily involved in processing, importing, trading, and supply of well-processed pulses and dals of various grades. The company's product portfolio includes sugar and all superior quality pulses like *moong dal*, *channa dal*, *masoor dal*, *urad dal*, *tur dal*, *moth dhowa*, *kabuli channa*, *rajma*, and *lobhia*. It is a key supplier to several corporations such as Haldiram's, PepsiCo, Balaji, and Crax, as well as retail chains like Bharti Walmart, Aditya Birla Retail Ltd., and several pulse traders in the unorganized sector. The company imports premium quality pulses from China, Myanmar, and Australia. The key source of competitive advantage for Tirupati Food is its quality assurance and timely delivery.

- **Quality assurance:** An ISO 22000:2005 (HACCP) certified company, Tirupati Food uses highly sophisticated equipment for processing and

purification to guarantee supply of high quality pulses. The company's in-house testing division is equipped with the latest machinery to apply the best of quality testing measures.

- **Timely delivery:** The company has maintained an impeccable supply chain across various strategic locations in India to ensure timely delivery of goods to its customers.



refined flour (*maida*), and gluten are some of the processed variants of wheat. Gluten has largely been a business-to-business market, while refined flour is sold in business-to-business as well as business-to-consumer.

The market for processed foods branding is large, as shown in the exhibits below. For example, the estimated market for rice, wheat, and Bengal gram products is Rs. 1,400 billion to Rs. 1,650 billion (see Exhibit 2.7, 2.8, and 2.9).

KEY CHALLENGES AND IMPERATIVES

High operational complexity due to wide regional preferences

India has a wide range of regional preferences for food. Within rice, there are ten different kinds of rice with strong regional preference. For example, in Andhra Pradesh, *sona masuri* rice is widely eaten, whereas in Madhya Pradesh, *kolam* rice, and in Gujarat, *surti kolam* rice is preferred. These regional preferences add to the operational complexity in terms of distribution, inventory management, etc. In the case of rice, the complexity is still limited as most consumption centers are closer to the production centers. For pulses, the operational

challenge is greater as the overlap between production and consumption centers is limited and varies across different pulses (see Exhibit 2.10). For example, in the case of moong pulse, Gujarat, Maharashtra and Madhya Pradesh are major production states, while it is being consumed mainly in Punjab, Haryana, and Himachal Pradesh.

Commodity price volatility

Price volatility associated with commodities adds to the operational complexities for businesses — particularly in case of pulses (compared with cereals), as highlighted in Exhibit 2.11. In 2010, prices of pulses almost doubled and also witnessed major volatility.

STRATEGIC CHOICES FOR PLAYERS IN FOOD GRAIN INDUSTRY

Many players have ventured successfully into food grains and have been able to build scale. Their business models reveal four key strategic choices that determine the suitability of a play in a particular food grain or processed product.

- **Segment focus:** A key decision lever is whether to focus on retail and / or

EXHIBIT 2.7 | Market for rice-based processed products

	Product	Size	Market	Processing	Basis of differentiation		
	Flaked rice (Poha) Parched rice	Rs. 67 bn – Rs. 135 bn	B2C	Low — only milling	Quality Hygiene	Fortify	
	Puffed rice (Kurmura)	Rs. 67 bn – Rs. 135 bn	B2C	Low	Quality Hygiene		
	Starch	Rs. 40 bn – Rs. 54 bn	B2B	Medium	Quality	Species Fortify	
	Rice bran + oil	Rs. 45 bn – Rs. 68 bn	B2B + B2C	Medium — by-products of rice mills, crushing + refining	Quality Hygiene	Fortify	Brand Health
	Flour, cereals and others	Rs. 90 bn – Rs. 135 bn	B2B + B2C	Medium — milling followed by grinding	Quality	Fortify	Brand
	Livestock feed Husk and straw			Low			

Sources: Corn crop profile on agmarket.nic.in, BCG analysis.

EXHIBIT 2.8 | Market for wheat-based processed products

	Product	Size	Market	Processing	Basis of differentiation		
	Atta (Household flour) Maida	Rs. 585 bn – Rs. 675 bn	B2C	Low — milling + fortification + packaging	Quality Hygiene	Fortify	Brand
	Bread / Bakery / Biscuit / Confectionery flour	Rs. 135 bn – Rs. 180 bn	B2B	Medium — sorting + milling + grade specification	Quality	Fortify Species	
	Semolina (Rawa / Suji)	Rs. 68 bn – Rs. 113 bn	B2B	Low — milling	Quality Hygiene	Fortify	Brand
	Pasta and noodle flour	Rs. 9 bn – Rs. 14 bn	B2B	Low — milling	Quality Hygiene	Fortify Species	Brand
	Enhanced flours	Rs. 18 bn – Rs. 27 bn	B2B / B2C	Medium — milling + fortification	Quality Hygiene	Fortify Species	Brand Health
	Gluten dried powder	Rs. 9 bn – Rs. 22 bn	B2B	Medium — milling + secondary processing	Quality	Species	
	Livestock feed			Low			

Sources: Wheat crop profile on agmarket.nic.in, Rabobank report, BCG analysis.

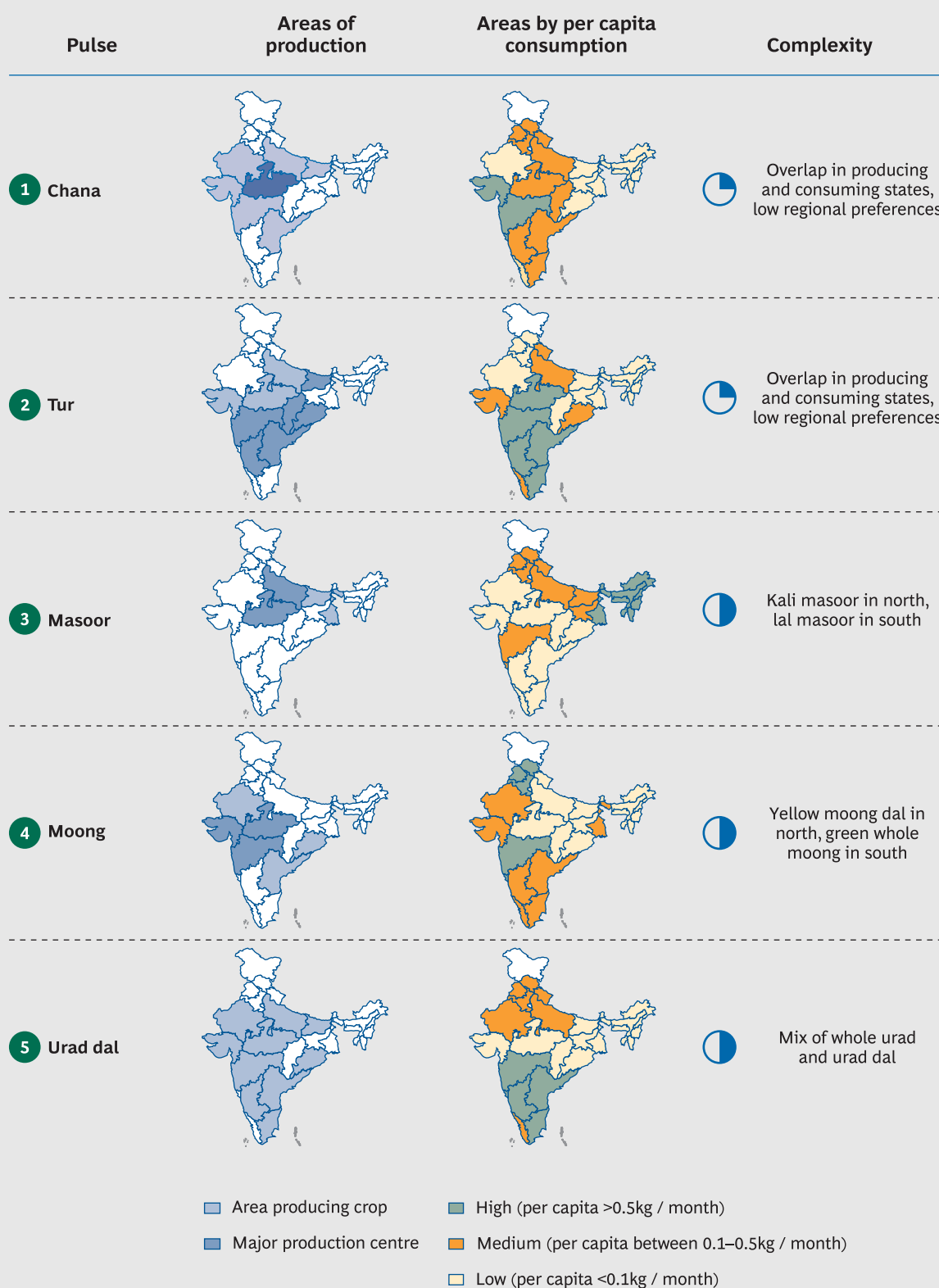
EXHIBIT 2.9 | Market for Bengal-gram based processed products (limited tertiary processing of other pulses)

	Product	Size	Market	Processing	Basis of differentiation		
	Branded dal + Besan	Rs. 126 bn – Rs. 171 bn	B2C / B2B (for Namkeens)	Primary + Secondary — milling / packaging	Medium — fortified with iron / quality / hygiene / brand / health		
	Dough products (Example Dhokla)	Rs. 9 bn – Rs. 13.5 bn	B2C	Tertiary — processing	Low		
	Namkeen	Rs. 9 bn – Rs. 22.5 bn	B2C	Secondary + tertiary — processing / packaging / branding	High — fortified namkeen / health / brand		
	Sprouts	Rs. 9 bn – Rs. 13.5 bn	B2C	Secondary — processing / packaging / branding	Health / brand / quality		
	Animal feed		Self / B2B	None	Low		

Sources: Corn crop profile on agmarket.nic.in, BCG analysis.

Note: Primary processing: primary processing activities consist of production of cleaned, graded, packaged pulses; Secondary processing: under secondary processing activities such as dehusking, splitting, polishing, turmeric / spices / salt coating and making powdered besan and packaged dal are done; Tertiary processing: these activities mostly consist of preparation of roasted, fried dal and other associated dal products.

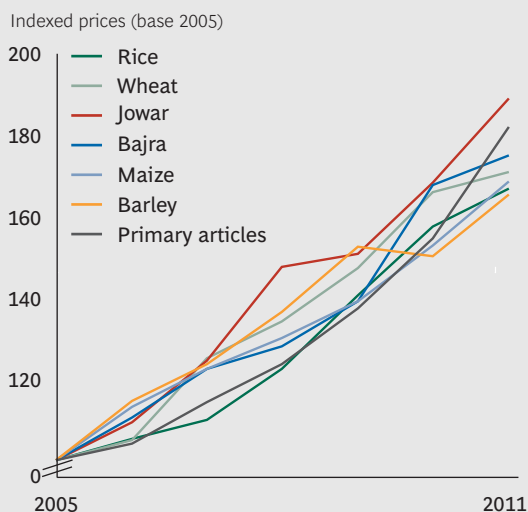
EXHIBIT 2.10 | Production and consumption centres for various pulses



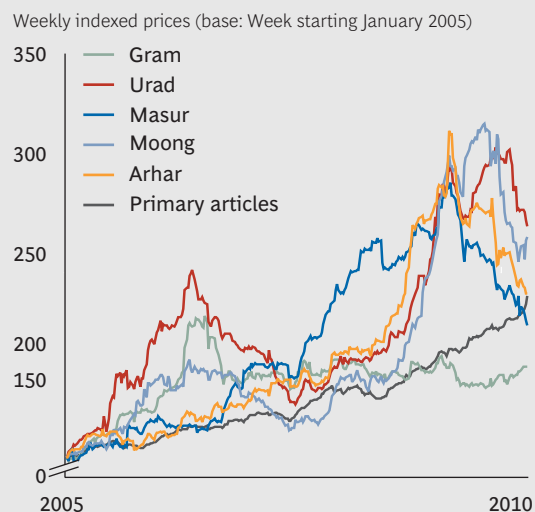
Sources: Area of production from agmart.nic.in and patterns of consumption based on real consumption data 2008–09 NFS data.

EXHIBIT 2.11 | Price volatility in cereals and pulses

Cereals tend to be stably priced — matching the primary articles index



High volatility over the long term in prices of pulses



Source: Ministry of Statistics and Programme Implementation (MOSPI).

institutional (business-to-business, exports, private label, etc.), users. Based on the focus, the procurement, processing and distribution requirements, and brand investments will also vary significantly.

- **Scope to differentiate:** The scope to differentiate varies significantly across food grains and processed products. Typically, as the level of processing increases, so does the scope to differentiate. That explains the limited success in branding / retailing of primary / secondary processed food grains (except in the case of organic foods or *Basmati* rice which is a premium variant). There have been attempts to differentiate through fortification, but the benefit of such value addition also needs to be communicated effectively to the customer.
- **Operating model preferences:** As discussed earlier, there is a significant potential for cost savings across the value chain. However, based on the preferred operating model (asset heavy versus asset light), the profitability of products may vary

significantly. More integrated business models are able to drive greater efficiencies but also become vulnerable to high demand fluctuations. It would be beneficial to analyze the additional gains from such savings vis-à-vis the required investments.

- **Brand investment appetite:** The level of investments broadly varies across two types of end-users — retail and institutional. However, there is also a continuum based on the products chosen and the exact nature of the end-user. For instance, exports, despite being an institutional segment, typically require brand investments on a scale comparable to the retail market. Similarly, fortified or functional foods would require higher brand investments to communicate the benefit of such value addition.

Dairy Industry in India

INDUSTRY LANDSCAPE

Operation Flood (a rural development program started by the National Dairy Development

Board in 1970) heralded a series of changes that have transformed dairying into a large industry, with a massive impact on rural incomes, employment, and nutrition levels across the country over the past four decades. Today, India is the world's largest milk producer (approximately 120 million tonnes in 2011). The per capita availability has risen to 281 grams from 112 grams in 1970, despite doubling of the population.

A source of income for millions of farmers, the dairy industry was estimated to be worth almost Rs. 1,600 billion in 2009. Milk is also the largest agricultural commodity produced in India, ahead of rice and wheat.

Despite the commendable growth achieved during Operation Flood, the dairy industry still faces some issues. Going forward, it is ill-equipped to meet the challenges. A majority of the marketable surplus² (about 70 percent) continues to be handled by unorganized players, while co-operatives and private dairies handle only about 20 percent, and 10 percent, respectively. In fact, unorganized players

account for an estimated 75 percent of the entire dairy industry, and dominate key segments like liquid milk, ethnic products³, ghee, and yoghurt. However, organized players in these segments have registered healthy growth over the past few years (see Exhibit 2.12).

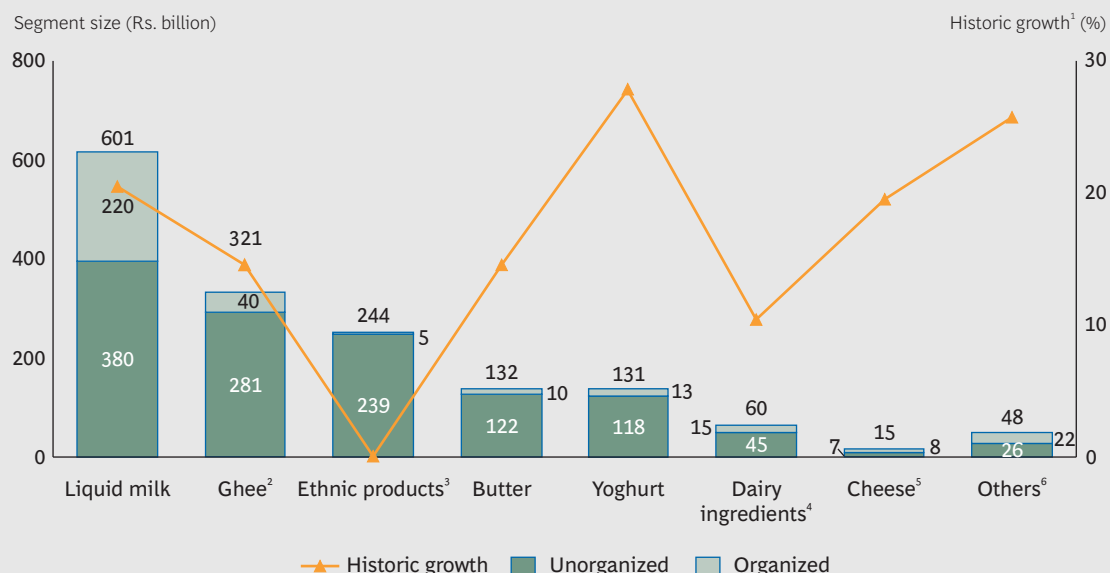
OPPORTUNITIES IN DAIRY INDUSTRY

The dairy industry holds significant growth potential, particularly for the organized players. The organized dairy industry is expected to expand at a Compound Annual Growth Rate (CAGR) of 17 percent — from approximately Rs. 350 billion to Rs. 750 billion — through 2015. Select product segments like liquid milk, yoghurt, and cheese are expected to register higher growth rates. Rising incomes and changing consumer preferences for processed dairy are expected to be the key growth drivers for organized dairy. Development in adjacent spaces like cold chain infrastructure will have an impact on this pace of growth.

Impact of rising incomes

The demand for milk and milk products in rural and urban households follows distinctly

EXHIBIT 2.12 | Segmental split of Indian dairy industry and growth of organized players



Sources: Ministry of Food Processing Industries in India, Department of Animal Husbandry Dairying and Fisheries, Corporate annual reports, Press releases, BCG analysis.

¹Organized players only.

²Clarified butter.

³Primarily *khoa* and *channa*.

⁴Includes milk powder and dairy creamer.

⁵Includes *paneer*, mozzarella and cheese spreads.

⁶Includes UHT milk, milk beverages and sour milk drinks.

different patterns (see Exhibit 2.13). Only dairy has an increasing share of the monthly food expenditure as one moves up the income deciles⁴. For all other items — cereals, pulses, edible oil, and vegetables — the share of consumption within a household drops steadily as monthly expenditure increases⁵. Dairy is thus an aspirational ‘luxury good’ for a majority of Indian households. Dairy also accounts for a significant chunk of the monthly expenditure; it is next only to cereals in both rural and urban households.

Changing consumer preferences

As indicated earlier, processed food is another food item whose share increases with expenditure. It currently has a small share in absolute terms, but this is expected to change. With growth in the economy, demand is expected to gravitate toward processed and functional dairy products (see Exhibit 2.14). A trend is already evolving in India, with the introduction of fortified milk, probiotic yoghurt, flavored cheese, etc., by multiple players. Presently, Amul markets Swiss (Emmental) and Dutch (Gouda) cheeses in India, while

Nestle has introduced fortified milk with Omega-3 fats. Increasing nutritional awareness and global exposure have created a nascent, but fast growing market for products such as these. However, even as this shift occurs, industry players will have to keep addressing the high demand for ethnic products like *ghee*, *khoa*, *paneer*, etc., which remain the mainstay of processed dairy in India.

KEY CHALLENGES AND IMPERATIVES

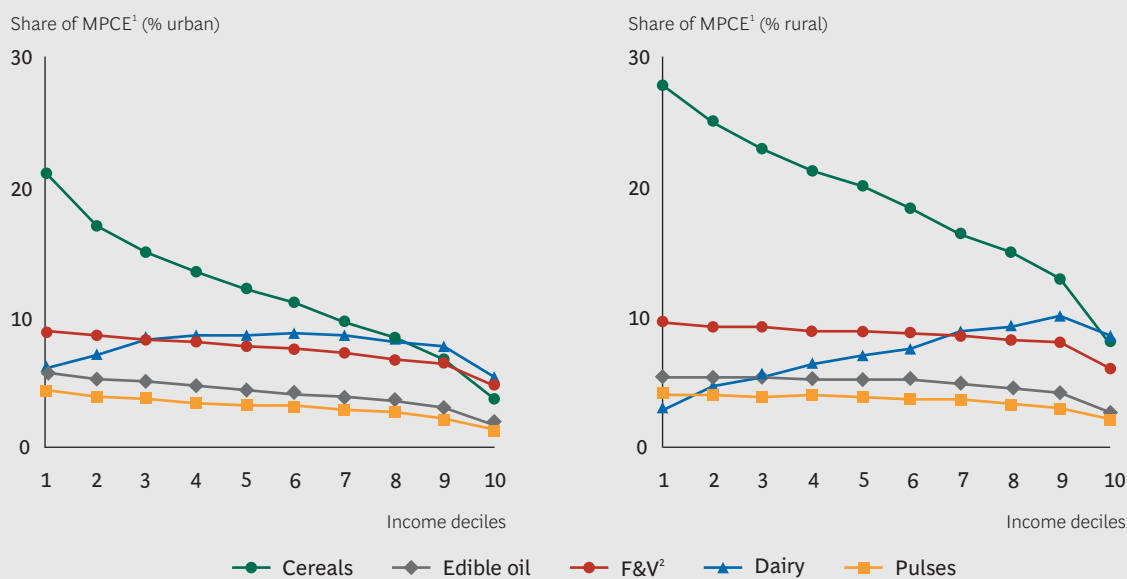
The dairy industry in India currently faces multiple challenges. Listed below are some of the critical areas which require immediate attention:

Low-quality breed stock

A majority of India’s livestock consists of low-yield breeds; the country’s average milk yield of almost 4 LPD⁶ is significantly lower than the global average of 7 LPD. India’s poor veterinary infrastructure and breeding practices are key impediments to improving the stock. States with better quality infrastructure like Punjab, Haryana, and Kerala have a significantly better breed stock (see Exhibit 2.15).

EXHIBIT 2.13 | Increasing demand for dairy as income deciles increase

Dairy an ‘aspirational’ good across income deciles



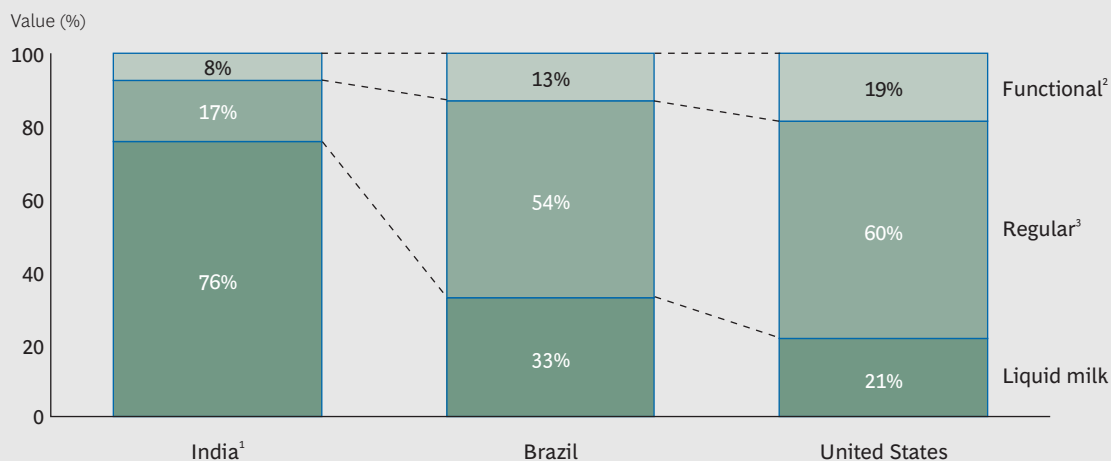
Sources: National Sample Survey Organization–2010, BCG analysis.

¹Monthly Per Capita Expenditure.

²Fruits and Vegetables.

EXHIBIT 2.14 | Shift towards higher value added products with rising incomes

Changes expected in product preferences



Sources: Euromonitor, Ministry of Agriculture, Department of Animal Husbandry Dairying and Fisheries, World Bank, BCG analysis.

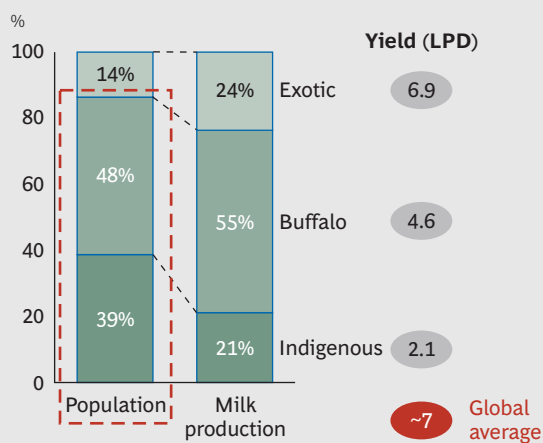
¹Only organized market included for India.

²Foods with added fortification for wellness benefits.

³Processed dairy products like cheese, butter, ice cream without any added functional ingredients.

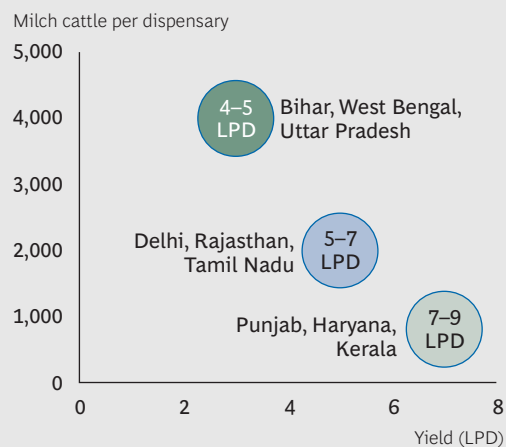
EXHIBIT 2.15 | Yield and infrastructure profile of livestock for different states

Yield profile of livestock (2010)



Lack of high potential breeding stock and poor breeding success adversely affecting profile

Livestock infrastructure¹ and yields



Significantly improved yields in states with better livestock infrastructure

Sources: Department of Animal Husbandry Dairying and Fisheries, BCG analysis.

¹Only hospitals and veterinary dispensaries considered.

Shortage of inputs

Traditionally, milch cattle in India were primarily fed on agricultural crop residue and open pastures. However, multiple factors — falling pasture availability (from 0.62 hectare per head in 1951 to 0.22 hectare per head in 2010), a shift toward cash crops and mechanization (leading to lower crop residues) and shrinkage of holding sizes — increased dependence on cattle feed. The green fodder and dry fodder shortages have been estimated at approximately 61 percent (666 million metric tonnes), and almost 22 percent (139 million metric tonnes) respectively⁷.

Availability of cattle feed inputs⁸ has also become an issue due to a strong export market and competition from alternate industries. Key cattle feed inputs have registered price increases of approximately 70 percent to 125 percent through FY2007–2010⁹, which have had an adverse impact on yields, and farmer profitability. Import tariffs on feed inputs have further aggravated the issue.

Policy support in terms of import tariff reductions or excise duty waivers for feed inputs and public investments in pasture development will be essential.

Poor credit flow

Low credit inflows have adversely impacted productivity. Despite contributing approximately 27 percent of the total agriculture value, the credit to animal husbandry is a mere 4 percent of total agriculture credit. Also, while agriculture credit expanded at a CAGR of about 14 percent through FY2006–2009, live-stock credit grew at approximately 9 percent¹⁰. As most dairying is still based on agri-residue and opportunity labor, there could be significant improvements in yields — if credit toward inputs (working capital loan for fodder and cattle feed) is made available.

Backward linkages and procurement costs

Establishing backward linkages for procurement is a challenge due to lack of large-scale producers like commercial dairy farms. Captive production, on the other hand, requires significant investments in livestock and allied infrastructure. In addition, the shift toward intensive dairying is likely to lead to a steady increase in procurement costs. It is, therefore,

critical to provide farmer extension (breeding services, health care, etc.) and improve accessibility to feed and credit in order to increase productivity and reduce costs.

Product distribution

Distribution of dairy (fresh, chilled and frozen) products remains a challenge given India's geographic expanse and poor infrastructure. Fresh products¹¹ require distributed manufacturing (own or contracted), as distribution costs become prohibitive. Moreover, distribution becomes unviable if products are manufactured centrally. A robust distribution network is also required for retailing or home delivery. This restricts scale, as is evident from the lack of pan-India players in liquid milk (players have presence only in select metros). Improvements in cold chain infrastructure have enhanced the distribution of chilled or frozen dairy, but reliability and costs remain a concern.

Product innovation

With the ongoing shift toward processed dairy products (including functional foods such as fortified or probiotic dairy, ethnic products like *raita*, flavored cheese spreads, etc.), product innovation needs a bigger focus — especially with regard to ethnic products. Innovations would also be required in packaging to effectively tackle poor storage infrastructure, Indian weather conditions, and buyer preferences for quantity. There are several interesting learnings from global leaders (refer case studies of select global dairy players) in this space that Indian companies can emulate in meeting the above stated challenges.

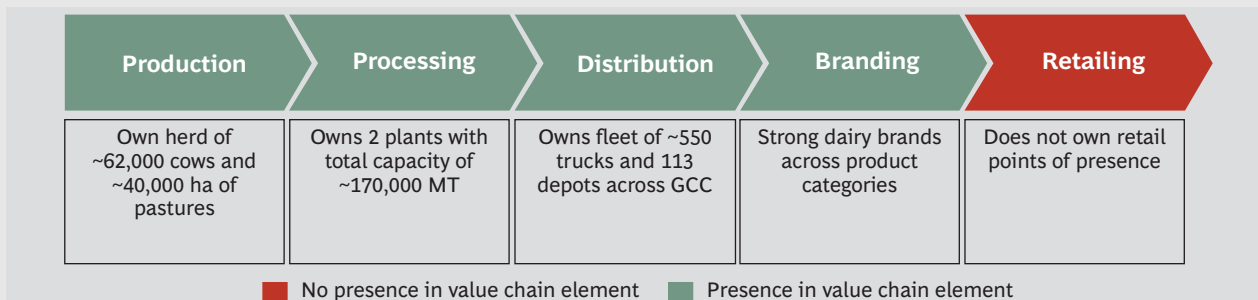
STRATEGIC CHOICES FOR AN INDIAN DAIRY PLAY

Players keen to cash on emerging opportunities in India's dairy segment need to focus on the following strategic choices (see Exhibit 2.16):

- **Product choices:** Players need to decide on the product portfolio — whether the portfolio would comprise fresh dairy or regular processed dairy products (like butter or cheese), or specialty dairy products (like probiotic *dahi*).
- **Geographic focus:** The geographic strategy (regional or pan-India footprint) should be driven by multiple considerations such as

CASE STUDIES OF SELECT GLOBAL DAIRY PLAYERS

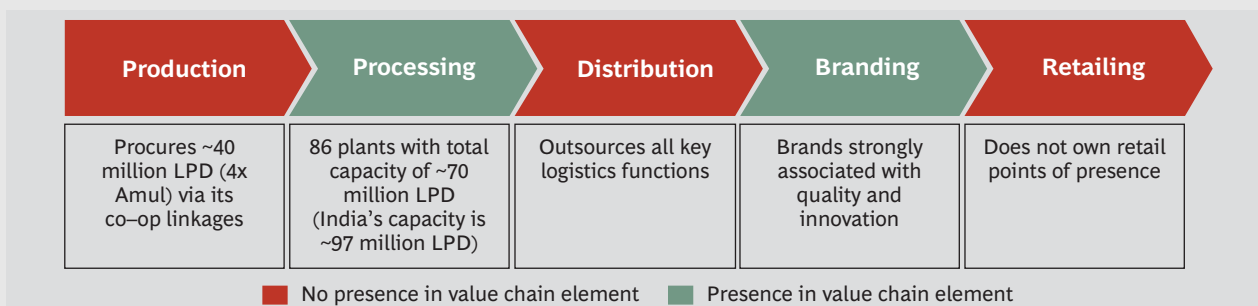
Almarai: One of the largest vertically-integrated dairy players (Saudi Arabia)



Competitive advantages

- Low-cost, pasture-based dairying system makes products price competitive
- Strong distribution allows daily replenishment of products at approximately 43,500 locations (market leading position across fresh dairy product categories)
- Strong association with quality due to continued brand investments

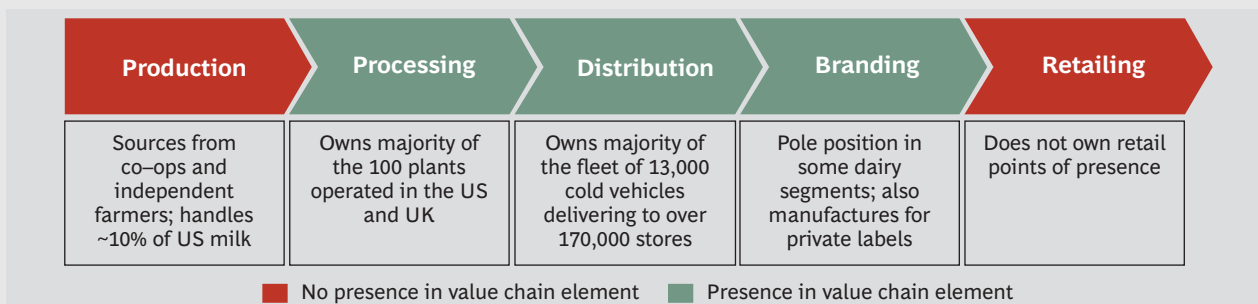
Fonterra: World leader in dairy exports (New Zealand)



Competitive advantages

- Low procurement cost as New Zealand is a highly cost-competitive milk producer
- Strong processing capabilities (cost-effective operating efficiencies)
- Association with quality and innovation due to investments in R&D and brand

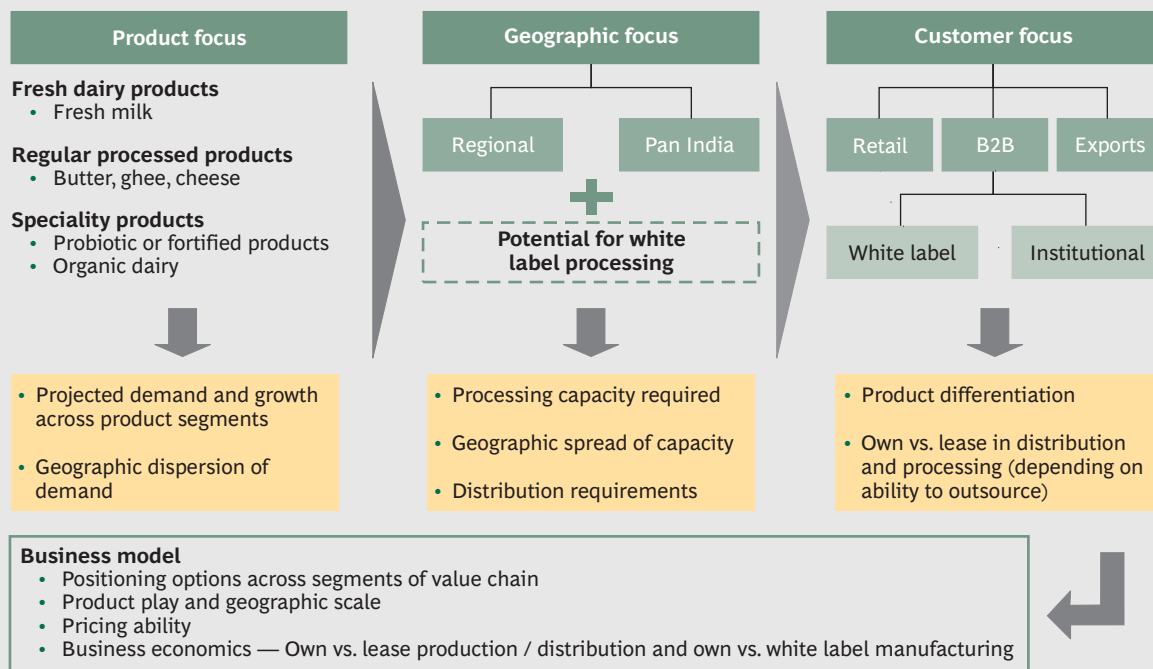
Dean Foods: One of the largest dairy processors in the United States



Competitive advantages

- Strong distribution capabilities, catering to over 170,000 locations across United States
- Processing excellence and scale (scale acquired primarily through acquisitions)
- Strong brands in select segments (portfolio of over 50 local and regional brands)

EXHIBIT 2.16 | Strategic choices for developing a successful dairy business model



Source: BCG analysis.

product portfolio, backward linkages, manufacturing capacities, etc., as this would have a strong bearing on the required distribution capabilities.

- **Customer focus:** Players also need to decide on their target segment — retail, business-to-business (white label or institutional), or exports.

The business model (product positioning, portfolio, pricing, and operating model) will depend on decisions taken in these key areas.

Meat Industry in India

INDUSTRY LANDSCAPE

The Indian meat industry is estimated at approximately Rs. 500 billion with bovine meat¹² (about Rs. 190 billion), chicken (almost Rs. 185 billion) and ovine meat¹³ (approximately Rs. 130 billion) being the key segments (see Exhibit 2.17). Pork is a minor segment with an estimated size of approximately Rs. 14 billion. The total meat production in India is estimated at 6 million tonnes and is dominated by chicken and beef (buffalo meat).

The domestic meat industry has limited organized presence and is dominated by the ‘wet market’¹⁴ or unorganized players (Exhibit 2.18). This is due to multiple factors — including a higher preference for fresh meat, low penetration of organized retail (especially in the food segment), weak food safety norms, and high cost of cold chain infrastructure. Buffalo meat has the highest organized presence, of approximately 22 percent, mainly on account of exports¹⁵.

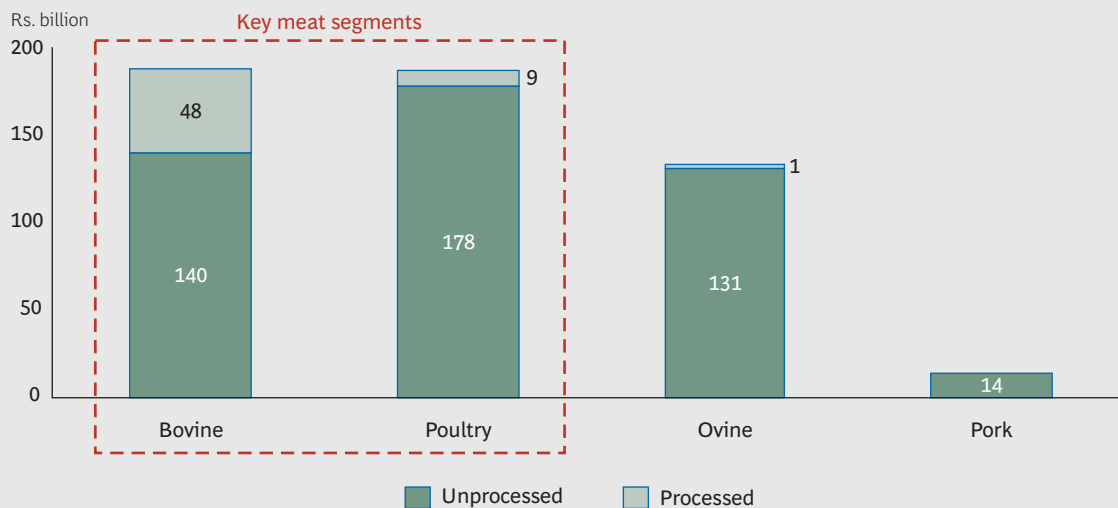
OPPORTUNITIES IN THE MEAT INDUSTRY

India is widely believed to have a large vegetarian population, and thus the meat industry was traditionally assumed to be of minor significance. The Hindu-CNN-IBN State of the Nation survey of 2006 indicated that approximately 60 percent of the population was non-vegetarian, with an additional 9 percent consuming eggs. Meat is thus a key constituent of the nation’s diet, and also a vital source of nutrition. However, the frequency of consumption remains low.

From a nutritional perspective, India’s per-capita protein supply is estimated at approximately 57 grams per day, which is

EXHIBIT 2.17 | Beef and chicken are key meat segments

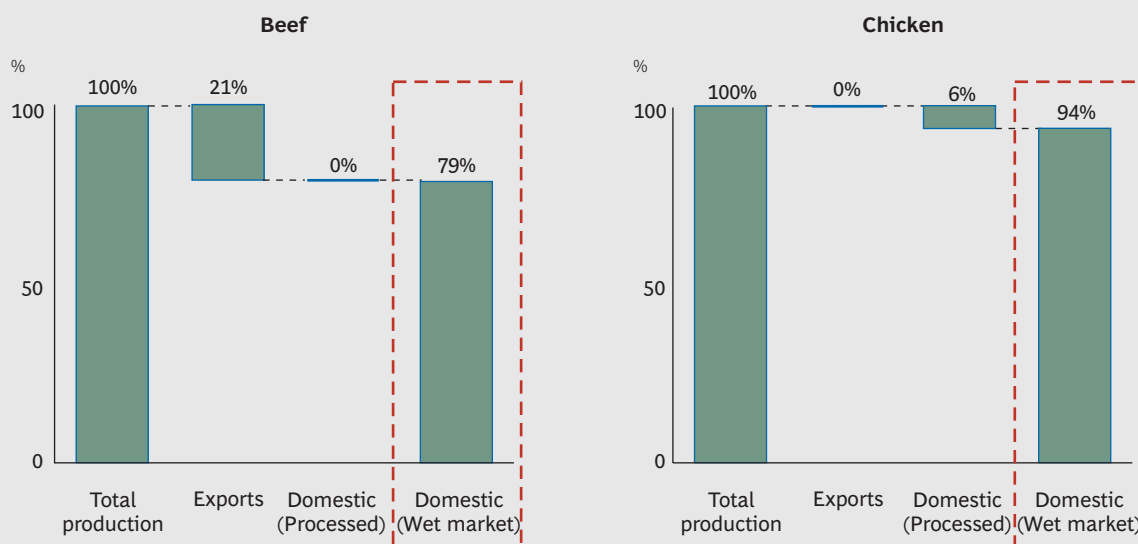
Highly unorganized meat market (2010)



Sources: USDA, FAOstat, MOFPI, APEDA, Suguna Poultry, Delhi agri marketing, Press releases, BCG analysis.

EXHIBIT 2.18 | High preference for fresh meat

India primarily a 'wet market'



Sources: USDA, FAOstat, MOFPI, APEDA, Suguna Poultry, Delhi agri marketing, Press releases, BCG analysis.

significantly lower than that in Brazil, China, or the United States (see Exhibit 2.19), and given the supply deficit in pulses, a basket of pulses and cheap animal protein sources (see Exhibit 2.20) would be essential to bridge India's protein supply gap.

India's share in the global meat trade has been limited and is dominated by beef (8.3 percent share of global exports), while chicken exports are negligible. However, India is strategically located close to some of the key poultry and beef importing markets — including the Middle East, Russia, and South East Asia — that together account for over 40 percent of global imports. To put this in context, India has negligible exports to proximal markets like Russia, Japan, South Korea, and Hong Kong, which between themselves import over three times India's current beef export volumes.

In poultry, the Middle East imports 17 percent of global volumes, and India has negligible export volumes. Key impediments have been price competitiveness¹⁶ and quality issues that may be addressed through appropriate policy initiatives and private investments.

There is strong growth potential for the meat industry in India, based on domestic demand alone (see Exhibit 2.21). The overall meat industry is expected to expand at a CAGR of approximately 12 percent through FY2015 and chicken is likely to overtake beef as the largest meat segment in India. The growth of organized players is expected to be higher due to penetration within the organized segment and increasing demand for processed meat.

KEY CHALLENGES AND IMPERATIVES

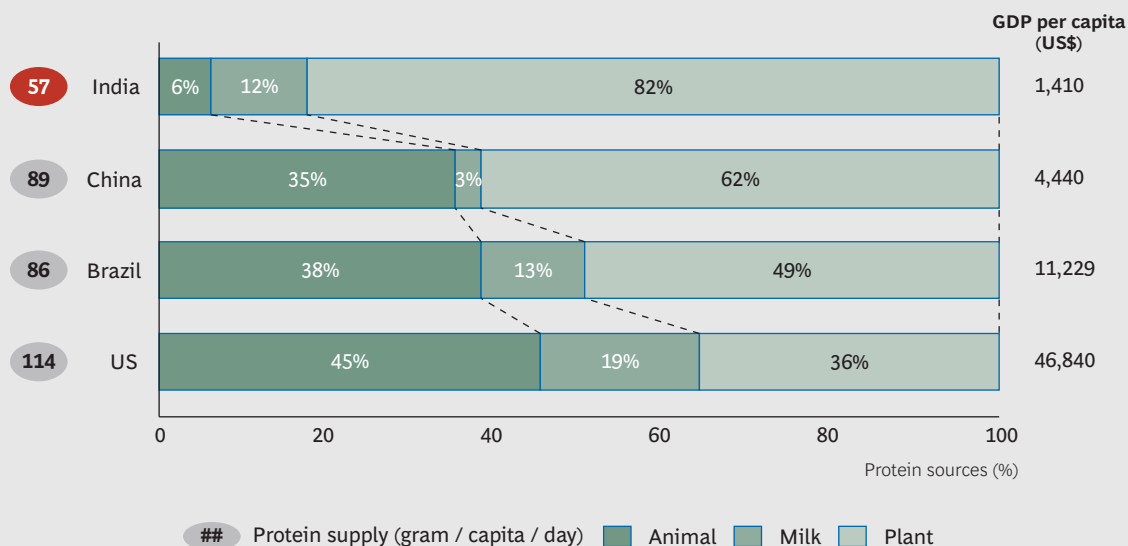
The meat industry in India faces multiple challenges, with quality and prices of inputs being key issues. There has been an increasing focus in this area with the establishment of the National Meat and Poultry Processing Board (NMPPB), which is responsible for harmonization of domestic and international standards, and for creating a policy framework for development of the meat industry. However, there remain certain issues that require the attention of policy makers.

Input availability and prices

There has been a significant increase in prices of key feed inputs over the past three years, with

EXHIBIT 2.19 | Beef and chicken are key meat segments

Low protein supply and higher reliance on low quality plant based proteins¹ (2010)

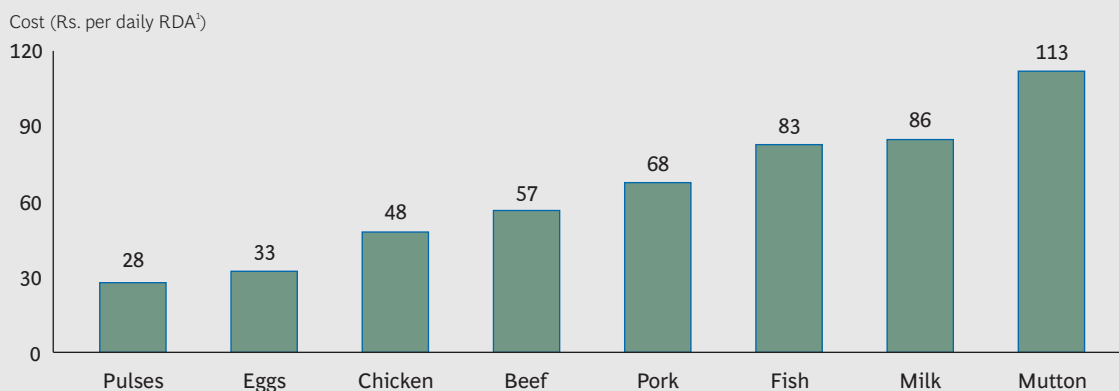


Sources: Ministry of Agriculture, World Bank, Delhi agri marketing, International Egg Commission, FAO, NSSO sample survey round 61 (2004–05), BCG analysis.

