

Agricultural Outlook and Situation Analysis Reports

Fifth Medium-term Agricultural Outlook Report

Project Sponsored by
Department of Agriculture, Cooperation and Farmers Welfare
Ministry of Agriculture and Farmers Welfare
with Technical Support from Food and Agriculture Organisation

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About the Project

The need for monitoring and analysis of emerging food scenarios is important for India both because of significant dependence of output on the monsoon rains and the fact that globally India is one of the major consumers of food crops influencing markets. Management of agriculture from a public policy perspective requires organisation of this information and analysis as inputs to policy making.

Against this backdrop the National Food Security Mission (NFSM), Ministry of Agriculture, commissioned a 3-Year study to National Council of Applied Economic Research (NCAER) in 2011–12 to bridge this important gap in analytical inputs for understanding the emerging agricultural scenarios both in the short-term of one or two quarters and also in the medium to longer term.

Accordingly, the agricultural outlook and situation analysis undertaken in this study refers to the main crop based food items: cereals (specifically rice, wheat, jowar, bajra, maize, and overall coarse grains), pulses (gram, tur), selected fruits and vegetables (banana, potato, onion), sugarcane and edible oils (groundnut, rapeseed/mustard, soybean). In addition the analysis also covers milk, one livestock product.

From January 2015, the Ministry has approved continuation of the project for the remaining period of the Twelfth Plan.

The main objective of the grant during January 2015–March 2017 is to sustain the work programme established in the previous grant period. The activities will be more focused on model-based analysis in the medium-term assessment. A forum for broad based consultations on the emerging outlook in the short-term would be developed. Efforts would also be made to involve the state-level agricultural departments in the discussion of emerging outlook for the sector. More high-value agricultural commodities, viz. horticulture and dairy products would be included in our analysis.

Main outputs of the project are:

1. Biannual Season-wise Agricultural Outlook Reports: These will cover the assessment of the output, prices and markets in the short-term including the global scenario.
2. Annual medium-term Agricultural Outlook Reports: These will cover an assessment of outlook in terms of production, utilisation, trade and prices for the major food commodities from national and global perspectives. The medium-term outlook assessment will utilise an adapted version of FAO-COSIMO model besides the econometric model presently being used for analysis.
3. Meetings/workshops: The representatives from industry, academia and government would be invited to share their assessment of commodity outlook on production, demand, prices and trade. These meetings will be organised by NCAER with the active support and participation by the Ministry of Agriculture. NCAER will provide a background review paper for the meetings and would also request for presentations by other experts on major commodity sectors.

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**National Council of Applied Economic Research
11 Indraprastha Estate, New Delhi 110 002**

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Preface

The recent slowdown in agricultural growth has highlighted the many problems that Indian farmers face. Prime Minister's Modi's vision of "doubling the income of farmers by 2022" has provided the Central and State Governments with a new goal and new incentives to help bring about a major agricultural revolution during the next five years. To this end, a range of new government programs have been introduced, including the *Pradhan Mantri Krishi Sinchai Yojana*, the *Pradhan Mantri Fasal Bima Yojana*, the *Paramparagat Krishi Vikas Yojana*, the Soil Health Card Programme, the Price Stabilisation Fund, the National Agricultural Market for electronic trading, and the National Livestock Mission.

The challenging goal of doubling farmer incomes by 2022 will require not just farmers in the crop sector to boost their productivity, but will also require a major growth push in high-value agriculture and allied sectors such as horticulture, livestock, and food processing. This can happen only if government policy is sound and is based on a deeper understanding of what policies or programs are working and what are not in both the crop and these other sectors.

Identifying and then removing the bottlenecks to achieving these growth, diversification, and productivity objectives requires tracking on a regular basis a range of variables affecting agricultural production, consumption, trade, and prices. To this end, NCAER has been working on India's short- and medium-term agricultural outlook for the demand and supply of food commodities in collaboration with the National Food Security Mission and the Directorate of Economic and Statistics in the Ministry of Agriculture and Farmers Welfare in New Delhi. The result of this work is the series of *Agricultural Outlook and Situation Analysis Reports* that NCAER has been releasing over the past several years.

These NCAER reports provide both seasonal and medium-term developments in the food economy and a detailed assessment of the prospects for Indian agriculture. The reports can be downloaded from the NCAER website (www.agrioutlookindia.ncaer.org/) and the website of the National Food Security Mission of the Government of India (www.nfsm.gov.in/NCAER.aspx).

This July 2016 publication is the fifth in the series of the *Medium-Term Agricultural Outlook Reports*. Besides presenting the medium-term outlook for India, it also presents an outlook for global food commodities based on comparing medium-term projections by the OECD/FAO, the US Department of Agriculture, the Food and Agricultural Policy Research Institute in the US, and the International Grains Council. Recognizing the importance of the livestock sector in providing better returns to farmers, improving nutrition, and diversifying Indian agriculture, this Report also provides a special chapter on livestock.

The OECD/FAO AGLINK-COSIMO model is one of the most widely used tools worldwide for agriculture sector projections. A major advance for this fifth report is the underlying work NCAER has done with active collaboration from FAO in developing an AGLINK-COSIMO model for the first time in India, and using this model for its projections.

I am grateful to Dr. Rajesh Chadha, NCAER Senior Research Counsellor, for ably leading the NCAER agricultural team preparing the *NCAER Agriculture Outlook Reports*. I am also grateful to Dr Shashanka Bhide, now Director of the Madras Institute of Development Studies, Chennai, for his continued advice and support after he left NCAER and the leadership of this work in 2014. Other NCAER team members include Dr Laxmi Joshi, Dr A Govindan, Mr V. P. Ahuja, Dr Anusha, Dr Charu Jain and Dr Tarujyoti Buragohain. Dr. Parmod Kumar at the Institute of Social and Economic Change in Bangalore, and also an alumnus of NCAER, remains an integral part of the team.

I am delighted that NCAER continues to partner with the Ministry of Agriculture and Farmers Welfare for developing this important series of outlook reports for the food and agriculture sector in India. NCAER researchers have benefitted greatly from the active and regular consultations between senior Ministry staff and the NCAER team. In many ways, this collaboration represents the best in how independent national research institutes like NCAER can work closely with Government to aid the process of evidence-based policymaking.

I look forward to NCAER continuing to work closely with the Ministry of Agriculture and Farmers Welfare and other related branches of government on important policy challenges in Indian agriculture.



Dr Shekhar Shah
Director-General

New Delhi
July 15, 2016

S.K. PATTANAYAK
SECRETARY



भारत सरकार
कृषि एवं किसान कल्याण मंत्रालय
कृषि, सहकारिता एवं किसान कल्याण विभाग
Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture, Cooperation
& Farmers Welfare

FOREWORD

After two successive Kharif season of deficit monsoon, India Meteorological Department has predicted above normal monsoon this year on back of weakening El-Nino conditions over the Pacific. Timely and adequate rainfall will bring big relief to our farmers most of whom are still dependent on rainfall for farming. In the recent period, Government has initiated a number of steps to strengthen Indian agriculture. To address farmers' distress caused by vagaries of weather, the Government has introduced a new crop insurance scheme 'Pradhan Mantri Fasal Bima Yojana'. Under the scheme farmers have to pay very low premium at a uniform rate of 2% for all Kharif crops, 1.5% for all rabi crops and 5% for all commercial and horticultural crops. Low rates are expected to improve crop insurance coverage.

National Agriculture Market (NAM) launched for trading on 14th April, 2016 on Pilot basis provides for a pan-India electronic trading portal which networks the existing mandis to create a unified national market for agricultural commodities. NAM is presently being implemented in 23 markets across 8 States on pilot basis and provides an online trading platform at State and National level to promote real time price discovery, transparency in auction process, streamline procedures across the integrated markets and access to a nationwide market for the farmer.

Government has initiated steps towards doubling of farmer's income through farm related and non-farm related activities. The Medium Term Outlook Report as part of NCAER's project 'India's Agricultural Outlook and Prospects' has projected the demand for cereals, pulses and oilseeds for the medium term period ending 2023-24 and also indicated that India may face some trade related issues during this period. The Report also points out that the annual growth rates projected by various international agencies, although differ in approach and methodology, generally agree that India's growth rates will be higher than the global growth rates.

The NCAER study is expected to help various stakeholders in formulation of appropriate strategies for the development of Indian agriculture to sustain the projected demand for foodgrains.


(S.K. Pattanayak)

Date: July 5, 2016



Highlights

- This report provides a comparison of the latest medium-term projections for wheat, rice, coarse grains, oilseeds, vegetable oils and sugar made by five international institutions (OECD/FAO, USDA, FAPRI, and IGC) on the supply and demand conditions globally and for India. These highlight common and diverging trends across projections, which are based on alternative assumptions and analytical frameworks, and identify uncertainties affecting production processes and the national economies that could significantly affect markets.
- A standalone model for Indian agricultural markets, using the OECD/FAO developed COSIMO model and an econometric model have also been developed and applied by NCAER for its medium-term projections.
- Realising the importance of livestock sector in providing nutrition, better returns to farmers and as a means for diversification of Indian agriculture, a chapter in the report focuses status and prospects of livestock sector in India.





Acknowledgements

The study team wishes to acknowledge the guidance, support and encouragement of Shri Shobhana K. Pattanayak, Secretary, Department of Agriculture, Co-operation and Farmers Welfare in the conduct of this study. Ms Sangeeta Verma, Economic & Statistical Adviser, Directorate of Economics and Statistics and Mr Sanjay Lohiya, Joint Secretary (Crops), Ministry of Agriculture and Farmers Welfare, have provided valuable guidance to improve the content and coverage of our work. Dr S. K. Mukherjee, Adviser, DES has provided feedback and data whenever requested.

Dr Shashanka Bhide, Director, Madras Institute of Development Studies, has also provided guidance and support in the conduct of the study. Mr Bhaskar Goswami of FAO, Delhi, and Dr Holger Matthey, FAO, Rome, have provided technical support for the study.

Reports of OECD/FAO, USDA, IFPRI, IGC and the Department of Agriculture, Co-operation and Farmers Welfare are major sources of data and information for this report. Specific references used for our assessment of the agricultural outlook have been cited appropriately.

Study Team

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CHAPTER I

Introduction

I.1 High Agricultural Potential

India has the second largest cultivable land area among major countries (almost 1.5 million square km), after only the United States,¹ and is endowed with varied agro-climatic conditions suitable to grow crops of all types – tropical, semi-tropical, and winter. It ranks first in wheat, rice, and pulses, second in sugarcane and third in coarse grains and oilseeds with respect to crop area. It also has a vast area under vegetables and fruit crops such as potato, onion, banana, apple, mangoes, and citrus fruits.

With a large number of perennial and seasonal rivers criss-crossing the country, India has adequate monsoon rains in most years and ample ground water reserves in most parts of the country. It has close to 45 per cent of cropped area under assured irrigation, one of the highest in the world.² But the available water resource is not effectively and efficiently harnessed and, in some regions, water has been overexploited leading to ecological problems. Despite various advantages, the country remains at the bottom in land productivity of most crops in the world, with the exception of one or two commodities like wheat. International agencies such as the FAO/OECD project India's yield gap with other countries to keep widening in coming years (see Chapter IV). Contributing to the widening yield gap compared to other countries are factors such as differences in natural resource endowments, differences in the varieties that are suitable for specific countries and for specific regions within countries, varying levels of access to technology, and differences in management practices. Private investment in agriculture is also relatively low as compared to many other countries. The specific factors that affect private investment in agriculture in India (to improve land quality and yields and adopt improved technologies) include shrinking holding size, extent to which property rights are protected, how inheritance and ownership of farm lands are handled and ambiguities surrounding government policy on the acquisition of farm land for non-agricultural purposes.

India's agriculture sector has made great strides in the period following the Green Revolution, which made the country self-sufficient in rice and wheat. But yields of crops have plateaued in recent years, although immense potential remains for improvement in productivity and value addition as reflected in yield gaps. Yields of oilseed, pulses, cotton, fruits, and vegetables have recorded a modest growth in recent years. Within India, there are significant variations among regions due to differences in climate as well as in the use of productivity-improving inputs such as irrigation, mechanised equipment, and fertilisers – and tailored responses are required to increase yields. In addition to facing a productivity challenge, Indian agriculture needs to diversify its crop mix to meet changing food habits, the nation's nutrition needs and raise incomes of poor farmers.

The strong economic growth in recent years along with rapid urbanisation has led to a change in food habits towards high protein and high value food items. Government policies and programmes historically favouring wheat and rice, currently the backbone of

Indian agriculture needs to diversify its crop mix to meet changing food habits, the nation's nutrition needs and raise incomes of poor farmers.

1. https://en.wikipedia.org/wiki/Land_use_statistics_by_country

2. <http://data.worldbank.org/indicator/AG.LND.IRIG.AG.ZS>

To meet the population's evolving food needs, the output of non-cereal-based foods and food processing sectors needs to improve substantially.

India's food security, has led to a decline in area under crops such as pulses and oilseed keeping production more or less stagnant. To meet the population's evolving food needs, the output of non-cereal-based foods and food processing sectors needs to improve substantially.

The continued dependence of a large share of crop area on monsoon rains, which has become more erratic in recent years, has further led to high volatility in production of less-irrigated crops such as oilseeds and pulses, resulting in high prices and large imports. The country also faces occasional shortages of onions and potatoes, the basic food items of the common man, due to unfavourable growing conditions and, in some years, due to trade malpractices, such as speculative hoarding, resulting in a sharp increase in prices. Post-harvest distribution is plagued by inefficiencies due to lack of proper infrastructure, and poorly functioning private markets. Thus, securing ample food security is still a matter of great importance.

There have been impressive yield gains in some countries (rice in China and maize in the United States are examples), but in some instances, these gains have come at the expense of quality and taste. These two attributes of food commodities are important to many consumers. With increasing per capita incomes, farmers continue to cultivate lower yielding varieties in order to respond to consumer demand (both for domestic and international markets). In the Indian context, two examples are consumer dislike for hybrid rice and the use of GM crops, due to environmental and health concerns. GM crops are also controversial because they require farmers to purchase seeds every year and because of pricing issues. There is increasing focus now on organic farming because of consumer preference but this has led to lower yields.

I.2 Salient Features of Indian Agriculture

Despite being an agricultural powerhouse, there are a number of constraints and challenges preventing it from realising the full potential of the sector. Some of these challenges are well known and discussed in the previous medium term report also. For example, the declining share of the sector in overall value added or the GDP of the economy even as the sector remains a source of employment and livelihood for a sizeable proportion of the population has led to income inequalities both within the farming sector and between agriculture and other sectors. The share of agricultural GDP has declined over time from 18.5 per cent in 2011–12 to 15.3 per cent in 2015–16. The percentage of rural workforce dependent on employment in agriculture is close to 60 per cent. The inability of the agricultural work force, particularly cultivators, to find better income generating livelihoods has meant that the average size of land holdings has become smaller and smaller over the years. The average size of an agricultural holding in India, according to the latest Agricultural Census (2010–11), is only 1.16 hectares. Generating savings for fresh investments from small holdings becomes difficult and productivity suffers.

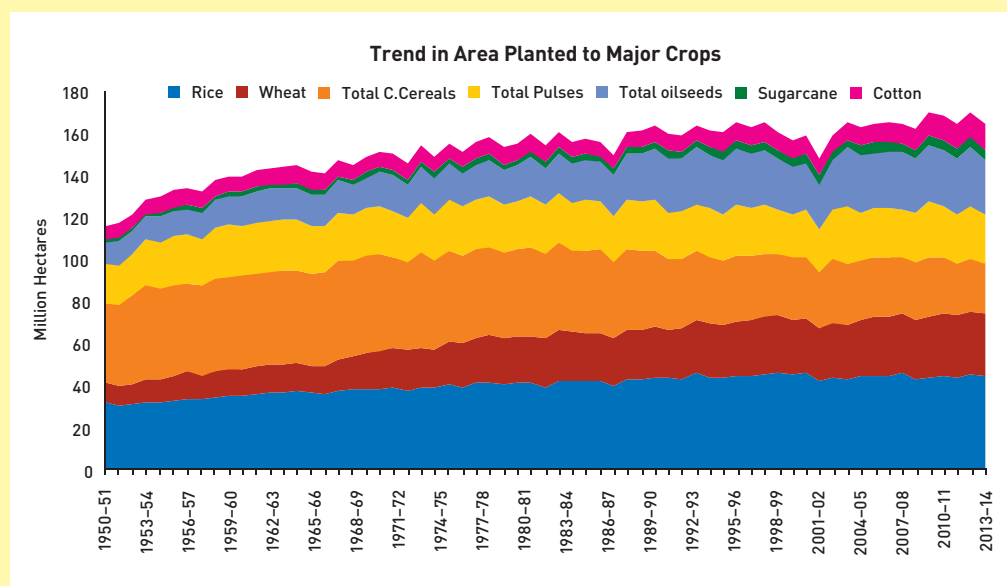
We discuss a few other challenges facing the agricultural sector today.

I.2.1 Changes in Cropping Pattern

Total cropped area under major crops (foodgrains, oilseeds, cotton, sugarcane) has increased by around 45 per cent during 1950–51 through 2014–15 to 170 million hectares, reflecting increased irrigation availability leading to increased cropping intensity (See Chapter IV).

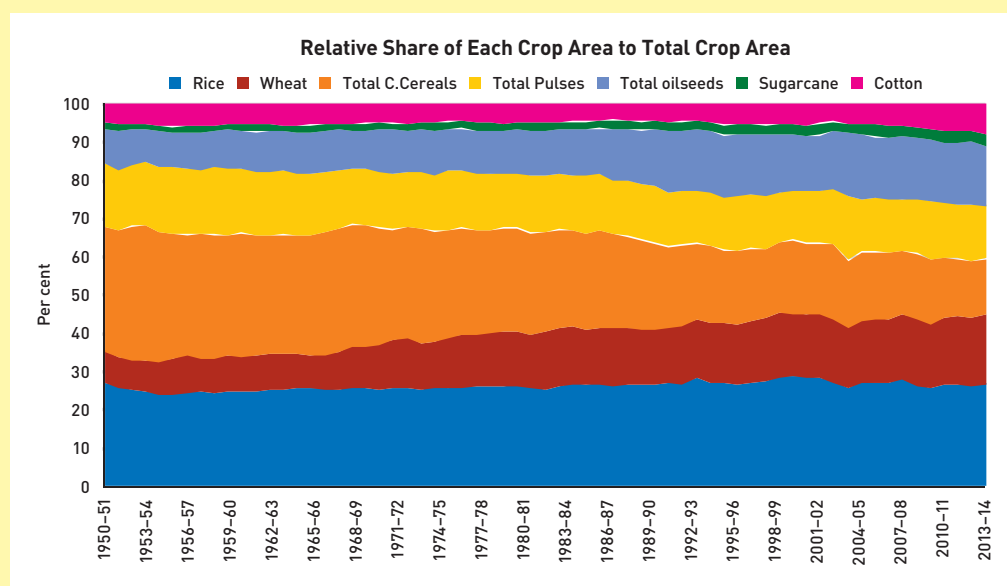
Figure I.1 shows the trend in cultivated area under various crops and Figure I.2 shows the relative share of area under major crops as a percentage of total cropped area.