¹Cereals considered low quality proteins due to lack of essential amino acids and constitute ~60% of total protein supply in India (~25–40% in other countries).

EXHIBIT 2.20 | Chicken an affordable protein source

Chicken a low cost, high quality protein

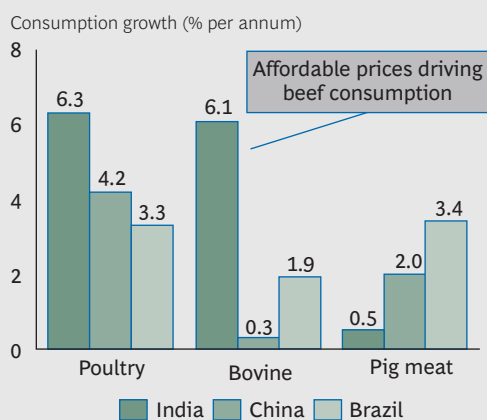


Sources: Ministry of Agriculture, World Bank, Delhi agri marketing, International Egg Commission, FAO, NSSO sample survey round 61 (2004–05), BCG analysis.

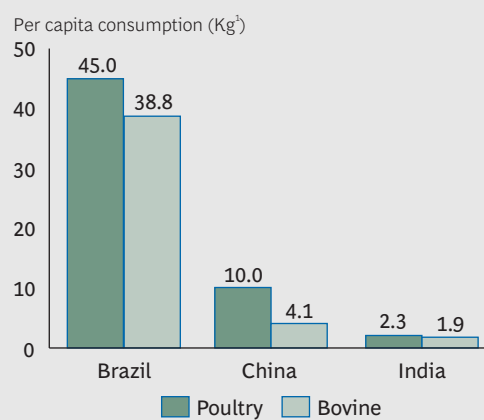
¹Recommended Dietary Allowance (~60 grams per day for normal adult of 60 kilograms).

EXHIBIT 2.21 | Expected growth in the meat industry in India

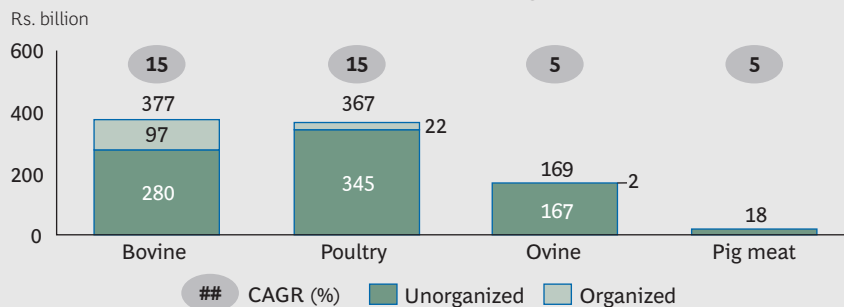
Steady growth in poultry, beef consumption ('06–'10)



Large headroom for further growth (2010)



Expected CAGR of ~13% through FY15



Sources: FAOSTAT, USDA, APEDA, Delhi agri marketing, BCG analysis.

¹Dressed meat.

the cost of oil meals rising by about 70 to 125 percent. This increase has largely been driven by strong export demand and usage by alternate industries (see Exhibit 2.22). For poultry specifically, the feed consists mainly of corn and soya and constitutes about 70 percent of the production costs. This proportion is higher than the corresponding figure for key global producers like Brazil, due to low crop yields of corn and soya in India (see Exhibit 2.23). In addition, the tariffs on oil meals make imports unviable.

Regulatory clarity on slaughter

Owing to religious and political sensitivity, there is lack of clarity on cattle slaughter. Since cow slaughter is banned in most states¹⁷, buffaloes remain the primary source of bovine meat in India. However, unlike cows or bulls, the slaughter guidelines for buffaloes are not well-defined, and vary widely across states. Moreover, issues like rearing for slaughter remain taboo, and permissions for establishing modern slaughter-houses are seldom granted. Clarity on buffalo slaughter and a revamp of municipal slaughter-houses could significantly improve bovine meat quality and production.

Inefficient livestock markets

Bovine meat processors in India typically procure cattle from brokers, who in turn source them from cattle markets. These markets are typically set up once a week, with buyers and sellers from adjacent villages assembling to trade cattle. Unlike *mandis*, these markets are not regulated and have non-transparent practices like the *hatha*¹⁸ system that allows middlemen to make margins of up to 40 percent¹⁹. Most importantly, traceability of cattle — a critical prerequisite for exports — is poor due to the change in ownership.

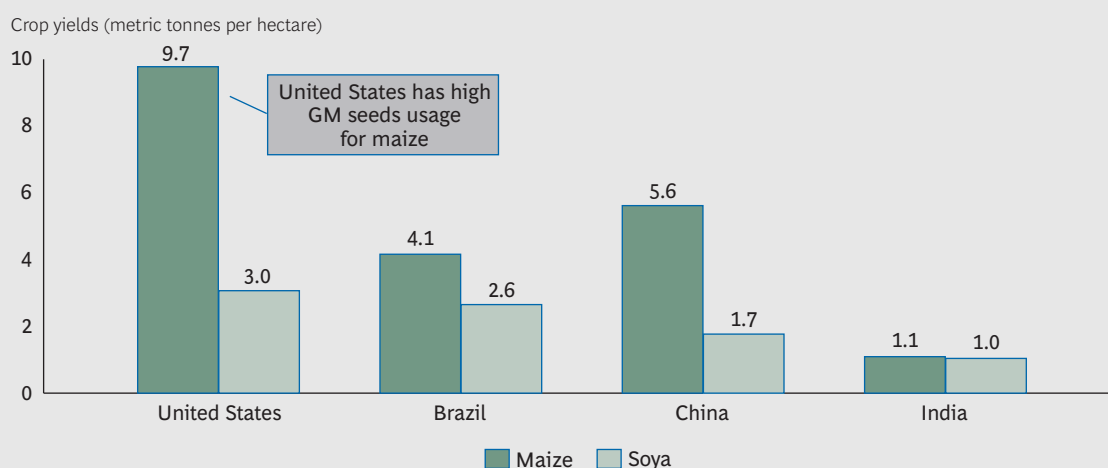
Poultry is increasingly being sourced via contract farming, thereby alleviating traceability-related issues.

In developed countries, livestock is traded on the exchange, or reared under contract farming through transparent terms. This ensures standardization of quality, appropriate traceability, and veterinary intervention.

Brazil's state-run System Of Identification and Beef and Buffalo Meat Origin Certification (SISBOV) uniquely tags cattle to ensure

EXHIBIT 2.22 | Sharp rise in prices of oil meal

Yields of key inputs significantly lower compared to global peers

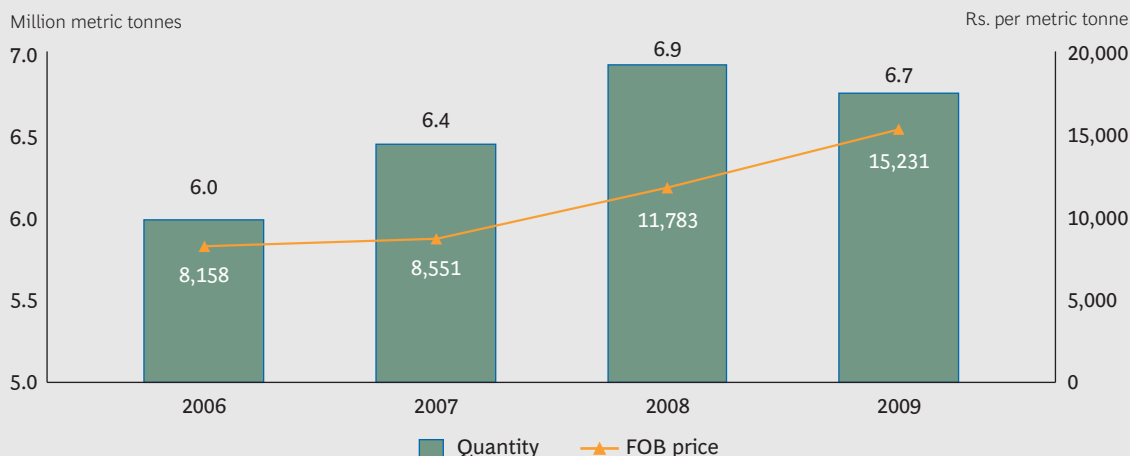


Significantly lower yields and lack of support prices impacting availability of feed inputs

Sources: Ministry of Agriculture, FAO, USDA, Solvent Extractors Association, BCG analysis.

EXHIBIT 2.23 | Low yields of key inputs

High oil meal exports escalating domestic prices



Increasing exports aggravating local availability of feed

Sources: Ministry of Agriculture, FAO, USDA, Solvent Extractors Association, BCG analysis.

traceability. Policy initiatives to promote efficient livestock markets will thus eliminate middlemen and also improve quality of meat produce (thereby improving export prospects).

Poor harmonization with international standards

Globally, key import markets have steadily introduced stringent SPS²⁰ standards requiring higher certifications and compliance from exporters. Another level of complexity has been introduced due to the variations in these standards across markets. Export potential has been highly constrained due to the absence of an overseeing authority that would harmonize standards across markets. The NMPPB²¹ has recently been given this mandate.

KEY IMPERATIVES FOR INDIAN MEAT PLAYERS

High integration along value chain

High value chain integration via feed manufacturing, contract farming, and veterinary care services holds the key to controlling costs and standardizing quality. For instance, integrated poultry processors in India typically provide the Day-Old Chick (DOC), feed, and veterinary care to contract farmers, and also

manufacture the feed through captive mills. This enables higher appropriation of value along the value chain and better operational metrics like FCR²². This may remain a challenge in the case of bovine meat due to the lack of regulatory clarity and the political sensitivity. There exists potential for integration into corn and soya procurement²³ via contract farming, through introduction of high-yielding varieties and efficient agri-practices (investments would be required to build these capabilities).

Scale and diversification

Apart from delivering economies of scale, large-scale operations also reduce compliance costs on a per unit basis. Due to the steadily increasing Sanitary and Phytosanitary (SPS) standards, there has been an increase in compliance costs that can only be managed through large-scale operations. In addition, for export purposes, product and geographic diversification reduces risks associated with disease outbreak in a particular geography or animal.

The export-oriented Brazilian meat industry illustrates a business model that encompasses both elements of scale as well as value chain integration.

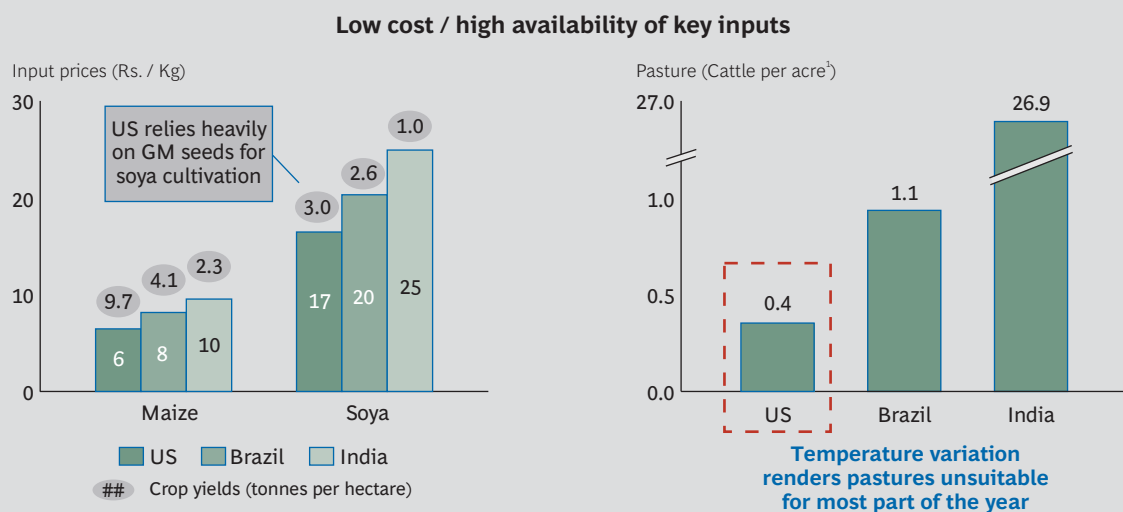
CASE STUDIES OF SELECT PLAYERS

The Brazilian meat industry

Brazil is one of the world's largest meat exporters (second only to the United States), with approximately 26 percent share of global meat exports. In 2009, Brazil was the world's largest exporter of beef and chicken, with a market share of almost 22 percent, and 38 percent, respectively. The country's leadership in the meat industry has primarily been on account of domestic attributes like high crop productivity and

availability of pasture land (see Exhibits 2.24, 2.25). Brazil treated approximately 50 million hectares of its savannah and converted it into cultivated pasture land, which boosted its meat industry. Other favorable factors include concentration of livestock ownership, low labor costs, and government initiatives like cattle traceability, interest rate subvention, and stronger domestic standards.

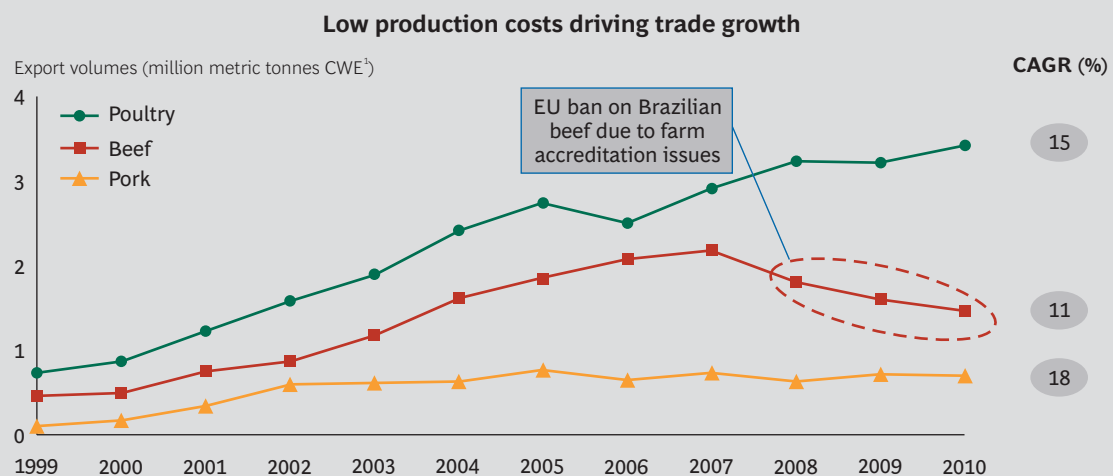
EXHIBIT 2.24 | High crop productivity and pasture availability



Sources: USDA, Ministry of Agriculture, FAO.

¹Includes dairy and beef cattle but excludes small livestock like hogs, turkey, chicken, goats, sheep etc.

EXHIBIT 2.25 | Strong growth in Brazilian meat trade



Sources: USDA, Ministry of Agriculture, FAO

¹Carcass Weight Equivalent.

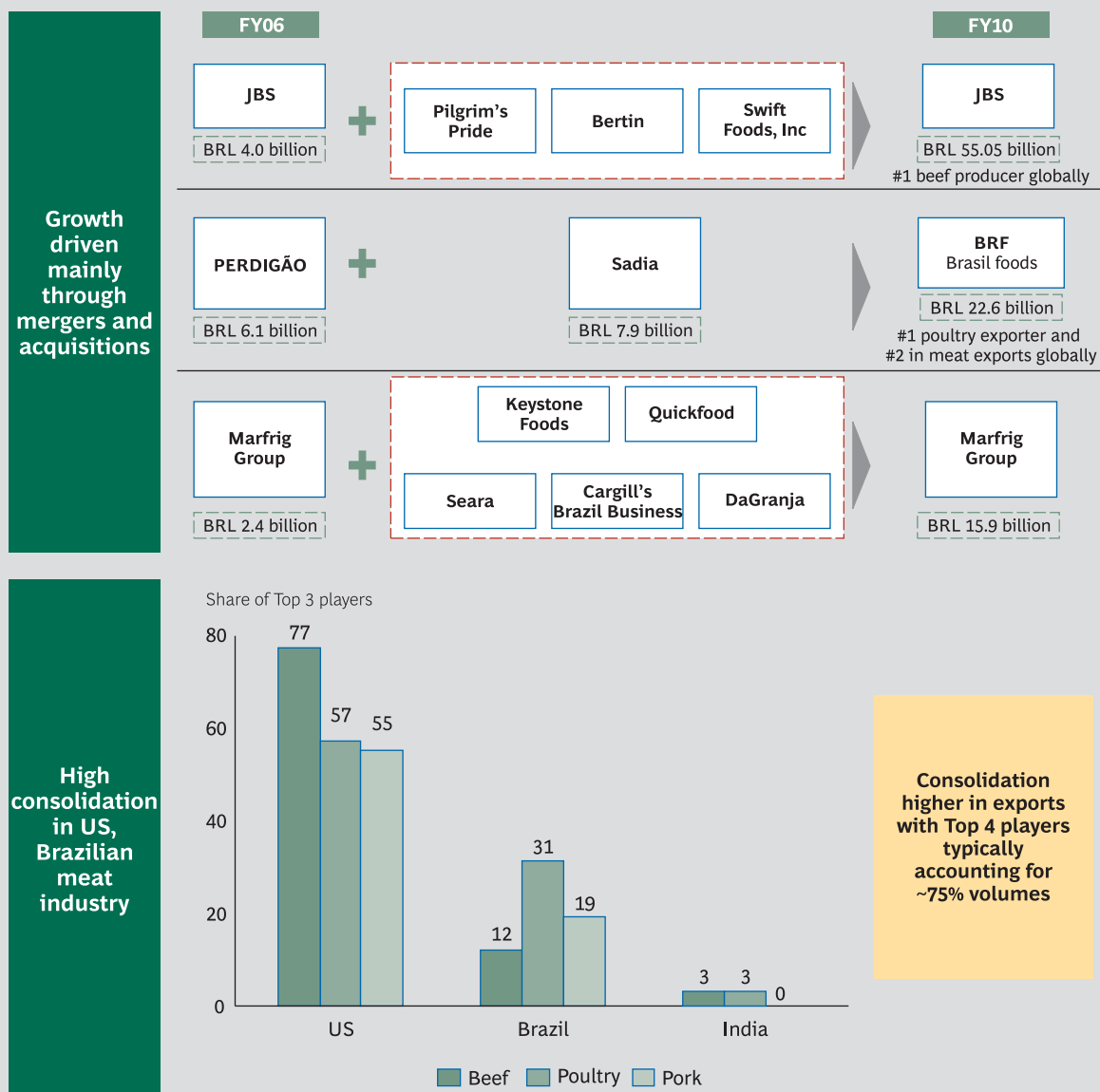
CASE STUDIES OF SELECT PLAYERS

The Brazilian meat industry (continued)

Brazilian meat processors today are highly integrated and operate on a large scale. They have acquired this scale primarily through the inorganic route (see Exhibit 2.26). To put the scale of their operations in perspective, the top three Brazilian processors together handle

around four times India's total meat production. Moreover, they have presence in other geographies, and operate across meat segments — primarily poultry, beef, and pork. This scale has resulted in significant savings and synergies.

EXHIBIT 2.26 | Consolidation in the Brazilian meat industry



Sources: Company annual reports, press releases, ABEF, BCG analysis.

CASE STUDY OF LEADING INDIAN POULTRY PLAYER

The company is a leading poultry player in India, with a share of approximately 18–20 percent in the live birds market. India is predominantly a ‘wet market’²⁴; live birds form about 95 percent of poultry. The player is present across 12 states, and has a contract farming network of approximately 15,000 farmers. It also manufactures feed in over 50 feed mills and markets processed chicken under its own brand. The company is integrated across the value chain and pioneered the contract farming model for poultry in India (see Exhibit 2.27).

High integration across the value chain

Successful implementation of contract farming and

backward integration have been key to the players success.

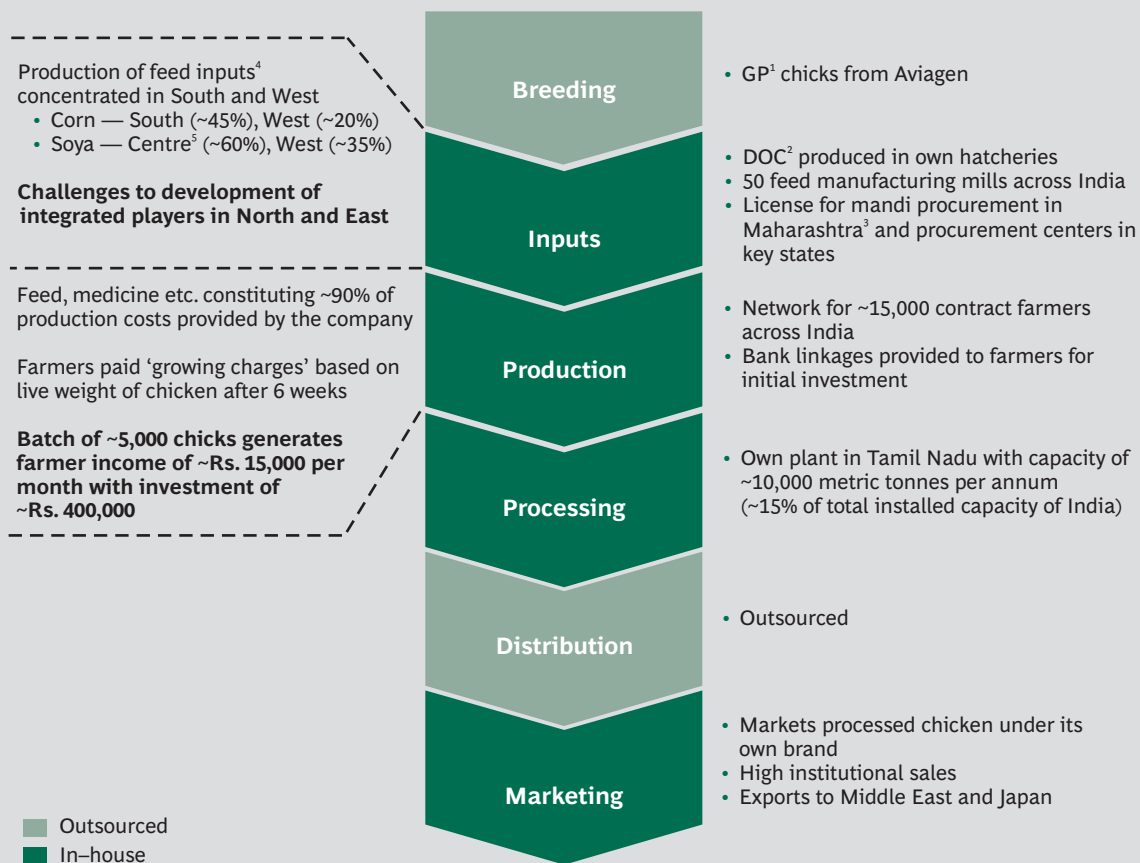
Contract farming

- De-links growth and capital requirements thereby creating greater capital flexibility
- Low cost of labor, as contract farming relies on surplus labor in farmer households

Backward integration

- Reduction in feed costs via direct procurement and investment in efficient mills
- Maintains control over feed supply throughout its network

EXHIBIT 2.27 | Poultry player integrated across the value chain



Sources: Management discussions, corporate website, press releases, Ministry of Agriculture, BCG analysis.

¹Grand Parent.

²Day Old Chick.

³ITC is the only other company that has this license.

⁴Feed constitutes ~60% corn and ~30% soya and ~10% of minerals etc.

⁵Madhya Pradesh accounts for ~60% of India’s soya production.

STRATEGIC CHOICES FOR AN INDIAN MEAT PLAY

Indian meat players have several levers which they may exercise towards growing their business. The key decision levers (as illustrated by Exhibit 2.28) for a successful Indian meat play are as follows:

- **Meat segment and market:** Identify high potential meat segments (poultry, bovine meat, pork, etc.) and markets (domestic versus exports), based on growth potential, competitive entrenchment, and potential for processed products.
- **Regulatory complexity:** Isolate meat segments and markets with a favorable regulatory environment, based on social sensitivity, domestic support for quality assurance, tariff and non-tariff barriers in key global markets (relevant for exports only).
- **Ease of establishing linkages and scale:** The ease of establishing backward linkages and scale, which are essential from a cost and quality control perspective, for a particular meat would depend on regulations concerning contract farming and rearing for slaughter. For the exports market, price competitiveness (based on availability and

prices of key inputs, compared with global producers) of products would be an additional factor affecting scale

Fruits and Vegetables Segment in India

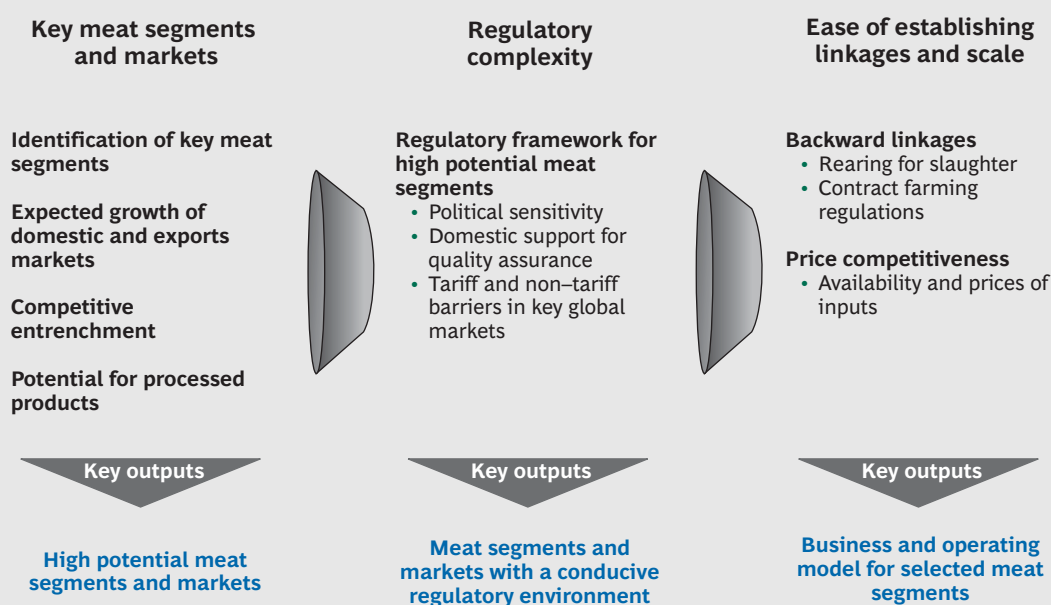
INDUSTRY LANDSCAPE

Fruits and vegetables (F&V) form an important component of the total consumer spend on food items. The share of F&V in India's food expenditure has ranged from 26 to 29 percent in the past five years (FY2005–FY2010). According to 2009 estimates, the market for F&V was Rs. 2,713 billion, with a historic growth rate of 12 percent. Using the historical proportional share of F&V in total food spend, the estimated size of the F&V market in 2010 was pegged at Rs. 3,000 billion to Rs. 3,200 billion (see Exhibit 2.29).

India is the world's second largest market for F&V. Importance of F&V in India will only grow in the future as the country's per capita consumption level of F&V — well behind other countries (see Exhibit 2.29) — increases.

India's F&V production has been growing steadily. In 2010, India produced 210 million tonnes of F&V. The share of fruits in the total

EXHIBIT 2.28 | Key levers for a successful meat play



Source: BCG analysis.

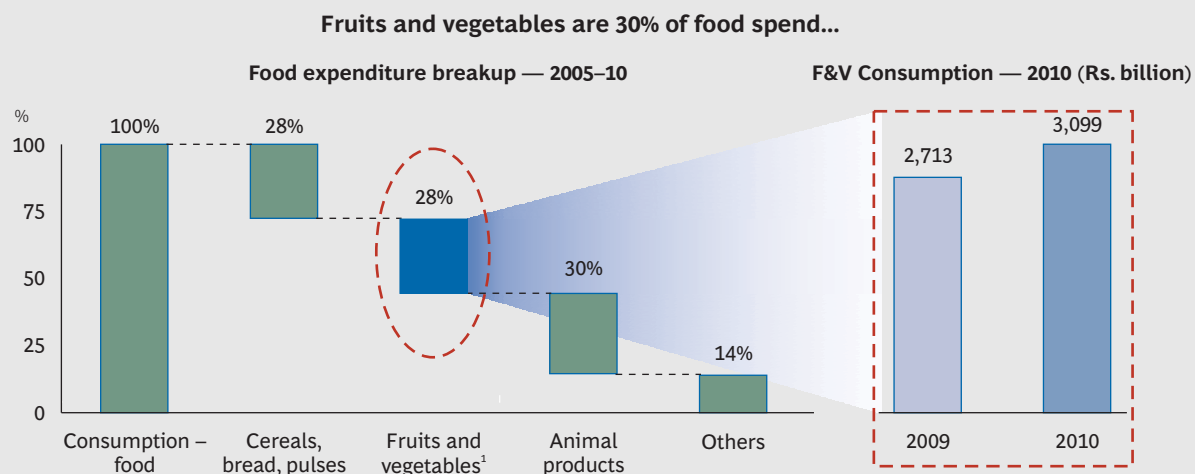
production has been in the range of 33 to 35 percent, while the share of vegetables accounts for 65 to 67 percent. Both production and area under cultivation are growing steadily, with growth rates of 5 percent, and 3 percent, per annum, respectively (see Exhibit 2.30).

Different regions in India produce a variety of crops, based on their distinct climate, soil type and weather. This geographical and environmental diversity has ensured a heterogeneous pattern across the country, as far as production of F&V is concerned. While

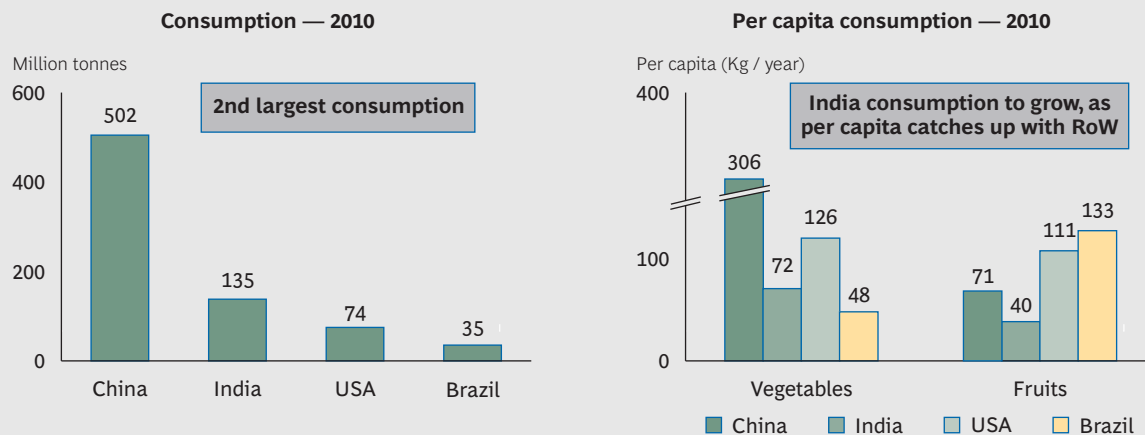
southern, western and eastern states dominate F&V production (see Exhibit 2.31), certain northern states such as Himachal Pradesh, Jammu and Kashmir and Punjab produce a specific variety of fruits.

In terms of F&V production, India is a world leader, accounting for almost 10 percent of total global output. However, the country, which has traditionally consumed more than 98 percent of its produce internally, remains a marginal player in the global exports market — with a typical share of less than 2 to 3 percent (see Exhibit 2.32).

EXHIBIT 2.29 | Consumption of fruits and vegetables — India



...comparing favourably with the world



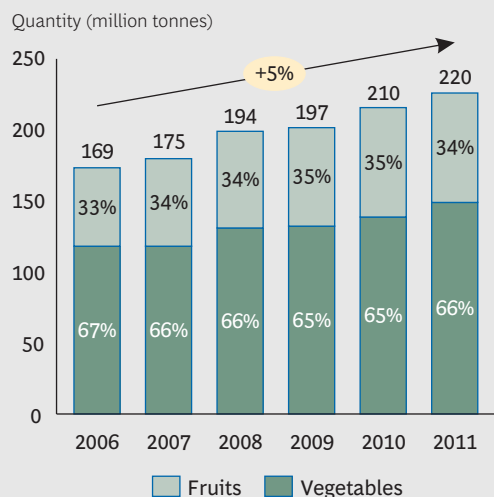
Sources: Central Statistical Organization — National Accounts publication, RBI, EIU database estimates, BCG analysis.

Note: All data relevant for financial years is earmarked with “FY”, otherwise data can be assumed to be relevant for the calendar year.

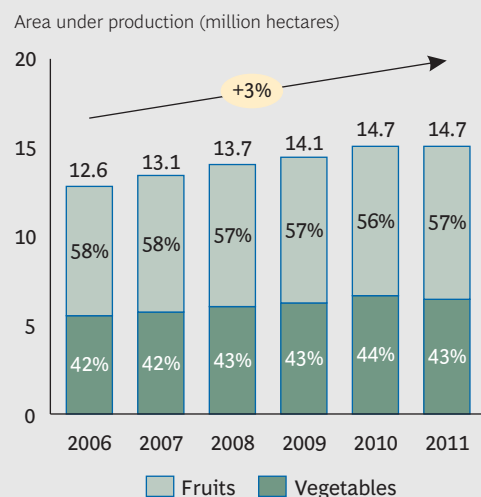
¹Fruits and Vegetables contains potatoes and other tubers.

EXHIBIT 2.30 | Production, area under production of fruits and vegetables India

Fruits and vegetables production — India



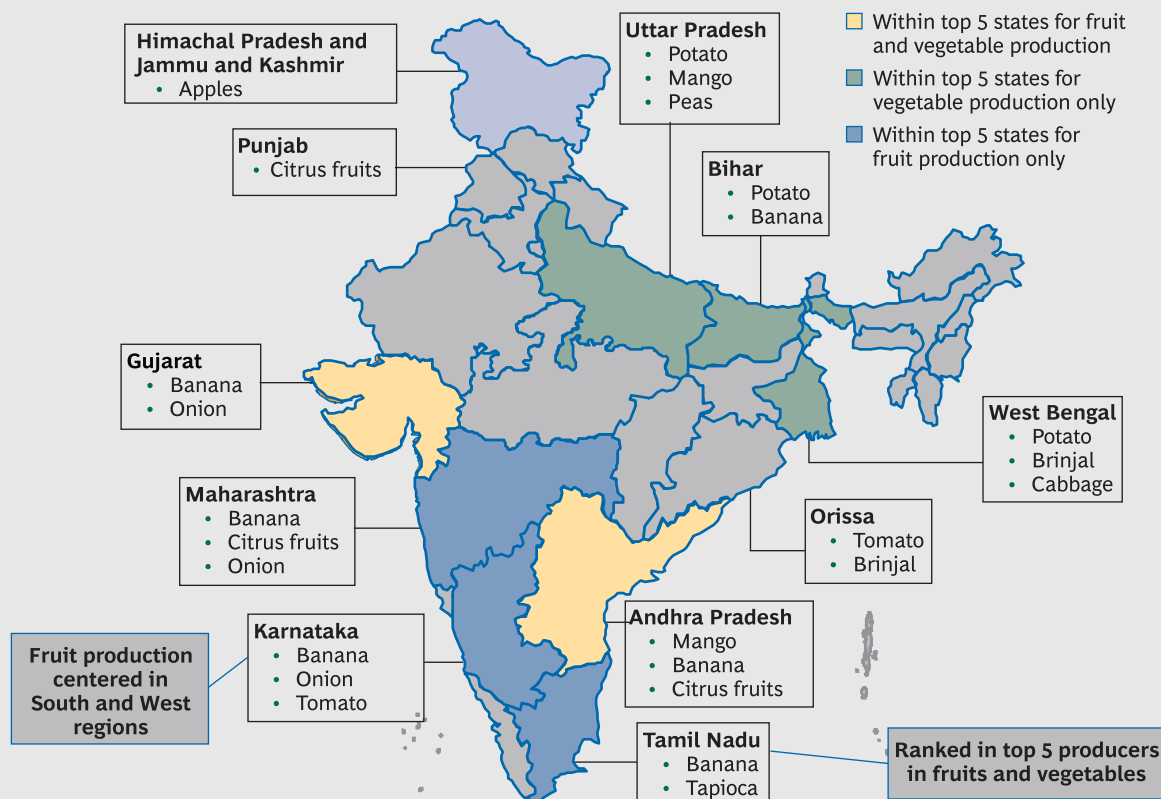
Area under cultivation of fruits and vegetables — India



Sources: FAO statistical database, National Horticultural Board, BCG analysis.

EXHIBIT 2.31 | Top fruits and vegetables producing states India

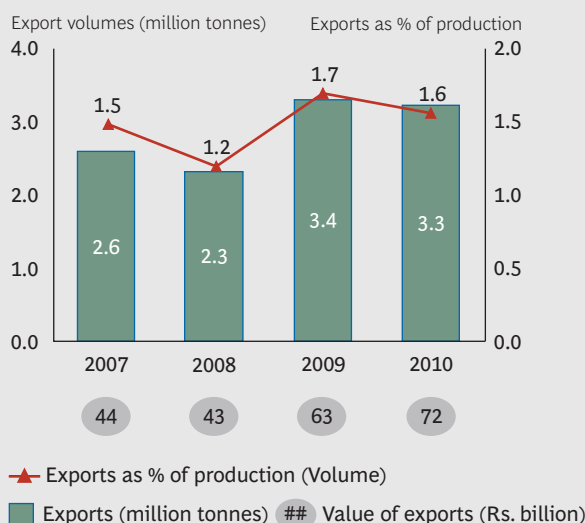
Geographical distribution — Fruit and vegetable production 2011



Sources: National Horticultural Board, FAO, BCG analysis.

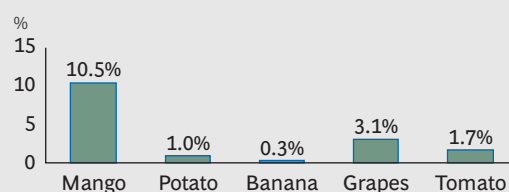
EXHIBIT 2.32 | Current scenario: Indian exports in the fruits and vegetables segment

India exports less than 2% of production...

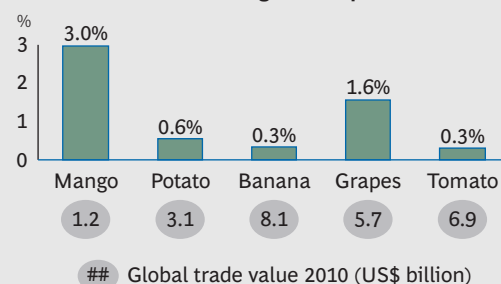


...lagging behind in global F&V trade

India's volume share of global exports — 2010



India's value share of global exports — 2010



Sources: APEDA, FAO, National Horticultural Board, BCG analysis.

OPPORTUNITIES IN FRUITS AND VEGETABLES

The relatively lower level of per capita consumption of fruits and vegetables in India (compared with other countries) points to a strong growth opportunity.

In future, growth in India's F&V consumption (see Exhibit 2.33) will be fueled by the following factors:

1. Rising income levels, increasing affluence in the middle class, and emergence of nuclear households will drive growth in per capita F&V consumption at the rate of 2 to 2.5 percent per annum.
2. Increasing overall consumer base, with a population growth rate of 1.5 percent per annum.

Processing of fruits and vegetables will offer further scope for growth. With the current levels of processing (2.2 percent) being very low compared with other nations (65 percent in the United States and 23 percent in China), there are opportunities for this segment to provide growth impetus through:

1. Increasing urbanization and the emergence of a middle class

2. Emergence of newer lifestyles, nuclear families, and female employment
3. Global market for processed F&V

The market for processed F&V is projected to be worth Rs. 11,500 billion in 2015, up from Rs. 5,800 billion currently, assuming an annualized growth rate of 15 percent.

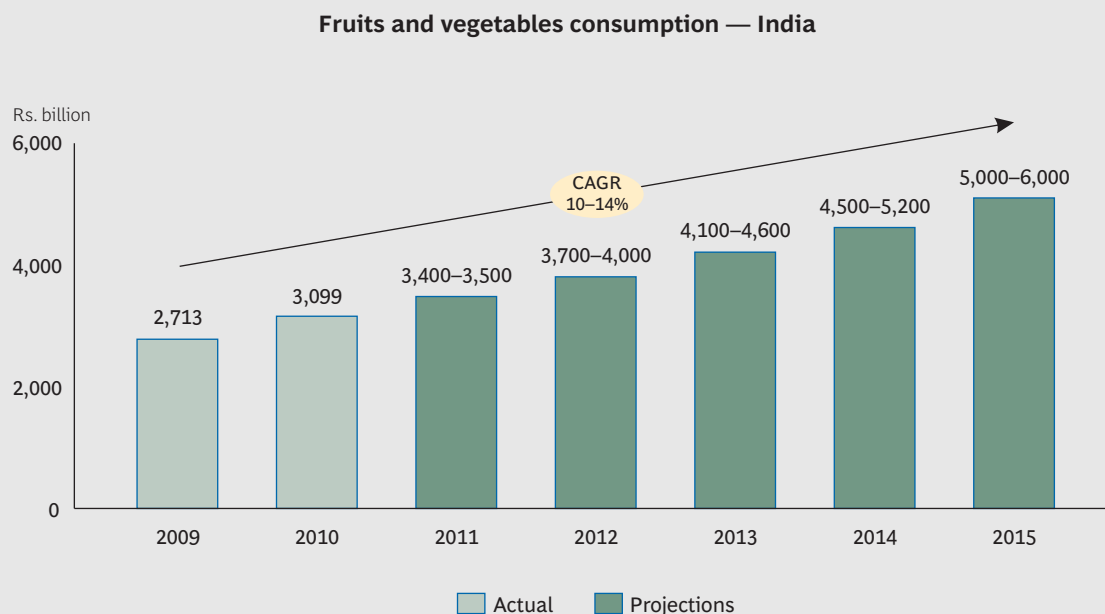
KEY CHALLENGES AND IMPERATIVES

While India's F&V market seems to be large and growing, it is suffering from certain systemic issues. It is critical to identify and resolve these issues in order to create the right conditions to ensure development of this segment.

Sub-standard farming sector

A primary issue is the fragmented landholding pattern. Over 60 percent of land holdings in India are less than 1 hectare in size, thus making the use of modern equipment and agri-technology economically unviable. Also, farming in India is characterized by a severe lack of adoption of modern farming practices, an over-reliance on natural irrigation, and variability of farming techniques. On top of that, the Indian farmer lacks access to credit, insurance, technology and agri-training.

EXHIBIT 2.33 | Projected market for fruits and vegetables consumption for India



Sources: Central Statistical Organization — National Accounts publication, RBI, EIU database, BCG analysis.

Inability to meet quality standards

Indian produce does not lend itself very easily to processing, or to meeting international quality standards. The lack of infrastructure in quality control, packaging, and testing facilities has prevented Indian exporters from meeting global standards such as HACCP, ISO 14000, ISO 22000, etc. Consequently, the country's exports in the F&V segment have been limited to nearby, developing countries.

Long and fragmented supply chain

The traditional farm-to-fork supply chain in India is long and fragmented. There is also a dearth of adequate infrastructure, in terms of cold storage / chains, warehousing, handling, and ripening facilities — resulting in wastage at each stage of the value chain (see Exhibit 2.34). Each stage effectively increases the price that the end-consumer has to pay. This has led to a situation where the consumer price is as high as two to four times the farm-gate price. While these estimates vary by distance, crop, season, etc., the overwhelming fact remains that the share of the farmer in the consumer price is often very low (see Exhibit 2.35).

Low processing levels

Processing levels in India's F&V segment are extremely low (2.2 percent, compared with 65 percent for the US and 23 percent for China). The issues holding back processing are:

- Indian F&V produce has been found unsuitable for processing (high pulp and fiber levels, inconsistency in quality, moisture content, etc.). This, along with factors like low yields and variation in supply, makes the situation unsuitable for the processing industry.
- The presence of intermediaries in the supply chain causes an undue build-up of cost at the input stage itself, increasing the cost of the end-processed product and falling out of favor with consumers.

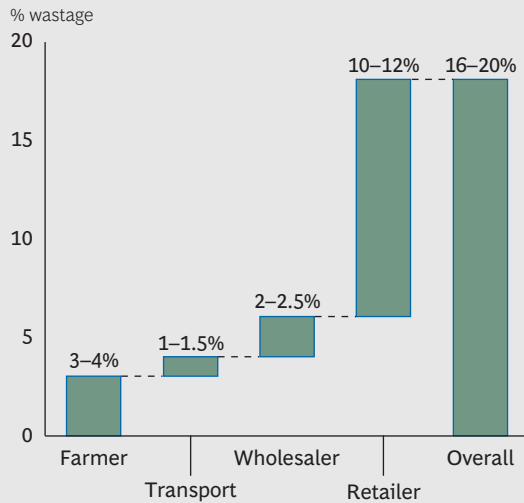
KEY IMPERATIVES FOR INDIAN F&V PLAYERS

Improve farming output

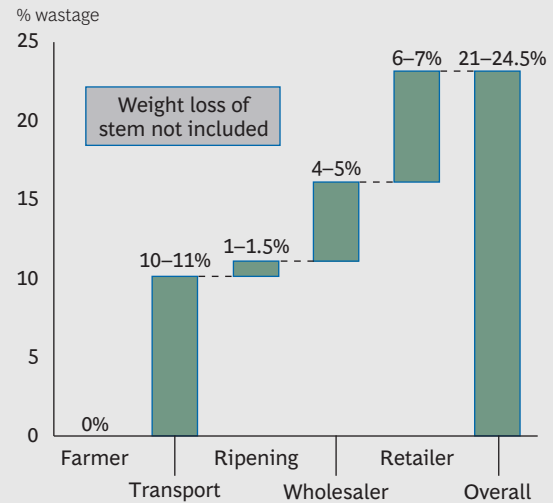
By working closely with the farmer, assisting him, and treating him as a partner, private players can help bring about better yields and quality of produce. Contract farming is an arrangement that has gained moderate

EXHIBIT 2.34 | Illustration: Wastage levels in onion, banana

Illustrative wastage in value chain — Onion



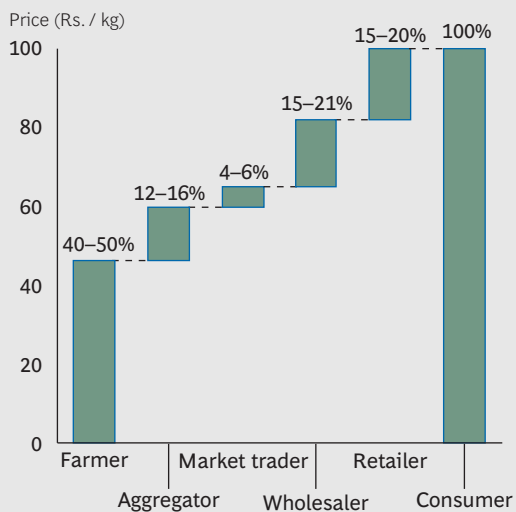
Illustrative wastage in value chain — Banana



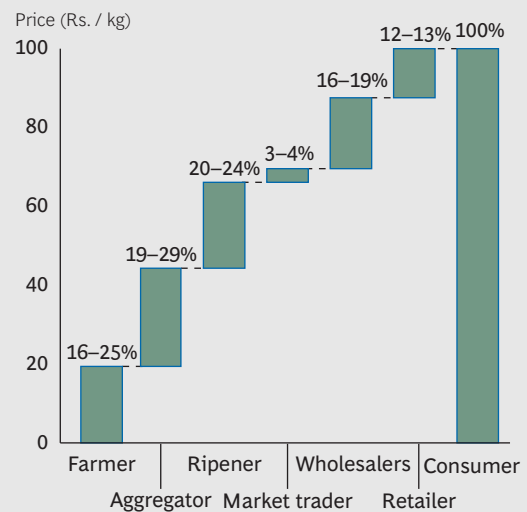
Sources: Expert interviews, BCG analysis.

EXHIBIT 2.35 | Illustrative price build-up — banana and onion

Illustrative prices in value chain — Onion



Illustrative prices in value chain — Banana



Sources: Expert interviews, BCG analysis.

acceptance. Some of the key considerations that need to be taken care of are:

- It is important to earn the farmer's trust and involve him as a partner. Providing him with quality inputs, training, modern equipment, and farming practices will definitely help the initiative.
- Invest in R&D in order to determine the correct crop variant and the appropriate agricultural practice that is required for it.
- It may be necessary to provide support through access to credit, insurance products, and contractual agreements.
- It is important to aggregate farmers in order to build scale and improve financial viability of the initiative.

Create an efficient value chain

Private players can benefit significantly by reducing the current levels of inefficiency in the F&V supply chain. Bypassing the traditional intermediaries will help them reduce their sourcing costs and wastage levels, thereby bringing down the cost for the end-consumer. Investments in the supply chain (cold storage, ripening, warehousing, etc.) are needed to handle the perishable nature of produce. However, private players — in order to make their investments economically viable — should build sufficient scale of operations (through farming of multiple crops, handling a large farmer base, and establishing a large distribution network). This essentially requires focus on two key areas:

1. **Sourcing:** Private players need to improve the sourcing mechanism by procuring directly from farmers, thereby bypassing intermediaries.
2. **Supply chain:** Private players must make substantial investments in cold storage, warehousing, ripening facilities, etc. to improve various supply chain elements.

Meeting quality standards for exports

Exports of Indian fruits and vegetables have been adversely impacted due to the producers' inability to meet international quality standards. Players in this space will have to

overcome this challenge through multiple efforts:

- **Partnering with farmers:** It is important for private players to enter into tie-ups with an aggregated farmer base, assist them in cultivation, and secure a steady supply of produce (wherever necessary) from them that meets global requirements in terms of quality, safety, and hygiene.
- **Developing infrastructure:** Investments in infrastructure such as port facilities, testing and packaging are important factors that would boost exports of F&V.
- **Getting certifications:** Players will need to help farmers achieve international certifications, a precondition to exports.
- **Implementing controls:** It is critical to play across the value chain in order to ensure that both quality and cost controls are properly implemented, prerequisites to running a successful export F&V business.

Increase processing levels

In order to realize its growth potential and succeed, F&V processing sub-segment will need to focus on the following areas:

- Forming tie-ups with aggregated farmers, providing assistance, if necessary, and ensuring consistent, high-quality produce.
- Establishing processing facilities close to farms, reducing transport costs and wastage.
- Tightly managing the entire chain to ensure control over costs, since price cuts will speed up adoption of these products.

Integration and scale

The success of a private player will depend upon how it executes against the imperatives listed above. The ability of a player to play across the value chain will translate into:

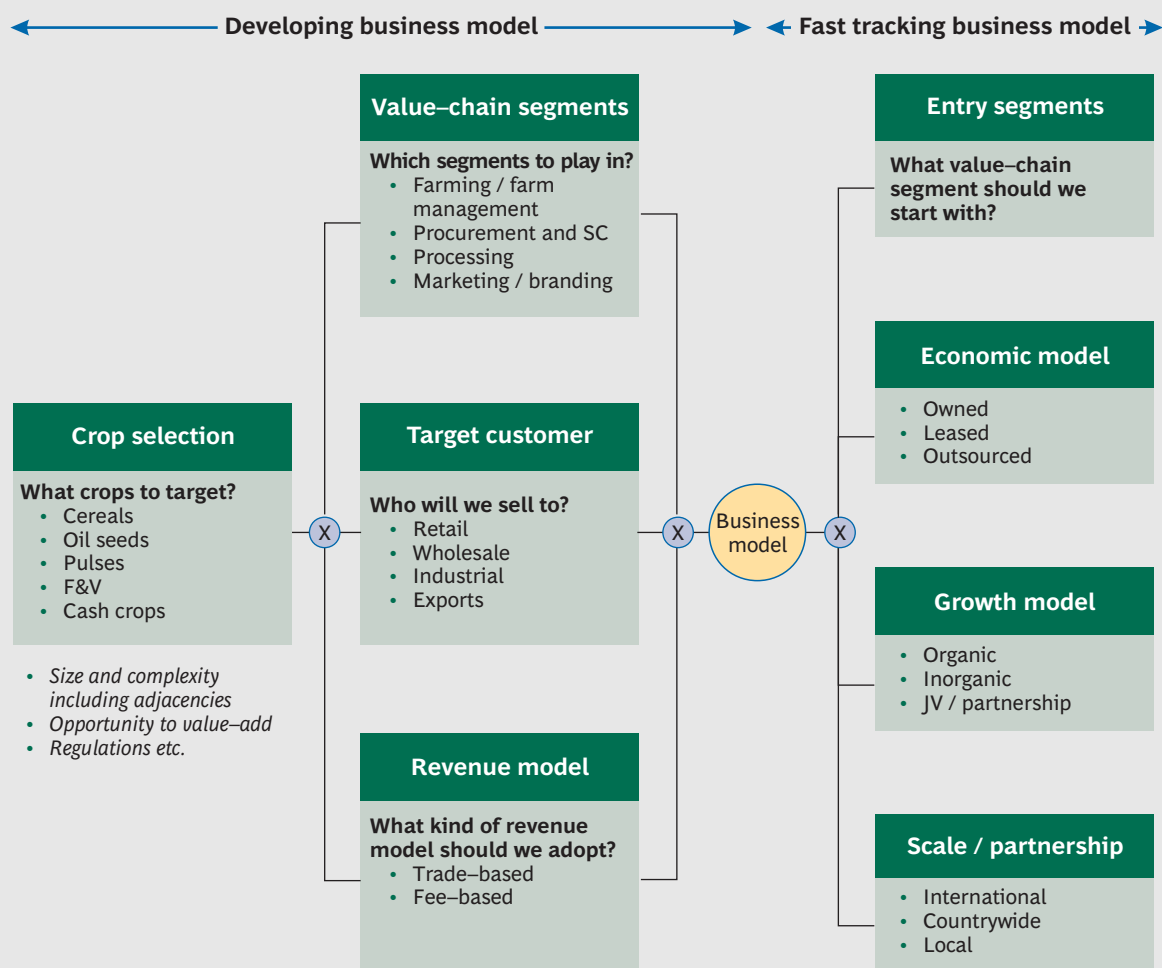
- Assured supply of quality inputs through efficient agri-practices.
- Exercising of strict control over the supply chain to monitor quality and costs, and to reduce wastages.

- Downstream presence in the retail channel leading to fuller monetization of upstream efforts.
- It will be important for F&V players to achieve scale, which will determine the viability of the investments required for implementing these imperatives. To achieve scale, private players will have to:
 - Diversify into multiple crops and geographies.

STRATEGIC CHOICES FOR AN INDIAN F&V PLAY

Companies pursuing opportunities in the fruits and vegetables space in India first need to determine the construct of their business models and then seek to accelerate development of the same (as illustrated in Exhibit 2.36). The emergence of companies with global scale, such as Dole and Pepsi, in the F&V market may offer some pointers to Indian players keen on building substantive interests in this space.

EXHIBIT 2.36 | Key decision levers for Indian fruits and vegetables play



Sources: Expert interviews, BCG analysis.

NOTE:

1. CII-BCG Report — Building a New India: The Role of Organized Retail in Driving Inclusive Growth.
2. ~48% of the milk produced is consumed within the producer household itself thus only ~52% is the marketable surplus.
3. Mainly includes *khoa* and *chenna*.
4. Some flattening or drop at the top income deciles.
5. Household consumer expenditure in India, 2007–08, NSS 64th Round, National Sample Survey Organization, Ministry of Statistics and Programme Implementation, Government of India.
6. Litres Per Day.
7. Dhyani S. K. et al 2009, “Agroforestry potential and scope for development across agro-climatic zones in India”, Vol. 32(2) pg. 181–190, Indian Journal of Forestry.
8. Rapeseed extract, Molasses, de-oiled rice bran.
9. Chairman’s speech, 36th Annual GBM, Amul, August 18, 2010.
10. NABARD Annual Report, 2009–10.
11. Primarily liquid milk.
12. Since cow slaughter is banned in most states, bovine meat in India mostly constitutes buffalo meat.
13. Sheep, goat and lamb.
14. Street side slaughter and sale of meat.
15. India exports ~20% of its buffalo meat production.
16. Relevant for chicken as India is a competitive producer of beef.
17. Cow slaughter allowed under certain conditions in Kerala, West Bengal and select north east states.
18. System of pricing in which buyer and seller communicate via hand movements under a piece of cloth.
19. Industry discussions.
20. Sanitary and Phytosanitary Measures.
21. National Meat and Poultry Processing Board.
22. Feed Conversion Ratio is the amount of feed required to produce the equivalent weight of meat.
23. A live animal market.
24. Suguna currently has a license for direct *mandi* procurement in Maharashtra.

CASE STUDIES OF SELECT PLAYERS

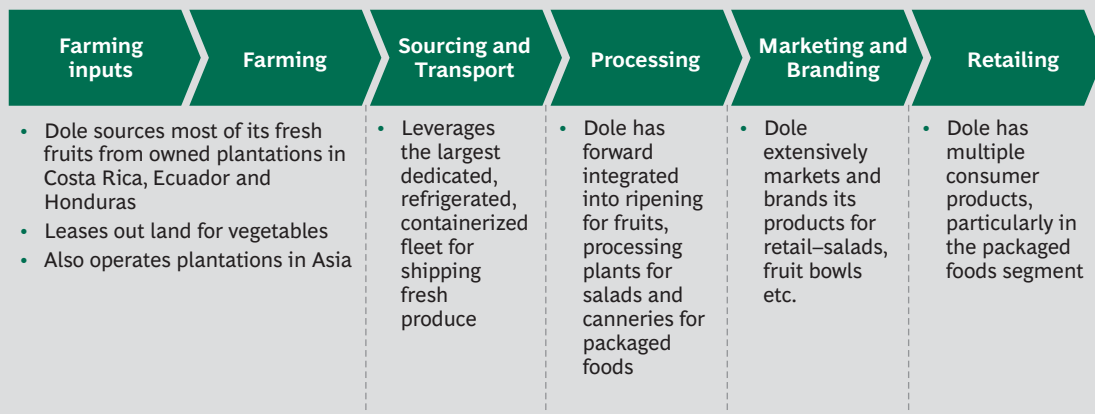
Dole Food Company

With a presence in over 90 countries, Dole is a leading global producer, marketer and distributor of fresh fruits and vegetables, including a line of value-added fruit and vegetable products. Its product portfolio includes fruits (banana, kiwi, pineapple, etc.), vegetables (lettuce, celery, packed salads, etc.) and packaged foods (canned fruit, juices, etc.). A key reason for Dole’s success has been its uniquely integrated model (see Exhibit 2.37) — including sourcing, growing, processing, distributing and marketing — which helps it maintain input supply and quality, and simultaneously minimize risks and costs.

The company is able to source inputs through its own plantations, in Costa Rica, Ecuador and Honduras, ensuring steady supplies. Assets in the supply chain help it maintain quality levels and reduce costs. Dole’s recent focus on value-added products, like salads, fruit bowls, frozen fruits, organic products etc., marks an extension of its integrated play, moving the company into higher margin products. Its ability to scale up to a diverse product portfolio has helped it leverage its distribution base, as well as minimize the volatility of its earnings. Dole established a ‘pipe-line’ first, building scale and ability, and then carried other products with it.

EXHIBIT 2.37 | Integrated play of Dole Food Company

Integrated value chain play — Dole Food Company



Sources: Company information, press research, industry reports, analyst reports, BCG analysis.

¹Net Fixed Assets.

²Ranges based on last available 5 years data.

CASE STUDIES OF SELECT PLAYERS

PepsiCo — Tomatoes

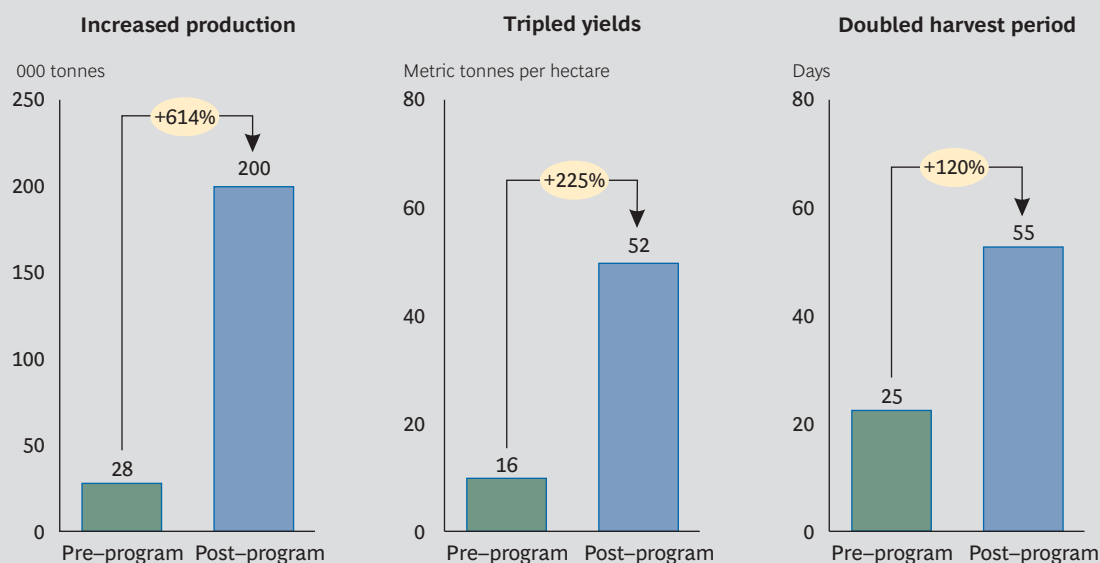
PepsiCo entered India in 1989 to sell beverages and snack foods which started with investment in horticulture-based food processing in Punjab. Pepsi decided to venture into tomato processing for selling pastes and purees. However, a key concern was the lack of tomato production in the state, which had a total output of 28,000 tonnes that was largely unsuitable for processing. Moreover, the yield levels were low, with a supply period of 25 days. Thanks to Pepsi's efforts, production grew manifold, improving yield and quality. The supply period increased to 55 days. The reasons for the company's success are enumerated below:

- Pepsi leveraged key local agencies such as Punjab Agri-University and Punjab Agro Industries Corporation, which helped the United States-based multinational corporation acquire local knowledge and provide the much-needed extension services to the farmer.
- Pepsi became closely involved in the farmer extension process, providing training to farmers.
- Investments were made in R&D and field trials were conducted to evaluate if the crop variety is suitable for use.
- Farming demonstrations were made to the farmers. The economics of the entire operation was explained to them in order to have greater transparency in working with farmers.

Pepsi's efforts in winning over the trust of the farmers, as well as the introduction of proper crop variety and agri-practices, led to its immense success (Exhibit 2.38). These initiatives also ensured a constant supply of quality inputs for its tomato processing plant, creating a successful model for Pepsi.

EXHIBIT 2.38 | Impact of PepsiCo contract farming in Punjab — Tomato

Impact of PepsiCo tomato contract farming effort



Sources: Company information, press research, industry reports, analyst reports, BCG analysis.

¹Net Fixed Assets.

²Ranges based on last available 5 years data.

INPUTS

CRITICAL TO THE NEXT agricultural revolution is the improvement in associated value chains. Inputs into agriculture include: Seeds, Fertilizers, Pesticides, Credit, Insurance and Information.

Each of these input areas is an industry in itself, and merits separate examination. However, this chapter outlines the levers that may be utilized across industries to have a positive effect on the downstream agricultural sector.

Agricultural inputs such as seeds, fertilizers, and pesticides play a critical role in extracting higher agricultural yield. The correlation between the quality of inputs and yield is clearly established. Lack of quality inputs prevents farmers from maximizing output from their land. The growth of Indian agriculture depends on improving the quality and availability of inputs. This chapter seeks to understand six key inputs that are required by farmers for increasing agricultural produce:

- **Seeds:** Once the decision to sow a particular crop has been taken (based on varied inputs), the use of the right variety of seeds is essential to ensure high yield. Examples of the use of high yielding varieties of seeds in the Green Revolution and the Bollgard technology in cotton clearly outline the importance of quality seeds in enhancing yield.
- **Fertilizers:** Along with seeds, fertilizers are credited with the significant yield improvement in wheat during the Green Revolution. Fertilizers provide the all-important nutrition to crops, and play a crucial role.
- **Pesticides:** Much as the use of quality inputs is essential to enhance yield, the use of pesticides is essential for protecting the crop from losses due to pest attacks, weed growth, and diseases. It is estimated that approximately 40 percent of crop yield losses occur due to pest attacks, weeds, and diseases.
- **Credit:** Most Indian farmers have limited resources at their disposal and also have little or no disposable income for re-investment in their farms. Credit, therefore, is indispensable to the farmer in meeting the crop-cycle expenses. Availability of credit is a key factor that will drive adoption of all other inputs.
- **Insurance:** On one hand, Indian farmers do not have access to low-cost institutional credit, and on the other hand there are several risks associated with agriculture that make farmers even more (financially) vulnerable. Some of these risks, such as weather, are beyond control. Therefore, insurance is a key input required to diversify these (uncontrollable) risks, and reduce the

risk profile of the farmer. Insurance would also enable better access to low-cost credit and catalyze the adoption of other inputs.

- **Information:** A farmer's decision to sow a particular crop or use a particular input is based on the (limited) information available to him. Access to quality information can assist the farmer in taking more informed and timely decisions. Similarly, the farmer can use (timely) information to improve his yield and realization.

This chapter looks at each of these six inputs to understand the current landscape, nature of challenges, and opportunities within each segment. Within each category, a detailed analysis is presented along the following parameters:

1. **Industry landscape and opportunity:** To understand the characteristics of the market, in terms of size, players, and product sub-segments, and identify key trends / opportunity in the sub-category
2. **Key challenges:** To identify potential challenges in order to realize the opportunity.
3. **Key success factors:** To identify potential ways to realize the opportunity by the private players

In addition, this chapter also looks at the possibility of convergence play in the distribution of inputs to address issues like low adoption and unscientific usage of inputs. This chapter looks at the possibility of four distinct business models in this space.

Seeds

INDUSTRY LANDSCAPE

Seed plays a critical role in improving agricultural productivity. It offers “low cost — easy to deliver” solution for raising the crop productivity. Seed is the only vehicle to carry superior genetics with high yield potential and biotech traits to the farmer. Technology delivery to both small and big farmer through seeds is the most convenient and effective way (as compared with other productivity enhancing inputs like fertilizers, irrigation etc.).

The Indian seed industry has seen tremendous growth in the past and has become the sixth largest in the world. The volume of certified seed consumption has more than doubled in the last five years from 1.3 million tonnes in 2005 to 2006 to 2.8 million tonnes in 2009 to 2010 (see Exhibit 3.1). Currently, the Indian seed industry is about Rs. 70 billion industry, and is expected to be about Rs. 125 billion by FY2015.

Evolution of the Indian seed industry

The seed sector in India has made impressive progress over the last five decades (as represented in Exhibit 3.2). In the 1960s and 1970s, it was dominated by the public sector, with minimal private sector participation, with R&D being restricted to the public sector domain. Until the 1980s, crop research institutes under the Indian Council of Agricultural Research (ICAR) and state agricultural universities were sources of technology for the seed companies. Foreign participation, both in terms of trade and capital, was restricted.

The seed industry was liberalized in 1988, with the articulation of National Seed Policy. It came with a Rs. 7 billion loan from the World Bank to help privatize the Indian seed industry. The policy was the turning point for the industry, and eventually gave shape to the organized seed industry. The policy allowed foreign direct investment and liberalized import of improved varieties and breeding lines. It has provided Indian farmers access to the best seed and planting material available anywhere in the world.

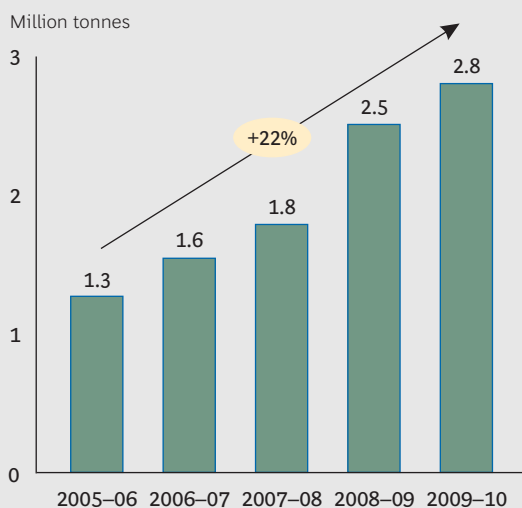
The policy stipulated appreciable investments by private players in the Indian seed industry, along with provisions for a strong R&D base for product development. As a result, the private sector has virtually taken over the seed industry, making spectacular progress in the supply of quality seeds. Currently, there are about 500 private seed companies accounting for 80 percent of the turnover in the seed industry. About one-third of the private companies have technology or financial partnerships with global players.

Low penetration of hybrid seeds

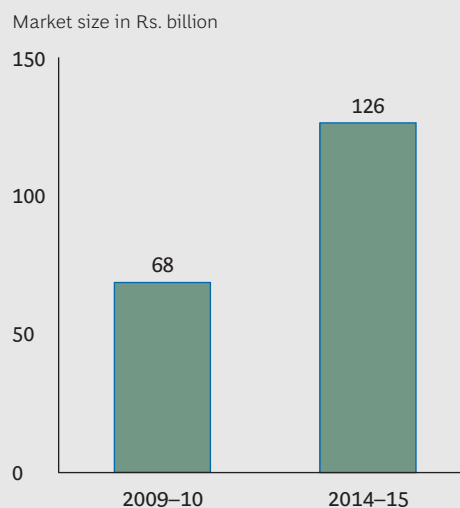
Seeds have been a key lever in improving agricultural productivity globally. The use of high yielding varieties of seeds played a

EXHIBIT 3.1 | Current and expected market size of seed industry in India

Significant growth in certified seed consumption in the last 5 years

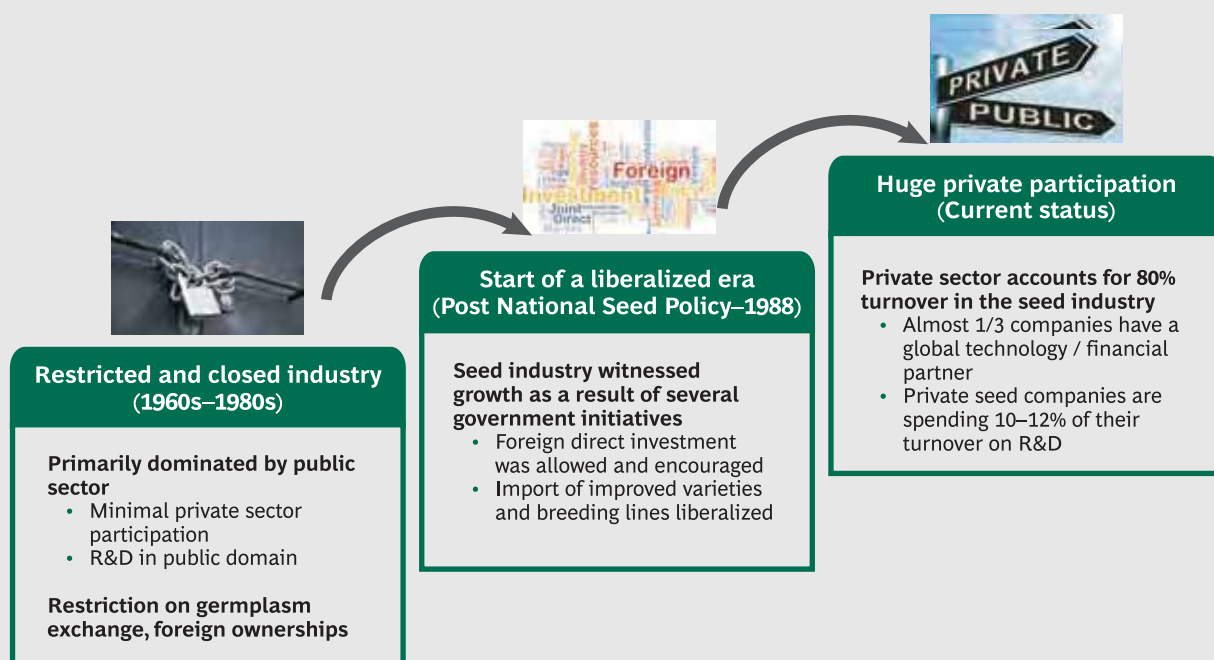


...leading to Rs. 68 billion seed industry and expected to reach Rs. 126 billion by 2015



Sources: Agricoop.gov.in, Grain Agricultural Information Report, Seednet.gov.in, National seed association of India, Indiastat.com, BCG analysis.

EXHIBIT 3.2 | Evolution of Indian seed industry



Sources: Literature review and BCG analysis.

significant role in making India's Green Revolution a success. Cotton yield has increased by 144 percent since the introduction of the Bollgard technology (Bt) in 2002. Yields for maize, which has also seen increasing use of hybrid seeds, have also increased by 30 percent in the last 10 years.

Despite the success of hybrid seeds in cash crops, their penetration is currently limited at about 25 percent of the total seed market in India. In certain crops such as rice, the penetration of hybrid seeds is just about 5 percent (see Exhibit 3.3). Rice yield has increased only by 15 percent since the introduction of hybrids in 2001. China, which has hybrids being sown in 70 percent of rice acreage, has seen yields jump by 72 percent in two decades following the introduction of hybrids in 1971.

Even among cash crops, certain crops such as mustard have low hybrid penetration as compared with other countries. Going forward, increase in penetration of cash crops such as maize, mustard, and fruits and vegetables as well as increase in the area under cultivation

for these crops is likely to drive growth in the seeds industry.

KEY CHALLENGES

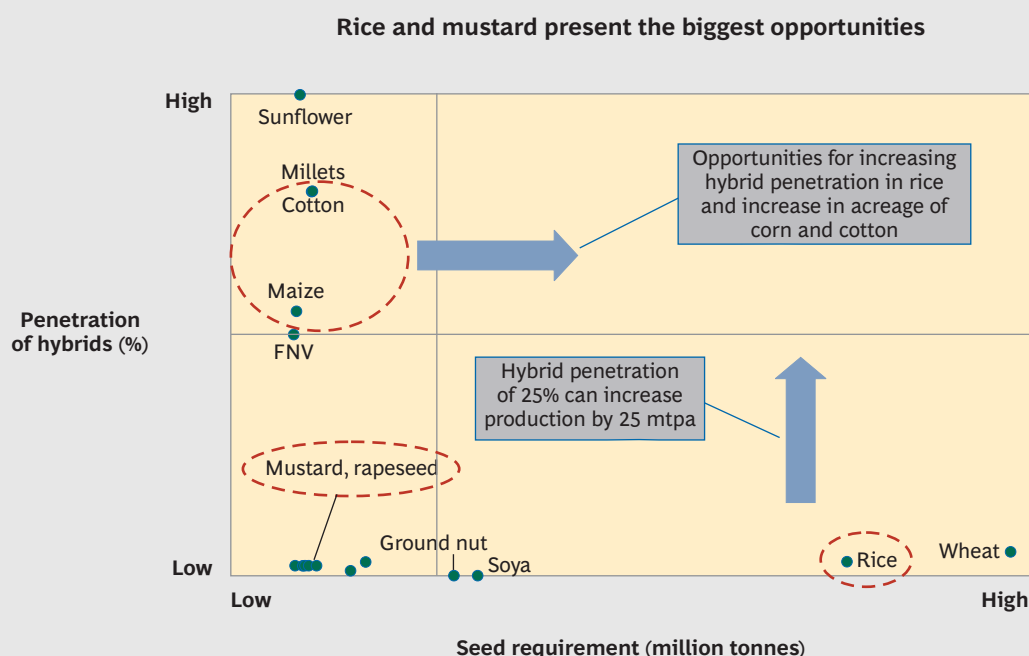
While the seed industry has immense growth potential, given the low penetration of non-varietal seeds in India, the following challenges restrict its growth:

- Stringent regulations for introduction of Genetically Modified (GM) seeds, restricting product introductions
- Low adoption of current products due to suitability issues

Stringent regulations for introduction of GM seeds restricting product introductions

Currently, all non-varietal seeds need to be certified by the government prior to sale. Further, there are stringent regulatory requirements relating to the sale of GM seeds. Sale of all GM seeds, except cotton, is prohibited. Globally, GM seeds have been developed in crops such as soya, maize, brinjal, tomatoes, etc. However, these are yet to be introduced in India given the stringent regulatory requirements.

EXHIBIT 3.3 | Seed Requirement and penetration of hybrid across various crops in India



Sources: Agricoop.gov.in, Grain Agricultural Information Report, Seednet.gov.in, National seed association of India, Indiastat.com, BCG analysis.
Note: F&V: Fruits and vegetables.

Low adoption of current products due to suitability issues

In case of certain crops such as rice, which saw the introduction of hybrid seeds in 2001, the adoption among farmers has been lower at about 5 percent of the cropped area. This is primarily due to issues relating to the suitability of these hybrids. For example, farmers sowing hybrid rice fetch lower realization for their produce due to differences in taste compared to varietal rice.

Overall low penetration of hybrids presents significant opportunities for seed companies in India. However, certain critical strategies would stand seeds players in good stead, as they look to accelerate growth going forward:

- Product development for a wider product portfolio
- Effective distribution network to drive adoption

Product development for a wider product portfolio

A farmer's decision to sow a particular crop and then a particular seed variety depends on various factors. In volatile climatic conditions, certain crops may not be suitable depending on the extent of rainfall or temperature in a particular season. This may impact revenues of companies supplying seeds for those crops. Therefore, it is essential that companies develop a wide product portfolio to reduce vulnerability arising from changing climatic conditions. Further, given the fact that farmers have to contend with new diseases and pests every now and then, first-movers that develop hybrids with resistance to such pests and new diseases stand to gain considerable market share. Seeds companies may also look at acquisitions of small or medium players to gain access to their product, or product portfolio, and gain a larger market share. Developing hybrids suitable to Indian taste is also essential to ensure higher adoption, especially in the food grains category.

Effective distribution network to drive adoption

As mentioned earlier, a farmer's decision to sow a particular seed depends on a variety of factors. Farmers typically sow more than one brand to mitigate the risk of failure of a

particular type of seed. It is, therefore, essential that a strong farmer ecosystem is developed to firstly encourage greater adoption of hybrids, and subsequently build brand loyalty. A well-developed network can also provide inputs on changing agronomic conditions, diseases, and pests for new product development.

Given the advantages from leveraging a distribution network and wide product portfolio, there appears to be a rationale for the emergence of a player with significant national reach and a wide product portfolio.

Fertilizers

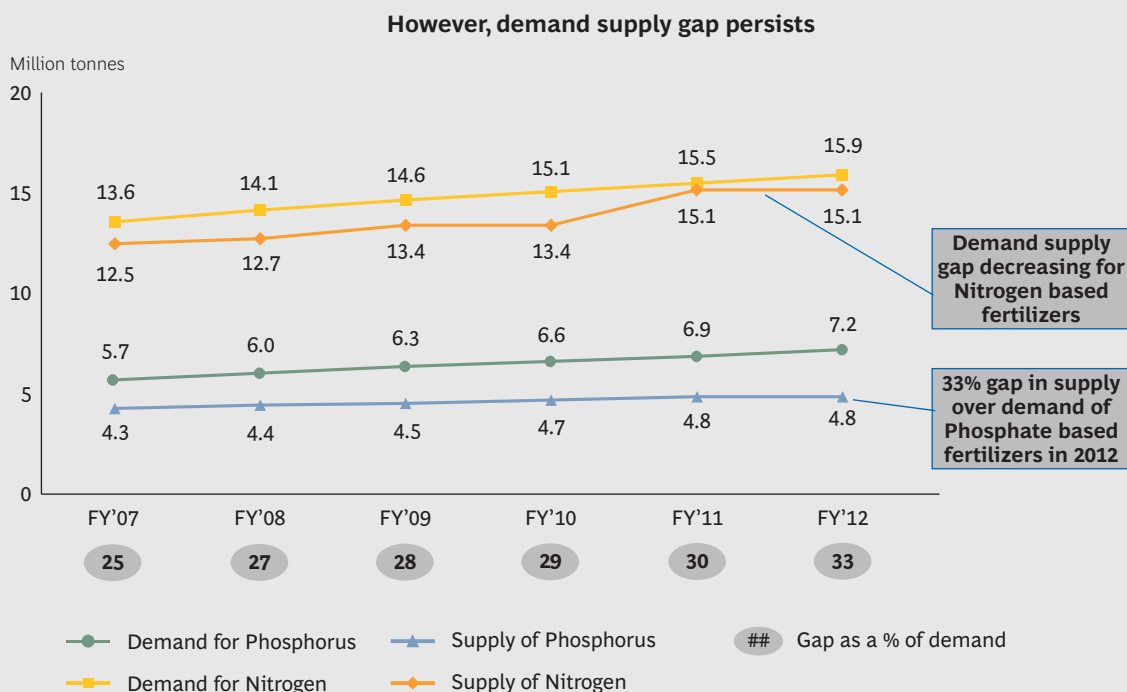
INDUSTRY LANDSCAPE

The Green Revolution in the 1970s brought in a stupendous increase in wheat productivity, helping India resolve the critical issue of food security. Today, as stagnating agricultural productivity impairs growth in food production to meet the growing demand, it is essential to take cues from the Green Revolution to resolve this issue. During the Green Revolution, chemical fertilizers were credited with significantly increasing wheat productivity by providing effective and balanced crop nutrition. Chemical fertilizers primarily contain three major nutrients — Nitrogen (N), Phosphorus (P), and Potassium (K) — and certain secondary nutrients and micronutrients that impart color to plants, strengthen roots, and build resistance to drought and diseases. The consumption of N, P and K increased significantly during the Green Revolution — from 0.8 million tonnes in 1965 to 1966 to 1.8 million tonnes in 1968 to 1969.

Availability of fertilizers to farmers

After nearly 65 years of Independence, availability remains the biggest challenge impeding balanced and adequate use of fertilizers in India. By 2012, there will be a supply shortfall of 33 percent in phosphate-based fertilizers against a requirement of 72 million tonnes. (see Exhibit 3.4). Nitrogen-based fertilizers are also expected to be in short supply as set out in the chart below. While low availability of raw materials is the root cause for the demand-supply gap in the case of urea, inadequate imports have resulted in shortage of phosphorus and potassium-based fertilizers. However, the demand-supply gap is expected to narrow down in the case of

EXHIBIT 3.4 | Demand supply gap in fertilizer



Sources: Indiatat, FAI, FAO, BCG analysis.

urea, given the imminent capacity additions after the recent allocation of natural gas.

High reliance on imports

The use of chemical fertilizers in India has grown by approximately 7 percent per annum through the period 2004 to 2005 to 2010 to 2011 (see Exhibit 3.5). However, production capacities for Nitrogen and Phosphorous have grown only by 6 percent in the same period leading to higher imports that grew by 24 percent during this period. The high growth in imports is primarily on account of higher imports of potassium-based fertilizers, for which India completely relies on imports due to the absence of potash reserves in the country. Limited availability of phosphate rock and natural gas, which are raw materials for phosphorus- and nitrogen-based fertilizers, has impeded growth in production capacities.

Imbalanced usage

The use of fertilizers in India is highly skewed in favor of nitrogen on account of high usage of urea. While the national ratio of consumption of Nitrogen, Phosphorous, and Potassium respectively was 5:2:1 in 2009 to 2010, close to

the recommended proportion of 4:2:1, the imbalance in the usage of urea is even higher in North India at 15:4:1 (see Exhibit 3.6). The imbalance in usage can be primarily attributed to better availability and relatively cheaper prices of urea as compared with other fertilizers. The increased use of nitrogen-based fertilizers has resulted in depletion of other soil nutrients and has affected crop productivity.

KEY CHALLENGES

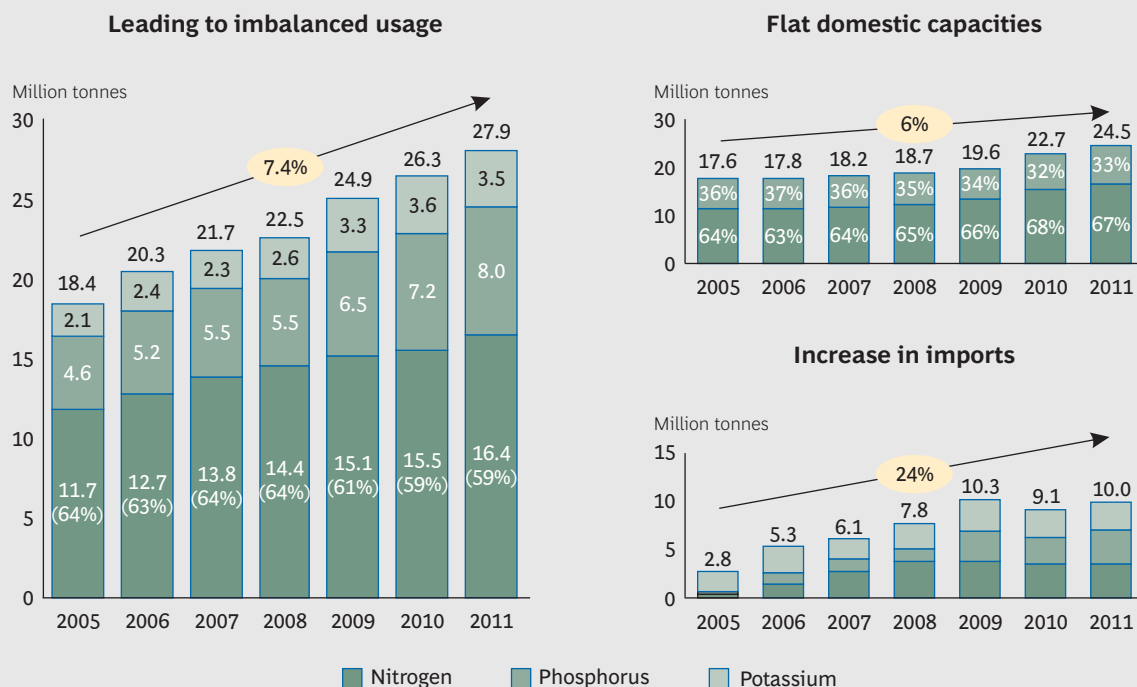
The two key challenges that have been impeding the adequate and balanced use of fertilizers are:

- High cost of production and imports, resulting in high subsidies
- Lack of raw material supplies for production

High cost of production and imports resulting in high subsidies

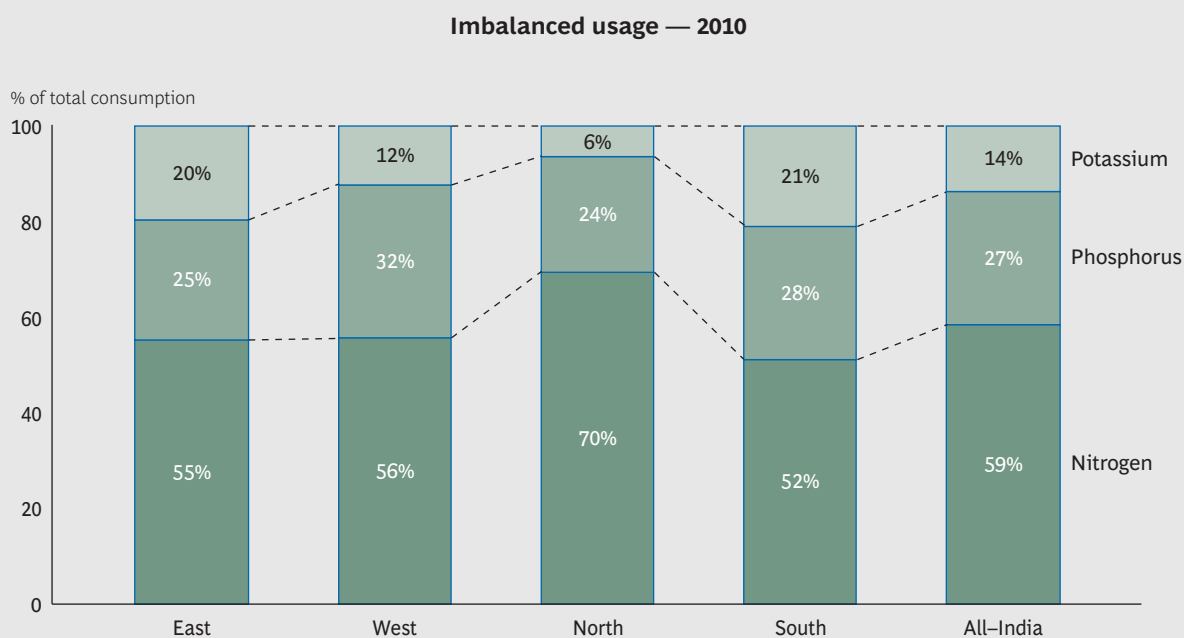
Under the cost-based subsidy regime, subsidy was paid to companies based on the cost of production or imports. However, with rising global prices and increasing fertilizer

EXHIBIT 3.5 | Fertilizer consumption, domestic capacities and import of fertilizer in India



Sources: Indiatat, FAI, FAO, Department of Agriculture, BCG analysis.

EXHIBIT 3.6 | Usage of NPK fertilizer in different parts of India



Sources: Department of Agriculture and Cooperation, Ministry of Agriculture — Government of India.

consumption, the rise in subsidy has been significant (see Exhibit 3.7). The government has discharged the subsidy liability in the form of bonds which can be sold off by companies, resulting in enhanced working capital requirements. While companies have the option of selling these bonds to raise cash, most of these bonds are trading at discounts resulting in losses to fertilizer companies. Higher working capital requirements have become a constraining factor limiting operations for most fertilizer companies.

With a view to reduce the subsidy bill and also to correct the imbalance in fertilizer usage, the government moved over to a nutrient-based subsidy regime for non-urea fertilizers. Under this regime, the subsidy is fixed per kilogram of nutrient in the fertilizer. Fertilizer companies are permitted to fix market prices based on changes in the international prices of fertilizers. Further, prices of urea have been increased by 10 percent, resulting in lower subsidy burden on the government.

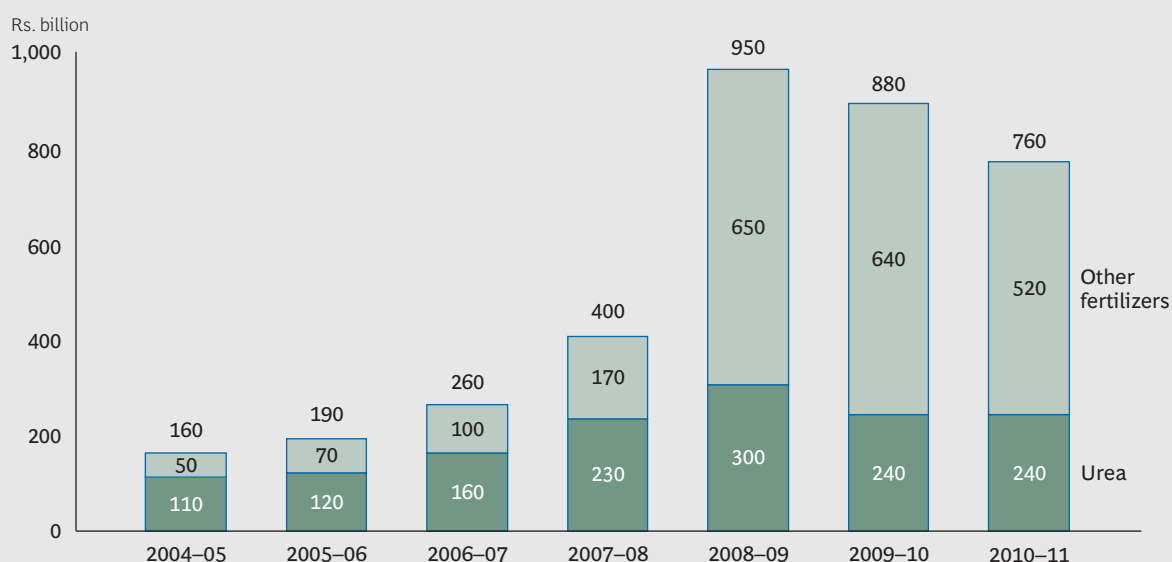
However, given that urea, which accounts for approximately 30 percent of the fertilizer

consumption in India, is not covered under the Nutrient-Based Subsidy (NBS) scheme, the objectives underlined in the scheme are unlikely to be met in entirety. Further, while availability of non-urea fertilizers, primarily di-ammonium phosphate and muriate of potash, has improved after the introduction of NBS, there is no definitive evidence to suggest there would be a correction in the imbalance, prevalent in the usage of fertilizers, in the future. However, it is still early to draw any conclusion. Correction in the imbalance is likely to happen over a long period of time.