Figure I.1: Changing Cropping Pattern



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

Figure I.2: Percentage Share of Various Major Crops to Total Cropped Area

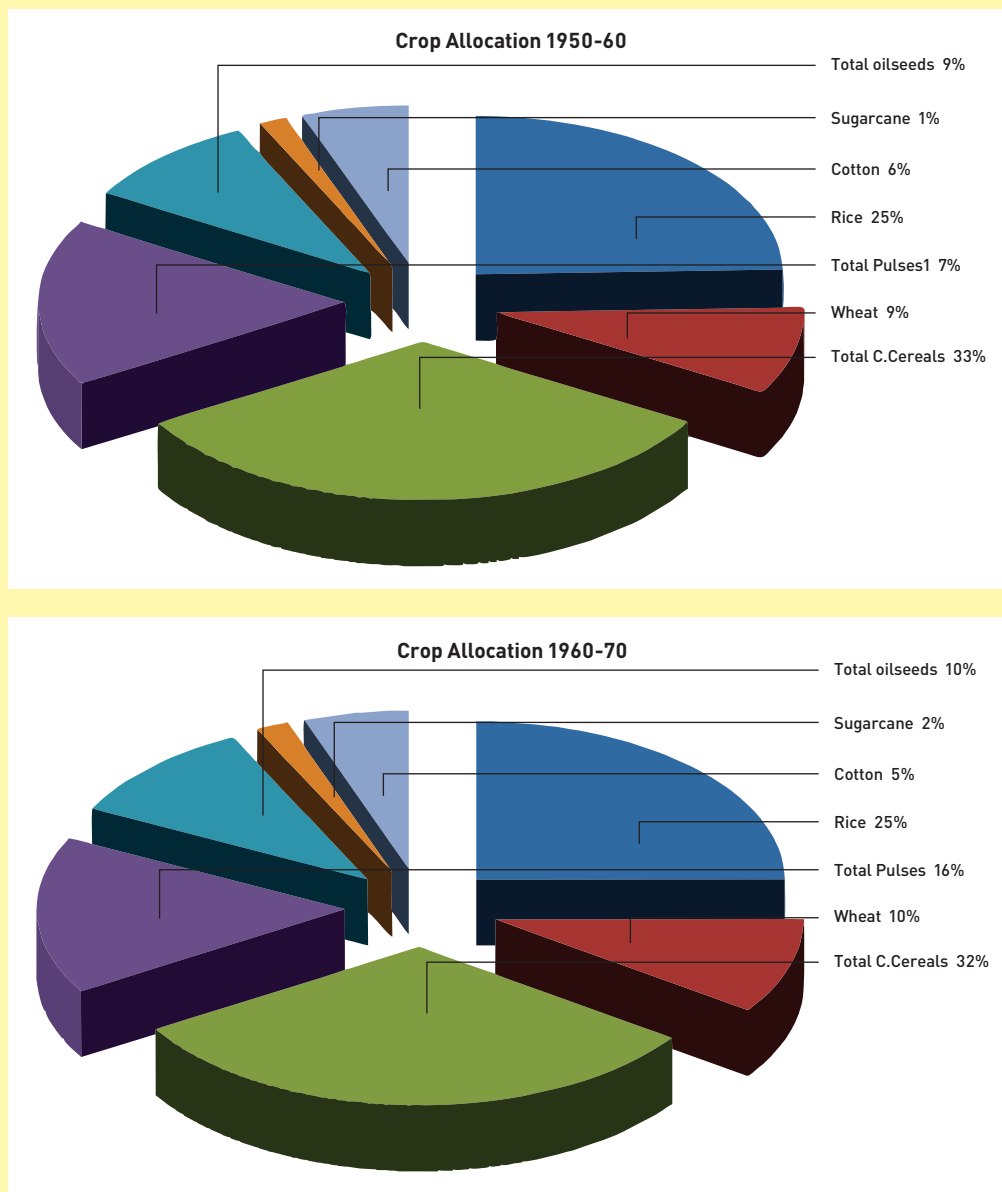


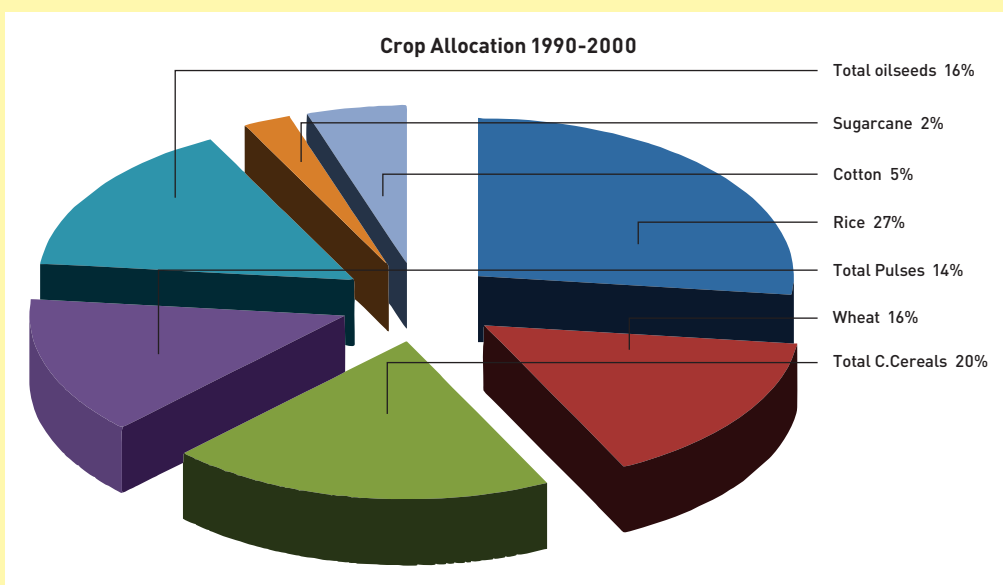
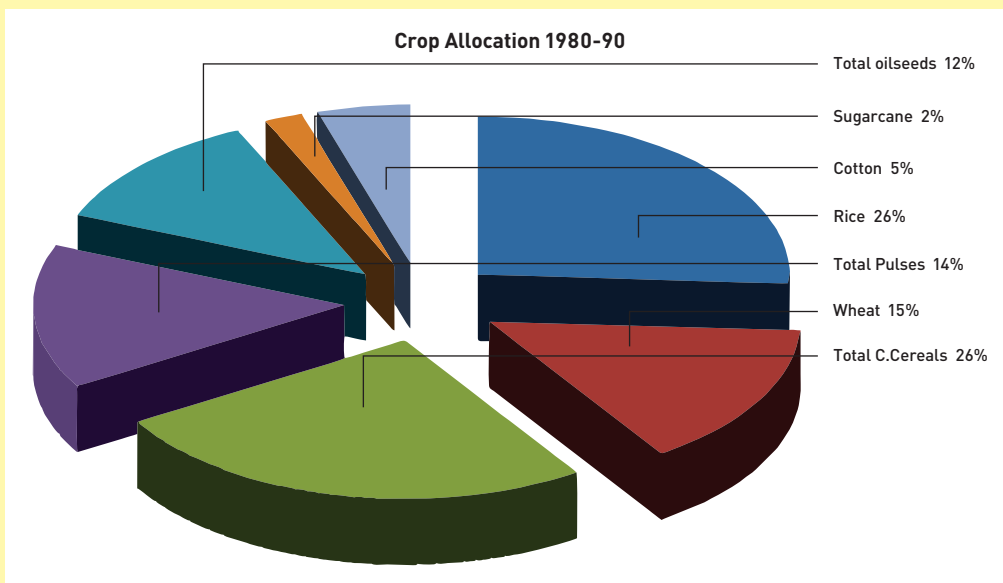
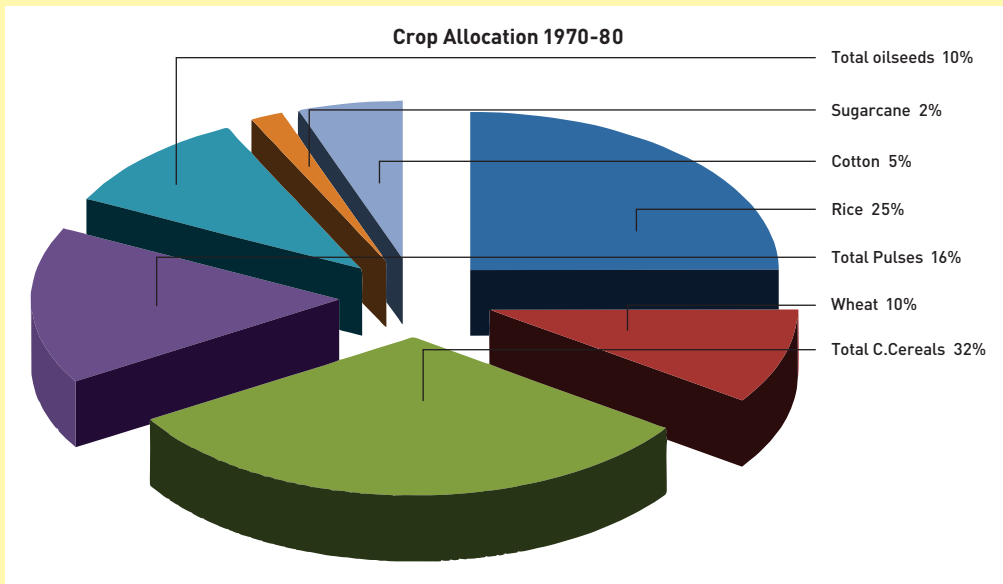
Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation.

Most of the increase in cropped area during the past decade was in wheat, oilseeds, sugarcane, and cotton and the decline was in coarse grains, and pulses (compared to a few decades ago). The area under rice and sugarcane has remained more or less unchanged, except for some year-to-year variations. The increase in cotton area occurred in recent years, coinciding with the introduction of Bt cotton. The area under pulses was stagnant between 2003-04 and 2009-10 and increased in the past two years with rising prices inducing higher planting and support from programmes as the National Food Security Mission.

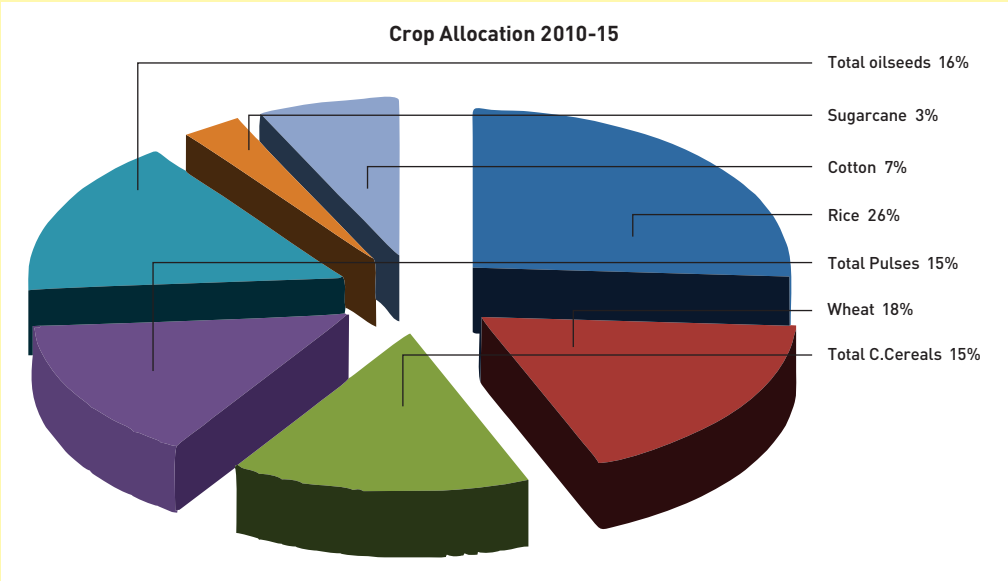
Figure I.3 tracks the gradual shift in India's cropping pattern since 1950 on a decadal average basis.

Figure I.3: Changing Cropping Pattern over the Past Six and Half Decades (Average)





In recent years the government has stepped up investment for irrigation development, developing marketing infrastructure, and soil improvement.

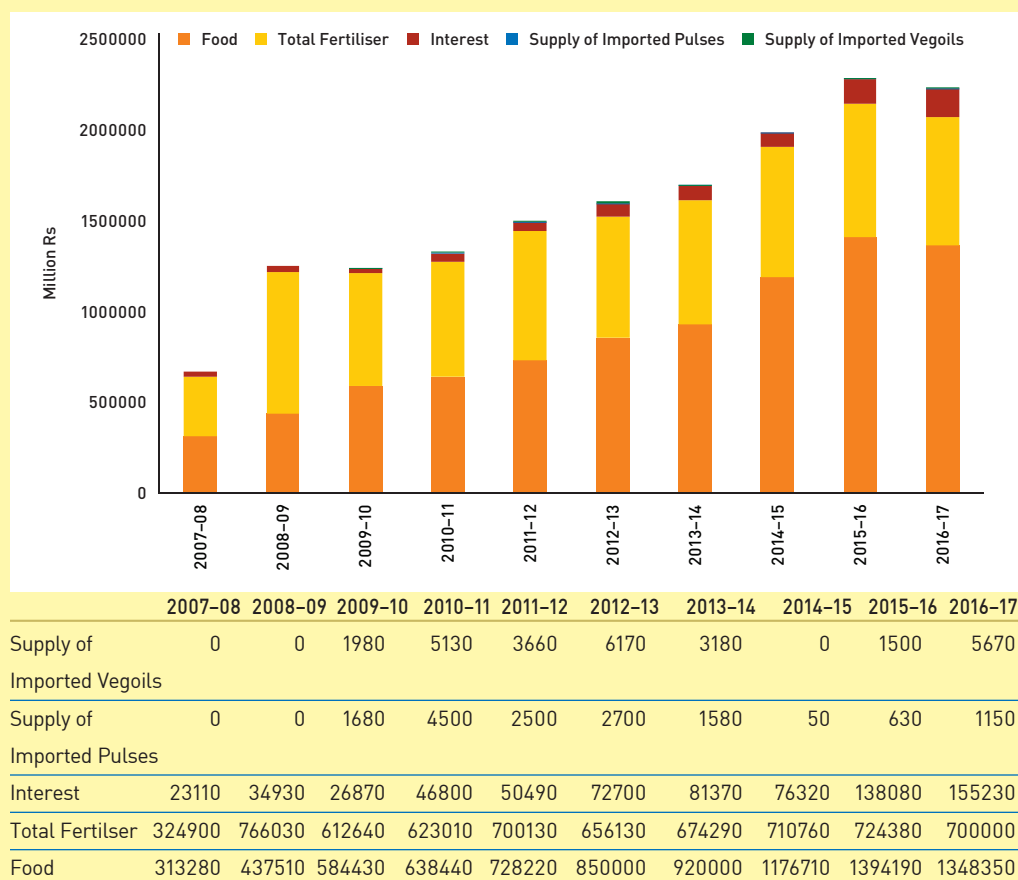


Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation.

I.2.2 Low Investment and Rising Subsidy

Private investment in agriculture has been tardy and not enough to raise agricultural productivity. The government is the largest investor in Indian agriculture, and in addition, supplies seeds, fertiliser, water (all at subsidised prices) and provides extension services to farmers to varying extent across crops and types of farming conditions. Thus, the government’s expenditure on agriculture has gone to meeting notonly development projects in the sector but also subsidising current inputs. The government’s operations in the distribution of wheat, rice and, to a small extent on pulses, to the consumers, which involves procuring these commodities from farmers at the minimum support prices established every year and supplying grains through the Public Distribution System (PSD), involves a large subsidy. However, in recent years the government has stepped up investment for irrigation development, developing marketing infrastructure, and soil improvement and development of solar energy, mostly for supplementing electricity availability in rural areas for operating tube wells.

Figure I.4: India: Rising Food and Agricultural Subsidies



Source: <http://www.unionbudget.nic.in/ub2016-17/eb/stat04.pdf>.

I.3 Recent Government Initiatives

Countries typically have three reasons for transforming agriculture: boost GDP growth, increase smallholder incomes, and ensure food and nutrition security. They have tried to achieve these objectives in many ways, mainly through policy reform and investments in broad programmes such as infrastructure creation, input subsidies and capacity building. Underscoring the vision of “doubling the income of farmers by 2022”, along with other objectives listed above, the government over the past two years has initiated various programmes. Some of these programmes also aim to sustain the ecological balance and usher in a second green revolution. Some of the major programmes are listed below:

- With the motto of ‘more crop per drop’, the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) has been launched to extend the coverage of irrigation in a focused manner. The programme aims at end-to-end solutions in the irrigation supply chain, namely water sources, distribution network and farm level applications. Under PMKSY, the focus has been on the creation of new water sources, repair, restoration and renovation of defunct water sources, construction of water harvesting structures, secondary and micro storage, ground water development and enhancing the potential of traditional water bodies at the village level.
- In order to protect farmers against crop failure due to natural calamities, pests and diseases, and the vagaries of weather, the government has recently introduced the Pradhan Mantri Fasal Bima Yojana (PMFBY) to be implemented from the kharif season this year. This crop insurance scheme has the lowest ever premium for the farmer: 1.5 per

cent for rabi and 2 per cent for kharif. It has also enabled insurance cover to be provided for various risks that have hitherto been uninsurable and aims to increase insurance coverage from 23 per cent to 50 per cent of the cropped area. Besides government entities, private insurance companies will also be eligible to participate in this scheme.

- c) To maintain and improve soil health through the judicious use of fertilisers, the government has initiated a soil health card programme. Under the scheme, a soil health card portal has been developed for registration of soil samples, recording test results of soil samples and generating a soil health card (SHC) along with recommendations on fertiliser use. The system envisages building up a single national database on soil health for future use in research and planning.
- d) A soil health promotion programme has been initiated for the preservation of soil health. Accordingly, the government has decided to produce only neem coated urea so that plants get nutrients easily.
- e) The government has established a National Organic Farming Research Institute (NOFRI) at Gangtok, Sikkim, which has recently been declared as the first organic state in the country. The Institute will provide research and technological backstopping to organic production system in the country in general and the North East Hills Region in particular. The institute will undertake basic, strategic and adaptive research on efficient, economically viable and environmentally sustainable organic farming systems for improving productivity, resource use efficiency and quality of produce. Besides, it will impart vocational and advanced training to stakeholders to promote organic farming in the country.
- f) The government has initiated a Paramparagat Krishi VikasYojana (PKVY), which ensures the promotion of organic farming. Under this programme, groups of farmers would be encouraged to take up organic farming. Fifty or more farmers will form 50 acre land clusters for organic farming. In three years, 10,000 clusters will be formed, covering an area of 5.0 lakh acres under organic farming. Farmers will have no liability for expenditure on certification. Government will give Rs. 20,000 per acre in three years for seed to harvesting of crops and to transport produce to the market.
- g) The government has approved the price stabilisation fund (PSF) as a central sector scheme, with a corpus of Rs.500 crore to support market interventions for price control of perishable agri-horticultural commodities. The PSF will be used to advance interest free loans to state governments and central agencies to support their working capital and other expenses on procurement and distribution interventions for such commodities. Procurement of these commodities will be undertaken directly from farmers or farmers' organisations at farm gate/mandi and made available at a reasonable price to consumers. Initially the fund was proposed to be used for onion and potato only; now pulses have also been included. Losses incurred, if any, in operations will be shared between the centre and the states.
- h) A National Agriculture Market (NAM)s has been set up for electronic trading. In this programme, 585 agriculture mandis of India will be connected to each other. The farmers will get the maximum price of their crops and the interference of mediators will be reduced. Direct foreign investment is also being encouraged in this field. As a part of NAM, Prime Minister Narendra Modi recently launched the national e-agriculture market. These e-mandis (markets) will integrate the various vegetable markets across the country, bringing them all to one platform and registered farmers will now be able to sell their produce online in any market where they are offered the best price.
- i) The Department of Animal Husbandry, Dairying and Fisheries is implementing, the National Livestock Mission (NLM) with a budgetary allocation of Rs.292 crore during the year 2016-17 with a sub-mission on feed and fodder development where financial assistance is provided to all states and union territories.

Table I.1 Agricultural Policy Developments during January–May 2016

| Sl. No. | Policy Issue/ Commodity | Date /Month | Policy Instrument | Brief Detail |
|---|---|-------------|-------------------|--|
| 1. | Crop Insurance | 13.1.16 | Cabinet Release | Cabinet approves New Crop Insurance Scheme – Pradhan MantriFasalBimaYojana. The premium rates to be paid by farmers for crop insurance are very low at 2 per cent for all kharif crops and 1.5 per cent for all rabi crops. The balance premium will be paid by the Government to provide the full insured amount to the farmers against crop loss on account of natural calamities. http://pib.nic.in/newsite/AdvSearch.aspx |
| Remarks: The scheme will encourage farmers to avail of crop insurance against losses due to natural calamities. | | | | |
| 2. | Eco-Mark standard for City Compost | 20.1.16 | Cabinet Release | Cabinet approves policy on promotion of city compost. Under the policy, market development assistance of Rs 1500 per tonne of city compost will be provided for scaling up production and consumption of the product. It would lower MRP of city compost for farmers. The compost from city garbage will not only provide carbon and primary/secondary nutrients to the soil but also help in keeping cities clean. Eco-Mark standard for city compost will ensure that an environment friendly quality product reaches farmers. http://pib.nic.in/newsite/AdvSearch.aspx |
| Remarks: Composting can reduce the volume of waste to landfill/dumpsite by converting the waste into useful by-products and Eco-Mark standard for City Compost will ensure that an environment friendly quality product reaches the farmers. | | | | |
| 3. | Pulses | 20.1.16 | DGFT Notification | The Government has permitted export of roasted gram (whole/split) in consumer packs of 1 (one) Kg. http://dgft.gov.in/Exim/2000/NOT/NOT15/noti3116.pdf |
| 4. | Groundnut | 1.2.16 | MoA&FW Release | Vietnam lifts ban on import of Indian groundnut – major step forward in securing market access. http://pib.nic.in/newsite/AdvSearch.aspx |
| Remarks: Vietnam is a major market for export of Indian groundnut; the development assumes significance for groundnut producers and exporters. | | | | |
| 5. | Potato | 15.3.16 | Media Reports | The government will create a buffer stock of potato using the Rs 500-crore Price Stabilisation Fund (PSF). The fund is being used for creating a buffer stock (of pulses and onions also) to control price volatility, thereby protecting interest of farmers and consumers. http://www.business-standard.com/article/pti-stories/govt-to-create-buffer-stock-of-potato-116031500901_1.html |
| Remarks: To control price volatility and to protect the interest of farmers and consumers. | | | | |

[Contd.]

Table I.1 Agricultural Policy Developments during January–May 2016 (Contd.)

| Sl. No. | Policy Issue/ Commodity | Date /Month | Policy Instrument | Brief Detail |
|--|---|-------------|-------------------|---|
| 6. | Wheat | 28.3.16 | CBEC Notification | <p>Central government has further extended 25 per cent duty on import of wheat till June, 2016.</p> <p>http://www.cbec.gov.in/htdocs-cbec/customs/cs-act/notifications/notfns-2016/cs-tarr2016/cs24-2016</p> |
| Remarks: To protect interest of farmers and consumers. | | | | |
| 7. | Marketing of Agricultural produce. | 14.4.16 | MoA&FW Release | <p>The Prime Minister launched the National Agriculture Market: 21 mandis from eight states have been linked to National Agriculture Market. 200 mandis will be linked within five Months and 585 mandis by March, 2018. The initiative will usher in price transparency, which will greatly benefit the farmers.</p> <p>http://pib.nic.in/newsite/erelease.aspx</p> |
| Remarks: To provide a single platform to farmers to market their produce and to usher in price transparency. | | | | |
| 8. | Pulses | 21.4.16 | MoCA&PD Release | <p>Government to release 10000 MT pulses from buffer stock. It has decided to release 10000 MT of pulses, mainly Tur and Urad, from buffer stock to ensure their availability at reasonable prices. State governments have been requested to avail of this benefit and utilise available stocks to manage prices of pulses in their respective state.</p> <p>http://pib.nic.in/newsite/erelease.aspx</p> |
| Remarks: To contain price rise of pulses and to provide relief to consumers. | | | | |
| 9. | Sugar | 27.4.16 | Cabinet Release | <p>The government has decided to allow states to impose and enforce stock limits to check the price rise in sugar.</p> <p>http://pib.nic.in/newsite/PrintRelease.aspx?relid=142382</p> |
| Remarks: To contain price volatility and provide relief to consumers. | | | | |
| 10. | Edible oils | 18.5.16 | DGFT Notification | <p>The government has exempted the export of rice bran oil in bulk (irrespective of any pack size) from the prohibition on export of edible oils.</p> <p>http://dgft.gov.in/Exim/2000/NOT/NOT16/noti0817.pdf</p> |
| Remarks: Will provide relief to the industry as demand for rice bran oil within the country has not picked up yet. | | | | |
| 11. | Sugar | 20.5.16 | Media Reports | <p>Centre ends sugar export subsidy. The central government has withdrawn the production-linked subsidy of Rs 4.50 a quintal that it transfers directly into the bank account of sugarcane farmers on the condition that the mills to which they sell sugarcane have exported 80 per cent of their prescribed quota of sugar. The mills also have to produce a certain level of ethanol.</p> <p>http://www.business-standard.com/article/economy-policy/centre-ends-sugar-export-subsidy-116051901774_1.html</p> |
| Remarks: The ex-factory sugar prices have improved significantly in the recent past. The move will discourage mills from exporting and will help in maintaining domestic supplies and prices. | | | | |

CHAPTER II

Medium-term Global Food Commodity Outlook

II.1 Introduction to Global Outlook

The medium-term agricultural outlook presents an assessment of the emerging agricultural scenario in the next 5–10 years covering production, consumption, trade, per capita consumption and prices, globally and for major economies. In this chapter, we discuss the projections provided by a number of agencies such as OECD/FAO, ERS/USDA³, agricultural research agencies in Canada⁴ and the European Union.⁵

The OECD-FAO,⁶ USDA,⁷ and FAPRI⁸ provide the medium-term global agricultural outlook every year: (the latest available FAPRI report is 2011 but data projection was updated in 2012). Since 2014, the International Grain Council (IGC) has been making five-year outlook projections for major grain and oilseed crops. The latest available is for the year 2015.⁹ In this report, we have used the latest available, detailed medium-term projections by these agencies as a reference scenario in the global context with special focus on India. A standalone model for Indian agricultural markets, using the OECD/FAO developed COSIMO Model, has also been developed and applied by NCAER for its medium-term projection.

A comparison of the projections by different agencies highlights common and diverging trends across projections as well as identifies uncertainties that could significantly affect markets.

II.2 Major Medium-term Outlook Models¹⁰

The analytical frameworks adopted by the major agencies whose projections are reported here are briefly described below for reference. They have been provided in the previous medium-term agricultural outlook reports too.

3. <http://www.ers.usda.gov/media/2022721/outlook-for-us-ag-trade-aes91.pdf>
4. <http://www.agr.gc.ca/eng/about-us/publications/economic-publications/alphabetical-listing/2016-canadian-agricultural-outlook/?id=1455901351212>
5. http://ec.europa.eu/agriculture/markets-and-prices/medium-term-outlook/2015/fullrep_en.pdf
6. OECD-FAO Agricultural Outlook 2015–2024, available at: www.oecd.org/site/oecd-faoagriculturaloutlook/
7. USDA Agricultural Projections to 2025, published in February 2016 available at <http://www.ers.usda.gov/media/2017463/oce-2016-1.pdf>
<http://www.ers.usda.gov/data-products/international-baseline-data.aspx#56954>
8. FAPRI-ISU 2011 World Agricultural Outlook, published in April 2011 available at <http://www.fapri.iastate.edu/outlook/2012/>
9. http://www.igc.int/en/downloads/grainsupdate/IGC_5yearprojections2015.pdf
10. We have referred to <http://www.ilr.uni-bonn.de/agpo/rsrch/capri-rd/docs/d4.1.pdf> for a comparison of the three models and some regional models.

II.2.1 OECD-FAO Outlook for World Agricultural Commodity Markets

The OECD-FAO annual agricultural outlook is prepared jointly by the Organization for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization (FAO) of the United Nations. The agricultural outlook provides a baseline for further analysis of alternative economic or policy assumptions. The outlook brings together the commodity, policy and country expertise of the OECD and FAO, providing an assessment of agricultural market prospects for production, consumption, trade, stocks and prices of commodities, which cover wheat, rice, coarse grains, oilseeds, sugar, dairy and meat, besides biofuel.

A jointly developed modelling system, based on the OECD's Aglink (a recursive-dynamic, partial equilibrium, supply-demand model of world agriculture) and FAO's COSIMO models, provides the analytical framework for the projections. The new model component is termed COSIMO (COMmodity SIMulation MOdel). The general programming structure of COSIMO was taken over from AgLink while the behavioural parameters for the new country modules were taken from its predecessor at FAO, the World Food Model.

The AGLINK-COSIMO modelling system is presently one of the most comprehensive partial equilibrium models for global agriculture. The model is one of the tools used in the generation of baseline projections underlying the OECD-FAO agricultural outlook. For many countries, agricultural policies are specifically modelled within AGLINK-COSIMO. This makes the model a powerful tool for forward looking analysis of domestic and trade policies through the comparison of scenarios of alternative policy settings against the benchmark of the baseline projections.

The methodological approach involves a set of assumptions on exogenous and policy-related drivers, a collaborative expert system and a joint modelling system that ensures the consistency of the projections.

II.2.2 USDA Agricultural Outlook

The Economic Research Service (ERS) of the United States Department of Agriculture (USDA) prepares a set of 10-year projections for US and world agricultural commodity markets. The commodity coverage is focused on products for which US government support programmes exist and are more focused on trade. The 10-year USDA baseline is developed using a composite of models and analysis of other available information. The baseline is based on specific assumptions regarding macroeconomic conditions, policy, weather and international developments. A set of economic models is used as a starting point for generating the baseline projections:

- A domestic crop-area allocation model.
- A number of US commodity market models.
- A US agricultural sector model, the Food and Agricultural Policy Simulator (FAPSIM), to analyse detailed technical and policy options. FAPSIM is an annual agricultural sector model, covering major US crop and livestock commodities.
- A global agricultural trade model, "Country-Commodity Linked Modelling System" that links 24 commodity markets in 39 countries/regions, to cover global agricultural markets. Projections cover production, demand and trade for agricultural commodities, as well as aggregate indicators for the sector, such as farm income.

II.2.3 FAPRI Projections for Agricultural Markets

The Food and Agricultural Policy Research Institute (FAPRI), housed jointly at Iowa State University and the University of Missouri, Columbia, prepares an annual multi-year baseline projection for the US and world agricultural markets. The results of the FAPRI baseline are published every year in the FAPRI US and World Agricultural Outlook, which is intended to serve as a point of comparison for evaluating alternative policy scenarios. The FAPRI baseline is prepared using comprehensive data, a computer modelling system and an expert review process. The model FAPRI uses to develop the baseline contains over 3,000 equations representing supply and demand relationships in the United States and major countries around the world, and consists of a set of partial equilibrium models, covering the US crops model, as well as the international cotton, dairy, livestock, oilseeds, rice, and sugar models. The commodity models are largely independent with some linkages with each other. The data sources included in the model are the USDA-FAS (Foreign Agricultural Service) Production, Supply, and Distribution (PS&D) data set, the International Monetary Fund' (IMF) International Financial Statistics (IFS) macroeconomic data set, USDA attaché reports, and other sources for commodity prices.

Because of budget constraints, FAPRI did not develop a joint 2012 baseline with colleagues at the University of Missouri or other institutions. However, FAPRI-ISU developed a separate outlook, available as the FAPRI-ISU 2012 World Agricultural Outlook, which is the latest. Due to budget cuts, the annual World Agricultural Outlook has been discontinued.

II.2.4 International Grains Council: Five-year Global Supply and Demand Projections

The projection covers wheat, rice, maize (corn), jowar (sorghum), barley, oats, rye, soybean and rapeseed. Details about the type of model used and outlook assumptions used by IGC are not available in the public domain.

II.3 Comparison of Global Medium-term Projections¹¹

The coverage of commodities and variables in the selected projections is summarised in Table II.1

11. A detailed report on the comparison and contrast of the projections by the three agencies is available in Agricultural Commodity Markets Outlook 2011–20:
http://ec.europa.eu/agriculture/analysis/tradepol/worldmarkets/outlook/2011_2020_en.pdf

Table II.1: Commodity Coverage and Projection Period by Various Agencies

| Commodity Coverage (Global) | Agency | | | |
|--------------------------------|--|---|---|--|
| | FAO/OECD | ERS/USDA | FAPRI | IGC |
| Grains | Wheat, rice, total coarse grains (breakup not given) | Wheat, rice, coarse grains (maize, sorghum, barley) | Wheat, coarse grains (maize, sorghum, barley) | Wheat, rice, coarse grains (maize, barley, sorghum, rye, oats, other coarse grains) |
| Oilseeds | Total oilseeds (breakup not given) | Only soybean | Soybean, rapeseed, sunflower, peanut | Soybean, Rapeseed |
| Veg. oil | Total vegetable oils (breakup not given) | Only soybean oil | Soybean, rapeseed, palm, peanut, sunflower | NA |
| Sugar | White sugar | NA | White Sugar | NA |
| Projection Period | 2015 to 2024 (10 years) | 2016 to 2025 (10 years) | 2015 to 2021 (7 years) | 2016/17 to 2020/21 (5 years) |

Only FAO, among the various agencies noted above, gives domestic (India) price projections in rupees, probably in real terms. The prices are indicative and commodity specific and market specific inferences cannot be drawn. FAPRI price projections for soybean are CIF, Rotterdam. FAPRI soy oil price projections are for Rotterdam (FOB).

The conclusions from projections drawn by the USDA, FAPRI, and IGC are generally in agreement with the FAO/OECD projection conclusions listed below:

- Global output of most crops is expected to increase at a moderate pace compared to the previous decade due to the stabilisation of land use.
- Yield improvements will drive growth in crop production, particularly in Asia, Europe and North America, whereas in South America, yield improvements are projected to be complemented by an expansion in agricultural area.
- Prices for all agricultural products are expected to decrease over the next ten years, as on-trend productivity growth, helped by lower input prices, outpaces slowing demand increases. Lower gasoline prices are a source of downward pressure on prices, principally through their impact on energy and fertiliser costs.
- Among crops, the prices of coarse grains and oilseeds used for feed should rise relative to the prices of food staples.
- Demand for staple commodities will be subdued because per capita consumption is approaching saturation in many emerging economies and because of generally sluggish global economic recovery.
- Major changes in demand are likely to be in developing countries, where continued but slowing population growth, rising per capita incomes and urbanisation all increase the demand for food. Rising incomes prompt consumers to diversify their diets by increasing their consumption of animal protein relative to starches.
- Policies are not expected to lead to a significantly higher biofuel production, which is projected to remain flat, except in Brazil and Indonesia.
- Overall, agricultural trade is expected to increase more slowly than in the previous decade, but will maintain a stable share relative to global production and consumption. Exports of some key commodities are projected to become concentrated in fewer countries, while imports will become more dispersed, which increases market risks,

including those associated with natural disasters or the adoption of disruptive trade measures.

The highlights of the global assessments by commodity and by agencies are discussed below:

II.3.1 Wheat

Please refer APPENDIX 1, Figures II.A.1 to II.A.5 for graphical representation of the global wheat situation

II.3.1.a Production

OECD/FAO

Global wheat output is expected to increase at a moderate pace compared to the previous decade to reach 787 mmt by 2024. An additional 86 mmt of wheat supply is projected, with a large share being produced in India, the Russian Federation, China, European Union and Argentina. Being the third largest wheat producer, India is expected to account for the biggest share of additional wheat supply (15 mmt) followed by the Russian Federation, the People's Republic of China and the European Union. The 52 per cent share of developed countries in global wheat production is projected to reach 50 per cent by 2024. The underlying factor for the lower production growth is the stabilisation of land use for wheat production over the outlook period. The potential for area expansion in the next decade is weak for cereals, including wheat, and production and growth will mostly be driven by yield increases. While the accumulated yield growth for the outlook versus the base period is projected at 10 per cent, the increase in crop land devoted to wheat is less than 3 per cent.

USDA

World wheat production is projected to reach 789 mmt by 2024, 9 per cent higher than in the base period. Due to technological innovations and increasing economies of scale in many countries, yield growth is expected to continue. Lower prices and profits affect production decisions throughout the world. Producers may reduce input use, which may lower yields. Lower prices will also limit overall area expansion. However, the relatively low energy prices projected will help lower production costs.

FAPRI

Global wheat production is projected to reach 738 mmt by 2024.

IGC

After successive big harvests, world production is projected to fall in 2016–17, mainly because of a drop in yields from the high levels of 2015–16. Production is projected to rise afterwards, but at a slower rate than in recent years. From 2017–18, a modest increase in world plantings is projected, but with expansion contained by competition from other crops, especially maize and oilseeds. Falling export market shares could prompt a further move away from wheat in some regions, including Argentina and the US. From 2017–18, growth in world yields is placed at around 1 per cent per annum, somewhat slower than the relatively strong rise in recent seasons. With harvested area edging upwards, global production is forecast to be up by around 1 per cent annually from 2017–18 to 741 mmt in 2020–21.

The potential for area expansion in the next decade is weak for cereals, including wheat, and production and growth will mostly be driven by yield increases.