Lack of raw material supplies for production

Within urea, availability of natural gas, which is the cheapest raw material, poses the biggest challenge for manufacturers. The government had instructed all urea manufacturing units to move from naphtha or coal to natural gas-based manufacturing of urea to control production cost, thereby limiting the subsidy. Fertilizer manufacturing has been identified as a priority sector for the supply of natural gas and the supply price from domestic sources is fixed at US\$ 4.3 / MMBtu.

EXHIBIT 3.7 | Fertilizer subsidy in India



Sources: Indiatat, FAI, FAO, BCG analysis.

However, in the absence of adequate domestic reserves and allocation from the government, many urea manufacturers continue to operate with alternative raw material. The discovery of natural gas reserves and subsequent allocation and supply from Reliance Industries Limited's KG Basin reserves has reduced the demand-supply gap and helped reduce the manufacturing cost of urea.

India relies on imports for P-based and K-based fertilizers, given the low availability of phosphate rock and the absence of potash reserves in the country. Other significant fertilizer consumers — such as Brazil, China, and the United States — are creating raw material supplies through acquisitions or joint ventures. However, while many Indian companies have made significant global acquisitions, there has been limited corporate action in this regard. Gujarat State Financial Corporation's (GSFC) joint venture with Groupe Chimique Tunisien (GCT) Tunisia for procuring phosphoric acid, and Indian Farmers Fertilizer Cooperative Limited's (IFFCO) joint venture with Jordan Phosphate Mines Company for phosphate rock are examples of Indian companies entering into joint ventures for their raw material needs.

The imbalanced use of fertilizers is not only impacting the growth in productivity but also the existing productivity of the soil by depleting its nutrients. Unless adequate supplies of raw materials and imported fertilizers are ensured, the subsidy burden on the government, and the existing imbalance in usage, will continue to increase.

KEY SUCCESS FACTORS

Fertilizer companies have long relied on subsidies for being profitable. However, given the new subsidy scheme, it is imperative for companies to look beyond subsidies in order to build sustainable and profitable business models. Going forward, successful business models will be built on the following two critical factors:

- Cost reduction by driving operating efficiencies
- Product innovation and effective sales models

Cost reduction by driving operating efficiencies

It is essential for companies to focus on achieving operational efficiencies and tying up with other players to secure supplies of raw materials. Companies need to de-bottleneck existing manufacturing operations for better capacity utilization, and also look to improve margins by reducing raw material cost through secured sourcing of raw materials.

Product innovation and effective sales models

Given the existing demand for fertilizers, current sales models focus on distribution and maximizing reach. However, with price de-regulation, companies would need to re-orient themselves to a sales-led model. In future, creating a push for products through product innovations would be essential to create successful business models. The recent forays of Tata Chemicals and Deepak Fertilizers into customized fertilizers are examples of product innovation.

Companies would also need to re-orient the existing sales force to focus on building customer relationships and driving extension programs to educate customers on the advantages of balanced usage of fertilizers.

Price sensitivity in global fertilizer prices is likely to have some impact, given the scale of India's fertilizer consumption and the reliance on imports. Hence, pricing innovations would be essential to create a pull for products in the future.

First-movers along these factors would be well-poised to derive a competitive advantage, through product innovations and stronger, push-based sales models.

Pesticides

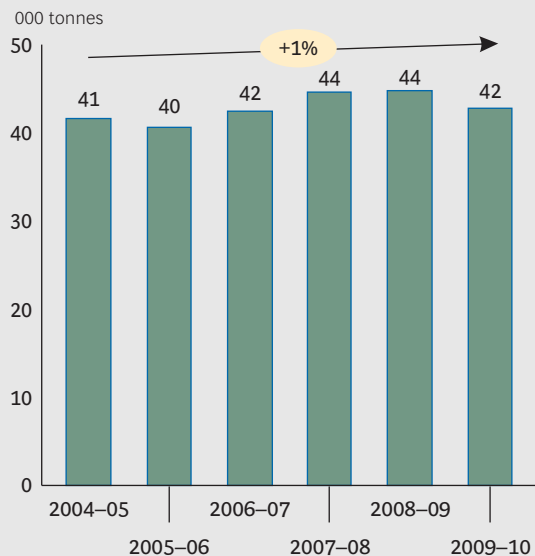
INDUSTRY LANDSCAPE

Low consumption

Pesticide consumption in India is significantly lower than the global average. The average consumption in India is 500 grams per hectare, as compared with 7 kg per hectare in the United States, and 14 kg per hectare in China (see Exhibit 3.8). Growth in consumption has been slow at 1 percent from 2004 to 2005 to 2009 to 2010. The sluggish growth is largely on

EXHIBIT 3.8 | Pesticide consumption in India as compared to global benchmarks

Slow growth in pesticide consumption



Global benchmarks

Country	Consumption (kg / hectare)
Taiwan	17
China	14
Japan	12
Korea	7
USA	7
France	5
UK	5
Pakistan	1
India	0.5

Sources: Indiatat, press releases, ICRA report, BCG analysis.

account of the significant de-growth in consumption of pesticides for cotton, which accounted for 35 percent of the pesticide use in India.

The use of pesticides is concentrated in a few crops. Consequently, the usage of pesticides is concentrated in the states that sow these crops. Paddy has the largest proportion of pesticides consumption in India, accounting for 26 percent of the pesticide consumption, followed by cotton with 20 percent. Consequently, Andhra Pradesh has the highest proportion of pesticide consumption at 23 percent, followed by Punjab and Maharashtra with 10 percent each.

While imports have increased as a percentage of domestic consumption, India still remains a net exporter of pesticides. Exports, which constituted 49 percent of industry sales in 2007 to 2008, are envisaged as the key growth driver for the industry going forward. India's pesticides are primarily exported to the United States, Brazil, Malaysia, and European countries.

Insecticides constitute 62 percent of the Indian market while weedicides have the smallest

share, with 21 percent of the market. This is unlike the global markets where weedicides constitute the largest share of the market (with a 45 percent share). The low use of weedicides can be attributed to the low agricultural labor costs in India. As a result, manual weed removal is more cost-effective as compared with the use of weedicides. However, given the significant rise in labor costs in the last few years, weedicide use is increasing among Indian farmers. Going forward, as usage patterns change, weedicides and fungicides are expected to grow faster as compared to insecticides.

Industry structure

While the industry is extremely fragmented with over 600 players, the top 10 players dominate with approximately 50 percent market share (see Exhibit 3.9). The large players are backward integrated and manufacture the active ingredient as well as end-formulations. The small- and medium-sized players only manufacture and sell end-formulations under local brands.

Off-patent products dominate the Indian pesticide market accounting for 70 percent of

EXHIBIT 3.9 | Different players in pesticide industry in India

Industry is fragmented with top 10 players accounting for ~50% of the market

~600 players in the industry

- ~50 large scale Indian companies and MNCs which are backward integrated
 - Engaged in production of active ingredients, pesticide intermediates as well as branded formulations
 - Examples: UPL, Rallis, Nagarjuna, Bayer
- ~550 small and medium sized formulators
 - Engaged in only formulations and selling them under own brands
 - Examples: Bharat Insecticides, National Pesticides and Chemicals

Top 10 players in the industry

Players	Market share (%)
United Phosphorus	10.0
Syngenta India	7.5
Bayer Cropscience	6.7
Rallis India	4.8
Gharda Chemicals	4.6
Bilag Industries	4.3
Godrej Household Products	4.2
Indofil Organic Industries	3.6
Nagarjuna Agrichem	3.5
PI Industries	3.0

Sources: Press releases, CMIE, ICRA Management Consulting Services Limited, Company Reports (Data for 2010).

industry sales. Investment into research and development has been low at less than 1 percent of sales. International players such as Bayer and Syngenta have invested in product development, while Indian players such as Rallis have entered into alliances for access to new products lines. Players such as United Phosphorus have focused on the inorganic route for access to new markets to launch products. United Phosphorus has completed 13 acquisitions since 2004, primarily in Europe and Latin America.

KEY CHALLENGES

While the low penetration in the Indian market presents significant opportunity for growth, the fertilizer industry in India is faced with certain specific challenges, such as:

- Increasing penetration of GM and hybrid seeds which are resistant to pests
- Emergence of bio-pesticides as alternative products

Stringent regulations for product registration pose a significant entry barrier for new entrants.

Consequently, while off-patent products form the largest proportion of industry turnover, innovators continue to enjoy a larger market share within off-patented products.

Increasing penetration of GM and hybrid seeds that are resistant to pests

Research and development into genetically modified seeds presents a significant challenge for pesticides since GM seeds are resistant to key pests. Research into hybrids is also focusing on resistance to pests in addition to yield enhancement. The case of BT cotton, wherein the use of pesticides in cotton reduced drastically after its use, is a case in point.

Emergence of bio-pesticides as an alternative

While inadequate use of pesticides could lower crop yields by as much as 42 percent, excessive use results in residues and degradation of land and low crop quality. Pesticide residues in food have impacted quality, which in turn has adversely affected exports of food products. Integrated pest management, which promotes the use of non-chemical methods such as the use of bio-pesticides, poses challenges to the

traditional chemical-based pesticide industry. As increasing number of farmers are sensitized to integrated pest management practices and the use of bio-pesticides, the growth in the industry is likely to be impacted. The global bio-pesticide industry is projected to grow at a significantly higher CAGR of 15 percent over the next five years than chemical pesticides that are projected to grow at a CAGR of 3 percent during the same period.

KEY SUCCESS FACTORS

Overall low penetration combined with concentration of usage within a few states presents significant domestic opportunities for pesticides companies in India. In the future, however, certain critical strategies would stand pesticides players in good stead as they look to maintain profitability while accelerating growth.

- Access to a wider product portfolio
- Wider distribution reach

Access to a wider product portfolio

A wider product portfolio is essential for better product lifecycle management since pests develop resistance to specific pesticides over a period of time. Access to new products is also essential for successful penetration into new areas. Given that cropping patterns in India differ from region to region, and hence face threats from different types of pests, access to a wider product portfolio will enable companies to cater to a wider geographic customer base. Further, a wider targeted crop portfolio would be less susceptible to risks from reduction in demand, due to introduction of hybrids or GM seeds.

Wider distribution reach

Given the low penetration in most regions, a wide-reaching distribution channel would be critical to ensure expanded reach. Access to a wider product portfolio will ensure greater focus from the distribution network. In addition, significant investment is required in marketing in order to create brand awareness.

At an industry level, companies are likely to increasingly look at inorganic growth opportunities to execute the critical strategies highlighted above. Historically, inorganic growth has primarily been through acquisitions.

However, the fragmented nature of the Indian industry also offers opportunities for inorganic growth.

Credit

INDUSTRY LANDSCAPE

Indian farmers, with limited financial resources at their disposal, rely heavily on credit to meet expenses during the cropping cycle. Farmers traditionally relied on local sources — such as money lenders — for credit. A majority of Indian farmers continue to rely on these non-institutional sources for credit. Only 34 percent of Indian farmers have access to institutional credit. The government's focus on credit for the agricultural sector has helped in achieving a robust growth of 17 percent in farm credit over the last four years. However, the farmer base, which has access to institutional credit, has remained more or less stagnant. There has been only a 4 percent increase in the number of farmer accounts over the same period as set out in the exhibit below. It is important to increase the reach of institutional credit to farmers. Going forward, setting lending targets for the number of farmers covered in addition to the amount of loans disbursed may help in achieving this horizontal growth as illustrated by Exhibit 3.10.

Imbalances in credit

Although institutional credit has seen growth, there are significant imbalances in the composition of credit. The composition of credit varies with the type of farmers, geography, and the type of credit. Small and marginal farmers, who are in dire need of credit, have the lowest coverage within the farmer base — approximately 7 percent of medium and large farmer accounts for 40 percent of total farmers universe who receive credit through organized channels (see Exhibit 3.11).

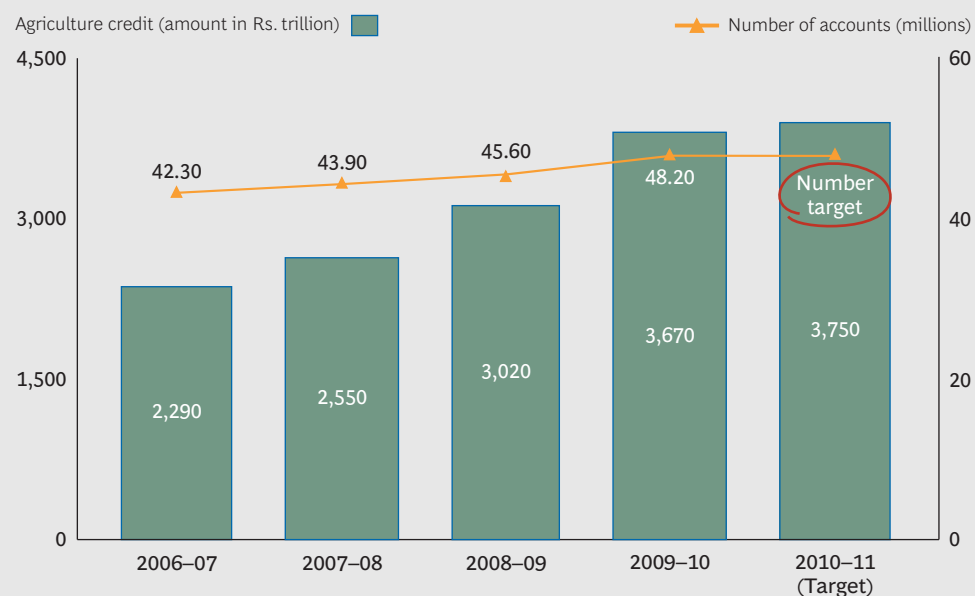
Investment credit accounts for only 25 percent of total agricultural credit (see Exhibit 3.12). Its share has been declining over the years. The decrease has resulted in lower capital formation in the sector, thereby impacting the use of technology and mechanized farming techniques.

KEY CHALLENGES

Agriculture is inherently prone to several risks on account of climatic conditions, commodity price trends etc. The risk factors in the case of

EXHIBIT 3.10 | Growth in Agricultural Credit

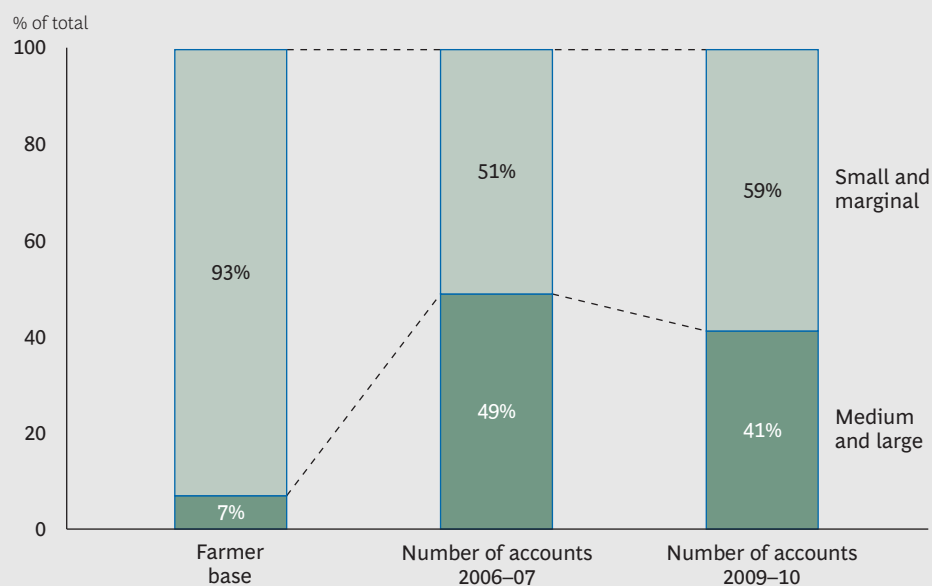
Growth in farmer accounts at 4% significantly lags behind credit growth at 17%



Sources: Agricoop.nic, Department of Agriculture.

EXHIBIT 3.11 | Penetration of credit across farmer categories

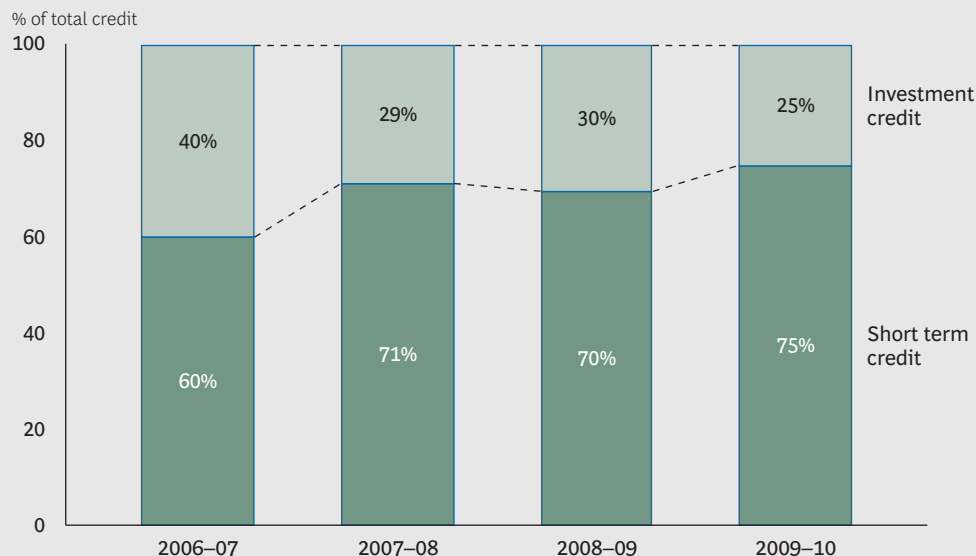
Penetration is lowest among small and marginal farmers



Sources: Agricoop.nic, Department of Agriculture.

EXHIBIT 3.12 | Share of different credit types

Proportion of investment credit to total credit is reducing over the years



Sources: Agricoop.nic, Department of Agriculture.

Indian farmers are further accentuated by the fact that the adoption rates for modern farming practices continue to be quite low, especially among small and marginal farmers. Banks and financial institutions providing credit to farmers primarily face the following challenges:

- High risk due to high default rates among farmers
- High transaction costs due to small ticket size of loans
- Limited end-use monitoring resulting in inappropriate usage of loans

The compounding effect of these risks is illustrated in Exhibit 3.13

High risk due to high default rates among farmers

Most small and marginal farmers are caught in a vicious cycle, as explained in the Exhibit 3.13. It is the lack of availability of institutional credit and the high cost of borrowing that forces farmers to reduce the use of high quality inputs. This, in turn, results in lower yield and

poor realization for the crop. Consequently, farmers are unable to repay loans on time, thereby tarnishing their risk profile.

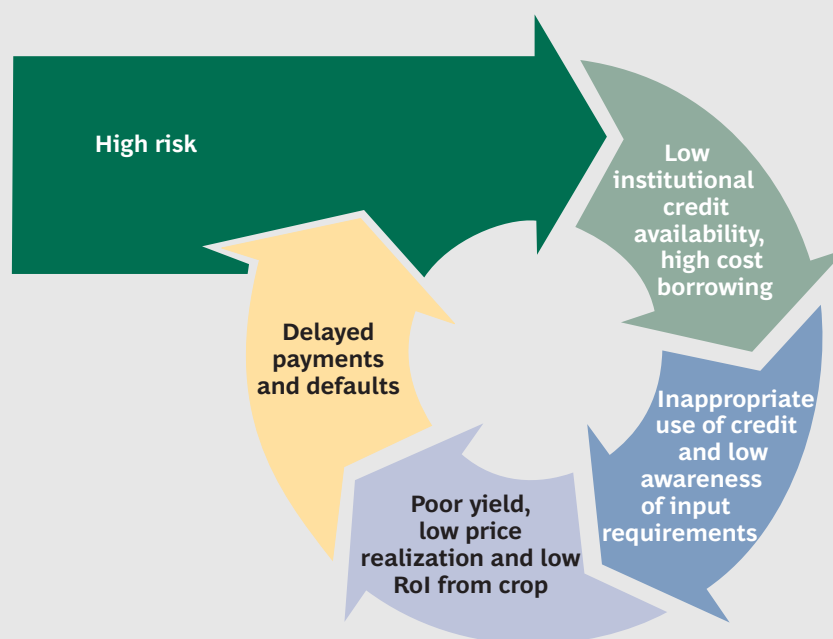
High transaction costs due to small ticket size of loans

Currently, the average ticket size for farmer loans ranges from approximately Rs. 150,000 for commercial banks to about Rs. 30,000 for co-operative banks. As a result, the transaction costs towards due diligence and loan administration and servicing are higher as a percentage of the amount lent. Banks either limit the due diligence to reduce costs or lend higher amounts to existing farmers in order to meet lending targets.

Limited end-use monitoring resulting in inappropriate usage of loans

The fragmented borrower base limits the end-use monitoring of loans. It is estimated that about 41 percent of the credit is utilized for non-farm purposes, such as repayment of overdue loans, personal expenses, etc. This also has an impact on the repaying capability of farmers, since there is no income accrual from such usage of loans.

EXHIBIT 3.13 | Compounding effect of low credit availability



Source: KGFS interviews.

KEY SUCCESS FACTORS

Specific actions are required at each step to break the vicious debt trap. Agriculture credit business models will have to focus on the following factors in order to be successful:

- Defraying risk by taking a broader system-based approach
- Expanding reach
- Ensuring appropriate lending and usage

Defraying risk by taking a broader system-based approach

Agricultural loans are primarily advanced to individual farmers, while on the other hand, certain other rural credit models such as micro-finance have focused on group lending. This has been done to reduce the risk and increase the ticket size, in order to lower the transaction costs as a percentage of the amount lent. Promoting similar practices in agriculture lending through promotion of producer — organizations and farmer groups would assist banks in reducing risks and transaction costs.

This would also instill a self-monitoring mechanism to prevent diversion of loans for non-farm activities.

Crop insurance is currently mandatory for all borrowers to the extent of the amount borrowed. However, delays in processing of claims and inadequate compensation have resulted in inadequate coverage of the banks' risks. Adequate coverage for specific uncontrollable factors — such as weather — with preset claim triggers would help banks in spreading their risks and encourage greater agricultural lending.

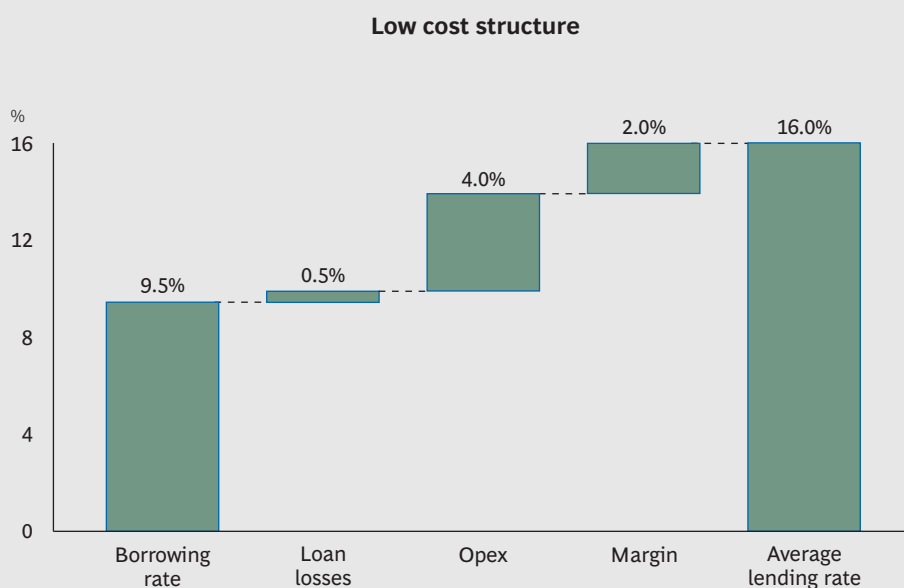
Expanding reach: The high cost of last mile reach has currently limited horizontal credit growth. Certain initiatives such as appointing business correspondents have been undertaken to drive financial inclusion. However, limitations in the scope of business correspondents constrain the outreach of agricultural credit. Banks would be well placed to explore strategic partnerships with organizations such as co-operative societies which have existing rural outreach.

Kshetriya Grameen Financial Services (KGFS) launched by the Institute for Financial Management and Research (IFMR) Trust has adopted an interesting model to expand the reach of rural credit. The local branches of KGFS are connected to a central hub at the block level, and then to the regional head office at the district level. All transactions by customers are recorded in biometric photo identity cards that send the data to the back-end for processing. The local village center offers a range of products such as savings, insurance, remittance, small-ticket loans and investments. Loans are mostly

made to joint liability groups. The portfolio is securitized to avail low-cost funds, thereby reducing the cost of borrowing for the rural customers. The branches are designed to build a sizeable portfolio, so that they can break even in a short time-frame of 8 to 12 months. A low operating cost structure per branch also facilitates faster break-even and profitability as illustrated in Exhibit 3.14.

Similar initiatives by banks can help create significantly higher reach and create a profitable agricultural credit lending business.

EXHIBIT 3.14 | Illustrative economics of KGFS branch



Source: KGFS interviews.

EL COMERCIO'S IN-KIND LENDING MODEL

El Comercio has entered into strategic alliances with silos to provide customers references, thereby facilitating customer acquisition. These silos provide in-kind credit by way of seeds, fertilizers, and other inputs and also refer farmers to El Comercio for cash requirements. Given the lower cash ticket size and reduction in misappropriation, El Comercio's initial portfolio at risk is lower,

resulting in lower lending rates. Transaction costs are also lower due to the alliances with silos that also manage repayment wherein the farmer receives payments after deduction of loan amount and El Comercio collects repayment from buyers for a fee. Over the years, El Comercio also covers default risk for the entire loan after getting repeat business from the farmer.

Ensuring appropriate lending and usage

Misappropriation of funds for non-farm activities is a significant cause of defaults in agricultural loans. Monitoring end-use is difficult due to the fragmented customer base. Faced with similar issues, certain countries have adopted an in-kind lending model to prevent misappropriation. An example is El Comercio's in-kind lending model for soybean farmers in Paraguay as explained briefly alongside.

However, given the reluctance of input manufacturers to provide credit at their own risk, a similar in-kind lending model can be operated only by banks with the input suppliers merely acting as facilitators. An illustrative model is depicted in the Exhibit 3.15.

Under this model, banks would provide cash credit to farmers for crop cycle expenses other than inputs. Input payments would be made directly to suppliers for inputs purchased through a three-way tie-up. A similar three-way tie-up between banks,

farmers and corporates would ensure faster and efficient recovery for banks and better price realization for farmers. The last mile reach in such a model can also be through third-parties, such as input providers or buyers who would facilitate customer acquisition. Innovation in outreach and risk management is essential to propel growth in rural credit, and catalyze the adoption of quality inputs in agriculture.

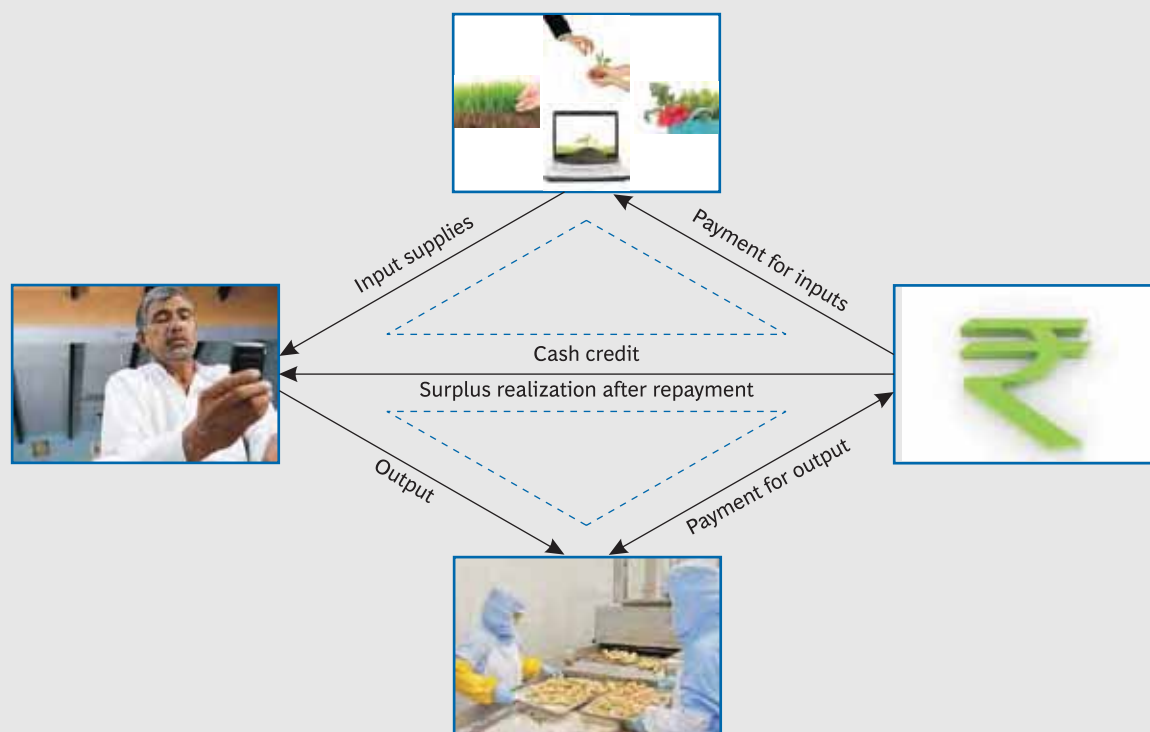
Insurance

INDUSTRY LANDSCAPE

Significantly low penetration

Agriculture insurance products in India are provided both by public as well as private sector players. The Agriculture Insurance Corporation (AIC), which operates the flagship National Agriculture Insurance Scheme (NAIS), is the only player with some level of penetration. However, the coverage under the NAIS is also limited; only 14 percent of the farmer base is covered under this scheme (as shown in Exhibit 3.16). NAIS is mandatory for

EXHIBIT 3.15 | Tie-ups to facilitate credit for farmers



Sources: Department of Agriculture, National Agriculture Insurance of India, Press run.

borrowers growing covered crops in states that implement this scheme. Low voluntary adoption is evident given that only 15 percent of the farmers covered by insurance under NAIS were non-borrowers.

AIC offers a single product for yield insurance. Private players such as ICICI Lombard and IFFCO Tokio have launched weather insurance products. However, these products are yet to make any significant headway in terms of penetration.

Product design

Under yield insurance, farmers are compensated based on yield shortages as opposed to occurrence of events leading to the problem of moral hazard. Compensation is based on the area approach i.e. the farmer is compensated as per the average yield shortage in the block / *taluka* as opposed to individual yield. Hence, farmers with significantly lower yield than the area yield do not receive adequate compensation while farmers without insurable losses receive claims.

CHALLENGES

The low penetration of insurance can be attributed to low awareness among farmers and complex claim trigger mechanisms that are not easily understood by them. Agriculture insurance faces two challenges that must be overcome to drive adoption and growth.

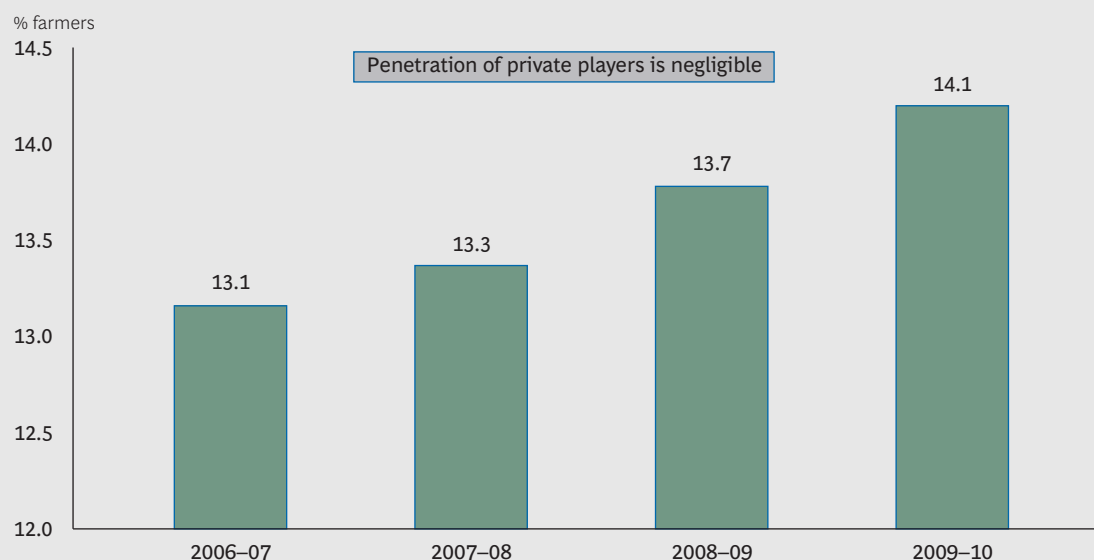
- Lack of resources for collection of reliable weather data
- Unviable pricing, resulting in losses and burden on the exchequer

Lack of resources for collection of reliable weather data

Critics have often pointed out that the current yield insurance has inherent product design flaws. They also question the concept of the claim trigger being based on yield as opposed to the specific uncontrollable risk of weather. However, the absence of reliable local weather data for each village impedes the provision of weather-linked insurance. Weather data is currently collected only at the district level.

EXHIBIT 3.16 | Farmer coverage under NAIS

Only 14 percent of farmers covered under flagship NAIS



Sources: Agricoop.nic, Department of Agriculture.

However, private insurers have recently tied up with certain private players who have set up local weather stations for collecting local weather data. The extent of coverage and reliability of data will be determined over the coming years.

Unviable pricing, resulting in losses and burden on the exchequer

To encourage adoption, the pricing of crop insurance has been subsidized. Most farmers are charged premiums of 1.5 percent to 3.5 percent of the sum assured, whereas total claims are up to 9 percent of the total sum assured. This has rendered the product unviable for insurers. This burden is not sustainable in the long term. Profitability is also impacted on account of adverse selection among non-borrowers since mostly farmers with high-risk profiles avail of insurance.

KEY SUCCESS FACTORS

Insurance can diversify the inherent risk in agriculture and act as a catalyst for agriculture credit growth as illustrated in Exhibit 3.17.

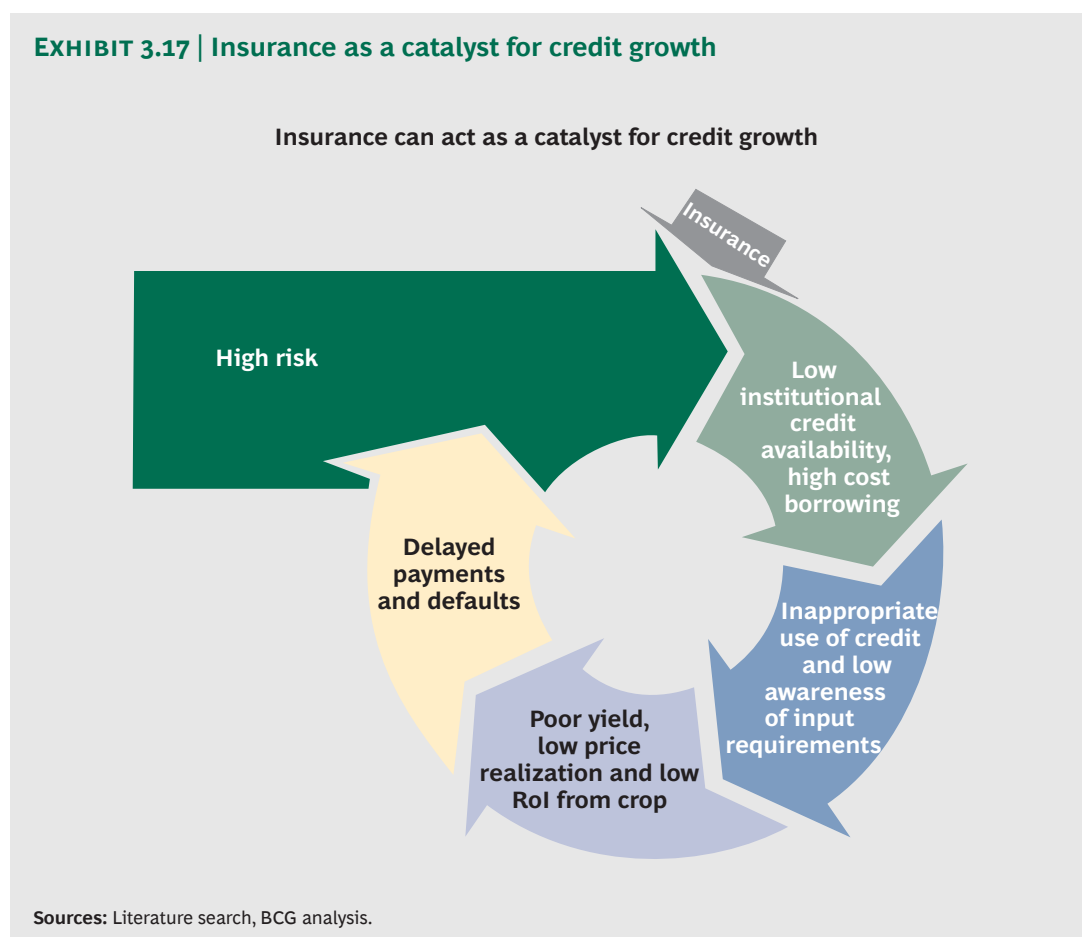
Availability of credit would in-turn assist in greater adoption of high quality inputs and the use of mechanized farming techniques. This would have a positive impact on yield as well as on capital formation in the sector. This would eventually break the vicious cycle of debt that farmers currently find themselves. However, specific action in the following areas is essential to drive higher adoption of insurance:

- Redesigning the existing insurance product
- Improvements in pricing

Redesigning the existing insurance product

Weather insurance should replace yield insurance in order to provide more objective triggers for claims. This would also protect the farmer against the specific uncontrollable risk and also control adverse selection of high-risk farmers, and prevent moral hazard due to the farmer not employing suitable agronomic practices. Such weather insurance must be based on localized weather as opposed to large area coverage, since weather conditions differ

EXHIBIT 3.17 | Insurance as a catalyst for credit growth



significantly within districts. Globally, there are examples of index-based weather insurance. Insurers can also customize products for each crop since the impact of weather conditions varies from crop to crop.

Improvements in pricing

Over a period of time, the pricing of insurance products needs to move to market-linked rates. However, in the interim, the subsidy must be passed on directly to users and not to insurers. Insurers may also look to leverage existing distribution networks such as banks, buyers, etc., to reduce operational costs of outreach, and offer competitive pricing.

Information

INDUSTRY LANDSCAPE

Agriculture is known to be an information-intensive industry. The importance of information is even greater in India, given that the knowledge of high-quality inputs and farming practices is yet to percolate to the majority of Indian farmers. There are

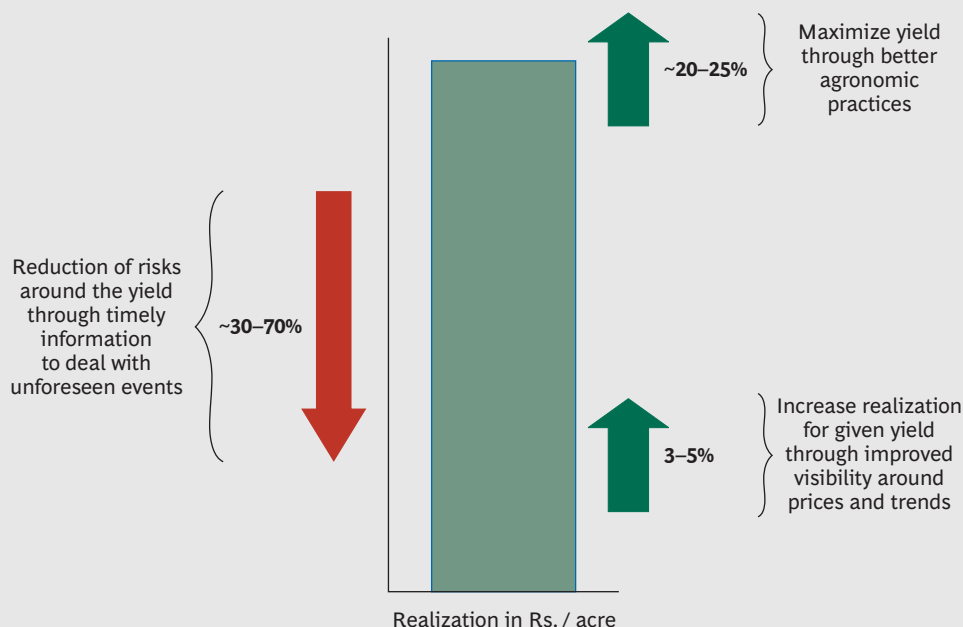
essentially three levers through which information supplied can impact a farmer's net realization as illustrated in Exhibit 3.18.

- Improve yield through better agronomic practices
- Reduce yield losses through prior intimation of unforeseen events such as rainfall, and pests attacks
- Improvement in net realization due to better information on prices

Currently, information is relayed to farmers mostly through informal channels (farmer or village meetings), formal channels (mass media, including television and radio), and farmer meets organized by the government or companies. Individual sources provide information on one or more aspects, but there is no single comprehensive source of information available to the farmer. Most solutions have attempted to resolve only certain missing links rather than focus on a comprehensive offering.

EXHIBIT 3.18 | Levers for realization improvement through better information provision

Three levers through which better information can impact farmers' realization



Source: BCG analysis.

KEY CHALLENGES

Various offerings, both by the government and private players, have attempted to provide information access to farmers through varied delivery mechanisms. However, there are specific challenges that information providers need to overcome in order to provide a suitable information offering to farmers.

- Richness of information
- Maximizing reach
- Providing information at the right time

Richness of information

While information on general agronomic practices provides useful directional guidance to farmers, certain practices and inputs need to be tailored to meet specific conditions such as soil type, local weather conditions, and so on. Traditional channels, such as television, are unable to offer customized guidance to farmers.

Maximizing reach

Companies have focused on providing right guidance on input use to farmers through one-on-one and group meetings with farmers. Although this information is better customized for farmers, as compared with information disseminated through mass media, such meetings have limited reach.

Providing information at the right time

Another challenge for information service providers is getting the timing right. Information or guidance, especially related to precautions against unforeseen events, needs to be provided close to the event. Also, it is critical to ensure two-way communication, where the farmer is able to access information when he needs it.

Certain offerings, like the Kisan Call Center by the government and offerings from private players, have attempted to break the richness versus reach trade-off, by leveraging technology and providing information services over mobile phones. The current offerings are, however, limited on account of low literacy levels and lack of high-cost advanced mobile handsets to access it. Also, none of the current offerings have achieved any significant scale.

Moreover, each of these offerings focuses on one or more specific information requirements as opposed to becoming a one-stop-shop for information.

KEY SUCCESS FACTORS

There are clear economies of scale emerging from technology-based offerings. With the rapidly increasing penetration of mobile and Internet, there is bound to be an improvement in the scope of offerings and delivery mechanisms. However, the following factors are essential to build a successful business in providing information services to farmers:

- Access to content that is actionable and relevant for farmers
- Providing a comprehensive and easy-to-use solution
- Identifying cross- / up- selling opportunities

Access to actionable and relevant content

Information provided needs to be actionable and relevant for the farmer. Information that has each of the following five features would be actionable:

- **Just-in-time:** Information needs to be provided just-in-time and at the right time in the cropping cycle.
- **Credible:** Information needs to be credible. Farmers are completely dependent on agriculture for their livelihood, and therefore have a significantly low risk appetite. They are likely to trust information only from a credible source.
- **Customized:** Information needs to be customized to a farmer's soil type, availability of water, weather conditions, other inputs used, and so on. The offering must also include incentives to ensure that the farmer provides the relevant data to customize information.
- **Consistent:** The farmer needs to be provided opportunities to interact and receive information as and when he needs it, in addition to information provided proactively by the provider.

- **Accessible:** Lastly, information needs to be accessible to farmers given the limitations of literacy and local languages.

Providing a comprehensive and easy-to-use solution

Most solutions available today focus on specific information needs. Further, certain modes of delivery are more amenable to literate farmers and hence are not easily accessible to a large section of farmers. An offering that is comprehensive and easy-to-use would be adopted on a large scale by farmers, thereby achieving economies of scale.

Identifying cross- / up- selling opportunities

Providing the features stated above would entail significant investment into research and development of content, delivery mechanisms, and recurring operating expenditure. Hence, it is essential to develop revenue models that go beyond subscription revenues. Depending on the provider, relevant up- / cross-selling opportunities should be identified.

Opportunity for Convergence in Distribution

As highlighted above, access to quality inputs is a key barrier to the agriculture sector. Non-availability of inputs — be it credit, information, seeds, pesticides, or fertilizers — affects not just the quality of produce, but also the yield per acre, and overall income generation. Therefore, if the accessibility and adoption of these key inputs does not increase, there is little that the country can do in terms of bringing about growth in the agricultural sector.

However, there is a significant cost of outreach for distribution of these inputs. Given the fragmented farmer base in India, several players in these segments have not found it economically-viable to go the whole hog while improving availability of their products. This coupled with the fact that there are strong inter-linkages between almost all of these inputs, makes a clear case for convergence play in input distribution.

Convergence in input distribution would essentially entail expansion on the part of any of the other three players in the value chain,

namely, input providers, distributors, and output buyers. A business model for convergence — which may be led by any of the three players in this segment — can create a win-win scenario for all the stakeholders, i.e., the input providers, millions of farmers spread across the country, and the buyers.

There are strong inter-linkages especially within the tangible inputs (such as seeds, fertilizers, and pesticides). Usually, there is just one shop (selling inputs like seeds, fertilizers, weedicides and pesticides) that caters to a village or a group of villages. Since most farmers buy these inputs from this retailer, input providers can leverage this distribution network by offering a bundle of inputs as opposed to individual inputs. Though retailers are bundling products even today, this bundling is driven by commercial motivations rather than any scientific rationale. Bundling of goods done in a scientific manner (based on crop type, soil type, and climatic conditions) should go a long way in increasing the adoption of quality inputs.

Convergence in inputs would also enable better understanding of the farmers' needs. An input provider has little or no direct contact with the farmer and relies on the channel to provide him customer feedback. An input distribution play would bring the input provider in direct contact with the customer, leading to a far better understanding of farmer needs. IFFCO and certain seed and pesticide companies have already taken steps along these lines and have also achieved partial convergence by selling both seeds and pesticides and / or fertilizers through the same channel.