Due to technological innovations and increasing economies of scale in many countries, yield growth is expected to continue.

From 2017–18, growth in world yields is placed at around 1 per cent per annum, somewhat slower than the relatively strong rise in recent seasons.

Per capita annual human consumption is projected to remain steady at around 67 kg.

Developing countries are expected to account for more than four-fifths of the projected increase in global consumption of grains.

Continuing historical trends, developed countries are expected to supply wheat to developing countries.

II.3.1.b Consumption

FAO/OECD

World wheat consumption for food, feed, and industrial usage is projected at 784 mmt by 2024, an increase of 13 per cent compared to the base period and will continue to be dominated by food use, which will have a constant share of about 69 per cent of total use. Per capita annual human consumption is projected to remain steady at around 67 kg. Feed use of wheat is projected at 149 mmt, growing at a slightly lower pace, representing 19 per cent of total use. Wheat use for biofuels is also projected to show a declining trend reaching 7.5 mmt by 2024.

USDA

USDA projects world wheat consumption to reach 787 mmt by 2024, close to the FAO/OECD projection. Low- and middle-income countries are the main sources of growing food and feed demand and are projected to account for most of the increase in world consumption of basic agricultural commodities, including wheat, over the coming decade. Developing countries are expected to account for more than four-fifths of the projected increase in global consumption of grains. In addition to rising household incomes and low commodity prices, several longer term demographic (particularly population growth) and economic trends are driving world demand for these commodities upward. Higher income growth, further urbanisation, upgraded infrastructures, better access to modern food markets, and changing diets and preferences in developing countries will expose consumers here to new types of food such as non-traditional instant noodles, bread, cakes, cookies, etc.

FAPRI

FAPRI projects world wheat consumption to reach around 736 mmt in 2024, with food use at 595 mmt and feed use at 141 mmt.

IGC

Consumption growth is seen continuing to be driven mainly by food demand, with the global projected at 742 mmt in 2020. Feed use is expected to stay relatively high up to 2020–21 and is projected at 140 mmt (19 per cent of total consumption), although demand may be capped by greater use of alternatives, such as maize and soybeans.

II.3.1.c Trade

OECD/FAO

OECD/FAO forecasts world wheat trade to increase to 165 mmt by 2024 from 151.5 mmt in 2014. Global cereal trade is expected to grow slightly faster than production (1.6 per cent p.a. vs. 1.3 per cent p.a.) which implies growing shares of trade in global production. For wheat this share is expected to reach 21 per cent by 2024, compared with 13 per cent in 2015. Continuing historical trends, developed countries are expected to supply wheat to developing countries. This situation is expected to be maintained and even strengthened in the coming ten years. In 2024, the United States' international trade accounts for about 17 per cent of global wheat exports followed by the European Union and Canada (16 per cent), and the Russian Federation and Australia competing for the third position at about 12 per cent to 14 per cent each. Supply in the major wheat producing members of the CIS, the Russian Federation, Ukraine and Kazakhstan has been volatile in the past decade mainly due to yield fluctuations. Nonetheless, in the recent past, production growth has on an average outpaced consumption growth so that further increases of wheat production and exports are expected.

USDA

World wheat trade (including flour) is projected to expand by nearly 26 mmt (16 per cent) between 2016–17 and 2025–26, reaching 187.3 mmt. Growth in wheat imports is concentrated in those developing countries where income and population gains drive increases in demand. The largest growth markets include Sub-Saharan Africa, the 15 countries of the Economic Community of West African States, the Middle East, North Africa, Indonesia, the countries of the Former Soviet Union (FSU), and Iraq. Egypt and Indonesia remain the world's leading wheat importers, with annual imports climbing to 12.6 mmt and 10.1 mmt respectively by 2025–26. India is projected to be a net wheat exporter over the projection period, exporting about 800,000 tonnes annually while importing about 100,000 tonnes per year. Similar to the past decade, the five largest wheat exporters (the EU, United States, Canada, Russia, and Australia) are projected to account for 73 per cent of world trade in 2025–26. The former Soviet Union (FSU region) exhibits the fastest growth in world export share, rising from 12 per cent in the late 1990s to 22 per cent over the past decade to a projected 27 per cent by 2025–26.

FAPRI

Net wheat trade (excluding inter-regional trade) is projected to reach 134 mmt in 2024–25, an increase of 23 per cent over 2014–15. India is expected to remain a growing net exporter of wheat, projected to reach close to 10 mmt by 2024–25.

IGC

After a modest fall in 2015–16, global wheat imports are projected to increase by around 1.4 per cent per annum, to 161 mmt in 2020–21. The strongest gains are in Asia and Africa, bolstered by rising populations and unpredictable local harvests, although increases may not be as rapid as recently. Measures to reduce local wastage are expected to contain import requirements in Egypt. In Far East Asia (Indonesia, South Korea, the Philippines, Thailand and Vietnam) buying for both food and feed contribute to larger imports. For India, imports are forecast to edge upward, but stay fairly low.

Exports by the EU and the US are placed at a similar level, each accounting for around 18 per cent of global trade on average. Both will likely face competition from competitively priced Black Sea (Kazakhstan, Russia and Ukraine) shipments. The Black Sea share of world trade is seen reaching 29 per cent in 2020–21, up from an average of 24 per cent in the five years to 2015–16. The share taken by Argentina (4 per cent), Australia (13 per cent) and Canada (13 per cent) are broadly unchanged from current levels.

II.3.1.d Stocks

OECD/FAO

World ending stocks of wheat are projected to show a steady increase reaching 238 mmt by 2024 from 198.7 mmt in 2014.

USDA

Similar to OECD/FAO projections, stocks are projected to grow steadily to reach 260 mmt by 2024 as production has increased faster than demand, which has contributed to lower prices and led producers and governments to increase their holdings of stocks. Government policies in some countries have facilitated the accumulation of higher reserve stocks as a way to support producers and construct a buffer against large future swings in commodity prices. Some countries such as India use price supports and input subsidies as policy levers to maintain food security and to support the incomes of farm households. These policies have led to large accumulation of stocks. Stocks-to-use ratio in major exporting countries is projected at 32 per cent, slightly lower than the base period.

India is projected to be a net wheat exporter over the projection period, exporting about 800,000 tonnes annually while importing about 100,000 tonnes per year.

The Black Sea share of world trade is seen reaching 29 per cent in 2020–21, up from an average of 24 per cent in the five years to 2015–16.

Government policies in some countries have facilitated the accumulation of higher reserve stocks as a way to support producers and construct a buffer against large future swings in commodity prices.

Consumption growth could outpace productivity gains in India, leading to a gradual depletion of stocks close to the government's minimum desired level of 7.5 million tonnes.

Almost the entire expected increase in production stems from productivity gains rather than area expansion, which is stagnating.

FAPRI

With a steady increase, world ending stocks of wheat are projected at 193 mmt in 2024–25 from 182 mmt in 2014–15, but significantly below the OECD/FAO and USDA projections.

IGC

Unlike projections by other agencies, IGC projects stocks retreating by about 14 million tonnes by 2020–21 to 195 million tonnes from the four-year high anticipated at the end of 2014–15. Given a rise in consumption, the global stocks-to-use ratio will tighten marginally, to 26 per cent, but will still be comfortably above the recent low of 22 per cent in 2007–08. Most of the fall in stocks is in the major exporting countries. Consumption growth could outpace productivity gains in India, leading to a gradual depletion of stocks close to the government's minimum desired level of 7.5 million tonnes.

II.3.1.e PRICE

OECD/FAO

The international wheat price as measured by the benchmark US wheat No.2 Hard Red Winter (fob), after peaking to an average US\$290/tonne in the 2014 marketing year (a level not seen since 2010), declining steeply to US\$247/metric tonne in 2015, is anticipated to follow a moderately upward trend reaching US\$272/tonne in real terms.

II.3.2 Rice

APPENDIX 1 Figures II.A.6 to II.A.10 provide a graphical representation of the global rice situation

II.3.2.a Production

OECD/FAO

World rice production growth is projected at 1.3 per cent per annum during the next decade, considerably lower than the 1.9 per cent per annum in the previous ten years to touch the level of 564 mmt. The global increase of 70 mmt in rice production is expected to be dominated by Asian countries (61 mmt), mainly India (17 mmt), Indonesia (8 mmt), Bangladesh, Thailand (6 mmt), Viet Nam and China (5 mmt)

Almost the entire expected increase in production stems from productivity gains rather than area expansion, which is stagnating. Africa and some Asian countries such as Cambodia and Myanmar, are exceptions, where area is expected to expand because of the availability of large tracts of uncultivated land and abundant water. Suspension of official paddy procurements from farmers in Thailand in 2014 could weigh on farmers' planting decisions and negatively affect production in the short run. In the medium term, however, yields in Thailand still have much room for improvement, and productivity gains will contribute to steady production growth.

USDA

Global rice production is forecast at 523 mmt by 2024, an increase of 9 per cent over 2014, with most of the increase in Asia. Tightening water supplies and the rising cost of pumping from underground sources are major impediments to yield growth in some regions, particularly in areas with falling water tables, and limit the ability to maintain or expand irrigated area. Some countries face worsening water quality problems due to pollution and natural salinity issues. Countries such as India are dependent on regular wetseason rainfall to recharge reservoirs for dryseason irrigation, but rains have become more erratic and below normal in recent years, which restrict yield gain.

IGC

Global rice output is projected to rise to successive highs on increases in Asia's leading producing countries. However, average annual growth is set to slow compared to the past and will be linked to productivity gains, given the limited potential for expanded plantings. Production in 2020 is projected at 503.5 mmt, close to the USDA forecast for that year.

II.3.2.b Consumption

OECD/FAO

Sustained by the demand for rice as food, the total utilisation of rice will expand by about 1.2 per cent per annum to 562 million tonnes in 2024. Per capita food use of rice worldwide is projected to rise by about 1 kg from 57.2 kg in the base period to 58.4 kg in 2024. In Asia, where much of the rice produced is consumed domestically, per capita rice consumption is expected to rise only marginally, as diets diversify. On the other hand, per capita rice consumption will keep growing in African countries, where rice is gaining relative importance as a major food staple. Asian countries are projected to account for almost 80 per cent of global consumption increase.

USDA

USDA projects global rice consumption to increase to 520 million tonnes in 2024–25 from 482 million tonnes in 2014–15, significantly below the OECD/FAO projections. In Thailand and Vietnam, per capita consumption will decline as rising incomes support shifts from rice toward a more diversified diet with increased meat consumption.

IGC

Global rice consumption is expected to continue along an upward trajectory during the next five years, reaching 503 million tonnes by 2020–21, close to the USDA projection. The increase in consumption will be driven by growing food demand in Asia. However, annual increases are projected to be smaller than before as higher incomes and changing diets prompt a shift to greater protein consumption at the expense of traditional staples. Accordingly, rice use per capita is set to fall slightly. In India, policy measures such as the implementation of the National Food Security Act (NFSA), which seeks to widen access to subsidised food grains including rice, will underpin rising consumption in coming years. Rice consumption in sub-Saharan Africa is seen expanding by slightly more than 2 per cent per annum over the medium term, with Nigeria remaining the largest market.

II.3.2.c Trade

OECD/FAO

International rice trade registered a particularly fast annual growth of 4.4 per cent in the past ten years. Trade is expected to slow down to 2.5 per cent per annum for the next ten years with the volume traded expected to rise to 52 Mt by 2024. Except for India, rice exports from all the traditional exporters, namely Pakistan, Thailand, Viet Nam and the United States, are expected to increase. Thailand, in particular, is foreseen to regain its leadership, following a relaxation of the high producer price policy applied until 2014 and the large inventories held in public warehouses, which will take several years for the market to absorb. After increasing in response to high prices during 2011–13, India's exports are expected to decline in the short term, followed by a recovery consistent with the trends during 1990–2010. Although the global players on international rice markets are expected to remain the same, Cambodia and Myanmar are also likely to emerge as major rice exporters, which would further stoke competition in the global rice market.

Per capita food use of rice worldwide is projected to rise by about 1 kg from 57.2 kg in the base period to 58.4 kg in 2024.

Annual increases are projected to be smaller than before as higher incomes and changing diets prompt a shift to greater protein consumption at the expense of traditional staples.

Cambodia and Myanmar are also likely to emerge as major rice exporters, which would further stoke competition in the global rice market.

African countries are expected to remain the major importers of rice as demand continues to outpace production in the region.

China remains the largest rice importing country throughout the projection period. Despite adequate domestic supplies of rice, its high prices are likely to attract import of lower priced rice, primarily from Southeast Asia over the coming decade.

African countries are expected to remain the major importers of rice as demand continues to outpace production in the region. Nigeria, in particular, is predicted to be the major destination. A number of countries in the Near East (Saudi Arabia, Islamic Republic of Iran) and in Asia (Malaysia, the Philippines) are also foreseen to step up imports, although strong government backing may translate into lasting production gains.

USDA

Global rice trade is projected to grow at an annual rate of 1.9 per cent from 2016–17 to 2025–26, and reach around 50 mmt by the end of the projection period. This is an increase of almost 40 per cent from the average over the previous decade. The main factors driving this expansion in trade is the steady growth in demand, largely due to population and income growth in developing countries, mostly in Sub-Saharan Africa. China remains the largest rice importing country throughout the projection period. Despite adequate domestic supplies of rice, its high prices are likely to attract import of lower priced rice, primarily from Southeast Asia over the coming decade. In Africa and the Middle East, strong demand growth is driven by rapidly expanding income and population, while the prospects of production growth are limited. Altogether, the African and Middle Eastern region accounts for 87 per cent of the increase in world rice trade during the projection period. Nigeria, the world's second largest rice importing country after China, Saudi Arabia and South Africa, is expected to show strong consumption growth over the next decade. After China and Nigeria, the next largest importers are Indonesia, Iran, Iraq, and the Philippines, each purchasing about 1.6 to 2.1 mmt a year by 2025–26. Bangladesh's annual imports are projected to rise rapidly from 640,000 tonnes in 2016–17 to almost 1.1 mmt in 2025–26, due to strong population growth and limited land for expanding the area under rice.

Thailand and Vietnam, the world's largest rice-exporting countries, account for more than 40 per cent of world rice exports and about 54 per cent of the growth in world exports in the coming decade. In Thailand, increasing production and a drawdown of large stocks will enable exports to rise from 3.1 mmt, to 12.9 mmt by 2025–26. Vietnam's exports will increase by 1.1 mmt, rising from 7.0 mmt to almost 8.1 mmt over the projection period. India is projected to remain the second largest exporter during the projection period, with exports increasing by 1.4 mmt and reaching 10.5 mmt by 2025–26. Myanmar and Cambodia are projected to increase production over the next decade. Annual rice exports of Myanmar and Cambodia are projected at 1.6–1.8 mmt by 2024–25.

IGC

Rice trade is projected to grow during most of the projection period, reaching an all-time peak of 44.5 mmt in 2021. However, the annual average growth over the medium term would be markedly less than in the past five years. While imports by China are tentatively anticipated to decline, increased total deliveries to Far East Asia, as well as to sub-Saharan Africa, are expected to underpin growth. Firm demand for high-quality, white and fragrant varieties, including basmati rice, is expected to boost sales to Near East Asia.

After reaching a peak in 2014, and averaging almost 11.0 mmt during 2012–2015, India's rice shipments are projected to contract owing to tighter supplies and rising domestic consumption. Consequently, Thailand is expected to remain the world's biggest exporter, its sales edging higher to a peak of 11.6 mmt by 2021. Only modest changes in exports by Pakistan, the US and Vietnam are forecast. In contrast, shipments by Cambodia and Myanmar could expand strongly, assuming that improvements in quality, infrastructure and logistics result in bigger sales to non-traditional markets.

II.3.2.d Stocks

OECD/FAO

Rice stocks are projected to decline during 2014 through 2019 and then to increase steadily to reach 184.5 mmt by 2024. Most of the increase is likely to be in China, whereas stocks in major exporting countries such as Thailand, Vietnam and India are projected to decline.

USDA

Rice stocks are forecast to decline during 2014 through 2018 and then increase steadily to 101 mmt by 2024.

IGC

Although global rice output is expected to trend higher, it will do so fairly modestly. Together with rising food use, end-season carryover stocks are seen declining during most of the projection period. Furthermore, the stocks-to-use ratio is set to fall to 16 per cent, down by three percentage points on 2015–16. World inventories are seen averaging close to 80.0 mmt during the medium term, a drop of about one-quarter on the prior five years. Although China's stocks are likely to edge lower in coming years, they would still be around 60 per cent of the world total. Reserves held by the major exporters are projected to contract further. Moreover, the average volume of inventories during the medium term would be only 17.8 mmt, almost 50 per cent lower than in the prior five years. Reflecting the government's need to ensure a minimum desired volume, India's stocks are expected to show little change in coming years.

II.3.2.e Price

OECD/FAO

The international rice price is likely to remain under pressure in the short term, as it will take a few years for the government of Thailand to offload the huge stocks accumulated since 2011 under the pledging programme on to the world market. In the longer term, prices in nominal terms are likely to recover, sustained by continued strong demand from countries in Africa, Asia and the Near East, to reach USD 449/mt by 2024. However, prices in real terms are forecast to remain almost unchanged over the next ten years.

II.3.3 Coarse Grains

APPENDIX 1 Figures II.A.11 to II.A.15 provide a graphical representation of the global coarse grain situation

II.3.3.a Production

OECD/FAO

Relative to the base period, world coarse grain production (which apparently includes corn, barley, oats, rye, millet and other coarse grains) in 2024 is projected to increase by 15 per cent to 1,450 mmt. The increase of 194 mmt is likely to be confined to the United States, China, European Union, the Russian Federation and Ukraine. Production growth will mainly be driven by yield improvements, albeit modest, while area expansion is expected to be limited. Land availability is expected to become more binding than in the previous decade. While the price ratio between wheat and coarse grain is expected to remain favourable for wheat, the dominant use of coarse grains to feed animals is expected to remain robust throughout the projection period and drive up production. Among the three major coarse grain producing countries, namely the United States, China and the

Stocks in major exporting countries such as Thailand, Vietnam and India are projected to decline.

End-season carryover stocks are seen declining during most of the projection period.

In the longer term, prices in nominal terms are likely to recover, sustained by continued strong demand from countries in Africa, Asia and the Near East.

Production growth will mainly be driven by yield improvements, albeit modest, while area expansion is expected to be limited.

Continued global expansion of biofuel production during the next decade, although at a slower pace than over the last half decade, should also support higher coarse grain production.

European Union, China is expected to show high growth. India is projected to remain the fourth largest coarse grain producer, with a production of 49 mmt.

USDA

USDA projects total global coarse grain production (which include only corn, sorghum, and barley) at 1,329 mmt by 2024, a 12.5 per cent increase over the projection period. Continued global expansion of biofuel production during the next decade, although at a slower pace than over the last half decade, should also support higher coarse grain production, particularly maize, as yield growth through technological enhancements, and area expansion continue. However, the growth in area is slower for the early years in the projections as low prices induce some countries to reduce planting on marginal cropland. The area under total coarse grains is projected to increase moderately throughout the projection period at an average annual rate of 0.2 per cent. While some countries have the potential to expand arable land, many countries have a limited ability to expand planted area. The growth rate for world average crop yields has been slowing for nearly 2 decades and is projected to slow further in the next 10 years.

FAPRI

FAPRI projection of total coarse grains (includes only corn, sorghum and barley) is 1,271 mmt by 2024, a 14.0 per cent increase over 2014.

IGC

IGC projects global total coarse grain production at 1,370 million tonnes by 2020–21, which include 1,058 million tonnes of maize, 150 million tonnes of barley, 71 million tonnes of sorghum, 22.7 million tonnes of oats, and 14.6 million tonnes of rye.

In the case of maize, gains will be mostly driven by increases in yields, with the harvested area forecast to rise only at about half the rate as before, reaching 181 mha by 2020–21, still more than 2 mha below the 2013–14 peak. With productivity in most large producing countries trending higher, world average yields are seen rising to 5.8 tonnes/ha in 2020–21, versus an estimated 5.6 tonnes/ha in 2015–16.

For barley, the second largest coarse grain crop by volume in the world, global output is forecast to fall in 2016–17 as average yields retreat from the high level of 2015–16, and from 2017–18, demand is expected to sustain an upward trend in sowing. Average world barley yields are projected to improve by close to 1 per cent per annum, taking production to 150 mmt by 2020–21, registering a growth rate of around 2 per cent per annum, a net gain of 5 mmt by volume.

With global prices supported by a surge in shipments to China, the area sown to sorghum has rebounded in recent years, touching a five-year high in 2015–16. Although the area planted to sorghum is expected to rise in the US in 2015–16, world area under shorgumis projected to rise only slowly thereafter. After a stronger than normal increase in world yields over the past five years, mainly in the US, lower yield growth is expected up to 2020–21 and world production is placed at 71 mmt by the end of the forecast period, up slightly from 2015–16.

II.3.3.b Consumption

OECD/FAO

World consumption of coarse grains is projected to increase by about 14 per cent by 2024 compared to the base period to 1,440 mmt, a pace slower than in the previous decade. Consumption growth will be largely driven by expansion in feed demand, accounting for

around 59 per cent of total utilisation in 2024. Modest increases in demand for food are also expected, mostly in developing countries where coarse grains form an important staple. Consumption of coarse grains, predominately maize for biofuel production, after tripling between 2004 and 2014, is expected to slow down during the projection period, mainly in the United States. The major global consumer of coarse grains are the United States and China, which will take a large share of the projected additional global demand, mainly for feed use.

USDA

World consumption of total coarse grains is projected to rise 15 per cent over the next 10 years at 1,341 mmt, mostly corn. Ethanol production in the United States is projected to be relatively flat over the next decade, with most production using maize as the feedstock. About 35 per cent of total maize use in the US is projected to go to ethanol production.

FAPRI

FAPRI projects total coarse grain consumption to reach 1,440 mmt by 2024–25, an increase of 13 per cent over 2014.

IGC

IGC projects total coarse grain consumption, which includes maize, barley, sorghum, oats and rye, to reach 1,375 mmt by 2020–21, close to the OECD/FAO and FAPRI projections, an increase of 7.6 per cent since 2014. Most of the increase is in maize, mostly for feed use, which is projected to increase to successive record highs in each year of the outlook period, with use projected at 1,062 mmt by 2020–21. With meat production expected to continue its long term upswing, maize will remain a central feed ingredient in many parts of the world. Food use of maize is projected to increase steadily, mainly because of population growth in the key consuming countries in Africa, Latin America and parts of Asia. Industrial demand will continue to expand in the five years to 2021, albeit at a slower pace than in the preceding period.

Stronger global feed demand combined with a near 2 per cent annual growth in demand for industrial use, led by the expanding brewing needs in China and Latin America, is seen underpinning consumption gains over the projection period for barley.

Owing to projected gains for feed, food and industrial uses, world demand for sorghum is expected to expand steadily over the medium term, but with average growth seen slowing to below 1 per cent per annum. Global human food consumption is projected to rise further because of population growth. Regarding minor coarse grains, modest growth is projected in oats consumption but rye consumption is projected to decline.

II.3.3.c Trade

OECD/FAO

Total coarse grain trade is projected at around 179 mmt by 2024, an increase of 19 per cent over 2014. The United States is projected to remain the main coarse grain exporter, followed by Argentina and Brazil.

USDA

Coarse grain trade (which includes trade in corn, sorghum and barley) is projected to increase by 20.2 mmt (13 per cent) between 2015–16 and 2024–25 at 178 mmt.

FAPRI

Coarse grain trade, which includes trade in corn, sorghum and barley, is projected to

Consumption of coarse grains, predominately maize for biofuel production, after tripling between 2004 and 2014, is expected to slow down during the projection period.

increase to 165 mmt by 2024–25, somewhat lower than the USDA projection. (FAPRI data do not include inter-regional trade)

IGC

Total coarse grain trade (including trade in corn, sorghum, barley, oats, rye, and other minor coarse grains) is projected at 175 mmt by 2020–21, higher than the FAO projection of 165 mmt. Most of the increase is in corn trade, which is projected to reach 132 mmt by 2020–21, followed by barley projected at 27 mmt, and sorghum at 13 mmt.

II.3.3.d Stocks

OECD/FAO

While OECD/FAO and FAPRI show an increase in stocks of total coarse grains (covered by these agencies), USDA and IGC project a downward trend in coarse grain stocks (covered by them) during their respective projection periods.

II.3.3.e Prices

OECD/FAO

The recent sharp increase in world inventories is likely to keep maize prices under downward pressure at least for another year; prices are expected to drop further to US\$170/mt in 2015. From 2016, the price is expected to recover to US\$194/mt by 2024. However, this will still imply a decline in prices in real terms. Based on this projection, the maize to wheat price ratio would reach around 71 per cent, which would be in line with the ratios observed before the start of the high price period in 2007–08 when wheat and coarse grain prices started to converge. In contrast, FAPRI projects a decline in corn prices after 2018, reaching US\$198.8/mt in 2024.

II.3.4 Oil Seeds

APPENDIX 1 Figures II.A.16 to II.A.20 provide graphical representation relating to global oilseed situation

II.3.4.a Production

OECD/FAO

During the outlook period, global oilseeds production (which includes almost all oilseeds) is expected to continue its expansion, but at a lower growth rate of 1.6 per cent per annum, compared to the 3.5 per cent per annum registered during the last decade, to reach 516 mmt by 2024. Growing demand for protein meal has been the main driver behind the expansion of oilseed production in recent years. This has increased the share of protein meal in the value of oilseeds and favoured soybeans over other oilseeds. Production of rapeseed in Canada and the European Union is expected to grow much slower than in the previous decade as high oil-containing oilseeds like rapeseed are more affected by the slower growth in vegetable oil prices.

USDA

USDA oilseed production data covers only soybeans, global production of which is projected to reach 375 mmt by 2024, an increase of 18 per cent over 2014.

FAPRI

FAPRI projects total oilseed production (includes soybeans, rapeseed, peanut, and

The recent sharp increase in world inventories is likely to keep maize prices under downward pressure at least for another year.

During the outlook period, global oilseeds production (which includes almost all oilseeds) is expected to continue its expansion.

sunflower seed) at 455 mmt by 2021, an increase of 11 per cent over the base period, as a result of higher area and yields.

IGC

IGC projection includes soybeans and rapeseed/mustard. After falling slightly in 2015–16, production of oilseeds is projected to expand continuously during the next five years. Being the most abundantly produced and consumed oilseed, the increase will be largely due to soybeans as major growing countries boost plantings in response to rising consumption and trade. Together with yield gains, total oilseeds output (soybeans + rapeseed) is anticipated to reach around 420 mmt in 2020–21, a net increase of 35 mmt.

Boosted by attractive prices relative to other crops against the backdrop of growth in consumption and trade, soybean plantings and output have risen sharply in recent years. After a possible decline in planting in 2016–17 in response to abundant availability and depressed market values, the projection is that the area under soybean will reach 130 mha by 2020–21, 7 mha higher than in 2015–16. Together with potential yield improvements, world soybean production is projected to reach 346 mmt in 2020–21, representing a net increase of 27 mmt or 9 per cent on 2015–16.

After a notable fall in 2015–16, world rapeseed/canola production is projected to recover during the next five years, underpinned by increased planting and yield improvements. Despite competition from other crops in some years, the global area under rapeseed is projected to expand continuously during the next five years, as growing consumption and trade encourage farmers to boost plantings. Together with assumed productivity improvements, total production is projected to climb to an all-time peak of 74.1 mmt by 2020–21, representing an 11 per cent increase over 2015–16.

II.3.4.b Consumption/Crush

OECD/FAO

Globally, crushing of oilseeds into meal (cake) and oil dominates the use of oilseeds; direct food use is significant only in a few Asian countries. Based on the projected smaller growth rate in global oilseed production, annual average growth in world oilseed crush is expected to be 1.6 per cent compared to 3.8 per cent in the previous decade. This, in absolute terms, translates into an expansion of 82 mmt over the outlook period at 451 mmt, with most of the increase in China. Including food, feed, and other uses, total oilseed consumption is projected at 515.7 million tonnes.

USDA

USDA projects global soybean consumption (crush + other use) to increase to 375 million tonnes (including crush of 360 mmt) during the projection period,

IGC

Global soybean consumption is expected to continue increasing, but more slowly than in the past to a record of 349 mmt in 2020–21, some 32 mmt higher than in 2015–16. Growth will again be underpinned by demand for soymeal from the animal feed sector – especially in Asia – spanning livestock, poultry and aquaculture, with a relatively smaller contribution from food and industrial use. In addition to being the most abundantly produced of all oilseed meals, the high-protein quality and nutritional value of soymeal compared to alternatives should ensure its continued attractiveness as a key ingredient in livestock, poultry and aquaculture feed mixes.

After dipping in 2015–16 as consumers shifted a portion of their requirements to ample

The global area under rapeseed is projected to expand continuously during the next five years, as growing consumption and trade encourage farmers to boost plantings.

International oilseeds trade accounts for a consistently high share of global production projected at around 31 per cent during the next decade.

Following heavy contraction in recent years, world rapeseed trade is anticipated to expand during the medium term on strengthening demand from the EU and China.

and competitively priced soybean supplies, global use of rapeseed is anticipated to rise – albeit more slowly than in the past – to 74.1 mmt on demand for rapeseed/canola products from feed, food and industrial sectors. Thus, combined soybeans/rapeseed consumption in 2020–21 is projected at 423 mmt.

II.3.4.c Trade

OECD/FAO

International oilseeds trade accounts for a consistently high share of global production projected at around 31 per cent during the next decade at 157 mmt. The main exporters are United States and Brazil, which together is projected to account for about one-third of world exports in 2024. Imports will be mostly confined to Asia (mainly China). Growth in world trade in oilseeds is expected to slow down considerably in the next decade compared to the previous decade. This development is directly linked to the projected slowdown of oilseed crush in China.

USDA

World soybean trade is projected to rise rapidly during the next 10 years, climbing to 157 mmt by 2024–25, with most of the increase in China.

FAPRI

Total oilseed trade which includes soybeans, rapeseed, sunflower, and peanut, is projected at 132.8 mmt by 2021–22, significantly below projection by other agencies. (FAPRI trade data do not include inter-regional trade.)

IGC

Global soybean trade registered strong growth in the past decade, linked to China's expanding requirements. While annual increases are likely to be moderate, rising deliveries to that country – as well as to other relatively small markets in Asia – are expected to remain pivotal in future years. Trade is anticipated to rise by more than 2 per cent per annum over the next five seasons, to 141.3 million tonnes in 2020–21, with China and EU accounting for a major share of total shipment. The share of the three major exporters in world trade (Brazil, the United States, and Argentina) is projected to be maintained at close to 90 per cent. Brazil is anticipated to be the world's largest exporter throughout the medium term, its sales averaging close to 58.0 mmt – about 25 per cent more than in the previous five years, and significantly higher than annual US dispatches. Argentina's shipments are expected to be much smaller.

Following heavy contraction in recent years, world rapeseed trade is anticipated to expand during the medium term on strengthening demand from the EU and China. Accounting for about 60 per cent of traded volumes, Canada is set to remain the biggest supplier to world markets.

II.3.4.d Stocks

OECD/FAO

Total oilseed stocks, after peaking at 51.0 mmt in 2015 are projected to decline gradually to 44.4 mmt in 2024, but will still be large enough to buffer most unanticipated production shortfalls in the short-term.

USDA

USDA projects global soybean stocks to remain at a high level of over 80 mmt through

2019 and then to gradually decline to 76 mmt by 2024. USDA soybean stocks projections are significantly above projections by other agencies for unknown reasons.

FAPRI

FAPRI's projection of soybean stocks by 2021 is 60 mmt, registering a steady increase from around 57 mmt in the initial projection period.

IGC

After reaching an all-time high in 2015–16, oilseed inventories (includes only soybean and rapeseed) are seen falling by around one-quarter during the next five years, with nearly all of the adjustment due to the major exporters. Nevertheless, the average level of stocks will still be markedly higher than in the previous five years.

Almost entirely reflecting bigger crops and supplies in the major exporters, global soybean carryovers have accumulated markedly at 49.1 mmt, 2015–16 carryovers are forecast to be the highest ever. While world output is seen trending higher during the medium term, consumption is set to grow more quickly, resulting in a contraction in stocks to 36.5 mmt in 2020–21. Nevertheless, inventories would still be historically comfortable, averaging 41.9 mmt during the outlook period, up 17 per cent on the previous five years.

World carryovers of rapeseed are projected to reach 5.8 mmt in 2020–21, mainly on accumulation in Canada after earlier steep declines. While this equates to an increase of 14 per cent on 2015–16, stocks would still be markedly below the 2009–10 record of 7.7 mmt. Furthermore, inventories are seen averaging 5.4 mmt over the medium term – broadly unchanged over the prior five years.

II.3.4.e Prices

OECD/FAO

After an initial downward correction, prices of oilseeds are expected to increase over the medium term due to strong demand for vegetable oils and oil meals.

FAPRI

After peaking at US\$500 per metric tonne in 2014, soybean prices are projected to show a steady decline reaching US\$465 per metric tonne in 2021. This is somewhat contradictory to OECD/FAO projections for total oilseeds.

II.3.5 Vegetable Oils

APPENDIX 1 Figures II.A.21 to II.A.25 provide graphical representation relating to global vegetable oil situation

II.3.5.a Production

OECD/FAO

OECD/FAO production projection for vegetable oils, which include the oil from crushing oilseeds such as soybeans, rapeseed/mustard, groundnut, and sunflower seed (accounting for around 53 per cent of total production) and palm oil (36 per cent), palm kernel, coconut and cottonseed (11 per cent). World vegetable oil production will remain concentrated among a few countries in the coming decade, which include Indonesia, Malaysia, China, the European Union, the United States, Argentina, Brazil, and India. Despite a slowdown in area expansion, significant growth will still occur in the main palm oil producing regions of Indonesia and Malaysia. The other source of growth is soybean oil.

Despite a slowdown in area expansion, significant growth will still occur in the main palm oil producing regions of Indonesia and Malaysia.

Rising per capita income is expected to lead to an increase in per capita vegetable oil consumed as food mostly in developing economies.

Indonesia and Malaysia will continue to account for almost two-thirds of total vegetable oil exports during the coming decade.

India's import dependency rates (imports divided by consumption) is projected to reach 66 per cent by 2024, almost entirely for food use compared to 39 per cent at the global level.

World total vegetable oil production is projected to increase by 20 per cent to 210.5 mmt over the outlook period ending 2024 from 175.9 mmt in 2014, with most of the increase in palm oil. Malaysia's and Indonesia's palm oil production is projected to grow on average at about 2.9 per cent per annum, a slower rate than in the past as land restrictions, environmental restraints and labour costs become bigger constraints.

USDA

Soybean oil production is projected to reach 62.4 mmt by 2024, an increase of around 15 mmt during the projection period.

FAPRI

FAPRI projects global total vegetable oil production (which includes soybean, rapeseed, sunflower, palm and peanut) at 171.6 mmt by 2021, an increase of 22 mmt since 2014.

II.3.5.b Consumption

OECD/FAO

OECD/FAO projects total vegetable oil consumption to increase to 210.4 mmt in 2024, an increase of 20 per cent since 2014. Rising per capita income is expected to lead to an increase in per capita vegetable oil consumed as food mostly in developing economies. It is projected that the use of vegetable oil as feedstock for biodiesel will increase by 2.1 per cent per annum over the next ten years compared to 19.6 per cent per annum in the previous decade when biofuel policies were taking effect. The share of vegetable oil used to produce biodiesel worldwide is expected to remain constant at 13 per cent of world vegetable oil demand in 2024, mainly confined to Indonesia, Thailand, Argentina, and European Union. In the United States, the use of maize oil for biodiesel production has emerged and will continue to substitute for soybean oil as biodiesel feedstock but overall biodiesel produced from vegetable oils in the United States is expected to stagnate.

USDA

USDA projection of global soybean oil consumption in 2024 is 62.4 mmt, an increase of about 14 mmt during the projection period.

FAPRI

FAPRI projects global total vegetable oil consumption to increase at a steady pace to 170 mmt in 2021 from 148 mmt in 2014. This growth is driven by both expanding food and industrial use. Because of their rising incomes, China and India present the highest growth in demand, almost entirely for food use.

II.3.5.c Trade

OECD/FAO

OECD/FAO projects total vegetable oil trade to increase steadily from around 70 mmt in 2015 to 81.8 mmt in 2024. Exports continue to be dominated by a few players, although a large share, around 39 per cent, of production is traded. Indonesia and Malaysia will continue to account for almost two-thirds of total vegetable oil exports during the coming decade. Argentina is expected to be the third largest exporter with a share of 8 per cent of the world vegetable oil market as Argentina's differential export tax system continues to favour exporting oilseed products over oilseeds.

Vegetable oil imports are less concentrated than oilseeds, with India, the European Union, and China, expected to represent 42 per cent, with India alone accounting for 22 per cent.

India's import dependency rates (imports divided by consumption) is projected to reach 66 per cent by 2024, almost entirely for food use compared to 39 per cent at the global level.

USDA

World soybean oil imports are projected to climb by 3.3 mmt (30 per cent) to 14.5 mmt over the 2016–17 to 2025–26 projection period, bolstered by rising food and industrial use. Growth in world soybean oil trade is expected to continue to be constrained by competition with palm oil, which is the leading vegetable oil traded internationally.