Existing distributors are already present in certain pockets and can look to expand to adjoining geographies with a view to achieving regional or national scale. This would generate economies of scale for the distributor as a result of the additional buying power from the large-scale operations. However, a foray into manufacturing of inputs is unlikely, given significant investments required in setting up manufacturing facilities.

Buyers today are constantly faced with inconsistencies in the quality of output. A foray

into input distribution would enable these buyers to customize bundles of inputs required to ensure quality of crop output. The existing channels used to procure end-products from farmers can also be used to distribute these customized input bundles. ITC's *e-Choupal* and Godrej Agrovet's *Aadhar* are examples of forays in this space.

Lastly, farmers would have access to customized product bundles suitable for specific crops and climatic conditions. This would encourage higher adoption of quality inputs, thereby assisting improvements in yield.

Based on the rationale underlined above, we see opportunities for four models for convergence in input distribution:

- **Input provider as distributor:** In this case, an input provider would collaborate with other input providers to aggregate supply and provide customized product bundles to farmers. The distribution network of retailers would, however, continue and would supplement the last mile reach to farmers. Through this model, all players can effectively utilize synergies in their sales force. Moreover, the input provider secures a presence in distribution and comes in closer contact with the farmers.
- **Input provider as the end-buyer:** In this case, an input provider would distribute customized product bundles to farmers and

also buy the end-product from farmers, thus aggregating the supply and demand chains. Use of inputs bundled in a scientific manner would lead to higher output and quality, which in turn would mean higher income for farmers, leading to even higher purchase of bundled inputs. Tata Chemicals has ventured into this domain.

- **Distributor-led model:** Under this model, the distributor would aggregate inputs to provide customized bundles to farmers and would also buy the final output from farmers. Here, the distributor is able to leverage the common network to push product bundles. The distributor also aggregates output supply and hence is able to command prices based on higher volumes. Currently, distributors offer partial aggregation of inputs and cater to a small network of farmers within a *taluka* or village. However, players need to make large investments in distribution network to achieve national scale.
- **Buyer-led model:** In this case, food processing companies or retailers aggregate and distribute quality inputs and also agree to buy the final output. Buyers may lock-in the purchase of produce initially or subject the purchase to achieving desired quality output. The biggest benefit, in this case, is the stability in output quality that the buyer is able to derive through the use of customized bundles of quality inputs.

FARMING

INDIA'S ARABLE LAND BANK, at approximately 140 million hectares, is next only to that of the United States. Today, India is the top producer of key agricultural commodities like milk, mangoes, papaya, spices, and the second largest producer of fresh vegetables, cereals, sugarcane etc. However, its productivity is much lower than that of its peers — cereal productivity in the United States is approximately 6.6 MT per hectare while it is approximately 2.7 MT per hectare in India. Even the growth in productivity — at 1.5 percent — has been lower than that of most peers. This has serious implications for a country that has approximately 10 percent of the world's arable land but supports approximately 17 percent of the world population. In this section, we examine the state of farming in India, identify issues that are limiting its growth, and look at the potential means to fix relevant issues.

Optimizing farm output is a direct function of the available land, choice of crop, and the cropping pattern followed (assuming the use of standard inputs) as described below:

- **Choice of crop:** A significant number of farmers in India engage in subsistence farming¹ and do not grow crops that could fetch them higher monetary gains. This could be due to multiple reasons like legacy, poor awareness, lack of capital, reluctance to buy staples etc. Thus, while cereals account for about 55 percent of the acreage they account only for approximately 30 percent of the total farm output.
- **Cropping pattern:** In 1970, only 15 percent land was sown more than once a year. While the cropping intensity² has almost doubled since then, at 30 percent, there is still significant scope for improvement. Farm realizations improve significantly with increase in cropping intensity. Moreover, certain set of crops when grown in rotation also improve soil fertility.
- **Landholding:** India's population has more than tripled since Independence creating tremendous pressure on its agricultural resources, both in terms of employment and food sufficiency. Continuous division of land, as it is passed on from one generation to another, has resulted in highly fragmented land holdings. As a result, approximately 80 percent of the farmers account for only about 40 percent of the total cultivated area. The average size of land holdings has halved from 2.3 hectares in 1971 to almost 1.3 hectares in 2009. Large farms (more than 10 hectares) account for only 1 percent of total farms in India. This limits the farmers' income and availability of funds, which in turn affects cropping patterns and agri-practices, thereby creating a vicious cycle leading to

GUJARAT'S SECOND GREEN REVOLUTION

Between 1996 and 2006, Gujarat revolutionized its agriculture through a gradual shift toward high value cash crops, animal husbandry, fruits and vegetables (F&V), and a series of measures to bolster productivity. Together, these initiatives resulted in a 9.6 percent growth in agricultural GDP in Gujarat, compared to 2.9 percent for India over the same period.

The Gujarat government's initiatives during the period included bolstering of infrastructure through various irrigation schemes, rural electrification, and road construction projects (which connected farms to the markets), as well as an amendment to the Agricultural Produce Market Committee (APMC) Act to bring forth greater private investment using subsidies. The government also created a special body — the Gujarat Green Revolution Company

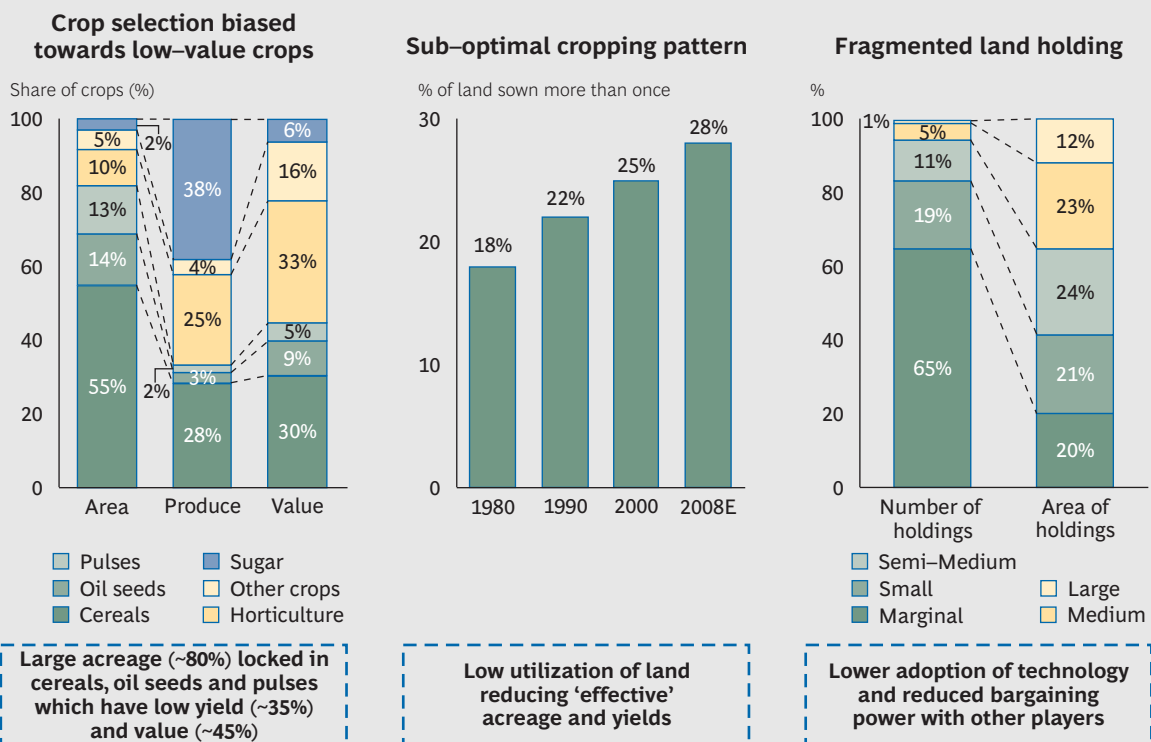
Limited, — as a nodal agency to implement government schemes that also provides 50 percent micro-irrigation subsidy to farmers. It aims to promote sustainable agri-practices and has already improved crop productivity and water efficiency. Private participation through contract farming led to an increased share of cash crops and fruits and vegetables (F&V) from 60 to 70 percent of the total value added by agriculture. There was also greater adoption of technology; for example, the cotton yield increased by approximately 130 percent due to Bt cotton adoption in about 54 percent crop area.

Gujarat provides a strong example that other states could emulate in order to improve farm productivity and farmer livelihoods in a sustainable manner.

lower productivity and even greater poverty. Smaller land-holdings also make it unviable to mechanize farming, further lowering farm productivity.

The three key issues that plague farming in India — staples-oriented choice of crop, low cropping intensity, and fragmented landholding — are summarized in the Exhibit 4.1 below.

EXHIBIT 4.1 | Three key issues with farming



Sources: MOSPI, Department of Agriculture and Cooperation, XI five year plan, Indiaagristat.

Note: Marginal farmers are defined as those with area less than 1 Ha; small farmers have area between 1 and 2 Ha; semi-medium farmers have area between 2 and 4 Ha; medium farmers have area between 4 and 10 Ha; large farmers have area more than 10 Ha.

Levers to De-bottleneck Farming

There are two key levers that could be used to address issues of sub-optimal crop selection, low cropping intensity, and fragmented landholding. These are:

- Farmer aggregation
- Farm mechanization using modern technology

FARMER AGGREGATION

Farmer aggregation is crucial to address the issue of fragmented land holdings. It can facilitate technology adoption and build scale, and also improve the bargaining power of farmers in the entire agricultural ecosystem. Agricultural extension is also significantly simplified through farmer aggregation.

Producers' organizations amplify the political voice of smallholder producers, reduce the cost of marketing of inputs and outputs, and provide a forum for a member to share information, coordinate activities, and make collective

decisions. They also create opportunities for producers to be involved in value-adding activities like input supply, credit processing, marketing, and distribution. Such organizations also help in lowering the transaction costs for processing / marketing agencies working with growers under contracts.

Different legal structures exist to enable aggregation like farmer cooperatives, producer companies, and even public limited companies (see Exhibit 4.2).

- **Producer cooperatives:** Producer cooperatives are registered under The Cooperative Societies Act with a focus on welfare, rather than business on commercial lines. They are largely state promoted and are allowed to conduct business only in a particular state. They are controlled by the State through Registrar of Cooperative Societies. India has a large number of cooperative institutions in a vast range of sectors, but there have been very few successes. In fact, the only stars are in the

EXHIBIT 4.2 | Different legal forms of producer organizations

Objective	• Aggregation of large number of small and marginal producers to pool produce • Collectively source inputs — seeds, fertilizers, technology • Value addition / processing		
Producer co-operative	Producer company	Public limited company	
Registered under the cooperative societies act: + Can have nominal members other than producers + Seen as welfare organization, tax benefit — High state involvement — Does not allow multi-state operations MACS have minimum state involvement; accepted in only few states	Registered under section IXA of companies act as producer company; new insertion amended in 2002: + Can have > 50 members, no minimum capital (unlike private limited) + Equal voting rights to all members, interests protected (one share / one vote) + Allows multi-state operations — Only producers are members, difficult to get equity capital — Large formalities, professional management requirement, taxed	Registered under the companies act as public limited: + Can get external equity (FabIndia model) + Can have > 50 members + Allows multi-state operations — Minimum capital required — Large formalities, reporting requirement, professional management requirement, taxed	

Source: BCG analysis.

cooperative dairy sector, and those are limited to a few states.

- **Producer companies:** The concept of producer companies was introduced in 2002, by incorporating a Part IXA into the Companies (Amendment) Act. This was done to imbibe the unique elements of cooperative business with that of a regulatory framework similar to that of companies. Only producers are allowed to be the members of the producer companies. It provides equal voting rights to all the members and also provides flexibility for multi state operations.
- **Public limited companies:** Public limited companies are registered under The Companies Act. They can have more than 50 members and can raise external equity. However, they are bound by a minimum capital requirement and also need to undergo formalities and reporting related to their operations.

Amongst all these producer organizations, the ‘producer company’ model appears to be the most suitable structure due to the following inherent advantages:

- Greater farmer control without any state interference
- Flexibility to operate across states
- Proven successful business models

There are strong incentives for both the private companies and the government to organize producer companies. From the government’s perspective, producer companies could be a strong channel for agriculture extension and other farmer welfare schemes. From the private companies’ perspective, producer companies are an effective way of achieving farmer aggregation. Private companies are increasingly looking for farmer aggregation due to increasing demand of sophisticated farm produce like organic food, exotic F&V etc. From the government perspective, producer companies could be a strong channel for agricultural extension and other farmer welfare schemes. Producer companies, with professional management, can also establish robust forward

linkages (processing, marketing, and retailing), thereby improving farmer livelihoods. The positive impact of producer companies has been analyzed in Exhibit 4.3 and 4.4 in further detail.

FARM MECHANIZATION USING MODERN TECHNOLOGY

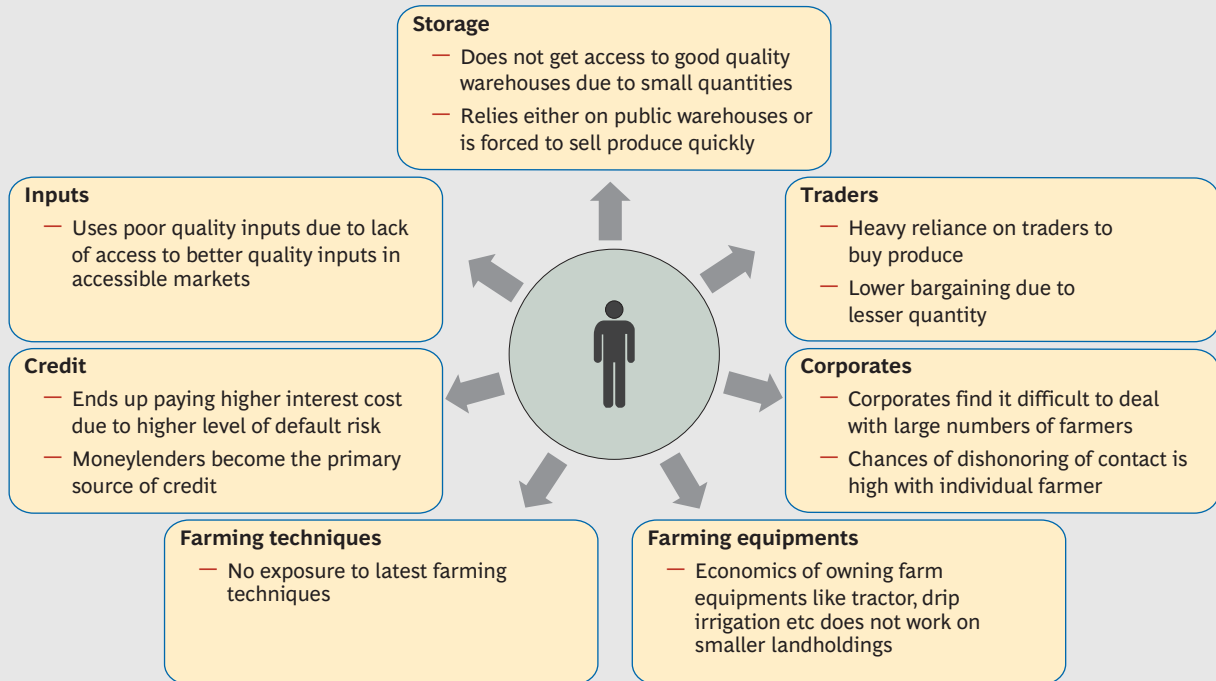
Farming in India is marked by low mechanization primarily due to fragmented landholdings that make mechanization unviable. The average landholding in India is only 1.3 hectares with more than 80 percent farmers having small or marginal holdings³. It is estimated that tractor ownership is financially unviable below a landholding of about 3.3 hectares. Thus, tractor penetration in India stands at about 17 per 1,000 hectare compared to approximately 29 per 1,000 hectare in the United States.

While there has been a steady increase in coverage in irrigation over the past few decades (see Exhibit 4.5); the current coverage is only about 42 percent of the Ultimate Irrigation Potential⁴. The problem is compounded by low utilization of area under irrigation (approximately 85 percent) and limited adoption of water management practices across crop types (see Exhibit 4.6).

Multiple approaches could be adopted to increase irrigation coverage:

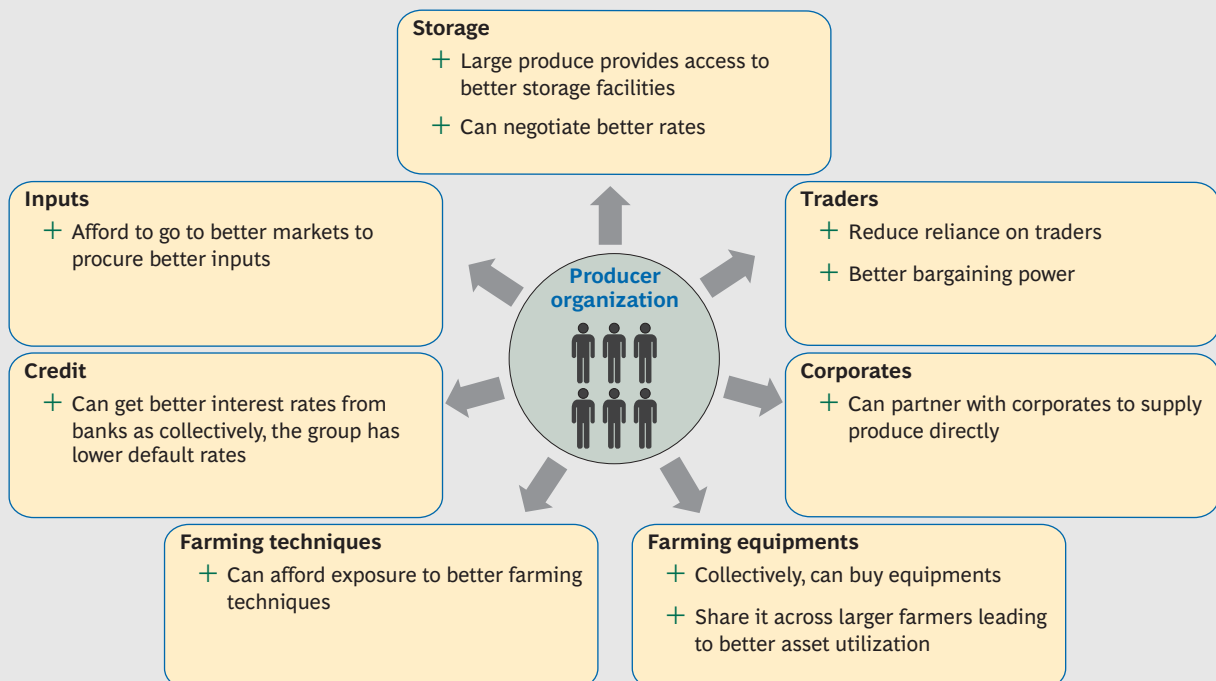
1. **Build water resources:** Increase irrigation potential through water conservation using check dams, *nullah bunds*, development of catchment areas through afforestation etc.
2. **Participatory irrigation management:** Multiple stakeholders can be involved to ensure successful implementation of irrigation projects. While funding can be provided by the government or private players, farmers can be involved to bring about greater accountability, and the expertise of NGOs and individuals can be used for efficient project management.
3. **Adopt Micro-Irrigation Systems (MIS):** MIS penetration in India, at 8 percent of irrigated land, is significantly lower than the world average of 21 percent and is fraction of the United States’ average of 63

EXHIBIT 4.3 | Individual farmers highly resource constrained



Source: BCG analysis.

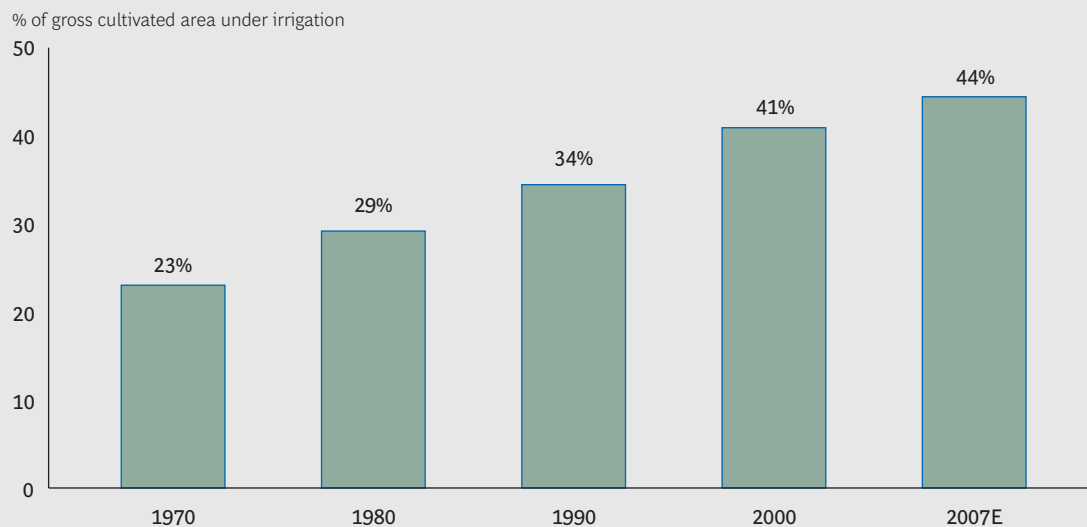
EXHIBIT 4.4 | Producer company allows farmer to leverage ecosystem



Source: BCG analysis.

EXHIBIT 4.5 | Progress in irrigation coverage

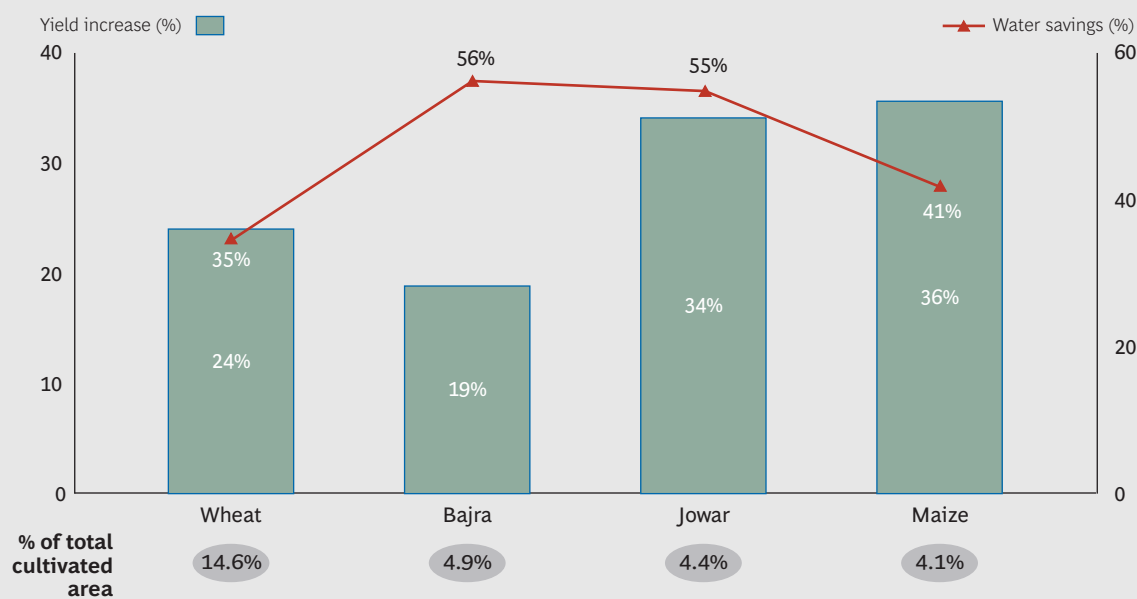
Steady increase in irrigation coverage of areas under cultivation



Source: BCG analysis.

EXHIBIT 4.6 | Impact of micro irrigation

High yield gains and water conservation



Source: BCG analysis.

LEADING INDIAN ORGANIC PLAYER

One of India's first farmer-owned private company, this player, aims to successfully create a win-win model for all its stakeholders. It has approximately 6,000 farmers that together hold more than 50 percent equity in the company. The company controls 20,000 acres of land for cultivating organic cotton. There are several benefits emerging out of this unique model:

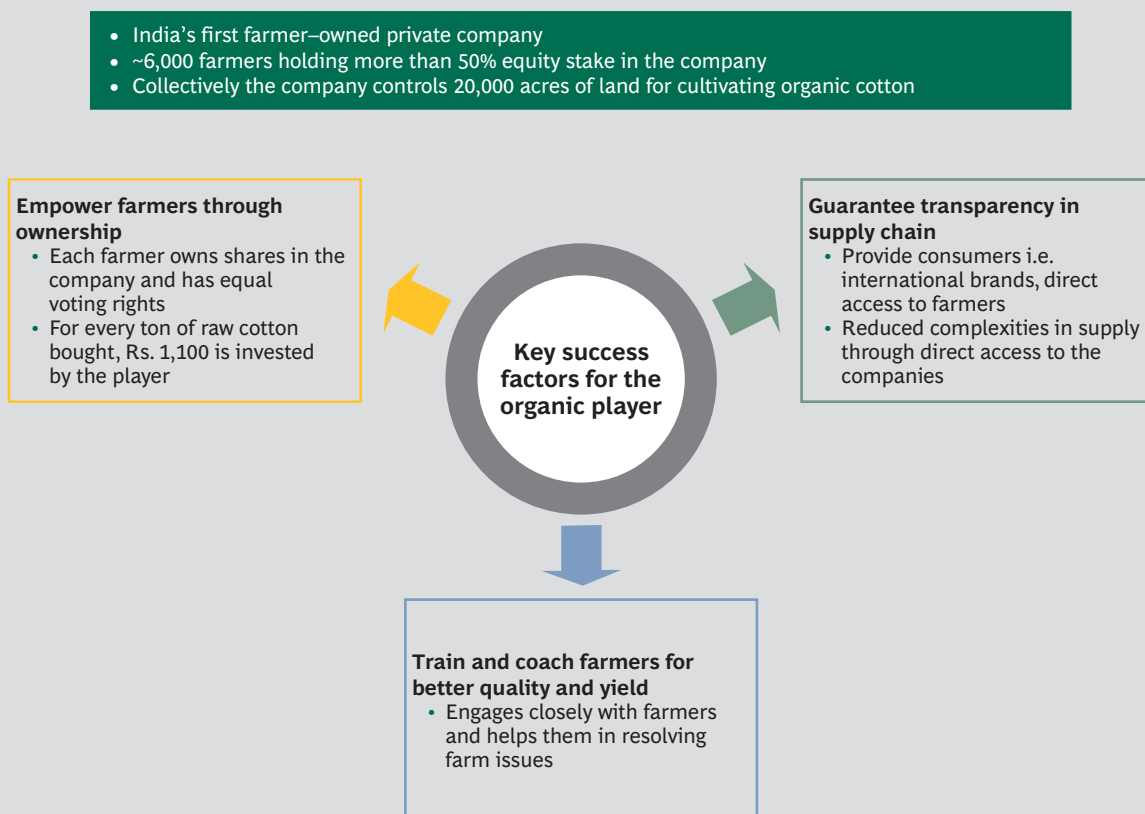
- **Promoting sustainable agricultural practices:** The farmer owned model deployed by this company reduces dependence on expensive agro-chemicals through the use of manure and crop rotation. This process also helps in reducing water contamination and soil degradation.
- **Enhancing farmer welfare:** Since its formation in 2007–2008, the player has paid farmers Rs. 10 million

as premium, apart from investing in community development projects.

- **Facilitating direct access to consumers:** It has entered into partnership with several international brands to procure cotton directly from farmers. It has also partnered with large Asian mills.
- **Enabling farmers to attract capital:** This model has also raised interest from venture capital funds and banks. Several micro-venture funds have picked up stake in the company.

Key success factors (see Exhibit 4.7) for this model include farmer ownership and empowerment, guaranteed transparency in supply chain, and training and coaching of farmers for better quality and yield.

EXHIBIT 4.7 | Key success factors in the organic players' business model



Source: BCG analysis.

percent. Adoption of MIS will provide the twin benefits of water conservation through efficient technology and greater productivity through scientific farming techniques (see Exhibit 4.6). From an opportunity perspective, even if MIS coverage grows to only approximately 4.9 million hectares, it would create an approximately Rs. 150 billion opportunity for private players over the next five years.

Wasteland Farming

Wasteland farming has so far drawn very little attention in India. Apart from approximately 140 million hectares of arable land, India also has approximately 13 million hectares of culturable wasteland. If made culturable, wastelands can substantially increase agricultural production.

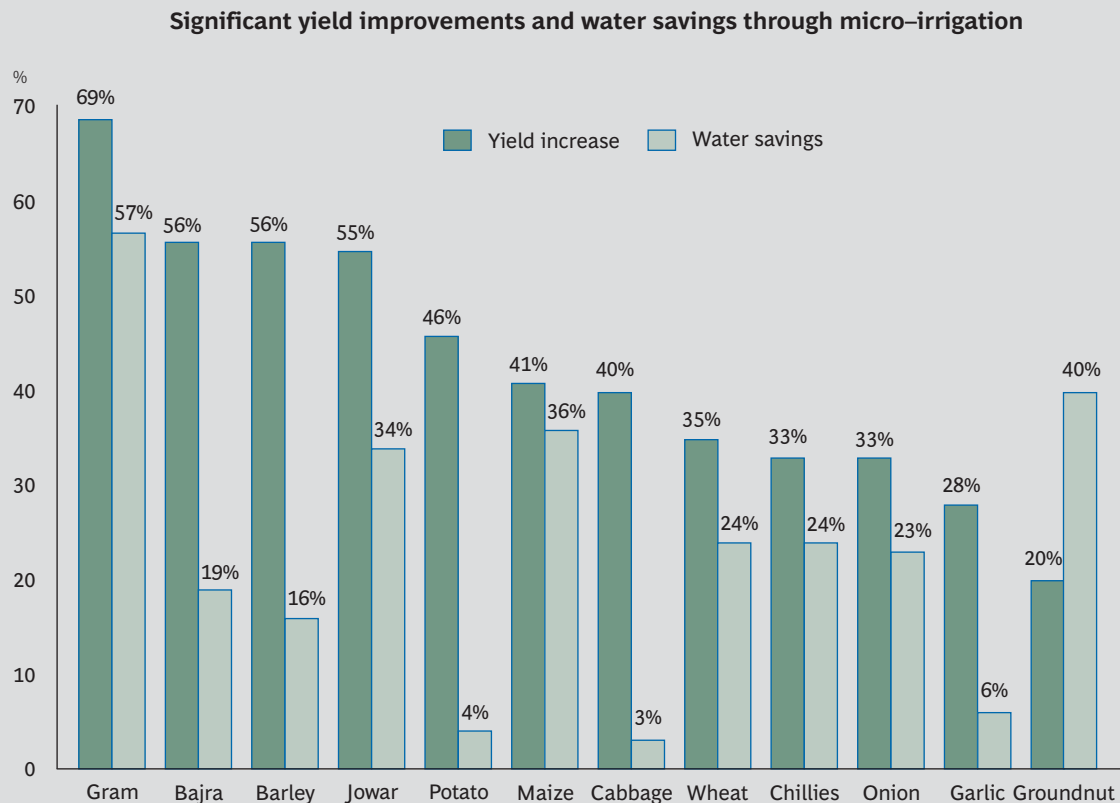
The Ministry of Agriculture classifies culturable wasteland as follows — “lands available for

MICRO IRRIGATION, A RS. 500 BILLION OPPORTUNITY

Water is fast becoming a bottleneck to improving productivity. Imprudent policies have resulted in over exploitation of resources and have also hurt farm productivity. It is in this context that micro-irrigation holds tremendous potential. Micro-irrigation can increase productivity while saving water (Exhibit 4.8). The Task Force on Micro-Irrigation (2004) had set a target of increasing coverage to 17 million hectares by 2012 of which only about 4.6 million hectares was

realized by 2010. With sustained government subsidies (50 to 75 percent of installation cost), it is believed that this target may be achieved over the next 7 to 10 years provided sustained focus by companies. Micro-irrigation thus presents an opportunity of approximately Rs. 500 billion over the next 10 years. Private players like Jain Irrigation Systems have already built a significant business around this opportunity, but there exists enough room for new entrants.

EXHIBIT 4.8 | Significant yield improvement and water saving across crops



Source: BCG analysis.

cultivation, whether not taken up for cultivation or taken up for cultivation once but not cultivated during the current year and the last five years or more in succession for one reason or other. Such lands may be either fallow or covered with shrubs and jungles which are not put to any use. They may be assessed or unassessed and may lie in isolated blocks or within cultivated holdings. Land once cultivated but not cultivated for five years in succession is also included in this category at the end of the five years."

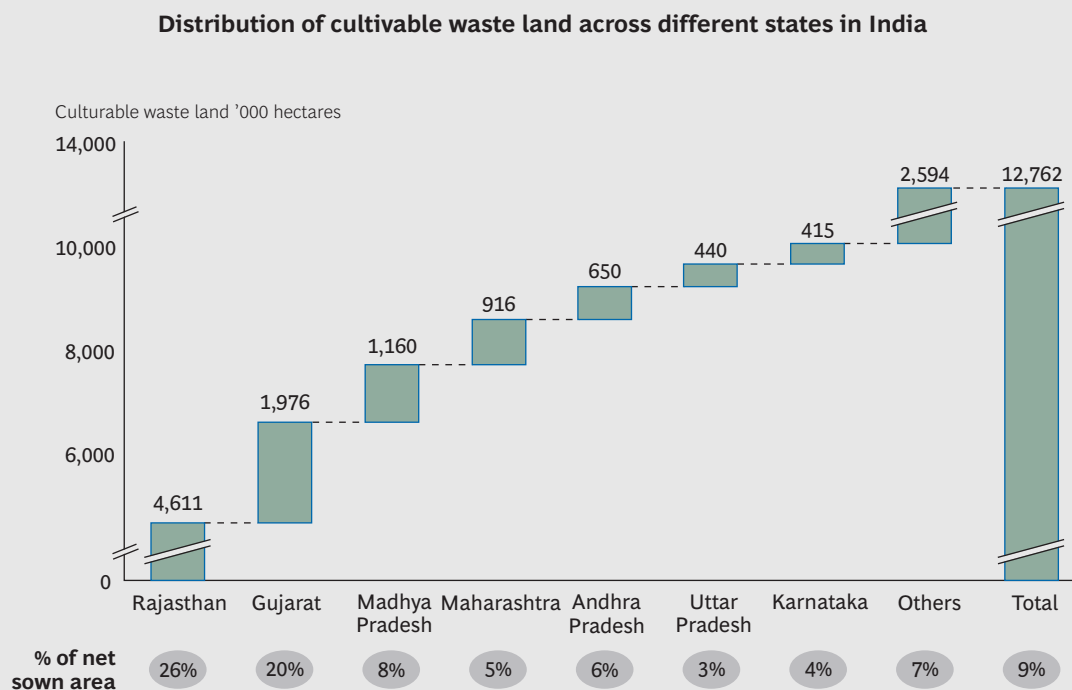
These large chunks of wastelands offer ample opportunity to bring about a step change in agricultural production. At approximately 13 million hectares, these wastelands offer a significant lever to improve agricultural production as this additional land bank constitutes about 10 percent of India's arable land. To put this in perspective, the current area under oilseeds and pulses cultivation is 26.7 million hectares, and 23.6 million hectares, respectively. If these wastelands can be used for the cultivation of oilseeds and pulses (in rotation), the production of both these commodities can be increased by up to 50 percent.

Interestingly, only three states account for over 50 percent of these lands (see Exhibit 4.9) — Rajasthan (26 percent), Gujarat (20 percent), and Madhya Pradesh (8 percent). The concentration of these wastelands in three states should make it a lot easier to bring them under cultivation.

Some states have initiated policies that allow for long-term lease of wastelands (Table 4.1), but there has been limited interest from private players. The government can generate interest amongst private players through a long-term, lease-based model with policy support by way of investment credit, tax exemptions, and allowing direct farm sourcing. The land may be leased to both corporate entities and individual farmers and a limit could be placed on the usage of wastelands for non-farm activities such as for setting up processing units, roads, offices etc.

Currently, wasteland farming is an untested concept and thus the burden of proof lies with the government to demonstrate its viability. Once proved, it is likely to find significant

EXHIBIT 4.9 | Distribution of waste land across states



Sources: Land Use Statistics from Directorate of Economics and Statistics, Department of Agriculture and Cooperation.

Note: Cultivable waste land refers to land available for cultivation, whether taken up or not taken up for cultivation once, but not cultivated during the last five years or more in succession. Figures for latest available year 2009–10.

TABLE 4.1 | Summary of policies for wastelands in key states

Particulars	Gujarat	Rajasthan	Madhya Pradesh
Year	2005	2007	2007
Waste land	2 million hectares	4.6 million hectares	1.2 million hectares
Period of lease	20 years	20 years	30 years
Use restriction	Preference for horticulture and bio-fuel trees	Bio-fuel crops only	No restriction specified
Maximum area	800 hectares	5,000 hectares	Not specified
Allocation to corporate entities	No restriction	30% of total	No restriction
Lease rent	• No rent for 5 years • Rs. 100 per hectare for next 5 years • Rs. 250 per hectare for next 10 years • 50% increment for value adding activities	• 10 times of land revenue of lowest category of barani land in the relevant tehsil	• Rs. 500 per hectare for first 5 years • Rs. 1,000 per hectare for next 5 years • Rs. 1,500 per hectare for next 20 years

Source: State Government websites.

uptake from the corporate sector and individual farmers alike, and this can substantially increase agricultural production. The benefits from this exercise will be manifold, as enumerated below:

- These farms will enjoy benefits of scale (resulting in superior productivity) and investments in allied infrastructure like food processing units
- Investments in these wastelands will create several rural employment opportunities
- They could serve as centers of excellence in farm practices for neighboring farms

- Wasteland farming can also be a less politically-sensitive means of introducing corporate farming in India which, if well-monitored, will undoubtedly boost production

NOTE:

1. Form of farming where production is primarily meant for self-consumption.
2. Ratio of gross cropped area to net sown area — thus if a farmer has two crops a year the intensity is said to be 200%.
3. Marginal farmers are those with area < 1 Ha, small farmers have area between 1 to 2 Ha.
4. Theoretical gross area that could be irrigated through available water resources.

WASTELAND FARMING IN BRAZIL

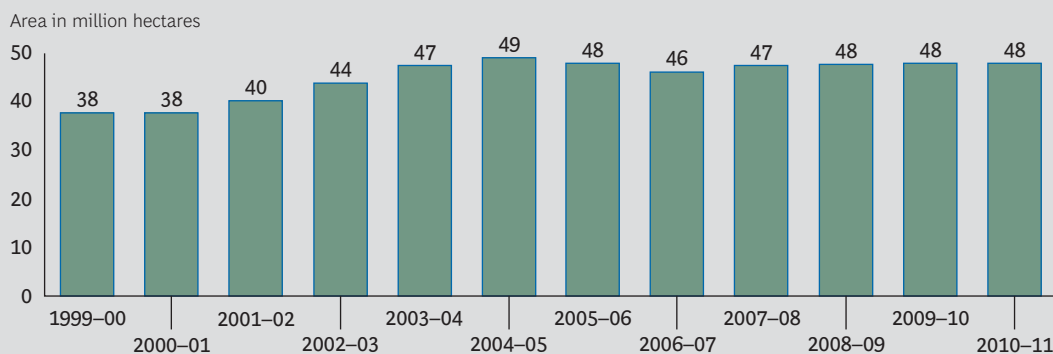
Brazil has already set the precedent through the development of its wastelands, also known as *cerrado*. The *cerrado*, spread over 200 million hectares, were widely believed to be infertile as the land was too acidic and lacked nutrients. In the 1970s, Brazil began investing heavily in the region in order to augment its agricultural land by 3 million hectares. Brazil's agriculture research organization, Embrapa, treated these lands and in three decades over 80 million hectares have been added and the *cerrado* today accounts for approximately 70 percent of Brazil's farm output. According to Edson Lobato, Technical Director of the Embrapa Cerrado Research Centre, this development has caused an annual reduction

of 5 percent in the average cost of food. The *cerrado* is widely credited with Brazil's growth in food trade (see Exhibit 4.10)

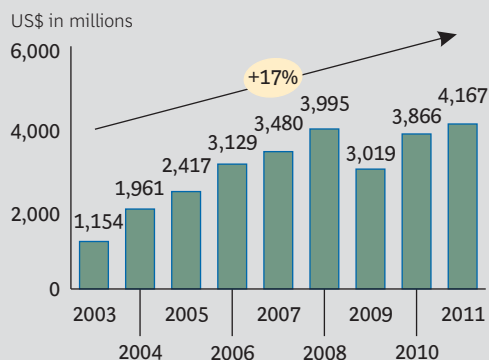
Brazil has also commercialized the process of wasteland development. BrasilAgro, a Brazilian real estate company, purchases wastelands and then makes them attractive from an agriculture perspective by treating them, developing suitable hybrids, and setting up the required support infrastructure. These wastelands are then sold to farming entities for a profit. BrasilAgro currently has over 165,000 hectares across Brazil, and has already made profits on multiple transactions in the past.

EXHIBIT 4.10 | Impact of wasteland farming on Brazil exports

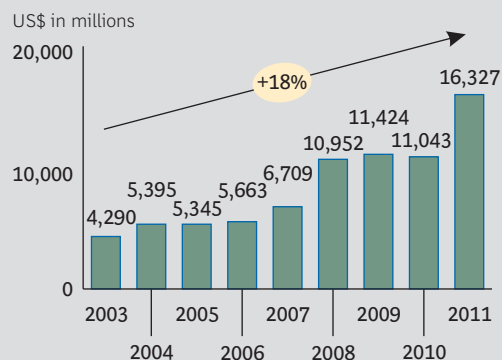
Brazil has increased area under cultivation over the last decade



~3.5x increase in beef exports



~4x increase in soybean exports



Brazil is the world's 2nd largest exporter of beef and soybean

Sources: CONAB, ABIEC (Secex-MDIC)

POST-HARVEST SUPPLY CHAIN

INDIA'S POST-HARVEST SUPPLY CHAIN is fragmented, with poor infrastructure and high levels of wastage. Inefficiencies in the supply chain are leading to major losses. The estimated loss of agricultural produce due to lack of adequate post-harvest infrastructure and an inefficient supply chain management is approximately Rs. 500 billion to Rs. 600 billion every year.

Most warehouses and logistics providers do not have adequate scientific and technical facilities to store and transport perishable commodities like seafood, fruits, vegetables, etc. Nearly 30 to 40 percent of horticulture produce is wasted annually because of inadequate storage and transportation facilities.

The post-harvest supply chain is one of the critical levers that can resolve some of the key issues plaguing agriculture in India. It also presents large opportunities for the private players to build a profitable business.

Storage / Warehousing

India is faced with an acute shortage of warehousing capacity. The current capacity of dry storage is to the tune of approximately 85 million MT, built by both public and private players, and the shortage is 45 million to 55 million MT. With increasing demand for warehousing space, the shortfall is expected to

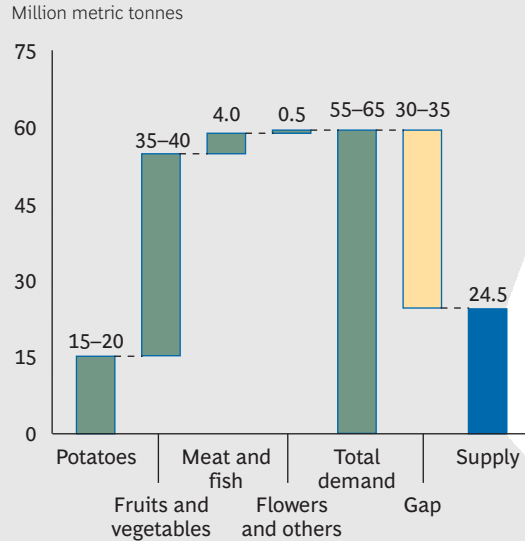
rise to approximately 70 million to 80 million MT by 2015. Therefore, the country currently requires 130 million to 140 million MT of dry storage for the annual produce of approximately 220 million MT of food grain, 27 million MT of oilseeds, and 35 million MT of other cash crops (cotton, jute). The cold storage infrastructure in the country is even scarcer. Current cold storage capacity is estimated to be about 25 million MT against the total demand of approximately 60 million MT, leading to a shortfall of about 30 million to 35 million MT. It is also highly concentrated toward one kind of agriculture produce, i.e., potatoes. Cold storage space for potatoes accounts for nearly 75 percent of the total cold storage space available in the country (see Exhibit 5.1).

KEY CHALLENGES IN WAREHOUSING INDUSTRY

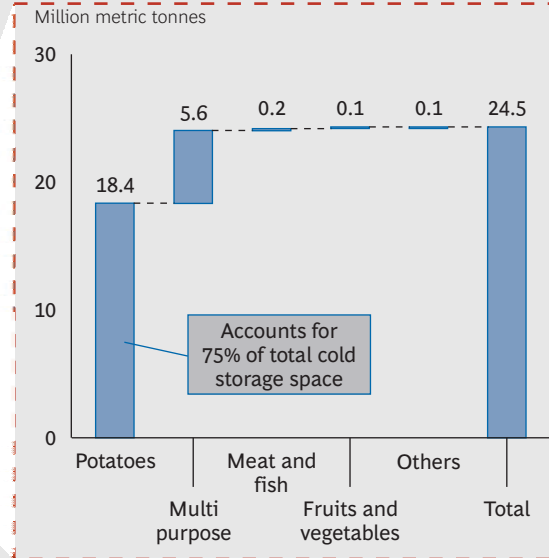
- **Highly fragmented sector with presence of many local players:** The warehousing industry in India is dominated by several unorganized players with low capacities and poor deploying, handling, stacking, and monitoring facilities. There is high competition from smaller players — ranging from small truckers to non-registered business entities — that offer only small space for storing goods.
- **Small and poor quality warehouses:** A majority of the warehouses in the country are about 5,000 square feet in space against

EXHIBIT 5.1 | Demand supply of warehousing infrastructure in the country

~25 million metric tonnes of cold storage space exists against the total demand of ~60 million metric tonnes

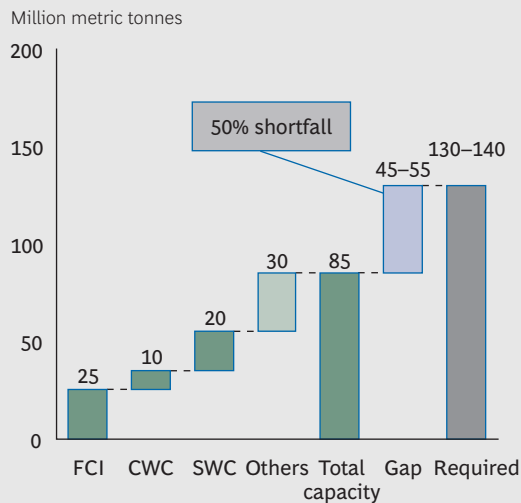


75% of cold storage space is meant for storing only potatoes

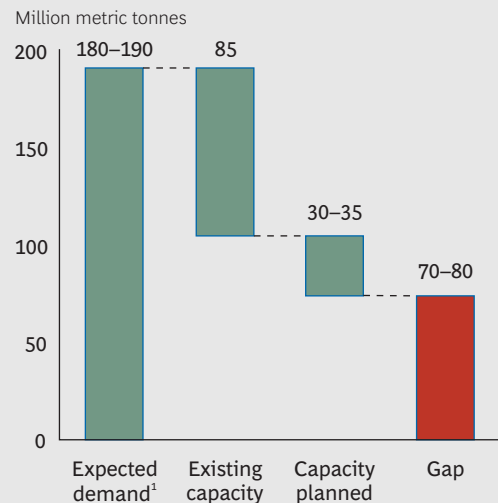


Significant shortage of cold storage space for fruits and vegetables

~25% shortfall in the current supply of warehouses in India



Current planned capacity addition would not be able to meet future demand



Leading to a loss of Rs. 50,000-60,000 crores worth of agriculture produce

Sources: Ministry of Agriculture; Department of food and public distribution; BCG analysis.

¹Expected to grow at a CAGR of 8% for next 5 years.

an average size of approximately 50,000 square feet in developed countries. Smaller sizes (and related economics) limit the ability of warehouse owners to invest in high-quality construction, technology, and modern material handling equipment.

- **Non-uniform distribution of warehousing facilities:** Existing warehousing capacities are concentrated in four states — Uttar Pradesh, Punjab, Haryana, and Andhra Pradesh — and account for 60 percent of the warehousing capacities nation-wide.
- **Lack of supporting infrastructure like power, specialized transportation:** Lack of power and specialized transportation to carry goods to and from warehouses leads to increase in the operating costs, making it economically unviable for the warehousing company.

STEPS TAKEN BY THE GOVERNMENT TO INFUSE INVESTMENTS IN WAREHOUSING

Over the last few years, the government has introduced several regulations and subsidies to make the warehousing sector attractive for private investments.

1. **The Warehousing Development & Regulation Act:** This Act, introduced in 2007, is the first regulatory initiative undertaken for the Indian warehousing industry. The Act has been enacted to ensure that farmers are able to keep their goods in certified warehouses and use the warehousing receipt as a negotiable instrument. This has enabled banks and other financial institutions to step into the commodities and warehousing space. With this regulation, farmers can take loans from commercial banks against negotiable warehousing receipt, and avoid distress sales to meet their urgent cash needs.
2. **Free Trade Warehousing Zone (FTWZ) Act:** This Act is aimed at the development of Free Trade Warehousing Zones (FTWZ) as a special category of SEZs to facilitate import and export of goods. Under this Act, several tax exemptions / benefits are given to FTWZs, such as exemption from income and service tax, free foreign exchange transactions etc.

3. **The Private Entrepreneur Guarantee Scheme:** This scheme has been launched to promote private investment in agricultural warehouses by making them commercially attractive. Under this scheme, the Food Corporation of India (FCI) guarantees constant revenue stream to the investor by renting out the warehousing space for the next ten years.

4. **Other subsidies and financial assistance:** Several other initiatives have been launched by the government to provide financial assistance to the entrepreneurs (for setting up warehouses) in the form of subsidy and low-cost loans. Some of these are mentioned below:

- **Investment subsidy:** Provides subsidy of up to 15 percent of the capital investment (required for setting up a warehouse) with an upper limit of Rs. 2.81 million.
- **Income tax benefit:** Allows deduction of capital expenditure, other than the cost of land, for setting up and operating a warehouse facility for agricultural produce.
- **Lower cost of capital:** Categories investments made in agricultural warehouses as priority sector lending leading to lower rates of interest for new developments.

In addition, 100 percent FDI investments are permitted in agriculture infrastructure like cold chains, warehouses, and food parks.

ECONOMICS OF THE WAREHOUSING INDUSTRY

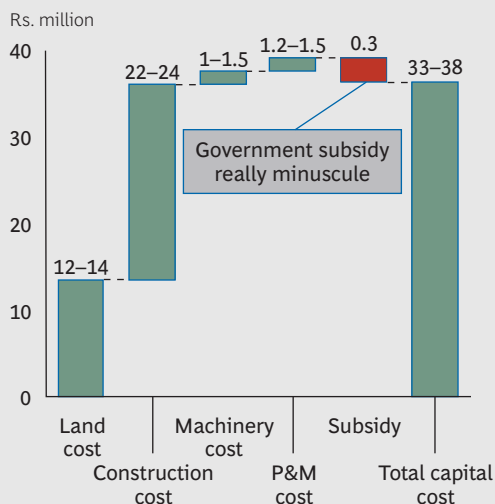
The traditional warehousing business model is highly asset-intensive. Both dry and cold storage require heavy upfront investments in land acquisition and infrastructure. On a standalone basis, a warehouse business is not an economically-viable business (see Exhibit 5.2, 5.3).

Changing government regulations and growth in organized retail have introduced a range of allied activities for the warehousing industry. For example, with the introduction of Warehousing Receipt¹, warehousing companies are partnering with banks to facilitate commodity funding and collateral management. Several warehousing companies are also

EXHIBIT 5.2 | Economics of a standalone dry storage warehouse

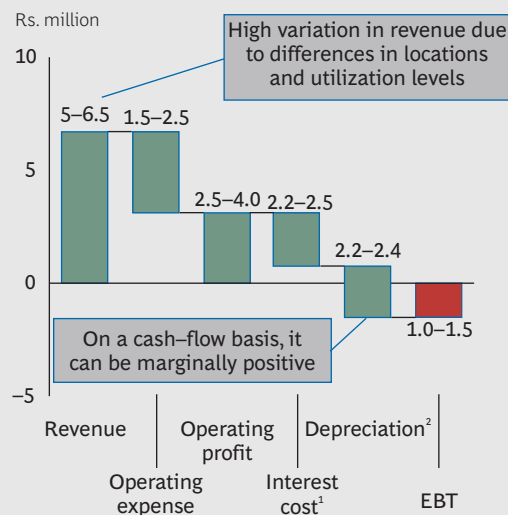
High capital investment required for constructing a warehouse

Capital investments required for a 10,000 metric tonnes warehouse



Not a profit making business on a standalone basis

Economics of a 10,000 metric tonnes warehouse



Sources: Industry interviews; BCG analysis.

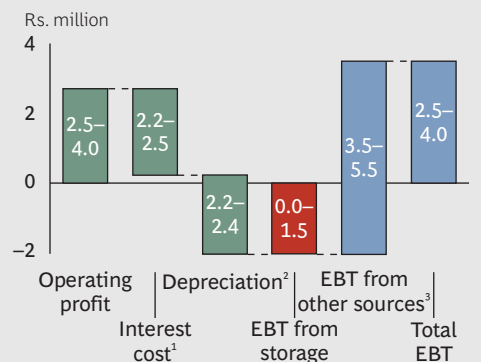
¹Calculated at 2:1 D:E ratio @10% interest rate.

²Straight Line depreciation for a 10 year period.

EXHIBIT 5.3 | Economics of dry storage warehouse with allied services

Dry storage can be made a profitable business along with allied services

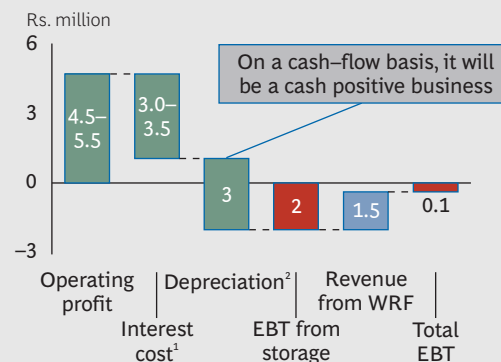
Economics of a 10,000 metric tonnes warehouse



- Dry storage has additional revenue streams like WRF, procurement, collateral management etc.
- Economically viable model for an independent play

However, cold storage is an economically unviable business

Economics of a 4,000 metric tonnes cold storage



- Limited scope for additional revenue streams in case of cold storage
- Most of the time present as captive units; subsidized by other business

Sources: Industry interviews; BCG analysis.

¹Calculated at 2:1 D:E ratio @10% interest rate.

²Straight Line depreciation for a 10 year period.

³Other sources include WRF, Collateral Management, Procurement.

partnering with retailers and traders to procure produce directly from farmers. However, many of these allied services are more conducive to food grains than horticulture due to the perishable nature of the produce. Hence, these additional revenue streams from allied activities make dry storage a more profitable business with a project IRR² of approximately 15 to 20 percent. With improved project IRRs and high growth, the dry storage industry has become an attractive industry for many private investors. Recently, the industry has seen

multiple investments from private equity players in companies like National Collateral Management Services Limited (NCMSL) and Sohan Lal Commodities.

_globally, several players have built a large, integrated warehousing business

Globally, warehousing is a large industry where several organized players have built large, profitable businesses (see Exhibit 5.4). For example, in the United States, the total

EXHIBIT 5.4 | Examples of Global agri-warehouse companies

	Agri-inputs	Farming	Warehousing	Logistics	Processing	Retailing	Revenues (US\$ mn)	EBIT (US\$ mn)
GrainCorp			Built a large integrated play in Australia starting with bulk grain handling to processing of flour, malt etc.				2,776	271
Viterra	- A large grain handler in Canada and the largest grain exporter in Australia - Retail products including agri-inputs, finance, crop protection, equipments etc. - Involved in canola and oats processing and malt processing - Also, provides animal feeds products and nutrient to dairy, beef etc.						11,790	488
CBH Group			- Manages a sophisticated network of ~20 million tonnes capacity - Built an integrated play through partnerships with logistics suppliers and food processors like Interflour				1,951	(31)
SGS Group			- Built a strong play in storage and integrated logistics supply chain - Provides additional support like testing, certification, analytical services etc.				N.A.	N.A.

Source: Annual reports.

Note: Revenue for year 2011. Value in brackets denotes negative figure.

GRAINCORP — A LARGE AUSTRALIAN AGRICULTURE STORAGE AND LOGISTIC PLAYER

GrainCorp Limited is a large Australian company with its core business as storage and supply of grains and related commodities. It not only provides logistics but also a market for these commodities. The company has presence in four key geographies — Australia, the United Kingdom, the United States, and Canada — with Australia accounting for 68 percent of its total revenues. In Australia, GrainCorp has built significant presence in the eastern region. Currently, the company stores and handles 60

percent of the grain grown in the region. It operates from seven out of eight bulk grain ports in the region, handling 80 percent of the volume.

GrainCorp started out as an agricultural storage and logistic player with approximately 20 million MT of storage capacity, 13 million MT of shipping capacity, and 1 million MT of road transportation capacity. Over a period of time, the company has forward-integrated into

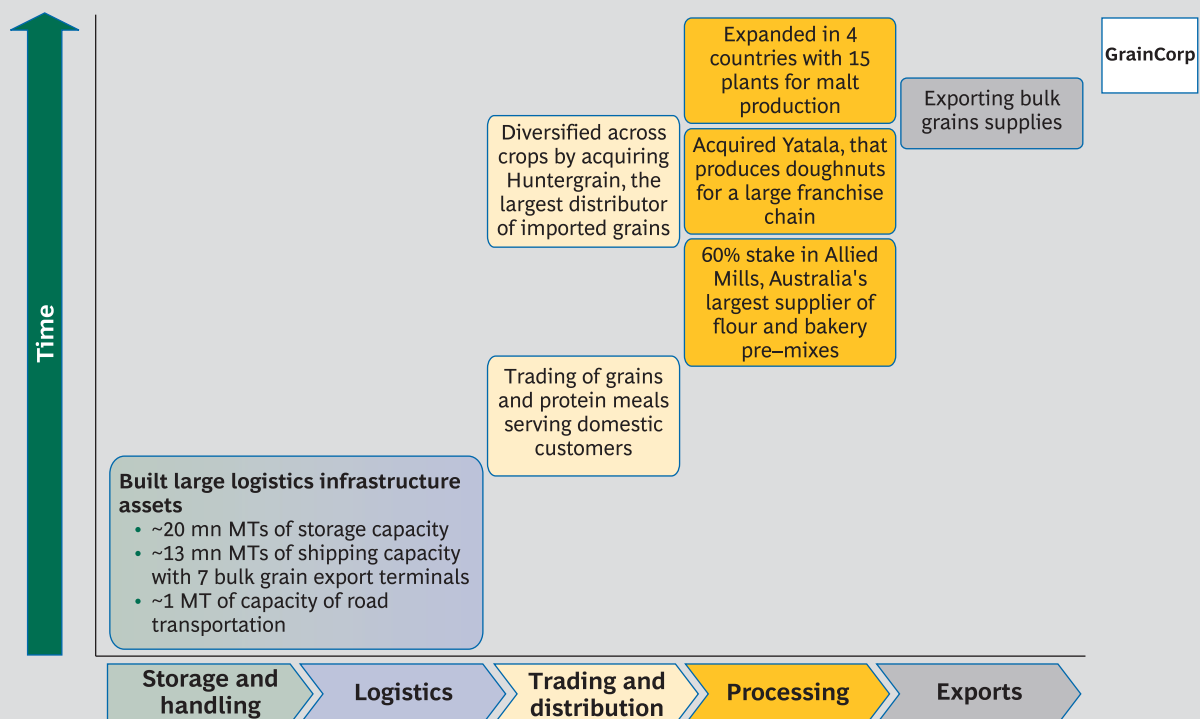
GRAINCORP — A LARGE AUSTRALIAN AGRICULTURE STORAGE AND LOGISTIC PLAYER (CONTINUED)

trading, food processing, and exports. After building a successful business in storage and logistics, it has forayed into trading of grains and protein meals, and is serving the domestic market. Lately, in order to improve its profitability, the company has entered into food processing by acquiring a 60 percent stake in Allied Mills — Australia's largest supplier of flour and bakery pre-mixes. The evolution of Graincorp, from a logistics focused player to an integrated player, is illustrated in Exhibit 5.5.

Key success factors for GrainCorp:

- **Build an end-to-end business across crops in a concentrated geography:** GrainCorp has focused mainly on the eastern region of Australia for several years and has built a strong method of grain procurement, storage, logistics, and export business in the region. The company has diversified across
- **Improved margins by forward integration into food processing:** In order to improve its margins, GrainCorp has entered into downstream processing of wheat and barley via Allied Mills and GrainCorp Malt. It is leveraging its grain sourcing and trading experience in barley procurement in the international markets for GrainCorp Malt.
- **Inorganic growth across the value chain and geography:** GrainCorp has gained substantial scale and acquired expertise rather quickly through multiple acquisitions and joint-ventures. For instance, it became the fourth largest commercial malt producer in the world in just a few years by acquiring four large malt companies in Canada, US, UK, and Australia.

EXHIBIT 5.5 | Progression in GrainCorp business with time



Sources: Company annual report and press search.

warehousing space is approximately 5 billion square feet, which is equivalent to 4.1 square feet of space in the warehouse for every American (the United States has a total population of about 300 million).

WAREHOUSE INDUSTRY IN INDIA

The warehousing industry in India is still at a very nascent stage. However, increasing demand for storage space, efficient handling, and supporting regulations have encouraged private players to make investments in this sector. Several companies like National Collateral Management Service Limited (NCMSL) and Shree Shubham Logistics have entered this space with aggressive ramp-up plans (see Exhibit 5.6). Different companies have adopted different business models to build a profitable business. Overall, four business models have emerged in the warehousing business. These are as follows:

- **Standalone, best-in-class storage provider:** The key focus area of players that have adopted this business model is to provide premium warehousing services by building

large-scale sophisticated storage space. For example, Sohan Lal Commodities offers high-end technical service like SAP solutions that are fully-integrated with its clients' supply chain management systems along with regular storage.

- **End-to-end logistics provider:** Under this model, the warehousing company offers a one-stop shop for the entire logistics requirement of a corporate. This model requires heavy capital investments since both warehousing and transportation are highly capital-intensive businesses. Players like StarAgri Warehousing and NCMSL are examples of players with this type of business model.
- **Forward / backward integrated players through the use of strategic assets:** There is a significant opportunity to leverage warehousing assets, be it tangible ones (like space, infrastructure and human resource), or intangible ones (like relationships with traders and farmers, brand image across other businesses etc.).

EXHIBIT 5.6 | Examples of Indian warehousing companies

	Players	Warehousing	Logistics	Processing	Retailing	Capacity (Mn MTs)
		- Storage - Collateral Management - Procurement	- Transportation - End-to-end supply chain outsourcing	- Primary processing - Secondary processing	Branded retailing	
Standalone storage provider	Sohan Lal Commodity Management Pvt. Ltd.	Storage and allied services				0.2
	National Bulk Handling Corporation Ltd. (NBHC)	Commodity and collateral management				1.5
End-to-end logistics provider	National Collateral Management Services Ltd.	Storage and allied services Multi-modal supply chain services				>1
	StarAgri	End-to-end management of supply chain				N.A.
Leverage assets	Shree Shubham Logistics Limited	Storage and allied services		Processing and retailing spices and dry fruits		0.6
Captive logistics	Adani Group	Manage entire supply chain for fresh fruit starting from procurement, storage, logistics and ripening				N.A.

Sources: Press search; BCG analysis.

LEADING INDIAN AGRI-WAREHOUSING COMPANY

The company offers end-to-end warehousing and logistics solutions to commodity stakeholders with a strong focus on traders. Along with warehousing, the company offers allied-services like commodity funding, collateral management, testing and certification, fumigation and pest management, commodity procurement, trading, and exports. It has also forward-integrated into branding and retailing of spices to leverage fixed assets more effectively (see Exhibit 5.7). The company has developed a strong presence in Rajasthan and Gujarat with more than 10 warehouses totaling more than 0.5 million MT of capacity. It plans to build approximately 1 million MT of capacity in five to six states including Madhya Pradesh, Karnataka, and Punjab.

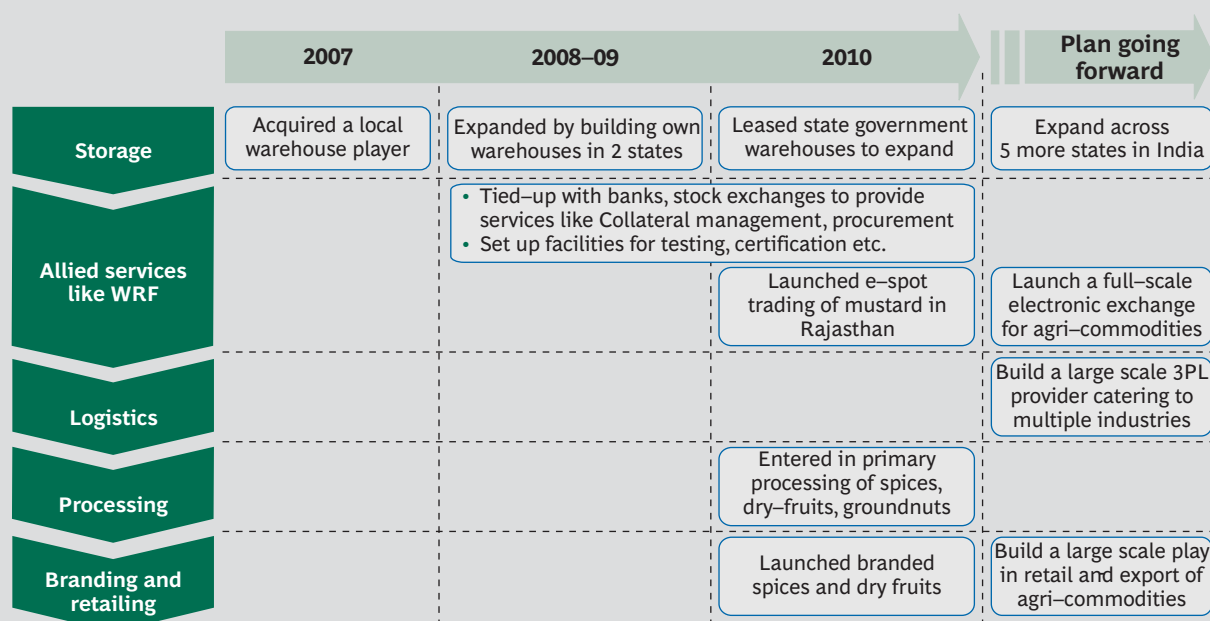
The player has strategically forged partnerships with multiple agri-stakeholders to build a scalable, stable, and asset-light model.

- **Partnership to ensure higher capacity utilization:** The company has tied up with NCDEX Spot Exchange (NSPOT) to provide warehousing and logistics support to the NSPOT participants. This partnership has not only helped the player in ensuring better capacity

utilizations, but also fetched it better warehousing rentals.

- **Partnerships to explore additional revenue streams:** The player has tied up with multiple banks to provide collateral management for extending post-harvest credit facilities to farmers, traders etc.
- **Partnerships to support asset-light expansion:** The company has entered into a strategic tie-up with the Rajasthan State Warehousing Corporation (RSWC) to manage the latter's warehouses by taking control over its entire operation. This partnership has enabled it to expand thrice its own capacity with minimum investments. Moreover, a tie-up with a public sector company has enabled the company to enter long-term contracts.
- **Captive storage:** This business model is mainly applicable for produce that requires special technology and methodology for preservation. For instance, Adani Agrifresh has set up a captive cold storage with imported technology to preserve its goods due to lack of local providers in this space.

EXHIBIT 5.7 | Business progression for leading Indian agri-warehousing player



Sources: Industry interview; press search.

SYSTEMATIC APPROACH FOR BUILDING A WINNING BUSINESS MODEL IN THE WAREHOUSING INDUSTRY

Warehouse businesses can be of varied types, offering different services, serving different geographies, and catering to different sets of customers. A player needs to make strategic choices on multiple dimensions which are listed below:

- **Services to be offered:** Several choices are available in services offered to customers:

- **Only storage facility:** Within storage, a provider can either be a generic player with basic preservation facility, or a highly specialized storage provider focusing on a particular crop. However, as of today, the need for specialized storage is limited to horticulture and players are focusing mainly on generic storage, leading to better asset utilization and hedging against crop-specific risk.
- **Storage along with allied services** like procurement, testing and certification, warehousing receipt finance etc.
- **An integrated third-party logistics provider:** Build a large-scale third-party logistics business catering to the end-to-end logistic needs of companies.

- **Customers:** The requirement for the kind of warehouse and allied services varies across customers:

- **Farmers:** In India, a majority of farmers are marginal growing small quantities of produce. They are highly sensitive to price and prefer warehouses closer to the local *mandis*. The need for sophisticated storage offerings is yet to evolve. Hence, warehouses catering to this segment have to be very small with basic storage facility.
- **Traders:** Traders form a crucial part of the post-harvest value chain and have large requirements for good quality storage. Apart from storage, they demand additional facilities like testing and certification, warehousing receipt finance etc.

- **Corporate:** With the upsurge of organized retail, warehousing requirements of large corporates in the agricultural business have grown significantly. Most of these corporates have a pan-India presence and demand good quality infrastructure with large-scale presence. They also require high investments in sophisticated technology to ensure efficient supply chain management.

- **Geographic coverage:** For a large-scale warehousing play, very high capital investments are needed. In the initial stages of business, two choices pertaining to geographic coverage can be made, in order to ensure optimal use of capital:

- **A concentrated localized player:** Build a concentrated play in one or two states in India, with presence across all the major market places in these states. A concentrated presence helps in establishing relationships with the local government and with intermediaries, and hence ensures faster capacity ramp-up. However, the selection of state/s is critical. It should be based on multiple factors like trade volumes (of the major *mandis* in the state), the level of competition from other private players, the kind of crops that are traded in both *kharif* and *rabi* seasons, prevailing state regulations, and existing relationships with key stakeholders etc.

- **A pan-India player with presence in key geographies:** The other option is to build warehouses in key geographies like metros, ports across India and provide large-scale service to corporates operating in these specific geographies.

RECOMMENDED APPROACH FOR BUSINESS DEVELOPMENT

Based on detailed cost-benefit analysis of various scale options available for a warehouse player, we recommend three-stage scale up for a new entrant (see Exhibit 5.8)

- **Stage 1: Build a strong presence in a select geography:** A new entrant should focus on building a strong footprint in one or two

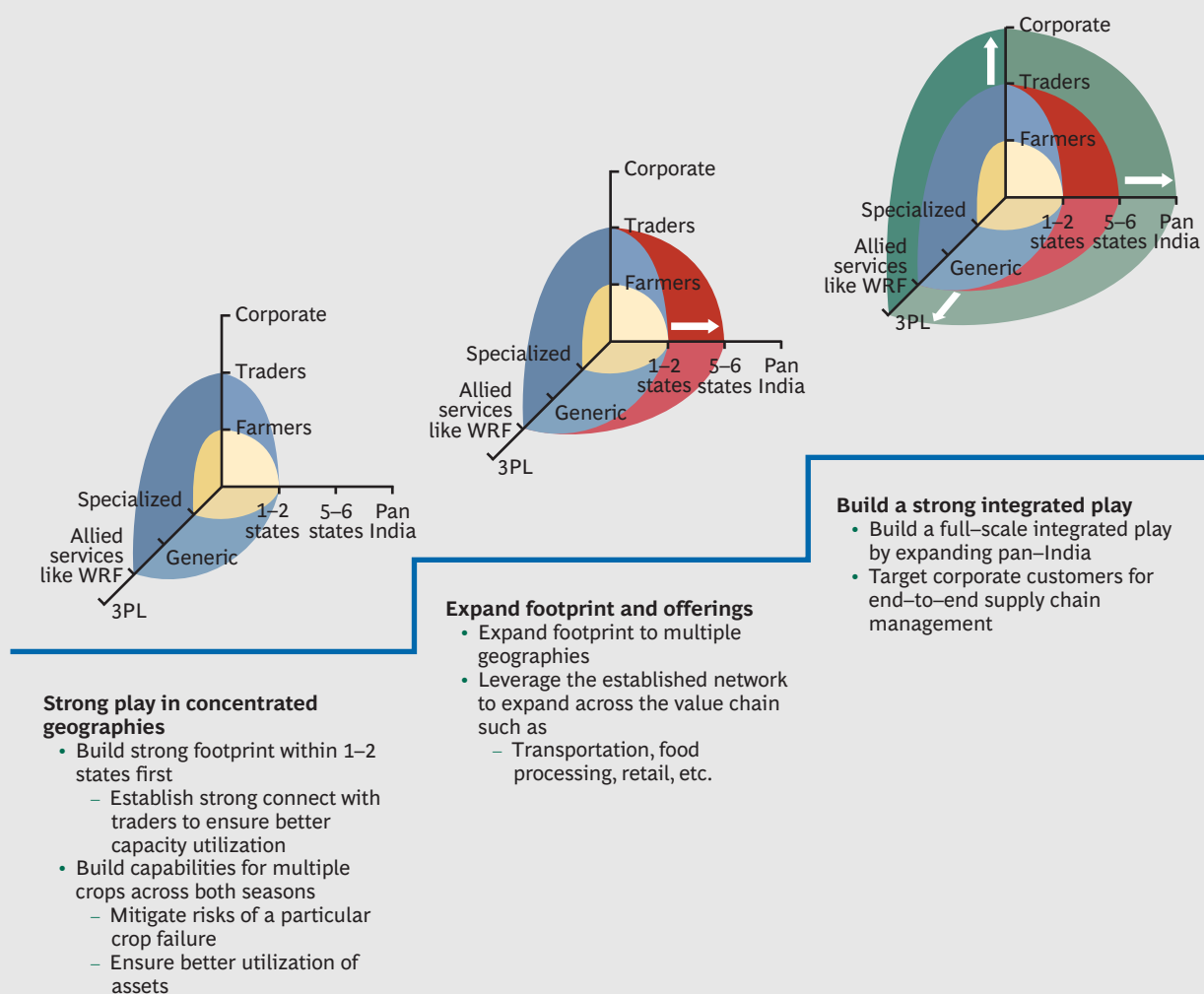
states with large *mandis* that have high volumes of food grains turnover. To optimally manage capacity, it is very important to select *mandis* with large volumes across both cropping seasons. A focused geographic approach will help a new entrant build and expand partnerships with banks and spot exchanges faster hence creating opportunities for better profitability through allied services offerings.

- **Stage 2: Expand footprint and offerings:** After establishing a strong presence in one or two states, the player should expand its

footprint to at least five to six states. Also, the player must now start leveraging its [already established] assets to forward integrate into logistics, food processing, branding or retailing. The choice of forward integration would depend on multiple factors like the size of the opportunity, the potential to leverage existing capabilities of the player, etc.

- **Stage 3: Build a strong pan-India integrated play:** The last and the final stage is to evolve into a large, pan-India third-party provider targeting corporate customers and expanding to other adjacent industries.

EXHIBIT 5.8 | Systematic approach for building a winning warehouse business



Source: BCG analysis.

CRITICAL SUCCESS FACTORS FOR WAREHOUSING BUSINESS

- **Multiple revenue streams:** A bouquet of services such as collateral management, procurement, testing, etc., would provide additional revenues on top of the earnings from basic storage services and make the business economically viable.
- **Local market knowledge:** Developing deep understanding of the local ecosystem is critical to build a successful warehousing business. To understand and resolve micro/local issues related to supply chain, procurement, it is critical for the service provider to have actual hands-on experience and knowledge of the relevant market conditions.
- **Strategic tie-ups to ensure better asset utilization:** Strong partnerships with players like financial institutions and commodity exchanges will help warehouse players to better utilize their assets and generate an additional revenue stream.
- **Leveraging assets to exploit adjacent synergies:** Assets built up as part of warehousing can easily be leveraged to forward integrate into logistics, food processing, branding, and retailing. For example, Shree Shubham Logistics is leveraging its fixed assets effectively by forward integrating into branding and retailing of spices.

LOGISTICS

The logistics sector in India is at an inflexion point. The strong growth in manufacturing, coupled with the high economic growth rate of between 8 and 9 percent per annum being experienced in India, throws open a plethora of opportunities for the logistics sector. Logistics, an approximately Rs. 6,300 billion industry, has grown at around 12 percent per annum in the last five years (see Exhibit 5.9). Strong growth enablers exist for logistics. These include infrastructure development, growth in organized retail, and a flourishing food processing industry. Further, strong inflows of FDI into sectors like electronics and automobiles have led to increased market opportunity and a strong growth rate for the organized logistics sector.

The logistics sector in India is still at a nascent stage especially logistics focused on the agriculture sector. Therefore, we are yet to see the emergence of logistics players that focus on agriculture alone. Most players' in this space have portfolios focused on multiple sectors, where agriculture is one amongst many end-user sectors.

THIRD-PARTY LOGISTICS, AN EMERGING CONCEPT IN INDIA

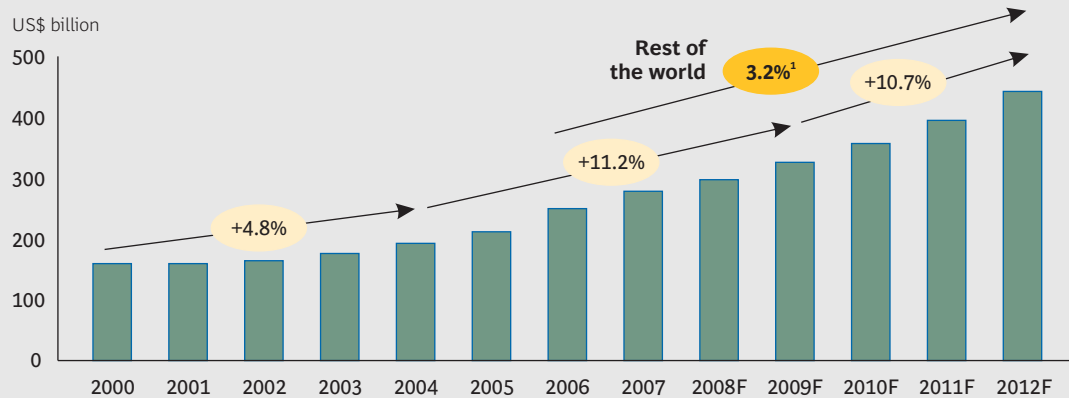
Third-party logistics (3PL) is a concept where a single logistics provider manages end-to-end logistics for a firm. The 3PL industry in India is still nascent and is dominated by basic offerings. It is a small industry of around Rs. 40 billion to Rs. 50 billion and is expected to grow between 15 and 25 percent in the next five years. The 3PL offerings in India are still very basic in nature with 90 percent of the market dominated by offerings like using a single provider for both transportation and logistics, with few value-added services. The share of value-added services like inventory management, supply chain optimization, integration with client IT systems etc., is still small.

KEY ISSUES IN INDIAN LOGISTICS

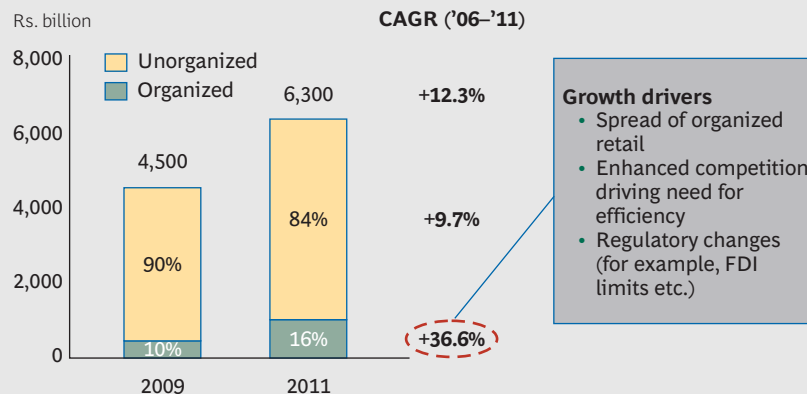
- **High competition from unorganized players:** Organized players are facing stiff competition from the unorganized players that provide basic logistics services at highly competitive rates.
- **High operating costs due to poor infrastructure:** Poor road infrastructure leads to a series of problems for the logistics players. It leads to higher usage of fuel, greater turnaround time, and higher maintenance costs. In the end, all these factors push up the operating costs for the players.
- **Non-conducive government regulations:** (a) Current tax structures and tax breaks for logistics players do not support large investments in logistics that require longer gestation periods. (b) Land acquisition plays a critical role in building an effective logistics play. However, under the current regulatory environment, it is very difficult to acquire a large portion of land for setting up a logistics business.

EXHIBIT 5.9 | Landscape of Indian logistics industry

Asia Pacific logistics market growing faster than rest of the world



Strong fundamentals driving organized logistics growth in India



Sources: Datamonitor market research, CB Richard Ellis.

Note: According to Datamonitor research, logistics market is composed of all in-house and outsourced expenditure from transportation, distribution and management of retail, consumer electronics, automotive, hi-tech and pharmaceuticals sector.

¹Rest of world logistics market growth CAGR (2005–09).

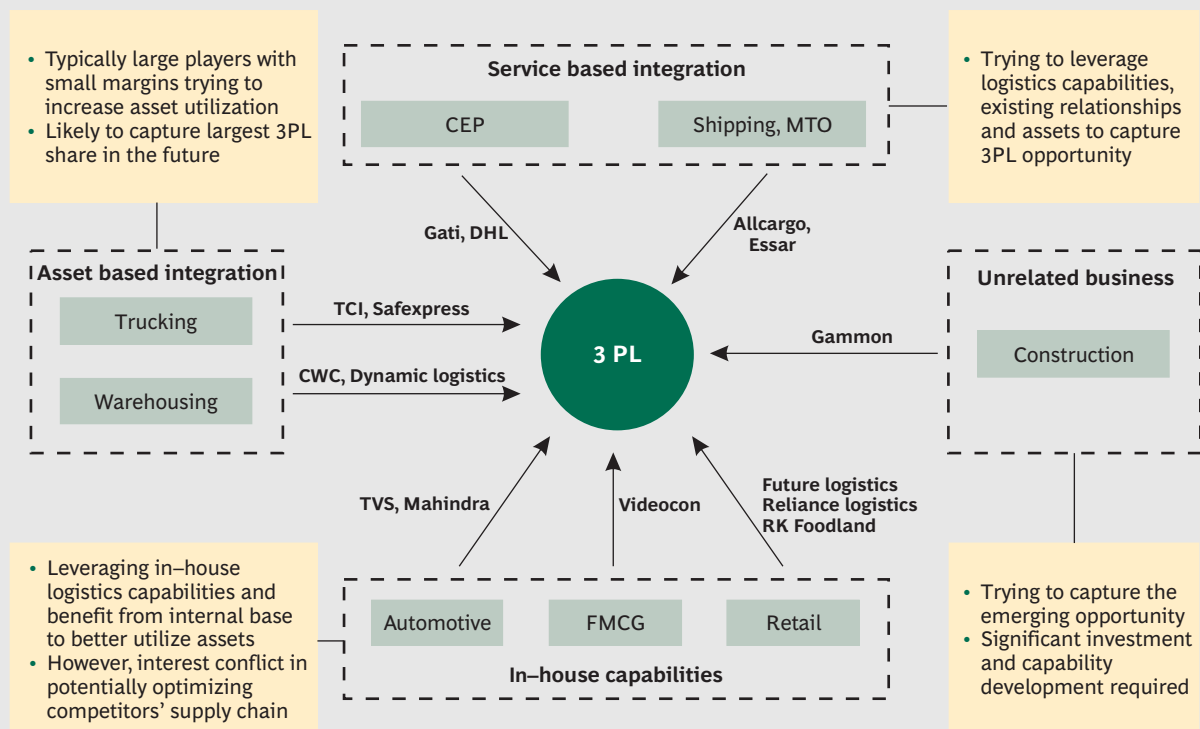
FOCUSED AGRI-BASED LOGISTICS BUSINESS MODEL WILL TAKE TIME TO EVOLVE

Multiple companies are trying to capture the 3PL opportunity (see Exhibit 5.10). Companies like TCI and Safexpress with sizable warehousing and logistics assets are trying to enter the 3PL space, in order to improve margins and ensure better utilization of assets. These categories of asset-based integrated players are seeking to capture the largest share of the 3PL opportunity riding on existing large asset base which would require significant capital and time for new entrants to replicate. Similarly, players such as TVS, Mahindra, Videocon, Future Logistics, and Reliance

Logistics are leveraging in-house logistics capabilities to cash in on the 3PL opportunity.

All of these players are focusing on building multi-commodity-based 3PL businesses in order to ensure better asset utilization. Focused logistics play only for agri-commodities will take time to evolve, as the demand for specialized logistics by food processing and retailing companies is still quite low to justify such a focused approach. However, there is demand for specialized logistics from both food processing companies and retail. In future, we see the emergence of focused agri-based logistics players.

EXHIBIT 5.10 | Players entering into 3PL industry in India



Sources: Analyst reports (Cushman Wakefield 08, Enam 07, Frost & Sullivan); Market interviews; BCG analysis.

KEY SUCCESS FACTORS FOR 3PL PLAYERS

Key success factors for building a large and successful 3PL play:

- **Build scale and optimize logistics operations:** While building the initial network of warehouses and transportation, 3PL players should carefully examine the prospective client base and set up a network where it would be possible to share the established asset across multiple clients and to have better asset utilization.
- **Ability to up-sell value added services:** 3PL players should build industry expertise by focusing on certain industries with high

scope for supply chain optimization. Players should set up the right infrastructure, IT systems, and manpower to cater to target industries.

- **Access to high quality sub-contractors:** In order to reduce upfront investment in warehouses and transportation networks, 3PL players can tie up with other high-quality sub-contractors and leverage their asset base.

NOTE:

1. With the India government introducing the Negotiable Warehouse Receipt System (NWRs), farmers can seek loans from banks against the warehouse receipts issued to them against storage.
2. Incremental rate of return.

FOOD PROCESSING, BRANDING AND RETAILING

INDIA'S POPULATION HAS BEEN growing at a fast pace. In order to keep pace with the increasing demand for agriculture and horticulture produce, India needs to improve its food processing capabilities. It is increasingly becoming evident that only a vibrant food processing and retailing sector can lead to increasing farm-gate prices, thereby increasing income levels, reducing wastages and increasing employment.

Food Processing Industry

For an agrarian economy like India, food processing is an important sector as it provides a strong link between agriculture and the end-consumer. Food processing is a set of methods and techniques used to transform raw agricultural produce into a form that can be consumed directly. It involves any type of value addition to agriculture or horticulture produce that enhances shelf-life of the food product. The food processing industry is made up of two kinds of processing.

- **Primary processing:** It includes conversion of raw farm output to intermediate commodity consumables with activities like shelling, hulling, milling, polishing, crushing, packing etc. It is required for certain farm products only — cereals, pulses and oilseeds. Examples of primary processed food sold to the end-consumer include packaged fruits and vegetables,

packaged milk, milled rice, flour, tea, coffee, sugar, pulses, spices, and salt.

- **Value-added processing:** It includes conversion of raw or intermediate farm output to value-added products with activities like flour milling, baking, fortification, refining etc. Examples of value-added processed food sold to end-consumers include juices, jams, pickles, squashes, concentrate, *ghee*, *paneer*, cheese, butter, ethnic Indian products, branded edible oil, breads, biscuits, snack foods, pasta-based foods, processed meat, poultry, marine products confectionery and chocolates, beer, spirits, wine, aerated, and malted beverages.

The potential for growth in food processing is enormous. Indian agriculture has the unique advantage of a large and varied raw material base for food processing. India can emerge as a leading food processor and supplier to the world if this advantage is leveraged optimally.

Food processing is a highly fragmented industry. There are over 700,000 registered food processing units — 25 percent of these are unorganized players, 42 percent fall in the Small Scale Industries (SSI) category and the remaining 33 percent are organized players. The unorganized and SSI players are small in their individual capacity, but account for 70

percent of the output in terms of volume and 50 percent in value. Though the organized sector is comparatively small, it is growing at a rapid pace.

Food processing is a Rs. 5,500 billion industry in India and has been growing at the rate of 10 percent per annum for the last seven years (see Exhibit 6.1). The proportion of food processing within each food category is very low in India as compared with other developed nations. India accounts for just around 1.5 percent of the global processed food trade.

FACTORS DRIVING GROWTH IN DEMAND

- **Growing urbanization:** India is witnessing rapid urbanization which is linked to the country's economic growth and foreign direct investment. The growth in urbanization is leading to a change in food habits. People are demanding more convenience and have increased spends on processed ready-to-eat food.
- **Increasing income levels:** This is leading to higher spends on food, as well as a switch

from staples to animal protein and processed food.

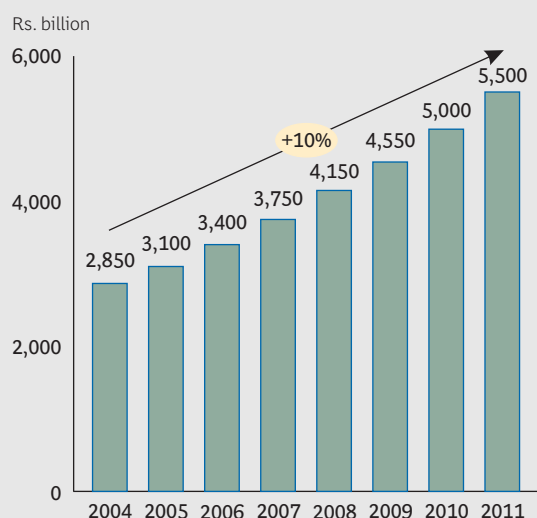
- **Social changes:** Increasing number of working women, growing health consciousness, and the need for convenience is going to drive the growth of the food processing industry in India.
- **Organized retail:** The rapid growth of organized retail provides the much-needed forward integration, leading to easy availability of processed foods.

KEY CHALLENGES

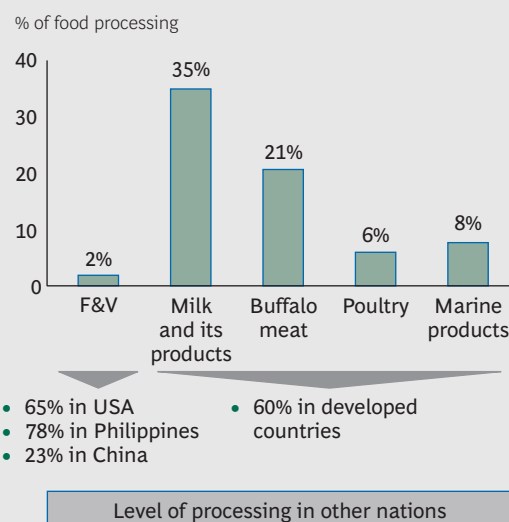
- **Input supply assurance:** Uncertainty related to availability, price and quality of raw material is one of the key challenges faced by the Indian food processing industry. Availability and price of the agriculture produce in India is impacted by a range of external factors such as heavy rainfall, drought, pests and diseases, etc. Poor farming practices, poor handling of produce, and inadequate quality control have led to poor quality raw material.

EXHIBIT 6.1 | Food processing industry at a very nascent stage in India

Food processing is ~Rs. 5,500 billion industry and has been growing @ 10% for the last seven years



Level of processing significantly low as compared to developed nations



Sources: India Stat, MOFPI Annual report.

- **Inadequate infrastructure:** One of the biggest impediments to the growth of the food processing industry is inadequate infrastructure. A key constraint experienced in the post-harvest handling of all the perishable agriculture commodities is the absence of an efficient cold chain, including on-farm storage facility. This not only leads to wastage but also adversely impacts the quality of inputs. High wastage adds to the total cost of raw material, ultimately affecting the competitiveness of the Indian food processing industry.
- **Preference for regional tastes:** India has a very diverse population, with each region and sub-region in India characterized by distinct food traditions, preferences, and taste. Many regional preparations are made with specific raw materials available only in the region, and tastes best when fresh.
- **Issues in meeting global quality standards:** India has only a 1.5 percent share in the global trade of processed food. One main reason is the inability of local producers to adhere to environmental and safety standards acceptable in the developed countries. Export competitiveness of the food processing industry depends upon access to the developed world markets. The issues of traceability in fresh produce and poor hygiene are the biggest impediments to the food processor in meeting global quality standards. For example, mango weevil in Indian mango pulp has affected its export to the United States, Japan, and the European Union. The major handicap is Sanitary and Phytosanitary (SPS) measures, relating to the presence of pesticides that are used to get rid of mango weevil. Japan had banned Indian mangos in 1986 on suspected pest infestation by fruit flies, followed by the United States and the European Union. The Indian Agriculture Research Institute (IARI) and other research bodies worked on eliminating the risk of fruit flies and came up with vapor heat treatment. Japan formally lifted the ban on import of Indian mangoes in June 2006.

WIDE VARIATIONS IN PROFITABILITY

At present, a large part of food processing in India includes primary processing for commodities with limited value-addition.