Although palm oil continues to account for the largest share of India's vegetable oil imports, India surpassed China in 2013–14 to become the world's largest soybean oil importing country. In the projections, India's soybean oil imports are projected to climb 39 per cent to 3.9 mmt in 2025–26. Factors contributing to the continued growth of India's vegetable oil imports include burgeoning demand spurred by income and population growth, limited area for expanding oilseed production, and lack of irrigation. Depending on the price parity among soybean oil, palm oil, and sunflower seed oil, the proportion of various oils imported could change, as was the case with palm oil in recent years. Low yields, associated with variable rainfall and low input use, also inhibit growth of oilseed production. A rapid increase in China's soybean imports for crushing in recent years caused soybean oil imports to decline during 2014–15, but subsequently rebounded and projected to increase further in the next decade. Income and population growth in North Africa, the Middle East, and Latin America will also contribute to gains in soybean oil demand and imports.

Argentina, United States, and Brazil are the top three ranking soybean oil exporters. Their combined shipments are projected to account for almost three-quarters of world soybean oil exports during the coming decade.

Argentina, supported by large crushing capacity, small domestic market for soybean oil and an export tax structure that favours exports of oil and meal rather than soybean oil, is projected to emerge as the largest exporter with a market share of 54 per cent of world soybean oil exports by 2025–26. Nonetheless, the export growth will be tempered as more soybean oil is used to produce biodiesel. Brazil's soybean oil exports are projected to decrease in 2016–17 to 1.1 mmt, but the expansion of soybean production into new areas of cultivation is expected to enable the country to increase soybean oil exports gradually to 1.3 mmt by 2025–26, although the country is expected to use more soybean oil for biodiesel production. US soybean oil exports are projected to rise steadily in the projections and reach 1.4 mmt in 2025–26, remaining the world's second-largest soybean oil exporter, with nearly 10 per cent of global trade.

FAPRI

FAPRI projects global total vegetable oil trade (soybean, rapeseed, sunflower, palm, and peanut) at 65.8 mmt in 2021.

II.3.5.d Stocks

OECD/FAO

The carryover stock level of total vegetable oils is projected to register a steady albeit modest growth over the projection period, reaching 25.2 mmt in 2024, an increase of about 7 per cent over the base period.

USDA

USDA projection, which covers only soybean oil, places global soybean oil stocks at 4.2

After the initial downward correction, all prices of the oilseed complex are expected to increase over the medium-term due to strong demand for vegetable oils and protein meal.

Based on the assumption of normal weather conditions, global sugar production is projected to increase by 2.2 per cent per annum in the coming decade .

mmt by 2024, registering a growth of 18 per cent during the projection period.

II.3.5.e Price

OECD/FAO

After the initial downward correction, all prices of the oilseed complex are expected to increase over the medium-term due to strong demand for vegetable oils and protein meal. OECD/FAO's indicative price of vegetable oils is projected at US\$839.4 per metric tonne, an increase of 6.5 per cent over 2014.

FAPRI

Soybean oil prices (CIF Rotterdam) are forecast to remain stable during the projection period at around US\$1,320 per metric tonne. However, palm oil prices are projected to increase marginally to US\$1,205 per metric tonne in 2021 from US\$1,141.5 in 2015.

II.3.6 Sugar

APPENDIX 1 Figures II.A.26 to II.A.30 provide graphical representation relating to global sugar situation

II.3.6.a Production

OECD/FAO

Based on the assumption of normal weather conditions, global sugar production is projected to increase by 2.2 per cent per annum in the coming decade to reach nearly 220 mmt by 2024, an increase of around 38 mmt or 21 per cent over the base period (2012–14). Most of the additional production will originate in countries producing sugarcane rather than sugar beet; the increase in production will be attributable more to area expansion, notably in Brazil, even though yield improvements are foreseen for sugar crops and sugar processing. A higher share of the world's sugarcane production will be used for the production of ethanol, which will rise from about 20 per cent during the base period to 26 per cent in 2024. Over the medium term, alternative sweeteners, in particular high fructose corn syrup, are set to compete further with sugar in the sweetener market. Given the dual use of sugarcane as feedstock for ethanol and sugar production in Brazil, the main sugar producer, changes in the ethanol to sugar price ratio have a direct effect on sugar production and price. Sugar production in the Asia-Pacific region is expected to increase by 2.1 per cent per annum until 2024. This expansion is driven mainly by higher output growth notably in China, Thailand and Pakistan.

The prospect for the sugar market over the medium-term in India will continue to be marked by a structural production cycle, although the amplitude of the production cycle will be dampened as a result of recent reforms introduced to address the millers' liquidity constraints. In Africa, sugar output is projected to increase by 54 per cent by the end of 2024 as a result of production expansion in Sub-Saharan countries and Egypt. In developed countries, over the coming decade, production is expected to grow the fastest in Australia averaging 1.4 per cent per annum, followed by the European Union and North America.

FAPRI

World sugar production is projected to increase by 30 per cent during the projection period to 212.7 mmt in 2021, from 187.8 mmt in 2015.

II.3.6.b Consumption

OECD/FAO

Being less volatile than production, global consumption of sugar is projected to grow at around 1.9 per cent per annum, slightly higher than in the previous decade, to reach 214 mmt in 2024. Growing concerns are raised about health problems that can be caused by excessive sugar consumption in most developed and developing countries, but the prospects are optimistic with regard to the average level of per capita consumption, which is projected to increase marginally to 26.7 kg by 2024. Demand in developing countries will continue its fast growth, driven by rising incomes, urbanisation and growing populations, although with considerable variation between countries. India's per capita consumption of sugar is projected at 22.2 kg, significantly below the global average but is catching up.

FAPRI

OECD/FAO projects world sugar consumption to increase by 16 per cent during 2013–14 through 2024–25 to reach 212 mmt. However, the OECD/FAO projection of around 202 mmt for 2021–22 is 10 mmt higher than the FAPRI projection of 212 million tonnes for 2021/22.

II.3.6.c Trade

OECD/FAO

Over the coming decade, sugar exports are projected to increase to 73 mmt in 2024 from 57 mmt in 2015. Exports will remain highly concentrated, with Brazil keeping its top position, followed by Thailand and Australia. It is anticipated that Brazil will account for about 44 per cent of world trade in 2024, the level prevailing during the base period. In Thailand, the world's second largest exporter, shipments are expected to increase by nearly 63 per cent, driven by a steady growth in production and export availabilities. Similarly, in Australia, with rising investment in irrigation, expansion of the sugarcane area as well as modernisation of milling capacities, higher production should boost export sales over the medium term. According to the outlook projections, Asia-Pacific, and Africa will see the strongest growth in sugar demand, and this will influence the growth in imports for those regions. Imports to the European Union will decline but will remain high. At the beginning of the period, China and Indonesia were the leading importers after the European Union, but over the projection period, Indonesia is expected to become the leading sugar importer. The United States, traditionally a sugar deficit region, will continue to be influenced by domestic policy, which tends to manage the amount of domestic production and the level of imports. The trade outlook for India may depend on government policy. India's occasional large trade volumes always have significant effects on international sugar prices.

FAPRI

FAPRI projects global sugar trade to increase steadily to 55.5 mmt by 2021 from 51.3 mmt in 2015, significantly below the OECD/FAO projection of 65.7 million tonnes for 2021.

II.3.6.d Stocks

OECD/FAO

There has been a large accumulation of stocks in many countries since the beginning of the surplus phase in 2011. After a significant decline in global sugar stocks in 2015 and 2016, due to higher consumption in response to lower prices, sugar stocks are projected to

Being less volatile than production, global consumption of sugar is projected to grow at around 1.9 per cent per annum, slightly higher than in the previous decade.

Exports will remain highly concentrated, with Brazil keeping its top position, followed by Thailand and Australia.

Thailand, the world's second largest exporter, shipments are expected to increase by nearly 63 per cent, driven by a steady growth in production and export availabilities

World sugar prices are expected to continue to be volatile and to oscillate over the course of the outlook period around a moderately upward trend but to decline in real terms.

increase steadily to reach 78.5 mmt in 2024 from the low 64.7 mmt in 2016.

According to FAPRI's projection, global sugar stocks will be 39 mmt in 2021, 30 mmt below the OECD/FAO projection of 69.3 million tonnes in that year. The reason for this large discrepancy is unknown.

II.3.6.e Price

OECD/FAO

World sugar prices are expected to continue to be volatile and to oscillate over the course of the outlook period around a moderately upward trend but to decline in real terms. International sugar prices have been on a declining trend since 2011, driven by four successive global production surpluses. With the world sugar market entering the deficit phase of the sugar production cycle at the start of the outlook period, prices should move upward as sugar producers adjust production to the currently prevailing lower sugar quotations. Nominal prices are then projected to strengthen more in the following two years, before declining as the market enters its downturn phase. This global price pattern mostly reflects longstanding production cycles in the leading sugar producing countries of Asia, particularly in India.

The indicator world white sugar price (Euronet, Liffe futures Contract No. 407, London) is projected to reach US\$434/t in nominal terms in 2024 and the white sugar premium is projected to narrow over the coming decade.

CHAPTER III

Medium-term Outlook for Food Commodity Sector Growth: India Compared to World

III.1 Comparison of Medium-term Projections by Various Agencies

Four international institutions, namely OECD/FAO, ERS/USDA, FAPRI and IGC have come out with their medium term projections regarding the global agricultural outlook, which includes projections for India too. In this chapter, a comparative analysis of the global and Indian agricultural outlook has been provided.

The data series and a graphical representation pertaining to production, consumption, trade, stocks, prices, and per capita consumption projection pertaining to India by the four agencies, from which the projected growth rates are derived, are given in APPENDIX2.

III.1.1 Wheat

Table III.1: Comparison of Annual Compound Growth Rates of Wheat (%) Projected by Various Agencies

| Parameter | Global/India | OECD/FAO | USDA | FAPRI | IGC |
|------------------------|--------------|----------|-------|--------|-------|
| Production | Global | 0.919 | 0.816 | 0.623 | 0.485 |
| | India | 1.396 | 1.776 | 1.302 | 2.051 |
| Consumption | Global | 1.096 | 0.937 | 1.061 | 0.738 |
| | India | 2.154 | 1.386 | 0.406 | 2.209 |
| Trade | Global | 0.982 | 1.622 | 2.104 | 0.949 |
| | India | -4.842 | 3.909 | 33.208 | NA |
| Per capita Consumption | Global | -0.010 | NA | NA | NA |
| | India | 1.116 | NA | NA | NA |
| Price | Global | 0.350 | NA | -0.328 | NA |
| | India | 4.248 | NA | NA | NA |

Note: Please note that these growth rates are not comparable in absolute terms and are only indicative as the projection periods are different for various agencies as indicated earlier. For OECD/FAO= 2015 to 2024 (10 Years); ERS/USDA= 2016 to 2025 (10 Years); FAPRI= 2015 to 2021 (7 Years); IGC= 2016–17 to 2020–21 (5 Years).

Assessment

- **Production:** The projected annual production growth rates by various agencies, although different in magnitude, are generally in agreement that India's wheat production growth rate will be higher than the global growth rate (Table III.1). IGC is most optimistic with production growth projected at 2.1 per cent per annum compared with 0.49 per cent globally to reach 110 million tonnes. Projections by other agencies range from 110 million by USDA and 96.8 million tonnes by IGC (APPENDIX2 Figure III. A.1)
- **Consumption:** Wheat consumption growth rate in India is also projected to outstrip the global level by most agencies, except by FAPRI (Table III.1). Total wheat

The projected annual production growth rates by various agencies, although different in magnitude, are generally in agreement that India's wheat production growth rate will be higher than the global growth rate.

Wheat consumption growth rate in India is also projected to outstrip the global level by most agencies, except by FAPRI.

India’s wheat export growth is projected to be significantly negative by OECD/FAO at - 4.8 per cent per annum. Other agencies, however, are optimistic about India’s export outlook.

Wheat price in India is projected to grow at a much higher rate of 4.25 per cent annually in rupee terms.

The projected annual rice production growth rate of 1.76 per cent by OECD/FAO and IGC, and 1.19 per cent by the USDA for India are higher than the global production growth rate in the range of 1.0 to 1.3 per cent by these agencies

consumption projected by OECD/FAO for 2024 is 108.6 million tonnes (APPENDIX2 Figure III. A.2). Projections by other agencies are also close. With the policy tilted towards increasing consumption of cereals to enhance food security such as the National Food Security Act (NFSA), OECD/FAO projects India’s per capita wheat consumption to grow at 1.12 per cent per annum to reach 69 kg/year in 2024 compared to a marginally negative world per capita consumption growth rate to reach of 66.9 kg/year, below the Indian level.

- **Trade:** While year-on-year growth in global wheat trade is projected to remain robust between 1 per cent and 2 per cent by most agencies, India’s wheat export growth is projected to be significantly negative by OECD/FAO at -4.8 per cent per annum. Other agencies, however, are optimistic about India’s export outlook (Table III.1). IGC projects India to be a net importer of wheat, albeit a small one, during most of the projection period (APPENDIX2 Figure III. A.3)
- **Price:** While OECD/FAO projects a year-on-year (y -o-y) growth rate of wheat prices globally in dollar terms at a modest 0.35 per cent to reach US\$272/MT, wheat price in India is projected to grow at a much higher rate of 4.25 per cent annually in rupee terms (Table III.1) reaching Rs.22,924 per tonne in 2024. FAPRI projects world wheat prices at US\$269 per MT, close to OECD/FAO projection. (APPENDIX2 Figure III. A.6)

III.1.2 Rice

Table III.2: Comparison of Annual Compound Growth Rates of Rice (%) Projected by Various Agencies

| Parameter | Global/India | OECD/FAO | USDA | FAPRI | IGC |
|------------------------|--------------|----------|-------|-------|--------|
| Production | Global | 1.309 | 0.982 | NA | 1.004 |
| | India | 1.760 | 1.192 | NA | 1.755 |
| Consumption | Global | 1.188 | 0.758 | NA | 0.632 |
| | India | 2.154 | 1.386 | 0.406 | 2.209 |
| Trade | Global | 2.426 | 1.775 | NA | 1.148 |
| | India | 0.000 | 0.231 | NA | -6.987 |
| Per capita Consumption | Global | -0.010 | NA | NA | NA |
| | India | 1.116 | NA | NA | NA |
| Price | Global | 1.490 | NA | NA | NA |
| | India | 5.137 | NA | NA | NA |

Note: Please note that these growth rates are not comparable in absolute terms and are only indicative as the projection period are different for various agencies. For OECD/FAO= 2015 to 2024 (10 Years); ERS/USDA= 2016 to 2025 (10 Years); FAPRI= 2015 to 2021 (7 Years,); IGC= 2016-17 to 2020-21 (5 Years).

Assessment

- **Production:** The projected annual rice production growth rate of 1.76 per cent by OECD/FAO and IGC, and 1.19 per cent by the USDA for India are higher than the global production growth rate in the range of 1.0 to 1.3 per cent by these agencies (Table III.2). As in the case of wheat, OECD/FAO’s projection for rice for India is the most optimistic with production projected at 122.6 million tonnes by 2024 (APPENDIX2 Figure III. A.7), growing at a rate of 1.76 per cent per annum compared with the global growth rate of about 1 per cent per annum to reach 564 mmt, led mostly by yield growth. Several government programmes and initiatives such as the National Food Security Mission (NFSM), Rashtriya Krishi Vikas Yojana (RKVY), and Bringing Green Revolution in Eastern India (BGREI) to increase production and

productivity, supported by anticipated higher support prices to farmers in line with the cost of production, and an increased focus on bringing more area under assured irrigation are factors likely to contribute to higher yield growth in India. IGC projection of Indian rice production, although available only up to 2020, at 114.5 million tonnes is close to OECD/FAO projection of 114.9 million tonnes for 2020, but the USDA projection is marginally lower at 112.5 million tonnes in 2020 and 117.1 million tonnes in 2024. .

- **Consumption:** The growth rate of rice consumption in India is projected to be almost twice the global growth rate by all the agencies. As in the case of wheat, with government policies such as the National Food Security Act (NFSA) focused on increasing consumption of cereals to enhance food security, OECD/FAO projects per capita rice consumption in India to reach 78.2 kg/year in 2024, compared to 74.3 kg/year in 2014, about 20 kg/year above the global per capita rice consumption level of about 58.4 kg/year (APPENDIX2 Figure III. A.9)
- **Trade:** Global rice trade y-o-y growth is projected at 2.43 per cent by OECD/FAO to touch 52.2 million tonnes in 2024, 1.78 per cent by USDA to touch 49.7 million tonnes also in 2024, and 1.15 per cent by IGC to touch 44.5 million tonnes in 2020 (Table III.2). However, Indian net rice exports growth are projected to grow at zero or negative rate during the projection period at around 7 million tonnes by OECD/FAO and IGC (APPENDIX2 Figure III. A.10), but somewhat higher at 10 to 11 million tonnes by USDA. IGC also projects a negative growth rate of 7.0 per cent at 6.9 million tonnes in 2019. This is due to rising production cost, growing domestic consumption, and competition from other traditional exporting countries such as Thailand and Vietnam, and new emerging exporters such as Myanmar and Cambodia.
- **Price:** OECD/FAO projects Indian rice price in nominal terms to increase steadily at 5 per cent per annum (Table III.2) to Rs.47,497 per tonne by 2024 (APPENDIX2 Figure III. A.12) compared to an indicative global price increase of 1.5 per cent to \$449.4 per tonne (in real terms). The global rice price increase over the projected period is expected to be restrained reflecting large supplies accumulated earlier in this decade, particularly in exporting countries in Asia. This will take long to offload on the market and will weigh on international prices at least for a couple of years. After this, the nominal rice price is projected to recover but real prices will continue to fall. Other agencies have not projected global and international prices.

The growth rate of rice consumption in India is projected to be almost twice the global growth rate by all the agencies.

Indian net rice exports growth are projected to grow at zero or negative rate during the projection period at around 7 million tonnes.

OECD/FAO projects Indian rice price in nominal terms to increase steadily at 5 per cent per annum.

III.1.3 Coarse Grains

Table III.3: Comparison of Annual Compound Growth Rates of Coarse Grains (%) Projected by Various Agencies

| Parameter | Global/India | OECD/FAO | USDA | FAPRI | IGC |
|------------------------|--------------|----------|--------|--------|--------|
| Production | Global | 1.270 | 1.079 | 1.242 | 1.096 |
| | India | 2.701 | 2.164 | 0.494 | 1.266 |
| Consumption | Global | 1.375 | 1.350 | 1.169 | 1.356 |
| | India | 2.619 | 2.264 | 1.518 | NA |
| Trade | Global | 1.904 | 0.748 | 3.368 | 0.815 |
| | India | 3.434 | -2.001 | NA | 10.364 |
| Per capita Consumption | Global | 0.696 | NA | NA | NA |
| | India | 1.534 | NA | 0.013 | NA |
| Price | Global | 1.215 | NA | -0.219 | NA |
| | India | 3.977 | NA | NA | NA |

Note: Please note that these growth rates are not comparable in absolute terms and are only indicative as the contents commodity group (coarse grains) and projection period are different for various agencies. For OECD/FAO= 2015 to 2024 (10 Years); ERS/USDA= 2016 to 2025 (10 Years); FAPRI= 2015 to 2021 (7 Years); IGC= 2016–17 to 2020–21 (5 Years).