Most businesses are operating on cost-plus basis with small margins. In order to bolster margins, it is important to forward or backward integrate businesses. Also, there is a need to move toward secondary processing with a unique value-addition in order to differentiate the product and charge a premium. Profitability of value-added processing players varies widely, depending on the level of processing. Commodity players (like those that produce F&V, mushrooms, and herbs) primarily focus on volumes with lower margins, whereas value-added products like edible oil and cereals attract higher margins, but generate lower volume (see Exhibit 6.2).

GOVERNMENT POLICIES FAVOR PRIVATE SECTOR PARTICIPATION

A financial outlay of 50 billion from the government has been planned in the 11th Five Year Plan period for setting up food parks, integrated cold chain infrastructure, as detailed below:

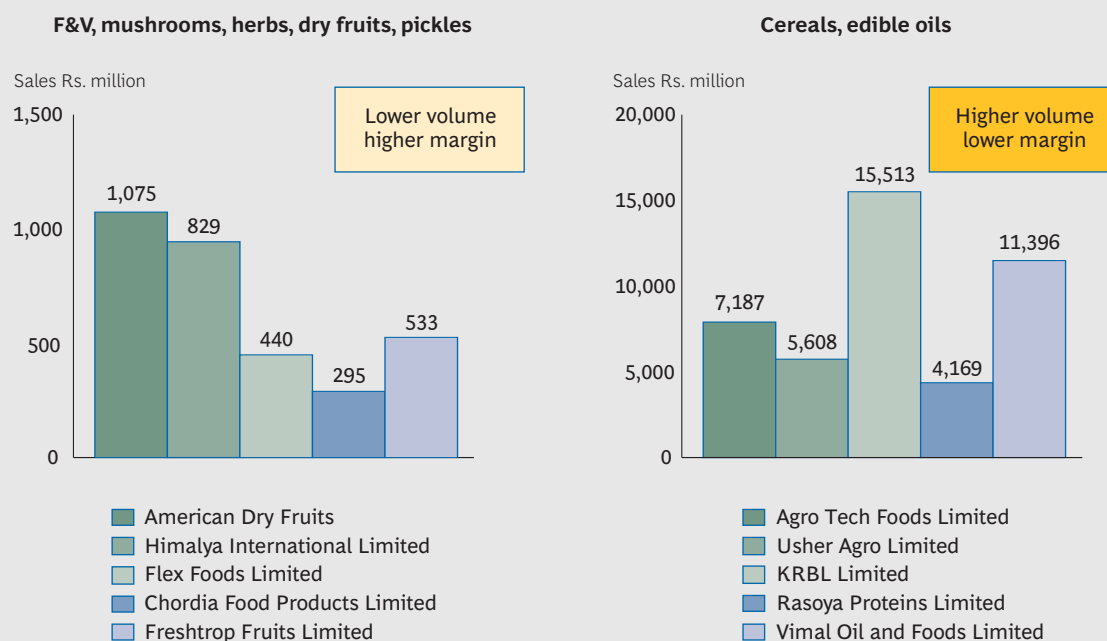
- **Integrated food parks:** The government plans to set up 30 integrated food parks during the 11th plan period at a (proposed) collective outlay of Rs. 15 billion. Keeping the high risks involved in the food processing business in mind, the 11th plan proposes a government grant of 75 percent of the project cost in general areas and 90 percent in difficult areas with an upper limit of Rs. 500 million.
- **Support for establishing cold chains and distribution infrastructure:** The government plans to invest Rs. 2.1 billion to support cold chain infrastructure projects over the next five years. A provision of Rs. 5.5 billion is proposed for supplementing the initiatives of the Container Corporation of India, Indian Railways, and private players in establishing a network of integrated cold chains and six strategic distribution centers in cities with high consumption.

A relaxed regulatory environment has been established to provide greater impetus to food processing in India. These initiatives include:

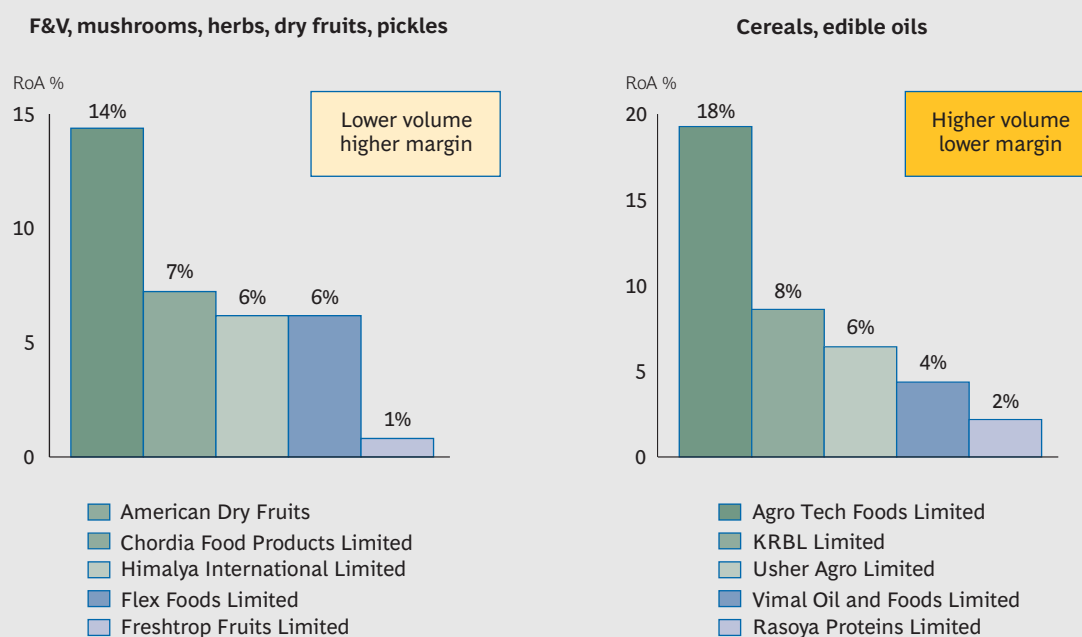
- The National Food Processing Policy has created an enabling environment by setting targets for the next five years:

EXHIBIT 6.2 | Profitability of different food processing players

Commodity players have high turnover



Value-added processing players more profitable



Source: Capitaline.

Note: All figures for 2011.

- The level of processing of perishables to increase to 20 percent from the current 6 percent
- Value-addition to increase to 35 percent from the current 20 percent
- Share in global food trade to increase to 3 percent from the present 1.5 percent
- Several steps are proposed to be taken in order to implement the Food Safety and Standards Bill, 2006
 - 84 labs are proposed to be revitalized/ upgraded during the 11th Five Year Plan
 - 500 cases may be supported for obtaining ISO / HACCP approval

industry with high levels of processing. In developed countries like the United States, almost 60 percent of the food consumed is processed food. Several companies like Dole and Cargill have built a large and profitable business in food processing (see Exhibit 6.3).

INDIAN PLAYERS IN FOOD PROCESSING INDUSTRY

Several Indian players are making in-roads to tap the food processing opportunity in India. Many large players like ITC have forayed into the processing of multiple commodities like spices, grains, coffee, marine products. Players like Ruchi Soya have built a large-scale, oil processing set-up with complete backward integration. Others have also invested in creating brands for different product categories. (see Exhibit 6.5)

EXAMPLES OF SUCCESSFUL BUSINESS MODELS GLOBALLY

On a global scale, food processing is a large

MULTIPLE SUCCESSFUL FOOD PROCESSING BUSINESS MODELS

Different food processing companies follow different business models. The choice of value

EXHIBIT 6.3 | Examples of global food processing companies

Player	Farming inputs	Farming	Sourcing / transport	Processing	Marketing and branding	Retail	Size (US\$ Bn)	RoIC ¹ (%)	RoE ² (%)
Cargill	Fertilizers, seeds			Oilseeds, grains			119	7–13	8–19
Archer Daniels Midland Company (ADM)				Oilseeds, corns, other grains			80	7–13	11–25
Bunge Limited	Fertilizers, seeds	Sugar		Oilseeds, grains, sugar			58	(1)–17	4–19
Dole Food Company, Inc.				Pineapples, bananas, vegetables			7	2–7	26–30

Sources: Bloomberg, Annual Reports, BCG analysis.

Note: Revenue for year 2011 except for Cargill and Dole where it is for year 2010.

¹Return on Invested Capital range for last 5 years.

²Return on Equity range for last 5 years.

DOLE: A FULLY-INTEGRATED F&V PLAYER

Dole is a leading global producer, marketer, and distributor of fresh fruits and vegetables, including a line of value-added F&V products. The company operates a fully-integrated model (including sourcing, growing, processing, distributing, and marketing), holding number one or number two share positions in the categories in which it participates. Overall the agriculture portfolio of the company comprises three categories:

- Fresh fruits account for US\$4.8 billion in revenues for the company. Dole is a leading player in the banana, fresh pineapple, grapes, apple, and kiwi market. The company has established large-scale ripening and distribution operations in the Europe.
- Fresh vegetables account for US\$1 billion in revenues. Dole's portfolio primarily consists of fresh produce like lettuce, celery, broccoli, etc., and fresh-packed vegetables and salad.
- Packaged food accounts for US\$1.1 billion in revenues. Dole's portfolio primarily consists of canned fruits, fruits bowl, juices, etc.

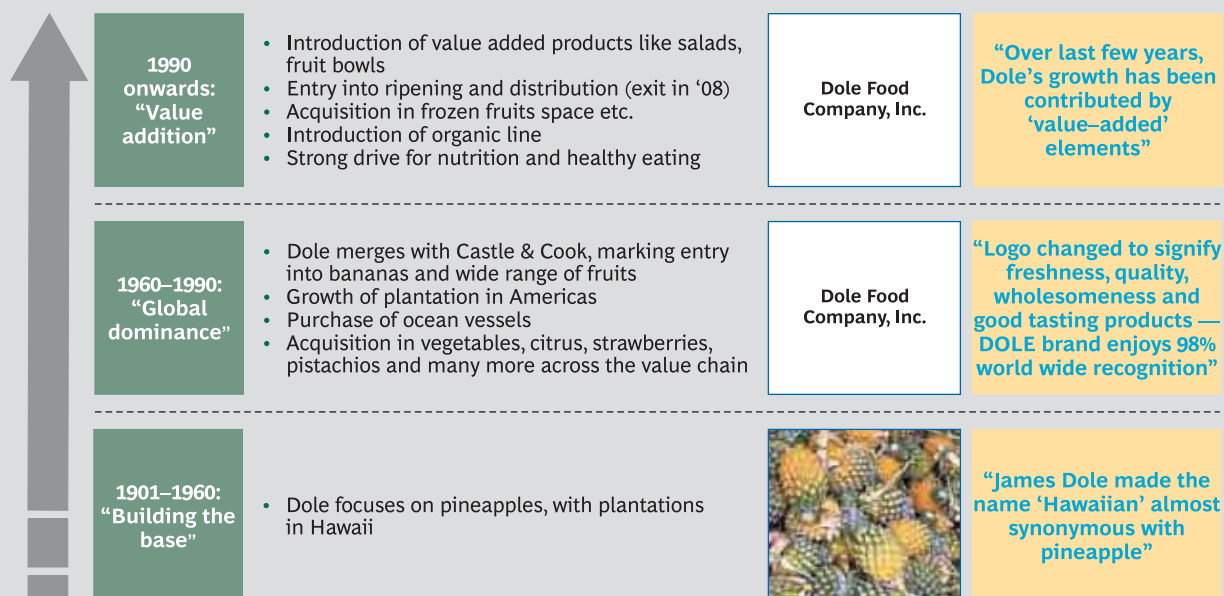
Dole has built a unique fully-integrated model in the F&V space. Dole sources most of its fresh fruits from its own plantations in Costa Rica, Ecuador, and Honduras. It has leased out land for vegetable farming and also operates plantations in Asia. Due to the perishable nature of its products, the company has invested heavily in building specialized and dedicated refrigerated containerized fleet for shipping the fresh produce across the world.

Apart from this, the company has forward integrated into fruit ripening, processing plants for salads, and canneries for packaged food (Dole business model evolution illustrated in Exhibit 6.4). Dole has built a strong brand imagery in fresh F&V segment by investing heavily in marketing and branding its products for retail.

Key success factors for Dole have been three-fold:

- **Efficient supply chain:** Dole has invested heavily in building a “closed-loop” cold storage supply chain with 60 processing and ripening centres, 25 ships and approximately 14,800 refrigerated containers, and port facilities in each of the countries it operates out of.

EXHIBIT 6.4 | Dole's business model



Sources: Company website, Analyst reports, BCG analysis.

DOLE: A FULLY-INTEGRATED F&V PLAYER

- Global scale and multiple products:** Dole has developed a diversified sourcing option and product lines to de-risk itself from country-specific factors. For instance, the company sources bananas from the Americas, vegetables largely from the United States, deciduous and citrus fruits from Chile, New Zealand, and South Africa. This way, the business is minimally impacted in case there are problems with sourcing a particular input from one country. The same ‘de-risking’ strategy works when Dole markets its products in several countries across the globe.
- Universal brand:** The company has invested heavily in marketing and branding in order to build a single, universal “Dole” brand with a strong recall across the world. For long associated with pineapples, the “Dole” brand has been extended across the portfolio.

EXHIBIT 6.5 | Example of leading Indian companies in food processing industry

Player	Farming inputs	Farming	Sourcing / transport	Processing	Marketing and branding	Retail	Size (Rs. billion)	RoIC (%)	RoE (%)
ITC Ltd. ¹	Grains, spices, coffee, marine products, etc.						40	18–25	N.A.
Ruchi Group	Mainly soya; presence in other oilseeds						134	1–7	8–15
K S Oils Ltd.	Mainly soya; presence in soya, palm						40	N.A.	19.2
Tirupati Food Industries Private Ltd.	Pulses — Moong, urad, arhar						4.5	N.A.	N.A.
PepsiCo, Inc. ¹	Potatoes, tomatoes, rice, barley, chilli						N.A.	N.A.	N.A.
Adani Group	Multiple oils, fruits (apples, citrus, grapes)						0.8	N.A.	N.A.

Sources: Annual Reports, Press search, Capitaline, Valuescience center.

Note: Figures for year 2010.

¹For farm inputs: primarily a partnership model where farm inputs are provided by third-parties with these firms coordinating the overall process.

chain segment plays a critical role in determining the success of a food processing business. The value chain segment is also dependent on the end-product the food processing unit is manufacturing. Four kinds of business models have been observed in this sector:

- An integrated input and farm management play:** A set of food processing players have backward integrated into farm management

and provide farm inputs like seeds and fertilizers to have better control over quality and quantity of the raw material used. Backward integration into farming inputs and farm management is critical for businesses where the raw input for food processing forms a critical source of differentiation. For instance, Pepsi is involved in contract farming for potatoes to procure a particular quality input for its chips. Through contract farming, Pepsi is

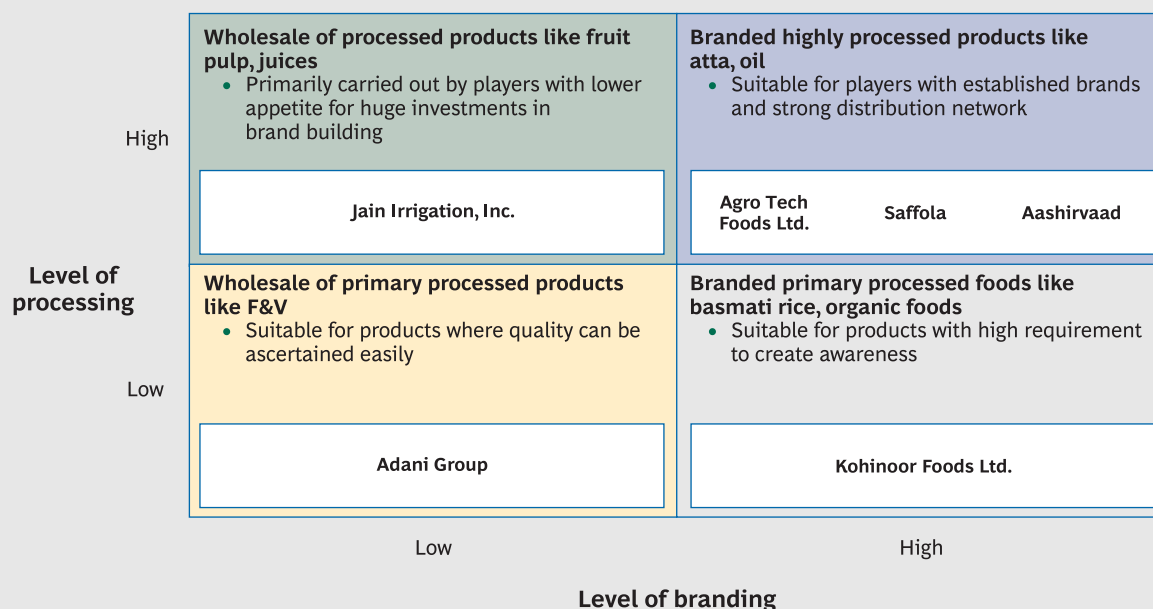
providing the required seeds, fertilizers and other inputs to farmers so that it can procure the desired quality of produce.

- **Direct procurement from farmers:** For businesses with highly commoditized products, lower cost becomes an important source of differentiation. For such commoditized processed food products, lowering cost through direct procurement from farmers not only helps in lowering raw material costs but also helps in reducing wastage by providing tighter control along the supply chain. For instance, ITC has invested heavily in setting up *chaupals* for direct procurement of raw material for *atta* and spices.
- **Focused food processing businesses:** Several players have developed a niche and focused play in highly specialized and high value-added food processing. These players have developed a unique source or formula for value-added processing to differentiate themselves from other players. For instance, MTR differentiates itself by developing food products catering to the taste-buds of a particular segment of the Indian society.

- **An integrated branding / marketing play:** Different players are following different approaches toward the level of processing and the extent of branding (see Exhibit 6.6). On the one hand, players like Agro Tech Foods Limited, are involved in high level of processing and have forward integrated into branding and marketing for better margins. On the other hand, players like Adani Farm fresh are involved only in primary processing of F&V. Adani Farm Fresh sells its produce wholesale to other retailers with limited branding. The forward integration into branding / marketing requires significant initial investments in building the brand. It is more suitable for players like ITC and Hindustan Unilever Limited, (HUL) with already established branding and distribution channels, since they can leverage the same for their food processing businesses.

The dimension of forward integration that may be considered by a food processing player into branding / marketing depends on three key levers:

EXHIBIT 6.6 | Different approach towards integrated branding / marketing



Source: BCG analysis.

ITC HAS PRESENCE IN DIFFERENT PARTS OF THE VALUE CHAIN

ITC is one of India's foremost private sector companies with a turnover of Rs. 280 billion. It has diversified presence in sectors such as cigarettes, hotels, paperboards, packaging, agribusiness etc. ITC's agribusiness division is the country's second largest exporter of agri-products with exports of over Rs. 10 billion. Its domestic sales of agri-products are in excess of Rs. 15 billion. ITC is present across different processed food products ranging from wheat flour, ready-to-eat food, biscuits, chips etc. Each of the businesses operates in different parts of the value chain depending on its source of differentiation. For instance, on the one hand ITC has

outsourced the entire production and sourcing operation to local food processors for its ready-to-eat food product category to cater to the preference for local taste. It leverages ITC's large distribution network and established brand along with stringent quality check process to build scale in the product segment. On the other hand, for Bingo chips the entire process is in-house. It relies on in-house technology and plants for the production of Bingo chips in order to ensure consistency in product quality and taste. It is also leveraging in-house production for the development of new products and innovation.

1. **Product category:** There are some product categories that are more amenable to branding as compared with others. Branding plays a crucial role in product categories such as oil and ready-to-eat food where the quality of the product cannot be ascertained easily. In the case of F&V, branding has a very limited role.
2. **Existing capabilities:** For players that have a strong brand and distribution channel, it is easy to leverage existing capabilities and enter into the branded food processing space.
3. **Investment:** Decision for forward integrating into branding / marketing depends heavily on the investment appetite of the players. Players like Jain Irrigation have strategically decided to be in the wholesale business of fruit pulp and juices, instead of retailing the same.

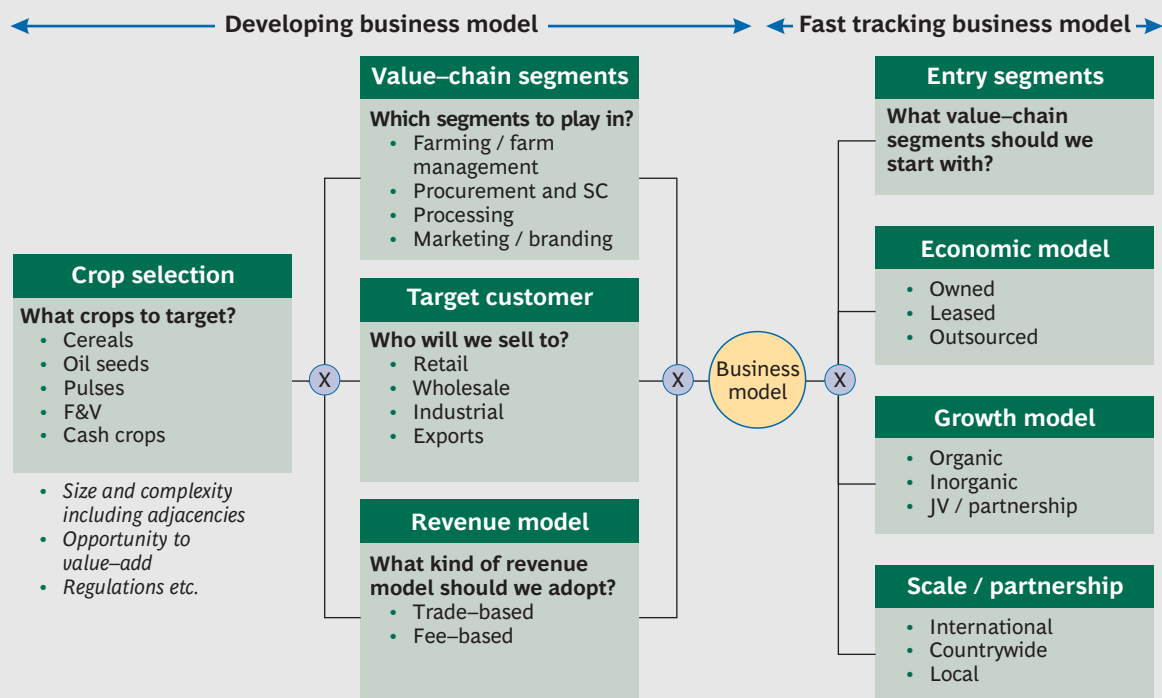
SYSTEMATIC APPROACH TO BUILDING A WINNING BUSINESS MODEL IN FOOD PROCESSING

Companies pursuing opportunities in the food processing space in India first need to determine the construct of their business model and then seek to accelerate the development of the same (as illustrated in Exhibit 6.7)

For a food processing business to succeed, several choices need to be made along multiple dimensions. These are enumerated below:

- **Value chain segments:** Selection of the right value chain is critical not only to improve profitability but also to build a competitive advantage. There are some food processing businesses where the requirement of inputs is very specific, whereas there are others where optimization of input costs is critical for acquiring a competitive edge in the market. For example, Pepsi requires potatoes of certain kind and size for its chips business to ensure taste of the chips, whereas for ITC's wheat flour business it is important to procure wheat at lowest-possible cost so as to compete with the unorganized market. The strategic choice of the value chain segment would be very different for both these businesses. The former would require high level of integration in farming inputs and farm management to ensure produce quality. The latter would require building local procurement centers and providing transportation facilities to farmers in order to bring down procurement cost through direct procurement.
- **Target customer:** The choice of customer segment largely depends on the existing

EXHIBIT 6.7 | Systematic approach for building a winning food processing business



Source: BCG analysis.

distribution model and the brand or the appetite to build the same. For companies like ITC and HUL that have a strong distribution network and an established brand, reaching out to the retail customer segment is easy. Such companies can easily enjoy higher margins. Other players may have to wholesale the processed product to other companies, and play the low margin but high volume game.

- **Revenue model:** Most of the food-processing business models are trade-based where food processors procure raw inputs, process it, and sell the finished goods. However, in some cases where the sourcing of the raw material requires special skill / abilities, food processors prefer the fee-based revenue model. For instance, in order to be successful in oil refining and retailing, it is very important to hedge business against fluctuations of oil prices in the international markets. Hence, some food processors have built refining capacities and have a fee-based

revenue model where they process oilseeds procured by other companies. Similarly, ITC has built a unique capability of procuring cereals at a low price through its wide *e-Chaupal* network.

KEY SUCCESS FACTORS FOR THE FOOD PROCESSING BUSINESS

- **Closeness to source:** The proximity of the food processing industry to raw material inputs is one of the most important levers for success given the perishable nature of the produce. The transportation of raw materials is not only costlier than that of processed food but can also lead to excessive wastage in the event of longer and repeated handling.
- **Low-cost structure:** Food processing, especially primary processing for commodities is typically a low-margin, high-volume game. Hence, it is very important to build low-cost structures by accessing cheaper sources of inputs — raw materials, labor, power, and land — by

utilizing government rebates and subsidies to the fullest, and also by investing in technology and equipment to bring down the overall operational costs.

- **Differentiability of finished product:** Specific and more value-added products command premium prices and offer better returns on investments.
- **Assured consumption centers:** A downstream linkage to wholesale, retail or the export market provides an assured revenue stream and prevents wastage.

Food Retail — A Fast Growing Industry

The current size of the retail market in India is estimated at Rs. 20,000 billion and is projected to rise to Rs. 59,000 billion by 2020 (based on estimates of BCG's recently published white paper — *Building new India*). Organized retail is currently estimated at Rs. 1,300 billion, amounting to 6 to 7 percent penetration of the total retail market and is expected to be a Rs. 8,000 billion to Rs. 12,200 billion industry depending on multiple factors like income levels, increase in consumerism, changing

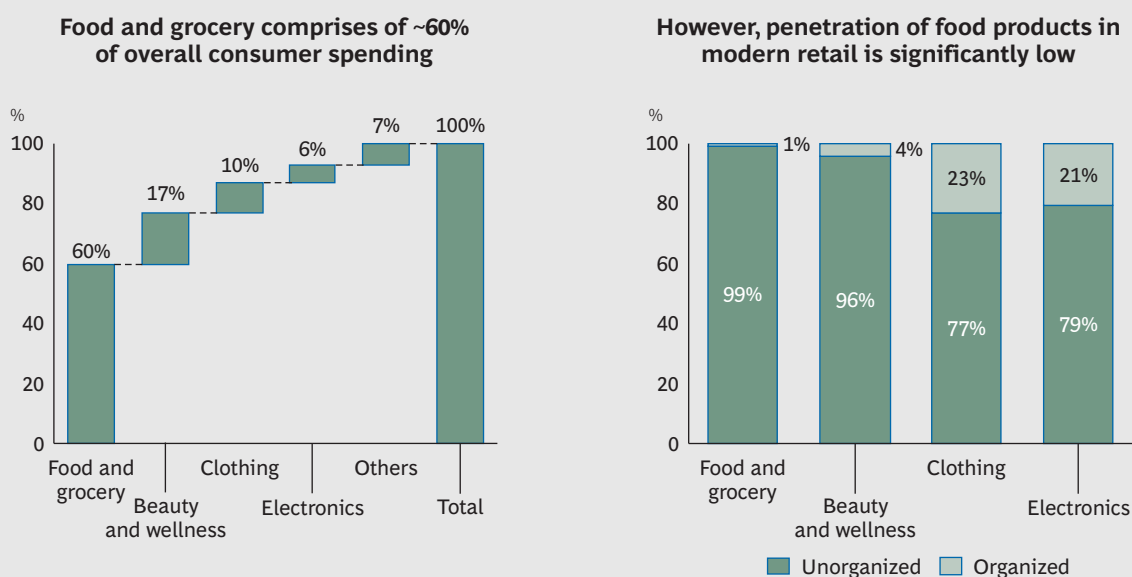
consumer preferences, etc. Within organized retail, food retailing is expected to grow at a much faster pace as it is highly unorganized with current penetration of organized retail limited to approximately 1 percent, despite 60 percent consumer spending on food and grocery (see Exhibit 6.8).

Relaxing FDI regulation is drawing international players

Slowly but steadily, the Government of India is opening up retail to foreign investment. In 1997, for the first time in India's history, the government allowed 100 percent foreign subsidiaries to operate in wholesale cash and carry business. In 2006, 51 percent FDI investment was approved in single-brand retailing. Companies were allowed to sell multiple products under a single brand name. In 2008, the government was mulling over the idea of allowing 100 percent FDI in single-brand retail and 50 percent in multi-brand retail. More recently, the Cabinet cleared the bill to increase FDI to 100 percent in single-brand retail.

These changes in the regulatory environment have attracted several international players to the Indian food retail industry. In 2003,

EXHIBIT 6.8 | Landscape of food retail industry in India



Sources: Analysts reports and BCG analysis.

Germany-based Metro AG founded ‘Metro Cash & Carry’ — a wholesale cash and carry store in India offering bakery, fish, dairy and other food products. The company currently caters to business customers like hotels and caterers on wholesale. In 2007, Bharti and Walmart entered into a JV to open cash and carry wholesale stores. The JV currently has three stores in Punjab and serves small retailers, manufacturers, and farmers. Players like Carrefour are also planning to start cash and carry stores in India and are in talks with local firms for partnerships.

KEY CHALLENGES

The challenges being faced by the food retailing industry in India are not just plenty, but quite substantial in nature. Some of these are described below:

- **High competition from unorganized ‘kirana’ stores:** The organized food retailer faces stiff competition from unorganized kirana stores. Often, these kirana shops score high on convenience as they are mostly located in their vicinity and are preferred by many customers especially for small ticket size purchase. Unorganized retail is often preferred by low and middle income customers due to the short-term credit they provide.
- **Lack of quality post-harvest infrastructure:** Lack of quality post-harvest infrastructure increases overall procurement and storage cost for the retailers. Overall cost of goods for the retailer increases due to high wastage that occur due to inadequate and poor quality warehousing infrastructure. Absence of established 3PL industry and poor logistics infrastructure leads to higher operating costs (logistics cost) for the retailer.
- **Fragmented supply base and large number of intermediaries:** Traditional retail has multiple aggregators, wholesalers, and retailers, all claiming margins in the value chain. Fragmented supply base not only leads to higher prices but also more wastage due to loading, unloading, and packaging of commodities at multiple places where it changes hands from one stakeholder to another.

- **Increasing rentals and food inflation:** Increasing rentals is a major concern for many food retailers. Margins are getting squeezed due to increasing cost of goods.

Of the above key challenges faced by the food retailing industry, few can be resolved through direct procurement and investment in agriculture post-harvest infrastructure.

Inefficient post-harvest supply chain is leading to significant losses and higher price for the end-consumer

In a traditional supply chain, farmers get only 25 to 30 percent of the price charged to the end-consumer, with profits being made by several intermediaries along the value chain. The fragmented industry structure also results in low investment in technology and supply chain management. For instance, a tomato is procured from the farmer at less than 30 percent of the price at which it is sold to the end-consumer. A significant portion of this mark-up is the result of a large number of intermediaries and the payouts to them during the several steps in the value chain, as well as losses due to multiple handling. In the case of a tomato, approximately 25 percent of the consumer price is lost in leakages and another 25 percent is earned by intermediaries as profits (see Exhibit 6.9).

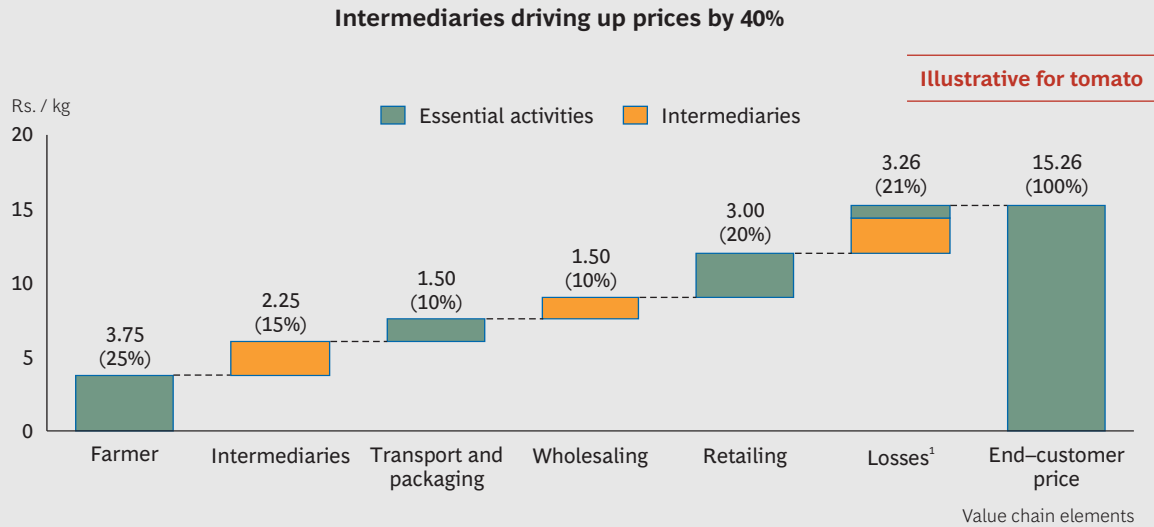
SEVERAL PLAYERS ARE TRYING TO BUILD LARGE-SCALE PLAY IN FOOD RETAIL

Several companies in India are seeking to build a large food retail business. Many have moved into this with a specific focus on the supermarket opportunity (see Exhibit 6.10) and have also started strengthening their backward linkages into the food supply chain. One such example is Reliance Fresh.

KEY SUCCESS FACTORS FOR INDIAN FOOD RETAIL PLAYERS

- **Backward integration to assure quality inputs and lower costs:** The existing supply chain for farm produce involves multiple handovers between several intermediaries, leading not only to wastage but also increases costs for the retailers. Hence, backward integration into farming or direct procurement from farmers is critical to improving margins and efficiency by reducing wastage. Several players like ITC

EXHIBIT 6.9 | Losses in tomato supply chain



Sources: Market research, trader interviews, BCG analysis.

¹Losses defined as wastage during post-harvest operations, moisture loss, spoilage / damage due to pests, rodents & adverse weather, process losses & spillage during weighing, packing, handling & transport. Does not include pilferage and mark-downs. Mark-downs loaded at appropriate value-chains stages as average cost / value increase.

EXHIBIT 6.10 | Leading Indian companies in food retail

	Revenues (Rs.)	Start year	Number of stores	Business highlights
more.	16.1 billion (FY '11)	2007	632 supermarkets 8 hypermarkets	Started in 2007 by acquiring a majority stake in Trinethra super store
Big Bazaar	60 billion ¹ (FY '11)	2001	38 supermarkets 119 hypermarkets	- Part of Pantaloon Retail Limited - Aggressive in launching private labels
Reliance Fresh	N.A.	2006	1,150 stores in 86 cities	- Pushing for leadership in fresh foods - Aiming to strengthen presence in multiple retail formats
Spencer's Retail Limited	10.5 billion (FY '11)	2001	280 retail stores	Multiple store formats ranging from Spencer's Express, Spencer's Daily, Spencer's Supper and Spencer's Hyper
Heritage Foods (India) Limited	9 billion (FY '10)	1992	N.A.	- Leading dairy player in southern India - Focuses mainly on fruits and vegetables, bakery
ITC Limited	N.A.	2000	5 retail stores - Supplier to other stores like Food Bazaar	Plans to launch 500 outlets for fresh produce and 100 cash and carry stores
METRO Cash & Carry India	N.A.	2003	6 wholesale distribution centers	- Offer food and non-food products at best wholesale price - Caters exclusively to restaurants, hotels, small retailers

Sources: Press run; Images retail report; Annual report.

Note: Includes revenue of Food Bazaar as well.

and Reliance are procuring directly from farmers to differentiate themselves in the market, on cost and quality of the produce.

- **Invest in support infrastructure like cold storage, logistics:** The agriculture supply chain in India is at a nascent stage with limited investments in quality infrastructure like storage, transportation etc. Third-party providers in the space are limited. This lack of adequate infrastructure leads to sizable losses. It also reduces product quality, especially in the case of perishables like fruits and vegetables. Hence, it is crucial to invest in captive cold chains and logistics in
- **Leverage technology to optimize processes:** Players also need to improve demand forecasting, reduce stock-outs, and increase sourcing efficiency and product movement visibility by investing in technologies like RFID, SAP etc.
- **Offer value-added products and focus on in-store experience:** In order to increase footfalls in stores, players are offering value added products like a live kitchen.

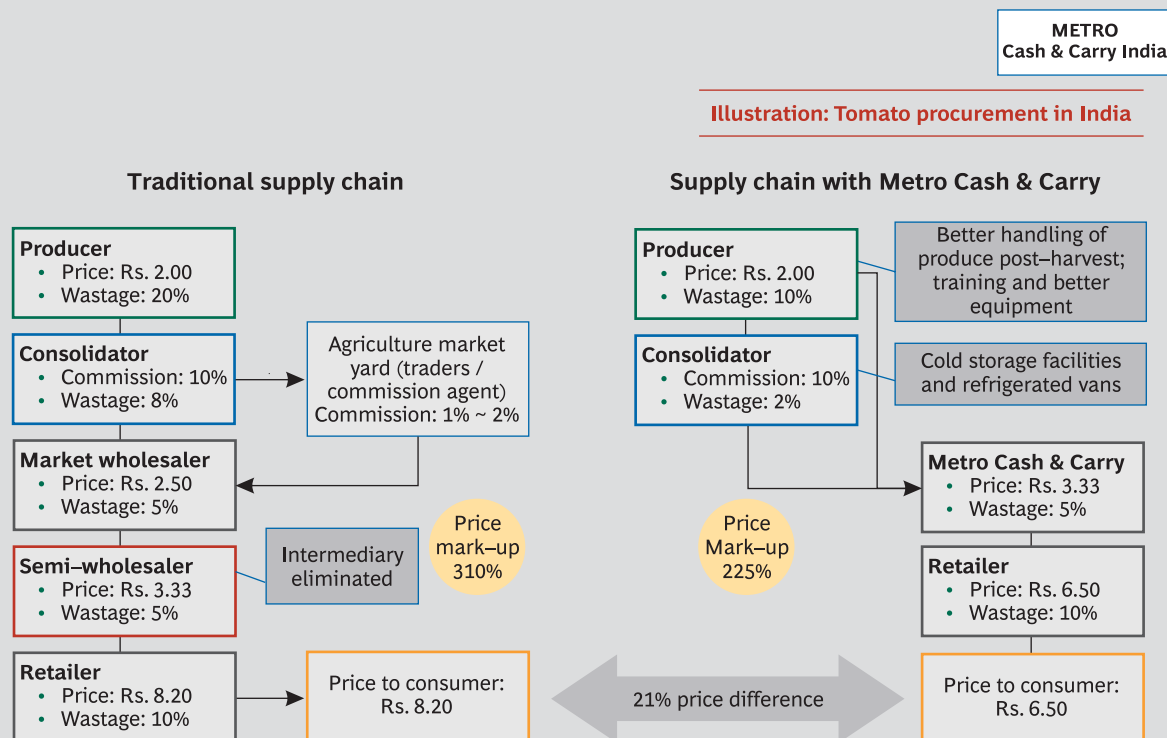
order to drive efficiencies and reduce wastage. Several players like the Future Group, Adani, and Bharti have in-house supply chain operations.

METRO CASH & CARRY SAVES 20 PERCENT BY DISINTERMEDIATION AND EFFICIENCIES OF SCALE

In order to improve margins and reduce wastage, several players are setting up collection centers at *mandis* for direct procurement. For instance, Metro Cash & Carry, a subsidiary of Germany-based Metro AG has set up an efficient supply-chain leading to significant savings and

21 percent lower price to the end-consumer. The wastage of produce at the farmer and intermediary levels have been reduced by as much as 15 percent (as illustrated in Exhibit 6.11) by training farmers on produce handling, investment in cold-storage, and refrigerated vans.

EXHIBIT 6.11 | Savings made by Metro Cash & Carry through disintermediation



Sources: S. Raghunath and D. Ashok, "Significance of Cash and Carry Model for Small and Medium Businesses in the Indian Wholesale Distribution Formats," Metro Cash & Carry Bangalore internal document, October 16, 2006, p. 5.

LEADING RETAIL CHAIN SHIFTED TO THE SECOND SUPPLY CHAIN MODEL TO PROCURE PRODUCE DIRECTLY FROM THE FARMERS' FIELD

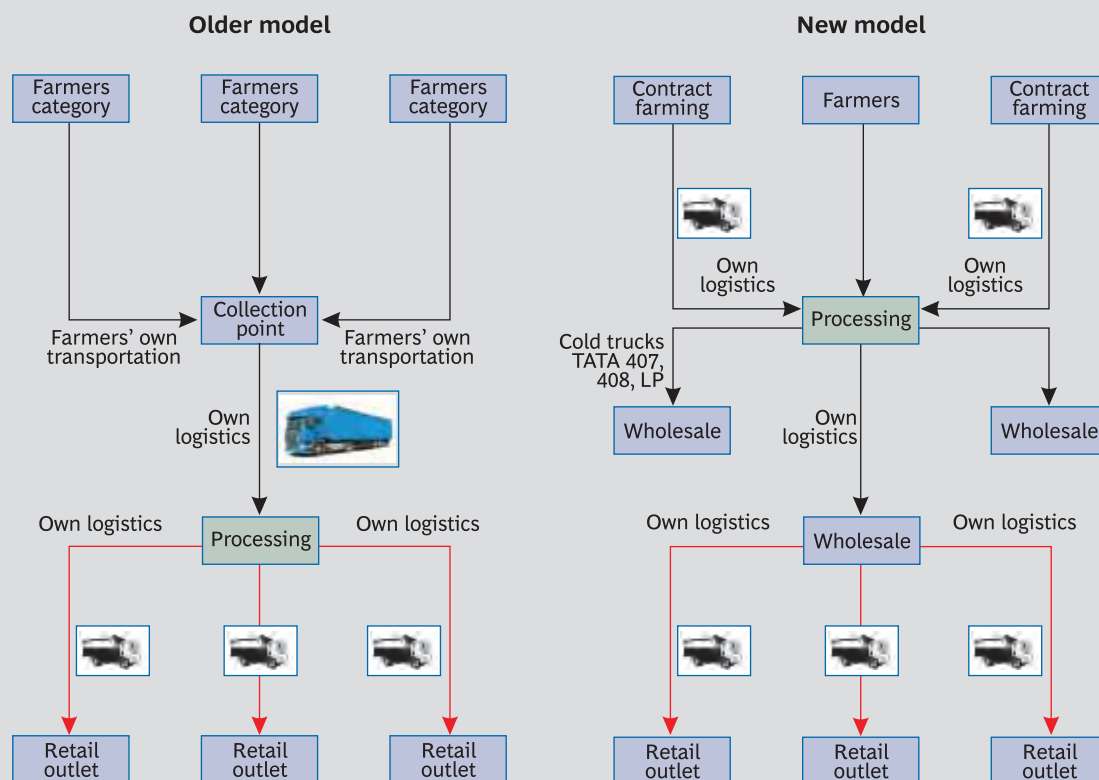
A leading retail chain has been able to extract higher margins by sourcing directly from farmers. It has bypassed several layers of intermediaries by opening up collection centers in *mandis* to facilitate farmers selling their produce directly to the company. The chain has collection centers closer to the produce for direct procurement, and has its own processing / distribution centers closer to the market.

However, the company found several limitations with the model. Typically, large farmers with large quantities of produce visit the *mandis* directly and sell it at the collection centre. Majority of the small farmers with limited produce sell their produce to the intermediary who collects the produce directly from their villages. Despite knowledge of better prices at the

collection centers, these farmers prefer selling the produce to intermediaries since the entire logistics costs — from village to *mandis* — is very high and not economically-viable for their smaller produce quantity.

In order to circumvent this issue and to reach out to smaller farmers, the company has shifted to a second supply chain model of procuring directly from the farm (see Exhibit 6.12). With the new supply chain model, it has set up its collection centers directly in the villages, and collects produce directly from the farmers. All the collected produce is aggregated at the processing centers where it gets sorted, graded, and processed. Post-processing, the chain not only distributes its produce to its outlets but also wholesales it to other players.

EXHIBIT 6.12 | Supply chain of a leading retailer



Changes in the model helped the retail chain in curbing public protests and also cater to a wider customer base

Sources: Literature search and BCG analysis.

SYNTHESIS AND IMPLEMENTATION

Introduction

Over the past few years, India has captured the imagination of the world, by posting strong GDP growth figures, attracting foreign capital, and increasing its presence as a global player. While the growth has been limited to a few sectors, and has not been inclusive, India finds itself at a point where it can choose to rectify its growth journey.

A CII — WEF study (2005) had come up with three scenarios for India till 2025:

1. **“Atakta Bharat”**: Marked by low growth, and a weak domestic economy, India will not be able to sustain the healthy growth rates, and will revert to the “Hindu” growth rate. In this scenario, the goal of inclusive growth is clearly not achieved.
2. **“Bollyworld”**: Many will identify with this scenario as India’s story till now. Stellar growth is achieved in certain sectors, while the rest of India lags behind. Motivated by short-term gains, we fail to invest in long-term opportunities, faltering to growth rates of 6 to 8 percent in the future.
3. **“Pahale India”**: This path will take us to the elusive inclusive growth, the path where everyone works towards India’s future. Marked by broad-based inclusive growth, this will create a strong internal economy to weather global slowdowns.

The end goal of inclusive growth will only be possible through:

1. Fostering entrepreneurship to ensure growth across the strata
2. Greater participation of the masses, to target all the sections
3. Strong policy reforms, aimed to remove the obstacles to growth

Agriculture — Vision 2020

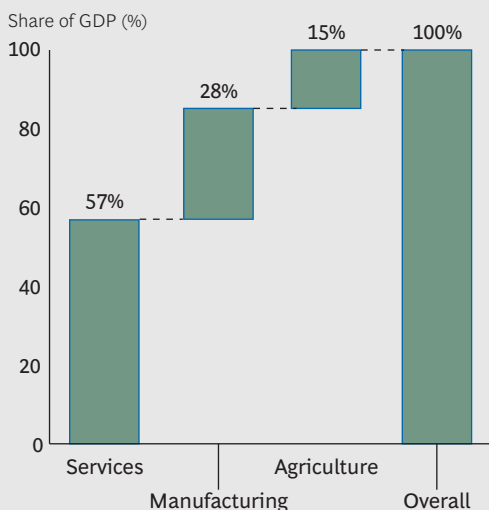
When we talk about inclusive growth, agriculture is perhaps one of the most important focus areas. It comprises approximately 15 percent of India’s GDP, supports other industries by providing inputs, and employs nearly 57 percent of the workforce (predominantly rural) as shown in Exhibit 7.1. The economic well-being of this populace (that directly or indirectly depends on agriculture) is critical to India’s growth journey. Inclusive growth will have to focus on agriculture due to the large potential impact. Also, great gains can be made by removing the current inefficiencies that ail India’s agri-sector.