Assessment

- Production:** All agencies project that Indian coarse grain production will grow at an annual compound growth rate well above the global total coarse grain growth rate (Table III.3), mostly driven by maize. OECD/FAO projects Indian total coarse grain production (includes all major and minor coarse grains) to grow at an annual compound growth rate of 2.7 per cent against 1.27 per cent globally to reach 48.7 million tonnes by 2024 (APPENDIX2 Figure III. A.13). The USDA projections are somewhat less optimistic about India with an annual compound growth rate of 2.16 per cent compared to 1.08 per cent globally, with production estimated at 36.8 million tonnes (includes corn, sorghum, and barley). FAPRI projects Indian coarse grain production growth at 0.494 per cent, lower than the global growth rate of 1.242 per cent to reach 27 million tonnes (includes corn and sorghum). The IGC projection is the most optimistic at 44.7 million tonnes in 2020, (includes corn, barley, sorghum, rye, oats, and other coarse grains), implying an estimated annual growth rate of 1.27 per cent.
- Consumption:** India's total coarse grain consumption growth rate is projected to outpace global consumption growth by all agencies (Table III.3). OECD/FAO projects an annual growth rate of 2.62 per cent in Indian total coarse grain consumption, estimated to touch 45.6 million tonnes by 2024 (APPENDIX2 Figure III. A.14) compared to the global growth rate of 1.38 per cent with global consumption expected to touch 1,440 million tonnes. However, on a per capita basis, Indian coarse grain consumption (human) is projected to remain significantly below the world per capita consumption (APPENDIX2 Figure III. A.15).
- Trade:** OECD/FAO projections are mildly optimistic about India's total coarse grain exports, mainly consisting of maize and small quantities of barley and sorghum in the medium term. At an annual growth rate of 3.43 per cent during the projection period (Table III.3), exports are projected to reach 2.84 million tonnes in 2024 (APPENDIX2 Figure III.A.16), which is only a miniscule share of the global trade of 178 million tonnes. The IGC projects a robust trade growth rate of 10.36 per cent per annum for India, with estimated exports of 2.5 million tonnes by 2020, while global trade, growing at 0.82 per cent per annum will touch 175 million tonnes. FAPRI projections

All agencies project that Indian coarse grain production will grow at an annual compound growth rate well above the global total coarse grain growth rate.

India's total coarse grain consumption growth rate is projected to outpace global consumption growth by all agencies.

OECD/FAO projections are mildly optimistic about India's total coarse grain exports, mainly consisting of maize and small quantities of barley and sorghum in the medium term.

indicatethat India will be a growing importer of coarse grains during the projection period and imports will reach 4.5 million tonnes by 2024. USDA is also pessimistic about India's coarse grain export prospects and shows a negative growth rate of 2 per cent per annum.

- **Price:** OECD/FAO projects the world price of all coarse grains to increase steadily at 1.22 per cent per annum to reach US\$193.7/MT in 2024, which is also close to FAPRI's projection. However, Indian indicative coarse grain price is projected to rise more sharply at around 4 per cent per annum to reach Rs.25,310 per tonne in nominal terms by 2024 (APPENDIX2 Figure III. A.17).

III.1.4 Total Oilseeds

Table III.4: Comparison of Annual Compound Growth Rates of Total Oilseeds (%) Projected by Various Agencies

| Parameter | Global/India | OECD/FAO | USDA | FAPRI | IGC |
|------------------------|--------------|----------|--------|--------|-------|
| Production | Global | 1.445 | 1.759 | 1.503 | 1.399 |
| | India | 2.205 | 3.724 | 1.471 | 2.660 |
| Consumption | Global | 1.497 | 2.270 | 1.738 | 2.227 |
| | India | 2.078 | 3.738 | 1.516 | NA |
| Trade | Global | 1.497 | 2.270 | 1.738 | 2.227 |
| | India | -0.373 | -0.270 | -1.273 | NA |
| Per capita Consumption | Global | NA | NA | NA | NA |
| | India | NA | NA | NA | NA |
| Price | Global | 1.192 | NA | -1.037 | NA |
| | India | 4.534 | NA | NA | NA |

Note: Please note that these growth rates are not comparable in absolute terms and are only indicative as the commodity coverage and projection period are different for various agencies. For OECD/FAO= 2015 to 2024 (10 Years); ERS/USDA= 2016 to 2025 (10 Years); FAPRI= 2015 to 2021 (7 Years;); IGC= 2016/17 to 2020/21 (5 Years). Total oilseeds included in the OECD/FAO projection include all oilseeds such as soybeans, rapeseed/mustard, groundnut, sunflower seed, cotton seed, copra, etc. In the case of the USDA and FAPRI, total oilseeds include only soybeans. Total oilseeds in the case of IGC include soybeans and rapeseed/mustard.

Assessment

- **Production:** Growing at a compound annual growth rate of 2.21 per cent (Table III. 4), OECD/FAO projects India's total oilseeds production to reach 28 million tonnes by 2024 up from 21.8 million tonnes a decade ago. (APPENDIX2 Figure III. A.18). The total annual oilseed production growth rate at the global level is expected to be 1.45 per cent and production is projected to reach 516.4 million tonnes by 2024. USDA projects a higher growth rate of 3.7 per cent per annum for India, whereas FAPRI projects a lower total oilseed production growth rate of 1.47 per cent. IGC's projected growth rate for India is somewhat higher at 2.7 per cent. These growth rates are not strictly comparable as commodity inclusion in the total oilseed group is different for different agencies.
- **Consumption/Crush:** OECD/FAO projects India's total oilseed consumption/crush to grow at 2.08 per centper annum (Table III.4) to reach 27.8 million tonnes by 2024 (APPENDIX2 Figure III. A.19), compared to the global growth rate of 1.5 per cent per annum; global consumption/crush is estimated at 515.7 million tonnes.
- **Trade:** OECD/FAO projects India's net total oilseed exports growth to decline at 0.373 per centper annum (Table III. 4) to around 200,000 tonnes in 2024 (APPENDIX2 Figure III. A.20). During this period, global oilseed trade is projected to grow by 1.5 per cent per annum. Other agencies also project a negative growth rate for oilseed

Indian indicative coarse grain price is projected to rise more sharply at around 4 per cent per annum.

exports from India. The decline could be attributed to increasing domestic consumption, both for crush and food use, phytosanitary problems, and competition from other exporters.

- Price:** Price projections are made only by OECD/FAO for total oilseeds (it is unclear which oilseed the price refers to). Indian oilseed price is projected to increase annually by 4.5 per cent to Rs.49,042 per metric tonne in 2024 from Rs.34,345 per tonne in 2014 (APPENDIX2 Figure III. A.21). This is significantly above the annual rate of increase in global total oilseed price of 1.19 per cent (Table III.4); global oilseed price is expected to reach \$459.6 per metric tonne in real terms.

III.1.5 Vegetable Oils

Assessment

- Production:** OECD/FAO projects India's total vegetable oil production at 9.4 million

Table III.5: Comparison of Annual Compound Growth Rates of Vegetable Oils (%) Projected by Various Agencies

| Parameter | Global/India | OECD/FAO | USDA | FAPRI | IGC |
|------------------------|--------------|----------|-------|-------|-----|
| Production | Global | 1.829 | 2.405 | 1.948 | NA |
| | India | 2.047 | 4.201 | 1.475 | NA |
| Consumption | Global | 1.857 | 2.433 | 1.974 | NA |
| | India | 3.184 | 3.301 | 2.694 | NA |
| Trade | Global | 1.615 | 2.669 | 2.534 | NA |
| | India | 3.892 | 2.909 | 3.358 | NA |
| Per capita Consumption | Global | 0.752 | NA | 0.964 | NA |
| | India | 2.071 | NA | 1.541 | NA |
| Price | Global | 1.390 | NA | 0.849 | NA |
| | India | 5.228 | NA | NA | NA |

Note: Please note that these growth rates are not comparable in absolute terms and are only indicative as the commodity coverage and projection period are different for various agencies. For OECD/FAO= 2015 to 2024 (10 Years); ERS/USDA= 2016 to 2025 (10 Years); FAPRI= 2015 to 2021 (7 Years.); IGC= 2016/17 to 2020/21 (5 Years) Total vegetable oils in the OECD/FAO projections apparently include all oils such as soybeans, rapeseed/mustard, groundnut, sunflower seed, cotton seed, copra, etc. In the case of the USDA and FAPRI, total vegetable oils include only soybean oil. IGC includes soybean oil and rapeseed/mustard oil in total oilseeds.

tonnes by 2024 (APPENDIX2 Figure III. A.22) at an annual growth rate of 2.05 per cent (Table III.5), higher than the global total vegetable oil growth rate of 1.83 per cent. USDA projection covers only soybean oil. The USDA projects India's soybean oil production at 2.0 million tonnes by 2024 at an annual growth rate of 4.2 per cent per annum while FAPRI projects total vegetable oil production (includes soybean, rapeseed, palm and peanut) at 6.0 million tonnes in 2021 at an annual growth rate of 1.48 per cent (Table III.5).

- Consumption:** OECD/FAO projects total vegetable oil consumption by India to increase by 3.81 per cent per annum (Table III.5) to touch 27.6 million tonnes by 2023. Soybean oil consumption is projected to reach 4.2 million tonnes by USDA in 2023 and 3.1 million tonnes in 2021 by FAPRI (APPENDIX2 Figure III. A.23). According to OECD/FAO projections, India's total vegetable oil per capita yearly consumption is projected to increase to 19 kg, marginally behind the global per capita consumption level of 21 Kg. The rise is attributed to increasing per capita income and change in dietary patterns. Indian vegetable oil consumption per capita is projected to grow at 2.07 per cent per annum compared to an annual global per capita consumption growth rate of 0.75 per cent.

Indian vegetable oil consumption per capita is projected to grow at 2.07 per cent per annum compared to an annual global per capita consumption growth rate of 0.75 per cent.

- **Trade:** According to OECD/FAO's projection, net imports of total vegetable oil by India are projected to increase by 3.89 per cent per annum to 17.8 million tonnes in 2024 (APPENDIX2 Figure III. A.24), significantly higher than the global vegetable oil trade growth of 1.62 per cent per annum (Table III.5), which is expected to reach 81.8 million tonnes. Thus, India will account for almost one-fourth of global vegetable oil trade by 2024.
- **Price:** Increasing at a rate of 5.2 per cent per annum, India's indicative vegetable oil price in nominal terms is projected to skyrocket to Rs.115,865 per tonne in 2024 (APPENDIX2 Figure III. A.26), almost double the price level of Rs. 68,845 per tonne in 2015 (Table III.5), a growth rate much above the global vegetable oil price growth rate of 1.4 per cent per annum.

India will account for almost one-fourth of global vegetable oil trade by 2024.

III.1.6 Sugar

Assessment

- **Production:** OECD/FAO projects a growth rate of 0.31 per cent per annum in Indian sugar production to 27.4 million tonnes in 2024 from 25.2 million tonnes in 2015, a

Table III.6: Comparison of Annual Compound Growth Rates of Sugar (%) Projected by Various Agencies

| Parameter | Global/India | OECD/FAO | USDA | FAPRI | IGC |
|------------------------|--------------|----------|------|--------|-----|
| Production | Global | 2.103 | NA | 2.128 | NA |
| | India | 0.317 | NA | 3.239 | NA |
| Consumption | Global | 1.901 | NA | 2.153 | NA |
| | India | 2.079 | NA | 3.158 | NA |
| Trade | Global | 2.880 | NA | 1.229 | NA |
| | India | NA | NA | 4.449 | NA |
| Per capita Consumption | Global | 0.879 | NA | NA | NA |
| | India | 1.025 | NA | 2.000 | NA |
| Price | Global | 0.505 | NA | -0.158 | NA |
| | India | 4.533 | NA | NA | NA |

Note: Please note that these growth rates are not comparable in absolute terms and are only indicative as projection periods are different for various agencies. For OECD/FAO= 2015 to 2024 (10 Years); ERS/USDA= 2016 to 2025 (10 Years); FAPRI= 2015 to 2021 (7 Years.); IGC= 2016/17 to 2020/21 (5 Years).

growth rate significantly below the global sugar production growth rate of 2.1 per cent per annum. FAPRI, however, projects a growth rate almost ten-fold of OECD/FAO's projection for Indian sugar production at 3.24 per cent, higher than the global production growth rate of 2.1 per cent to 37.6 million tonnes by 2021, compared to 26 million tonnes projected by OECD/FAO for 2021. (APPENDIX2 Figure III. A.27)

- **Consumption:** India's sugar consumption is projected by OECD/FAO to increase at an annual rate of 2.08 per cent per annum to 31.3 million tonnes from 26 million tonnes in 2015 (APPENDIX2 Figure III. A.28). This compares with the FAPRI's projected annual consumption growth rate of 3.16 per cent to 34.5 million tonnes in 2021 from the base level of around 28.7 million tonnes in 2015, both at rates higher than the rate of growth of global sugar consumption (Table III.6). Despite increase in total consumption, India's per capita annual sugar consumption is projected by OECD/FAO to remain below world per capita consumption throughout the projection period (APPENDIX2 Figure III. A.31).
- **Trade:** According to OECD/FAO projections, India will remain a net exporter of sugar in some years and net importer in others. However, OECD/FAO projects India

to remain a growing importer of sugar from 2020 with imports gradually rising to around 5 million tonnes by 2024 (APPENDIX2 Figure III. A.29). In contrast, FAPRI projects India to remain a net exporter of sugar during the projection period ending 2021, registering an annual compound growth rate of 4.45 per cent per annum (Table III.6, and APPENDIX2 Figure III. A.31).

- **Price:** Indian sugar prices in nominal terms is projected to increase in a cyclical fashion to reach around Rs.44,531 per metric tonne in 2024, at an annual compound growth rate of 4.53 per cent per annum (Table III.6 and APPENDIX2 Figure III. A.30), significantly above the indicative global sugar price growth rate of 0.5 per cent to reach \$434 per tonne in real terms. FAPRI projection of global price, showing a marginal negative growth, places it at US\$582 per MT in 2021.

CHAPTER IV

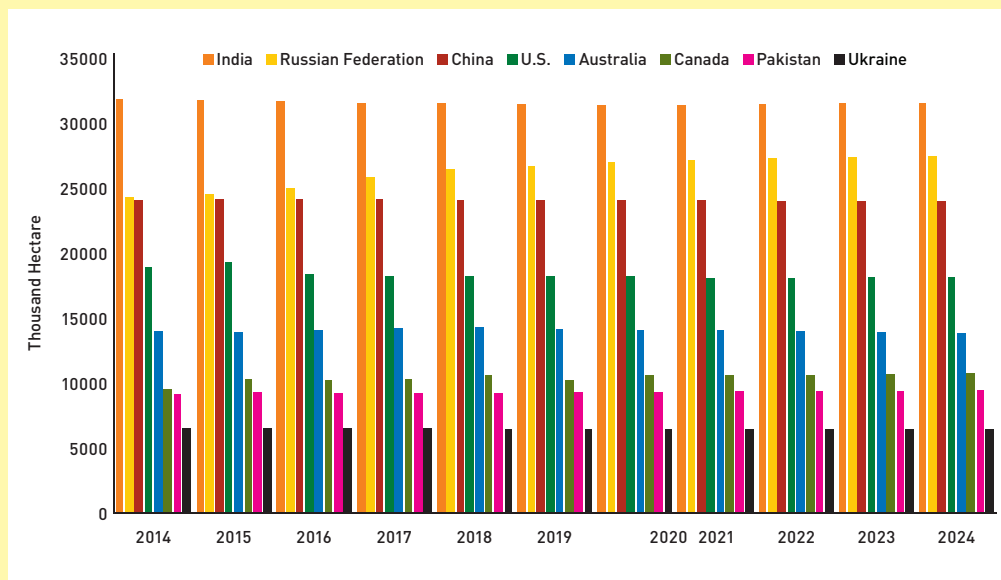
Medium-term Projections for India

IV.1 Comparison of Projected Trends in Growth Rates in Area, Yield and Yield Gap for Selected Food Crops – India vs. World and Major Global Players

The following charts and tables give a visual portrayal of trends in India's relative position or ranking over the next decade with regard to area, yield, yield-gap and growth rates of major food commodities vis-à-vis other major players in the world for major food commodities based on the OECD/FAO Medium-term Outlook Report 2015. This should help Indian policy makers and agricultural scientists/administrators probe and identify factors causing such gaps (in most cases huge). On a pilot basis, interactions, discussions, deliberations, and collaborations with agricultural scientists, agricultural economists, and policy makers of those countries with which India has a yawning yield gap should prove helpful in initiating action plans to narrow or close the yield gap, leading to higher production. Later on, perhaps other countries having high yield gaps could also take up such a programme. Perhaps international organisations or funding agencies such as the FAO and the Bill & Melinda Gates Foundation could facilitate or support such initiatives, which will go a long way in tackling global food insecurity.

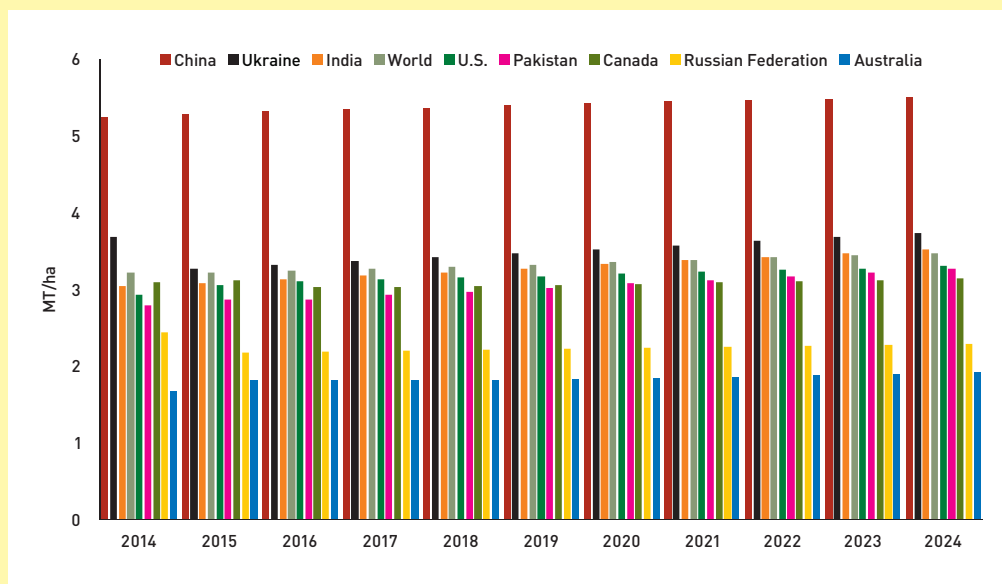
IV.1.1 Wheat

Figure IV.1: Wheat Area Projection Comparison India vs. Major Players



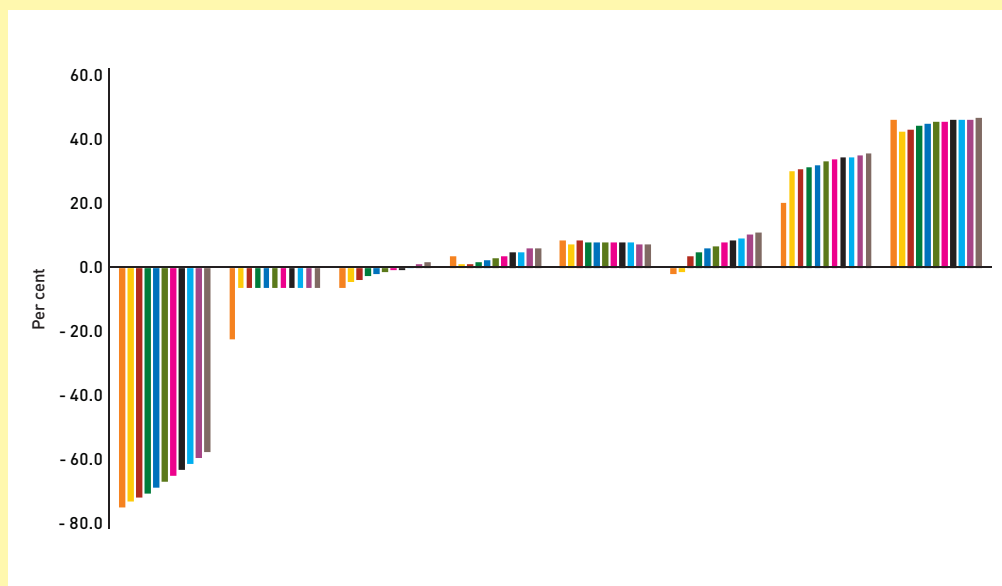
Source: OECD/FAO Medium-term Outlook Report 2015.