Agriculture in India must be transformed by an era of strong-growth that is driven by:

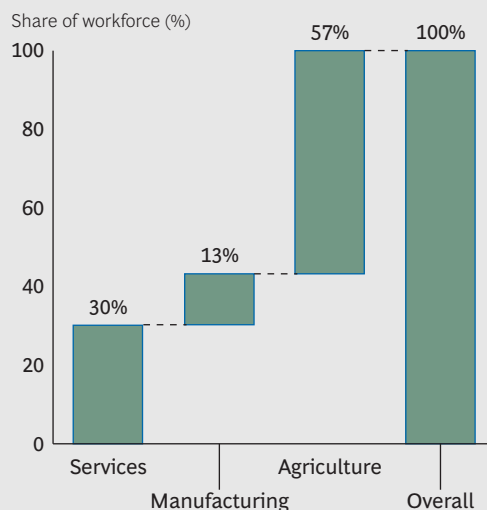
1. **Strong growth in Indian yield levels, and hence overall output**: The increase in output

EXHIBIT 7.1 | Role of agriculture in Indian context

Agriculture — a significant part of economy



And one of the biggest employers



Source: Ministry of Statistics and Programme Implementation (MOSPI)

may be as much as 30 to 40 percent for cereals and fruits and vegetables (F&V) and 100 percent for meat, oilseeds, and pulses, based on relative competitive advantages in each of these areas.

2. **Greater share of commercial crops:** Land under commercial crops must rise to 35 to 40 percent from the current 32 percent, increasing share of high-value crops.
3. **Higher food processing levels:** Quantum leap in the levels of processing (for example, F&V — 20 to 30 percent, dairy — 40 to 50 percent).

This growth will be based on a solid foundation of policy and regulatory reforms, technology, and business model innovations, investments in capacity building, as well as public-private partnerships. Also, Indian stakeholders (corporate, government etc.), need to be selective on determining which of these activities need to be done in India versus leveraging potential resources in other countries, for example, plantations in South East Asia.

INCREASES IN OUTPUT

The current yields are woefully behind global levels, due to poor crop variety, lack of modern technology and farming practices, as well as dearth of irrigation. Focus on these areas will help improve yields to global levels (illustrated in Exhibit 7.2), thereby securing India's food supply and leading to better farm incomes and higher on-farm employment. In our attempt to quantify our vision, we seek to present a picture of what Indian yields and outputs will look like. The calculations are based on Indian yields increasing their rank in the global yield ranking to the top 20 to 50 (depending upon the current rank). The benefits of an increased yield are not only production, but also freeing up demand for one of the most precious resources — land.

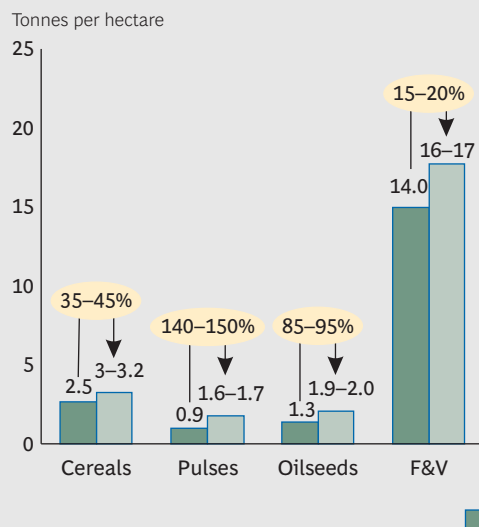
LAND USAGE

Increase in yield will free up land, helping drive down requirement for land. The freeing up of the land under food grains will help drive up the share of land for high-value crops (such as horticulture and cash crops like cotton and tobacco) to almost 35 to 36 percent from the current 32 percent. The consequent increases

EXHIBIT 7.2 | Vision for Indian yield and production levels

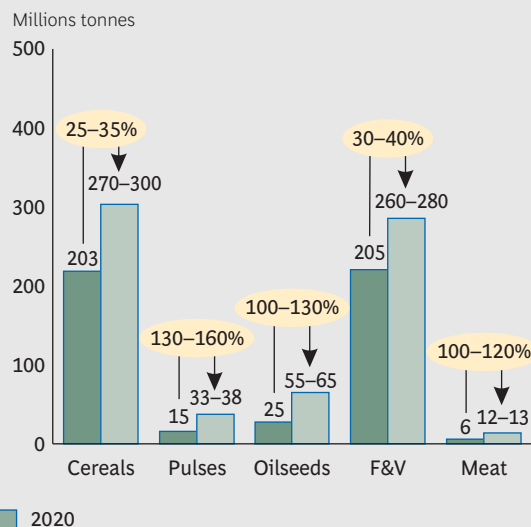
Focus on farming will improve yields

Agri — Yields¹ (2010 vs. 2020)



Leading to substantial rise in output

Agri — Production (2010 vs. 2020)



Sources: Indiastat, FAOstat, National Horticultural Board, NMCE report on oilseeds, India Vision 2020 — R. Radhakrishna and K Reddy, BCG analysis.
Note: The above projections are based on our analysis of the potential rise in India's production levels.
¹Yield figures are best on global benchmarking, we compared Indian yields with other countries.

in high-value crops will supplement the existing income of farmers (see Exhibit 7.3).

FOOD PROCESSING

While food processing in India is quite behind global levels, our vision is for it to go through a sea change by 2020 driven by:

1. Higher government support
2. Establishment of infrastructure
3. Entry of private and organized players
4. Greater demand for convenience foods

The above factors will take Indian food processing to new heights, placing it in a comparable position globally (illustrated in Exhibit 7.4).

Driving Overall Growth

The step change growth achieved in India's agri-sector will be the primary driver for growing our agri-GDP at a sustained rate of 5 to 6 percent, reaching approximately Rs. 17,000

billion by 2020. This would also have a spillover effect on the entire agribusiness industry, leading to growth at approximately 8 percent and a GDP contribution of Rs. 36,000 billion by 2020. Steps in the right direction would serve as "cogs" in the wheels, driving our overall economic growth to about 9 percent, leading India's GDP to a size of Rs. 140,000 billion by 2020 compared to Rs. 59,000 billion in 2010 (see Exhibit 7.5).

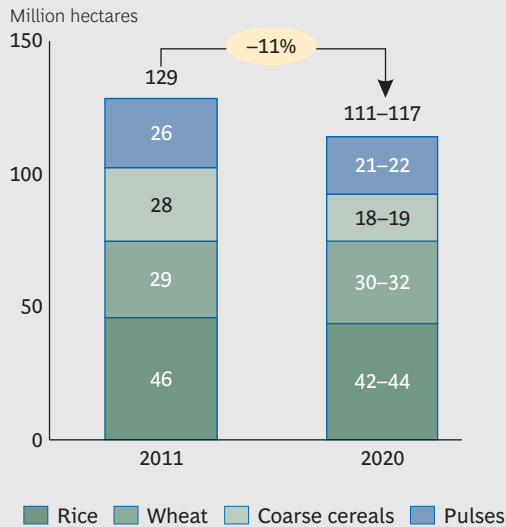
Imperatives for Key Players

Indian agriculture clearly holds considerable promise to improve the lives of millions of farmers and propel the economy. Significant bottlenecks exist in achieving this potential, and unfortunately there is no silver bullet. In order to realize Indian agriculture's true capability, coordinated and tenacious efforts will be required by both policy makers as well as private players. In this section, we draw upon the key issues that have been identified thus far to distil imperatives for policy makers and private players, and also elaborate on the potential of public-private partnerships.

EXHIBIT 7.3 | Vision for Indian agri-land cropping patterns

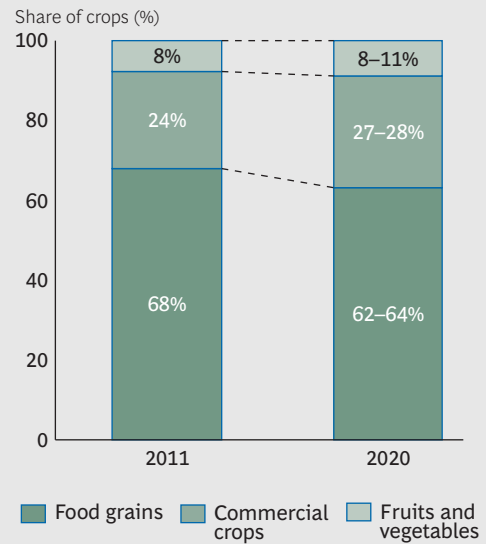
Improvements in yields¹ will free up land...

Area under food grain cultivation (2011 vs. 2020)



...increasing cultivation of cash crops

Land cropping patterns (2011 vs. 2020)



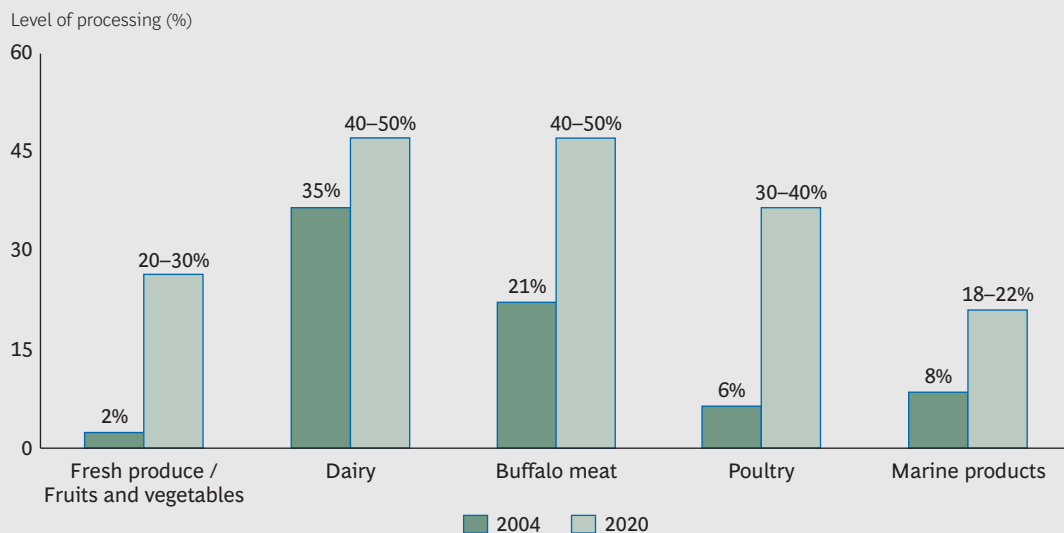
Sources: Indiastat, FAOstat, National Horticultural Board, NMCE report on oilseeds, India Vision 2020 — R. Radhakrishna and K Reddy, BCG analysis.

Note: The above projections are based on our analysis of the potential rise in India's production levels.

¹Yield figures are best on global benchmarking, we compared Indian yields with other countries.

EXHIBIT 7.4 | Vision for Indian food processing levels

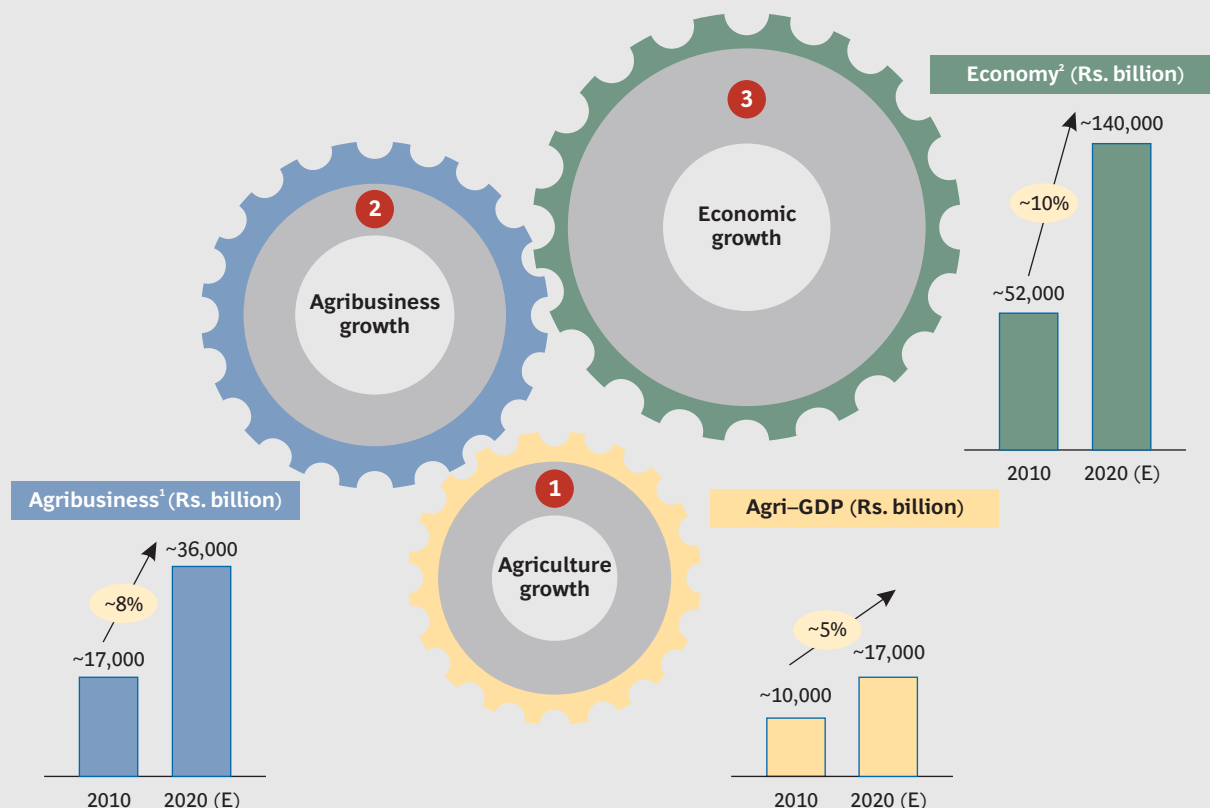
Food processing levels — India



Sources: Indiaagristat, India Vision 2020 — Planning Commission, MOFPI reports, MOFPI annual report, BCG analysis.

Note: As per Ministry of Food Processing vision for processing levels.

EXHIBIT 7.5 | Driving overall growth through agriculture



Sources: Datamonitor Agricultural products in India, India Brand Equity Foundation, World Economic forum, NCAER, RBI database on Indian economy, BCG analysis.

Note: Fixed exchange rate of Rs. 45 to 1 USD taken.

¹Does not include non-food cash crops such as jute, cotton, tobacco; includes only food crops: cereals, pulses, oilseeds, F&V, sugar, tea, coffee etc.

²Assuming industry and services grow along historical growth rates of 9% and 10% respectively (observed over 2005–10 period)

IMPERATIVES FOR POLICY MAKERS

Political will and cooperation has been a critical component of all agricultural ‘revolutions’. It will play a key role even now, in order to bring about the next revolution. In fact, without political will, the agricultural sector is unlikely to see any dramatic change. We have highlighted select imperatives across the entire agricultural landscape that need to be undertaken on a war footing.

Policy and regulatory reforms

Liberalize procurement: The government’s attempt to liberalize marketing through the Model APMC Act has not yielded expected results. The implementation of the Model Act has been done selectively, and does not retain its spirit. There is thus an urgent need to standardize and ensure implementation of this

Act. The process of acquiring a license for direct procurement / marketing, needs to be simplified to a single, unified, national license, i.e., there should be no separate license for procurement, storage, warehousing etc. The Essential Commodities Act should also be scrapped to allow free inter-state movement of commodities.

Reform Minimum Support Price (MSP) norms:

Procurement at MSP should be done only when prices go below the MSP, and only quantities enough for buffer stocks and social schemes should be procured — and that too at market prices. A fair and remunerative price, ensuring similar incomes as wheat / rice, and assuming cost of cultivation as for irrigated lands, will encourage farmers to shift to pulses and also invest in irrigation.

Redesign subsidies to ensure sustainable use of inputs: Current subsidy schemes encourage indiscriminate use of inputs like power, water, and fertilizers. These could be redesigned to encourage judicious usage without impacting productivity or costs. The micro irrigation equipment subsidy is a step in the right direction. However, farmers are more likely to respond to productivity gains than sustainability. It would thus be crucial to educate farmers on yield gains from appropriate use of inputs.

Link agri-credit with crop insurance to manage default risks: Cost-effective and efficient insurance schemes can encourage banks to provide credit which allows farmers to invest in farm productivity thus creating a virtuous cycle. Such insurance schemes are already in place in countries like Brazil. The premium could be shared by the lending institution and also be partly subsidized. Reforms are also required in agriculture-lending practices to ensure that small, and marginal farmers have access to credit. Instead of total volume, priority sector lending targets should be defined in terms of the number of people and the type of credit (working capital, capital formulation etc).

Capacity building

Launch a national awareness program to promote best practices: It is interesting to note that hybrids capable of best-in-class yields already exist for select crops and agro-climatic zones. However, the yields realized by farmers have been significantly lower. Agricultural extension is thus one of the most potent solutions for yield enhancement. A cohesive national awareness drive involving research institutions, state administration, and the private sector is required to increase awareness of the best practices in farming. Practices like Systems of Rice Intensification (SRI) have already demonstrated 20 to 50 percent increase in yield and should be encouraged.

Promote land aggregation measures: Fragmented land holdings in India are an impediment to agricultural extension. This can be overcome through land aggregation via lease-based models that zealously safeguard the land ownership of farmers, while bringing in large-scale investments in agri-infrastructure from the private sector. Contract farming is also an effective way to infuse best practices

and provide assured returns to farmers. However, contract standardization and enforcement need attention in order to protect interests of both parties. Growth of producer companies should also be encouraged as it provides both business orientation and all the benefits of co-operatives. Some successful examples include Ma-suta Producers Company and Zameen Organic. Finally, wasteland development should be used to pilot commercial farming (over 500 hectares) in order to leverage India's cultivable wasteland (approximately 13 million hectares) and scale.

R&D investments in hybrids and developing a process for GM seeds: A key factor behind the success of the Green Revolution was the high yielding variety of wheat hybrid imported from Mexico, which was later indigenized. Focus is now required on local development of hybrids suited for Indian conditions. This could be achieved by setting up a dedicated fund to promote R&D and by introducing R&D cost subsidies to encourage private participation. GM seeds can provide a fillip to productivity, as in the case of cotton, but needs to be thoroughly tested to safeguard public interests. A world-class safety standard and approval process should be put in place to fairly test GM seeds.

IMPERATIVES FOR PRIVATE PLAYERS

Develop innovative business models: India is a unique market, and business models that worked in other markets may not necessarily be relevant here. Business model innovations like catering to the 'bottom of the pyramid' have reaped rich rewards for players in the past. The telecom sector is a stellar example of how innovations can lead to additions of millions of subscribers each month. This report has highlighted opportunities to develop innovative business models such as those based on the increasing convergence of agri-inputs. While large white spaces exist across the agriculture value chain, business model innovations will play a key role in bringing about the next revolution in agriculture.

Customize and transfer best-in-class practices: Relatively smaller countries like Egypt and Israel have developed agri-practices that have enabled them to enjoy world-class yields in many crops. Given some of the similarities in agro-climatic zones between these countries

and India, there exists significant scope to understand, customize, and transfer such practices to India. Contract farming provisions are gradually being strengthened in India, and players that are successful at transferring such practices will benefit significantly.

Undertake joint R&D with government bodies: Embrapa, the key agri-research organization of Brazil, routinely works with global giants like Monsanto and Syngenta to jointly develop inputs and farming technologies. Such technologies are also jointly marketed through a combination of government and private resources to increase farm penetration. This is a highly symbiotic relationship as it draws on a larger body of expertise, lends credibility to the proposed technologies (due to government participation), and leverages the state administration for distribution of the same. Private players would thus do well to seek out opportunities for joint efforts with state agricultural universities and research institutes.

PUBLIC PRIVATE PARTNERSHIP

Create agri-parks to develop a conducive ecosystem

Establishing agri-parks through Public Private Partnerships (PPP) could stimulate agricultural

productivity and address key inefficiencies. The government should focus on ensuring availability of critical inputs and access to information and best practices in these agri-parks. The private sector would make investments in storage, processing infrastructure, and provide forward marketing linkages (exports etc). It is critical to note that agri-parks would not result in transfer of land ownership.

Agri zone-based PPP model: Agri zones could be an effective means of blending public and private sector initiatives. These will be geographically demarcated zones comprising of key producer states of a certain crop (see Exhibit 7.8). The objectives of these zones will be two-fold:

- **Improving production** by offering an enabling infrastructure, agricultural extension, and focused R&D support
- **Addressing market failures** by enabling private investments and improving regulatory framework

Farmers in other states will continue to have the freedom in crop selection and each state would be part of multiple agri zones to allow farmers flexibility in crop selection.

BRAZIL — THE AGRICULTURE REVOLUTION

Brazil today is in an enviable position in global agriculture and is the leading producer and exporter of key global commodities (see Exhibit 7.6). The credit for this is usually given to ‘structural’ advantages enjoyed by Brazil, such as farm sizes (commercial operations produce approximately 75 percent of the output), water resources (Brazil has the world’s largest renewable water resources, larger than Asia) and smaller population (approximately 20 percent of India’s population) that leads to higher marketable surplus. However, one of the biggest contributors to agricultural growth in Brazil has been the focus on agricultural research and government focus.

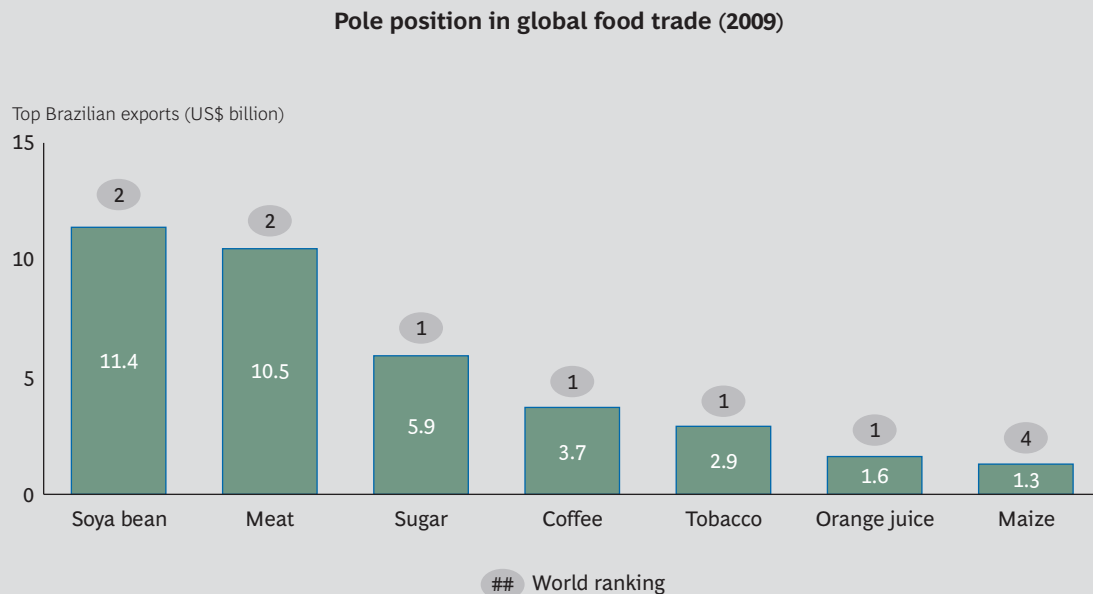
Embrapa, the state-owned Brazilian research corporation, has improved the productivity of crops (see Exhibit 7.7) and converted large tracts of grasslands into cultivable land that account for approximately 70 percent

of Brazil’s farm output. Embrapa has a high research spend (about US\$ 20 million per hectare compared to US\$ 5 million per hectare in India), and also has research arms in tropical countries to source high yielding varieties which are later indigenized. The Brazilian government has also taken significant measures to improve the agriculture ecosystem. These are:

- High access and availability of subsidized rural credit (about 85 percent participation)
- Creation of innovative agri-financial instruments like sale option contracts
- Rural insurance (about 10 percent cultivated area covered as of 2009)
- Strong investments in storage, transportation, and port infrastructure
- Policy co-ordination across ministries to reduce taxation, tariffs, etc.

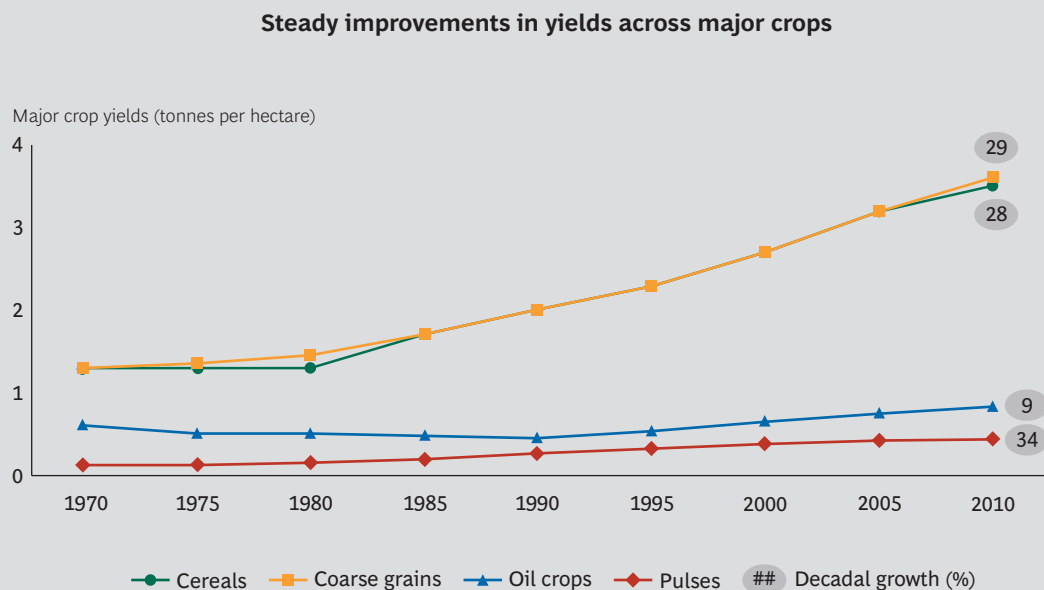
BRAZIL — THE AGRICULTURE REVOLUTION (continued)

EXHIBIT 7.6 | Brazil's position in food trade



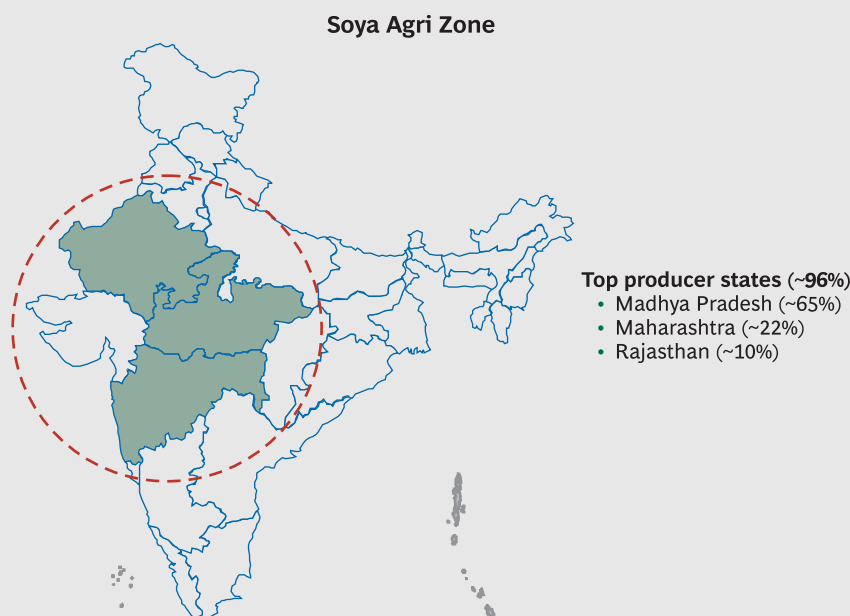
Sources: FAO, USDA.

EXHIBIT 7.7 | Brazil's productivity across crops



Sources: FAO, USDA.

EXHIBIT 7.8 | Soya Agri Zone comprising of key producer states



Source: Department of Agriculture.

The nature of interventions introduced in agri zones would depend on the issues identified with the particular crop (see Exhibit 7.9). Public and private initiatives are fundamentally more suited to target certain types of issues and hence a combination of these could be used to develop a holistic intervention.

Agri zones would create a conducive ecosystem to boost crop production through multiple means — regulatory changes, accelerated public investments, financial, and other incentives (see Exhibit 7.10).

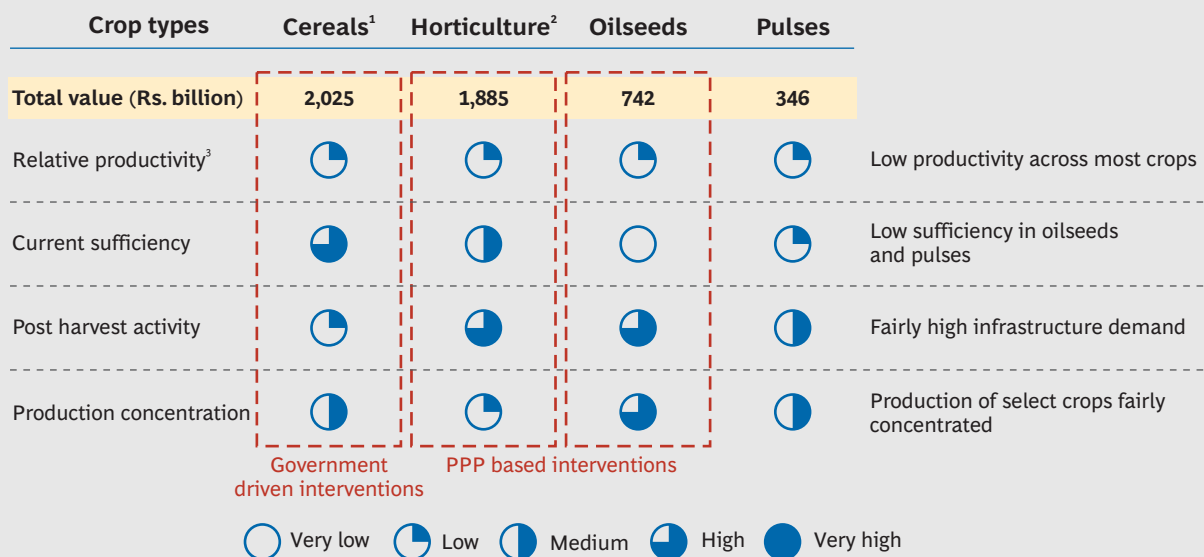
A central government agency would be responsible for overseeing the creation, implementation, and progress of agri zones. While various state bodies would be engaged in the creation of agri zones, each zone would have a multi-state nodal agency. Funding would be undertaken jointly by the center and the state governments with the central government funding, contingent on implementation progress and matching investments from states. This will ensure that states prioritize the agri zones they choose to

participate in. An action plan for the crop zone model is set out in Exhibit 7.11

Soya agri zone: Soya bean is an important oilseed for India and contributes over 17 percent of India's edible oil requirements (see Exhibit 7.12). India's total soya oil consumption in 2010 was estimated at approximately 2.7 million MT of which about 50 percent is imported in the form of crude soya oil. The crude oil is refined and then sold for domestic consumption. Increasing production is critical for multiple reasons:

- Reduce imports that cost approximately Rs. 50 billion in foreign exchange each year
- Low utilization of 30 to 40 percent of extraction capacities increases the cost of soya oil
- Soya oil is perceived as beneficial from a public health perspective compared to other sources like palm oil
- Soya meal, a by-product of processing, is a key input for the livestock industry

EXHIBIT 7.9 | Soya Agri Zone comprising of key producer states



Sources: Ministry of Agriculture, MOSPI, BCG analysis.

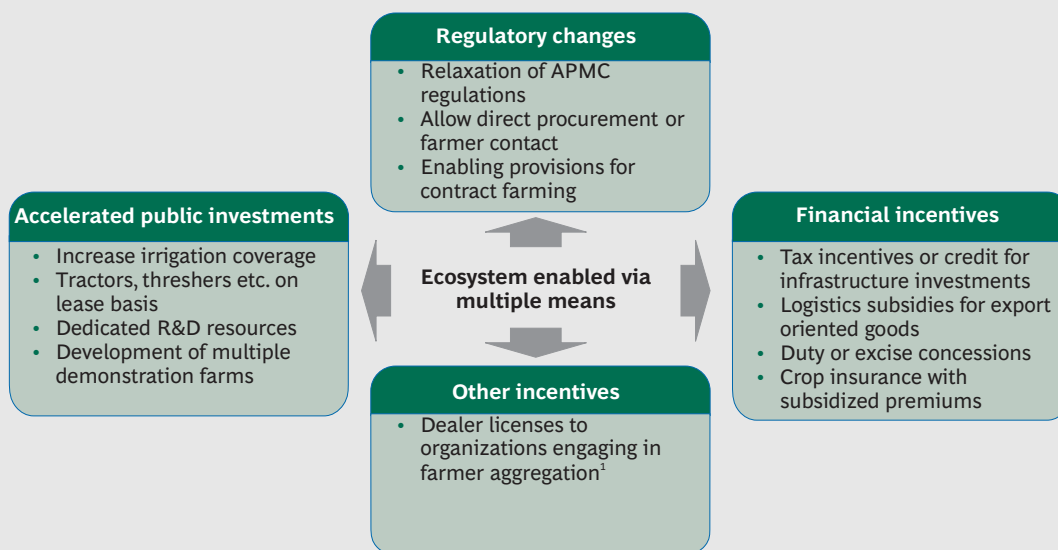
¹Rice and wheat.

²Primarily fruits and vegetables.

³Compared to Brazil, United States and China.

EXHIBIT 7.10 | Multiple means to enable crop ecosystem

Illustrative — incentives to vary by crop type



¹Contract farming, producer companies, farmer co-operatives etc.

EXHIBIT 7.11 | Action Plan to Create Crop Zones

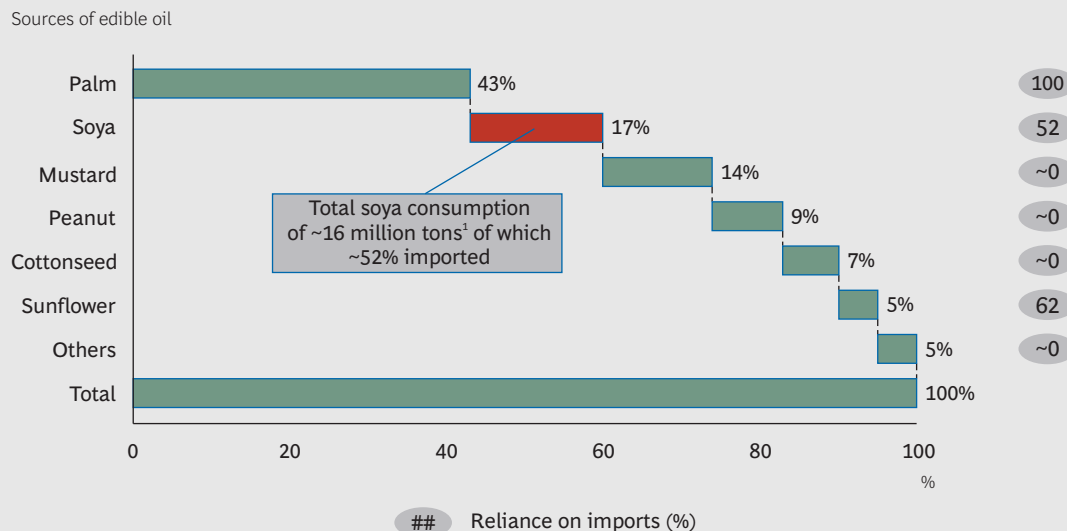
Illustrative

Task	Objective	Responsibility										
1	Set up a Central Agency (CA) to oversee implementation	Government of India, Planning Commission	 National level agency to administer funding and monitor progress across AZs									
2	Crop wise production and productivity targets	CA	 <table><tr><th>Crop</th><th>Productivity (tonnes / hectare)</th><th>Production (million MT)</th></tr><tr><td>Crop 1</td><td>~6.5</td><td>~140</td></tr><tr><td>Crop 2</td><td>~1.6</td><td>~20</td></tr></table>	Crop	Productivity (tonnes / hectare)	Production (million MT)	Crop 1	~6.5	~140	Crop 2	~1.6	~20
Crop	Productivity (tonnes / hectare)	Production (million MT)										
Crop 1	~6.5	~140										
Crop 2	~1.6	~20										
3	Demarcate Agri Zones (AZ), appoint AZ nodal agencies	CA + state agriculture ministries	 Crop 1: Madhya Pradesh, Rajasthan, Maharashtra Crop 2: Gujarat, Maharashtra, Madhya Pradesh									
4	Identify key issues in crop ecosystem	CA + AZ nodal agency	 Low productivity, high intermediaries, processing infrastructure, low mechanization etc.									
5	Design and roll out plan across states in the AZ	AZ nodal agency + state governments	 Crop 1: Seed subsidy, irrigation targets, infra incentives, APMC relaxations etc. Crop 2: APMC relaxations, tax incentives, mechanization subsidy etc.									
6	Review implementation periodically	CA + AZ nodal agency	 Central funding assistance terminated and state to be removed from AZ if targets unachieved due to poor implementation									

Sources: Literature review, BCG analysis.

EXHIBIT 7.12 | Soya a key source of edible oil

Soya — One of the largest edible oil sources in India



Sources: Department of Agriculture and Cooperation, Indiastat.

However, the soya ecosystem has multiple issues impeding production growth (see Exhibit 7.13). An agri zone-based intervention could significantly increase production. As Madhya Pradesh (about 60 percent), Maharashtra (about 28 percent), and Rajasthan (about 8 percent) constitute approximately 95 percent of the production, it would be ideal to notify them as the Soya Agri Zone (SAZ). Specific interventions, as detailed below, could be introduced in these states to boost soya production.

Incentives identified for SAZ are as follows:

Regulatory reforms

- Amend APMC in SAZ states to allow direct soya procurement from farmers.
- Create enabling provisions for contract farming of soya, like standardized contracts, contract enforcement agency etc.

Accelerated public investments

- Increase irrigation coverage for soya bean from about 2 percent currently to

approximately 80 percent over the next 15 years.

- Tractor services via subsidized lease-based model to be operated by private players.
- R&D in hybrids / GM targeting productivity gains of about 3.5 percent per annum.
- Establishment of soya demonstration farms throughout SAZ states.

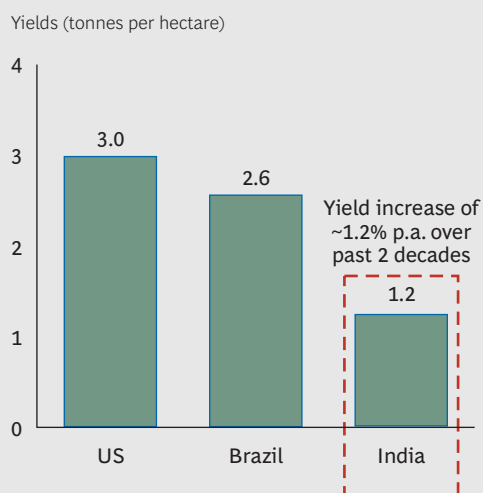
Financial incentives

- Tax holiday and investment credit on processing infrastructure within SAZ.
- Logistics rebate for soya meal transportation to ports for inland units.

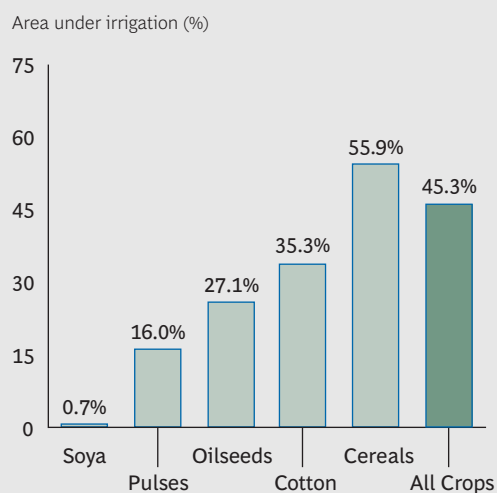
These incentives together create a favorable ecosystem which is highly remunerative for farmers. If targeted yields are achieved, India could be self-sufficient in soya by 2020 and expect a large surplus of about 5 million MT by 2025. Economic benefits accruing from the SAZ clearly outweigh the public

EXHIBIT 7.13 | Low yields and poor irrigation inhibit soya bean production

Low yields compared to key global producers



Least area under irrigation for soya (2009)



Source: Department of Agriculture and Cooperation.

investments in irrigation or subsidies (see Exhibit 7.14).

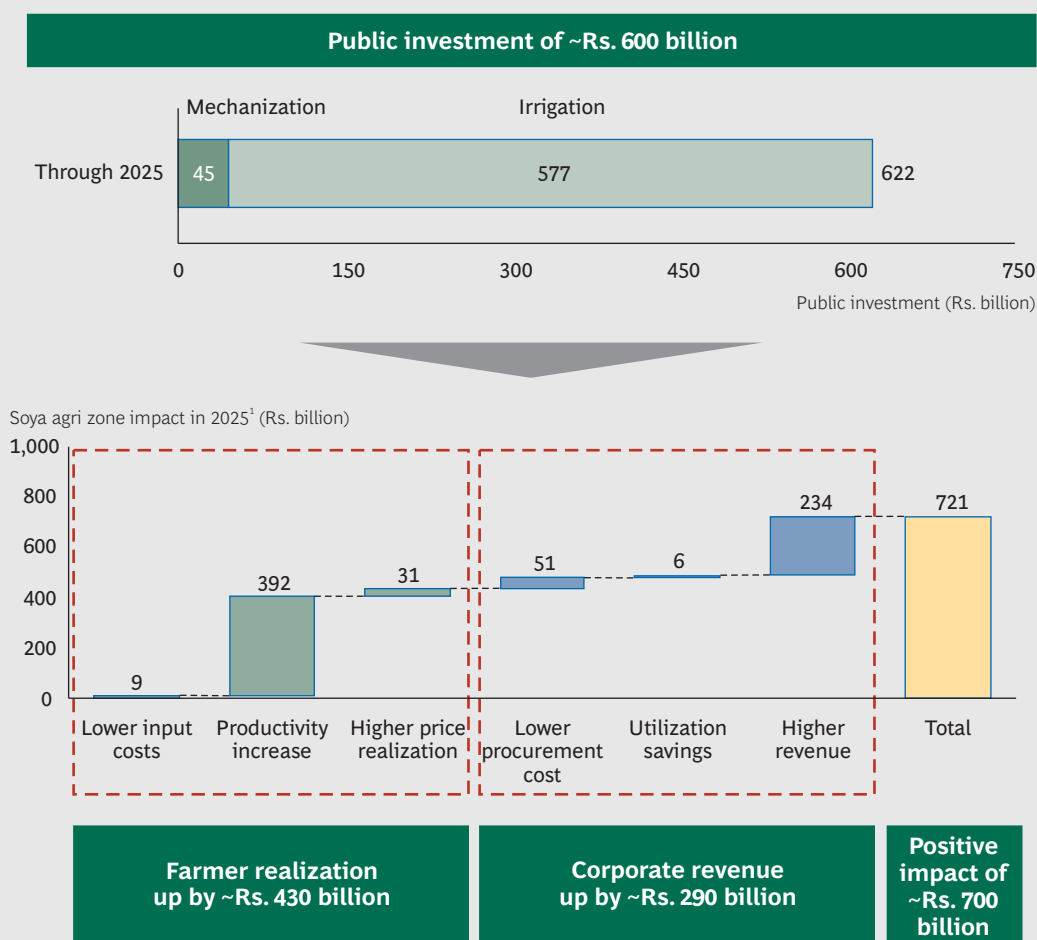
Agriculture, without doubt, has massive potential to generate equitable growth. It can change the trajectory of our economy in the years to come. Many national and international players — like Suguna Poultry, Ruchi Soya, Cargill, and Monsanto — are building large businesses around this opportunity. Many more are waiting on the sidelines to enter this space. Their entry can unleash large investments, thereby creating millions of jobs, increasing supply chain efficiencies, and improving farmer livelihoods.

The full potential of Indian agriculture can only be realized through the creation of a shared vision backed by strong political will to ensure timely execution.

And what are the consequences of a *status quo*?

Stagnant agricultural growth has dire consequences for a populous country like India, which also aspires to become an economic superpower. With the extent of food shortage projected in 2020, mass social unrest, spiraling inflation, and burgeoning imports are a very real threat. Majority of the changes

EXHIBIT 7.14 | Economic impact of Soya Agri Zone



Sources: Solvent Extractors Association, Ministry of Water Resources, Solvent Extractors Associations, Analyst reports, Press releases, BCG analysis.
¹At constant prices.

required to avert this situation are institutional in nature and will not happen overnight. In any case, India has a track record of delays in implementation of key reforms. A knee-jerk reaction, on the other hand, would be too disruptive and may not fly in a democratic set up like India's.

Having said that, it is also true that India is much better placed today, as compared with the 1960s, in terms of the capabilities required to change its course. It has become a global manufacturing hub for key industries, boasts of technical superiority in areas like IT and biotechnology, and powers the global economy with its skilled manpower. In addition,

dissemination of information has also simplified immensely due to high telephony and media penetration in rural India.

This report should thus be viewed as a call for action to all stakeholders. Agriculture must be their priority. We ignore agriculture at our own peril; for soon it may reach a point of no return.

NOTE:

1. Farmers are sold options to sell to the government at a particular price. Government has the flexibility to pay the farmer for options held in case it decides not to procure.
2. Part premium subsidized by the government while the farmer's credit limit increases by 15 percent which reduces his premium component.

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A report by The Boston Consulting Group, March 2012

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A report by The Boston Consulting Group in association with The Confederation of Indian Industry (CII), February 2012

Going to Market in Developing Economies: The Consumer Insight Advantage

BCG Perspectives, January 2012

Prime Minister's Council on Trade and Industry: Sub-Committee on Improving Agricultural Production and Food Security

A report by The Boston Consulting Group, November 2010

The Next Billions: Business Strategies to Enhance Food Value Chains and Empower the Poor

A report by World Economic Forum in collaboration with the Boston Consulting Group, January 2009

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