Figure IV.2: Wheat Yield Projection Comparison India vs. Major Players



Source: OECD/FAO Medium-term Outlook Report 2015.

Figure IV.3: Wheat Yield Gap Trend Comparison India vs. Major Players



| | China | Ukraine | World | U.S. | Pakistan | Canada | Russian Federation | Australia |
|------|-------|---------|-------|------|----------|--------|--------------------|-----------|
| 2014 | -72.8 | -21.5 | -6.2 | 3.6 | 8.1 | -1.6 | 19.5 | 44.9 |
| 2015 | -71.2 | -6.0 | -4.3 | 1.1 | 7.1 | -1.1 | 29.6 | 41.4 |
| 2016 | -70.0 | -6.0 | -3.6 | 0.9 | 8.3 | 3.3 | 30.2 | 42.1 |
| 2017 | -68.5 | -6.0 | -2.7 | 1.5 | 7.9 | 4.8 | 30.8 | 43.0 |
| 2018 | -66.7 | -6.0 | -2.1 | 2.2 | 7.8 | 5.7 | 31.4 | 43.9 |
| 2019 | -65.0 | -5.9 | -1.5 | 3.1 | 7.7 | 6.7 | 32.1 | 44.2 |
| 2020 | -63.2 | -5.9 | -0.9 | 3.7 | 7.6 | 7.6 | 32.7 | 44.5 |
| 2021 | -61.5 | -5.9 | -0.2 | 4.4 | 7.6 | 8.5 | 33.3 | 44.7 |
| 2022 | -59.9 | -6.0 | 0.3 | 4.9 | 7.5 | 9.2 | 33.8 | 45.0 |
| 2023 | -58.0 | -6.1 | 0.9 | 5.7 | 7.4 | 10.0 | 34.4 | 45.2 |
| 2024 | -56.3 | -6.1 | 1.4 | 6.2 | 7.3 | 10.8 | 34.9 | 45.4 |

Source: OECD/FAO Medium-term Outlook Report 2015.

Assessment

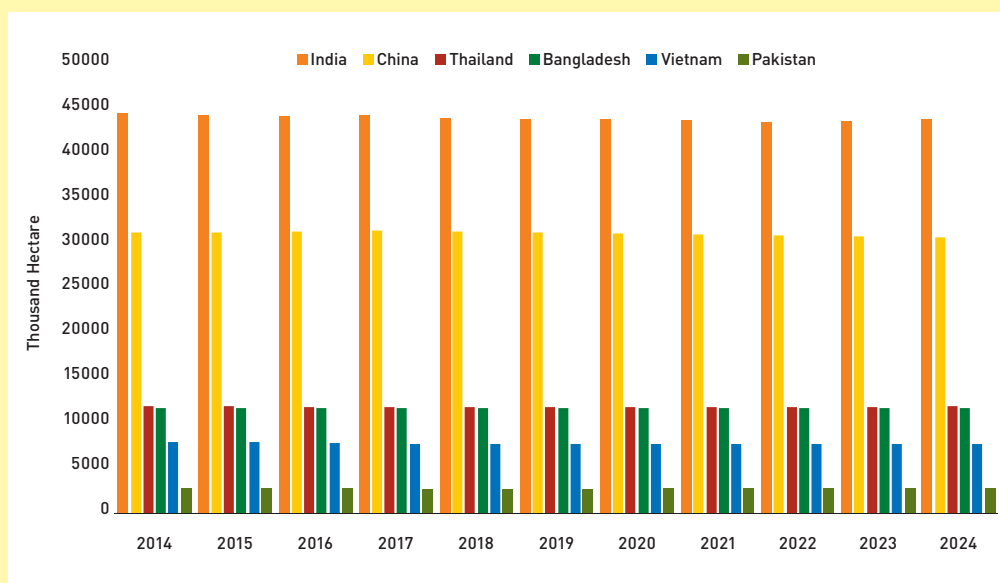
Area: India is projected to remain a country with largest are under wheat, although the area will decline marginally over the projection period to 31.2 million hectares in 2024, accounting for close to 14 per cent of the area under wheat globally. The largest area expansion is projected in the Russian Federation and Canada. Wheat area coverage is projected to remain fairly stable in other major wheat producing countries (Figure IV.1).

Yield: Despite a likely gradual improvement in productivity, India is projected to rank only 3rd after China and Ukraine in wheat yield at 3,530 kg/ha, in 2024, but higher than the world average yield of 3,479 kg/ha. China will continue to remain the topmost in wheat yield with 5,516 kg/ha.

Yield Gap: An analysis of the trend in India’s wheat yield gap (per cent) compared to other major countries show India’s negative yield gap with China and some other countries will narrow over the projection period, but Indian wheat yield will still be more than 50 per cent below the projected Chinese yield by 2024. Compared with other countries too, India’s negative wheat yield gap is projected to taper. Indian wheat yields will continue to overtake wheat yields of major producing countries such as the United States, Canada, Russian Federation, and Australia.

IV.1.2 Rice

Figure IV.4: Rice Area Projection Comparison India vs. Major Players



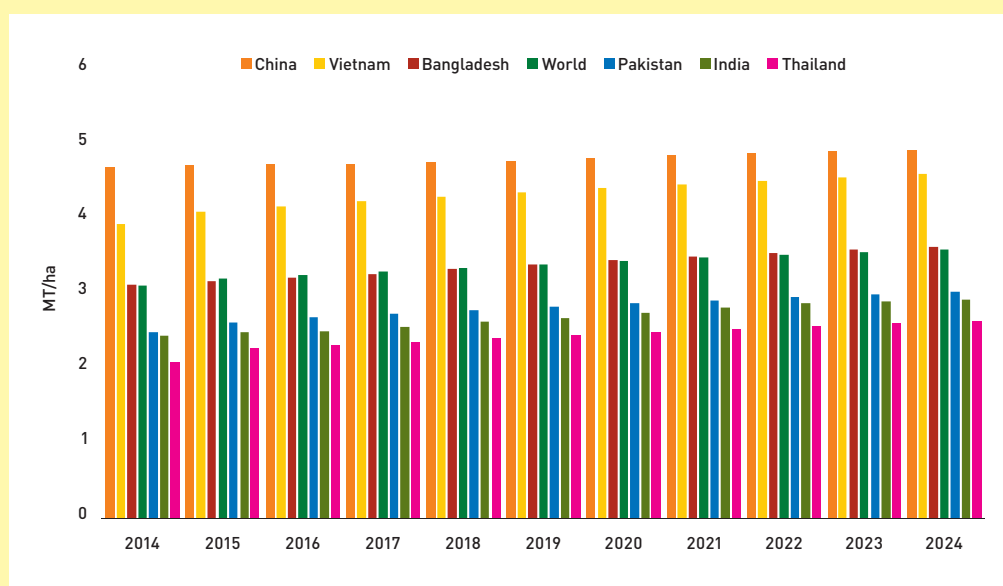
Source: OECD/FAO Medium-term Outlook Report 2015.

India is projected to remain a country with largest are under wheat, although the area will decline marginally over the projection period to 31.2 million hectares in 2024.

Despite a likely gradual improvement in productivity, India is projected to rank only 3rd after China and Ukraine in wheat yield at 3,530 kg/ha, in 2024.

India’s negative yield gap with China and some other countries will narrow over the projection period, but Indian wheat yield will still be more than 50 per cent below the projected Chinese yield by 2024.

Figure IV.5: Rice Yield Projection Comparison India vs. Major Players



Source: OECD/FAO Medium-term Outlook Report 2015.

Figure IV.6: Rice Yield Gap Trend Comparison India vs. Major Players



| | China | Vietnam | Bangladesh | World | Pakistan | Thailand |
|------|-------|---------|------------|-------|----------|----------|
| 2014 | -92.8 | -61.2 | -28.0 | -27.5 | -2.2 | 14.5 |
| 2015 | -89.8 | -64.7 | -27.3 | -29.1 | -5.5 | 8.6 |
| 2016 | -89.3 | -66.9 | -28.6 | -30.2 | -7.5 | 7.2 |
| 2017 | -84.8 | -65.6 | -27.8 | -28.8 | -7.0 | 7.6 |
| 2018 | -80.7 | -63.4 | -26.5 | -27.3 | -5.9 | 8.5 |
| 2019 | -78.3 | -62.5 | -26.3 | -26.4 | -5.6 | 8.6 |
| 2020 | -75.6 | -60.8 | -25.7 | -25.2 | -4.8 | 9.2 |
| 2021 | -71.8 | -57.9 | -24.1 | -23.4 | -3.2 | 10.4 |
| 2022 | -70.0 | -57.1 | -23.6 | -22.8 | -2.9 | 10.5 |
| 2023 | -69.3 | -57.4 | -23.8 | -22.8 | -3.4 | 10.0 |
| 2024 | -68.2 | -57.4 | -24.0 | -22.6 | -3.6 | 9.7 |

Source: OECD/FAO Medium-term Outlook Report 2015.

Assessment

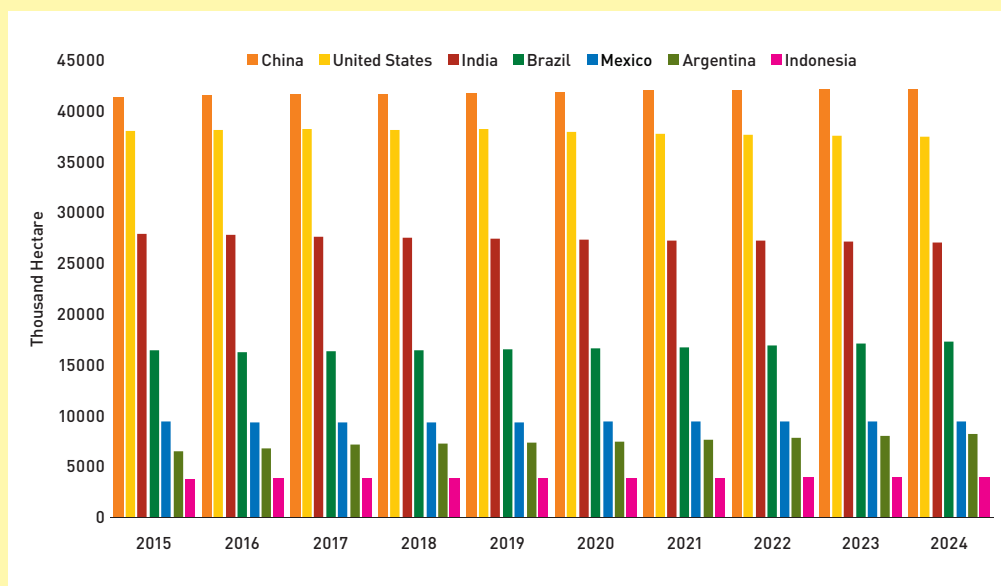
Area: As in the case of wheat, India will have the largest area under rice cultivation in the world in 2024, with 42.9 million hectares, despite a marginal decline over the projection period. China ranks second with 30 million hectares. No significant shift in rice acreage is projected in other major producing countries during the projection period.

Yield: Despite a marginal growth in yield during the projection period, India is projected to remain the second lowest rice yielding country among major rice producers, with a yield 2,861 kg/ha, only marginally above Thailand's. China's rice yield is projected to be the highest at 4,812 kg/ha followed by Vietnam.

Yield Gap: Although India's negative yield gap in rice compared with other major producers in per cent is expected to shrink during the projection period, the gap is still projected to remain huge with countries such as China, Vietnam and even with Bangladesh and Pakistan to a small extent. Thailand is the only major rice producing country with which India will have a positive yield gap.

IV.1.3 Coarse Grains

Figure IV.7: Coarse Grains Area Projection Comparison India vs. Major Players



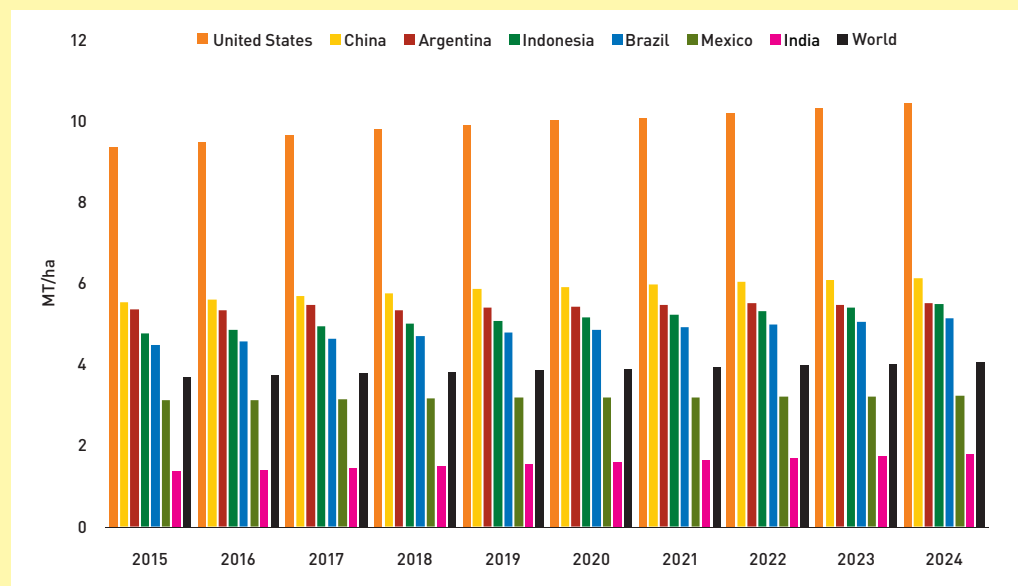
Source: OECD/FAO Medium-term Outlook Report 2015.

India will have the largest area under rice cultivation in the world in 2024, with 42.9 million hectares, despite a marginal decline over the projection period.

Despite a marginal growth in yield during the projection period, India is projected to remain the second lowest rice yielding country among major rice producers.

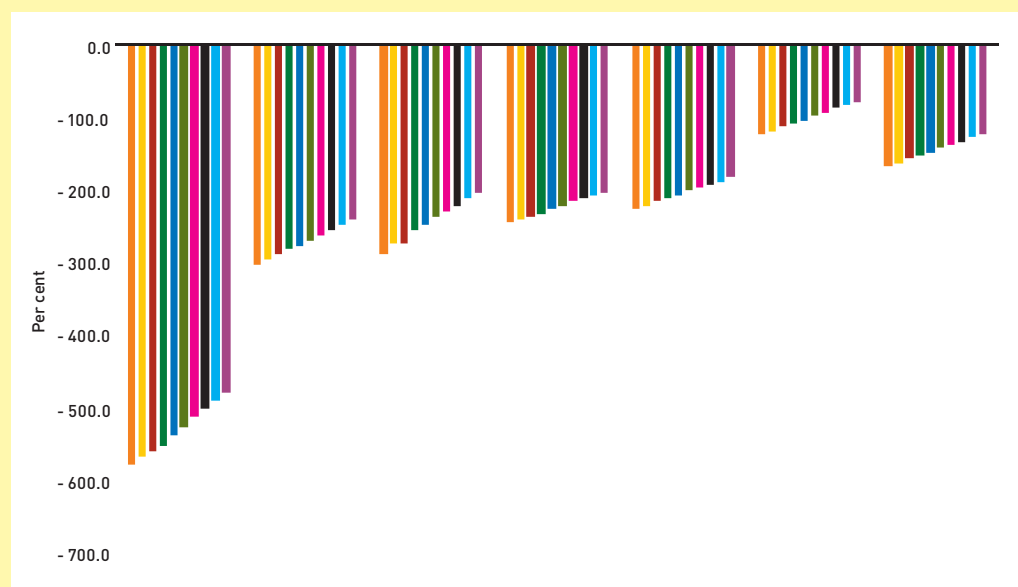
India's negative yield gap in rice compared with other major producers in per cent is expected to shrink during the projection period.

Figure IV.8: Coarse Grains Yield Projection Comparison India vs. Major Players



Source: OECD/FAO Medium-term Outlook Report 2015.

Figure IV.9: Coarse Grains Yield Gap Trend Comparison India vs. Major Players



| | United States | China | Argentina | Indonesia | Brazil | Mexico | India | World |
|------|---------------|--------|-----------|-----------|--------|--------|-------|--------|
| 2015 | -583.3 | -304.3 | -291.5 | -247.5 | -228.0 | -127.1 | 0.0 | -170.2 |
| 2016 | -571.5 | -296.9 | -277.7 | -244.4 | -223.6 | -120.5 | 0.0 | -164.1 |
| 2017 | -564.0 | -291.4 | -275.9 | -239.3 | -218.5 | -115.8 | 0.0 | -159.9 |
| 2018 | -555.7 | -284.3 | -256.6 | -234.3 | -214.3 | -110.5 | 0.0 | -154.7 |
| 2019 | -541.4 | -278.9 | -249.2 | -228.9 | -209.1 | -105.8 | 0.0 | -149.7 |
| 2020 | -529.3 | -271.4 | -240.5 | -223.3 | -204.0 | -100.1 | 0.0 | -144.6 |
| 2021 | -514.6 | -264.3 | -232.9 | -218.7 | -199.8 | -94.5 | 0.0 | -139.7 |
| 2022 | -504.1 | -257.1 | -225.6 | -214.4 | -195.2 | -89.5 | 0.0 | -135.2 |
| 2023 | -493.2 | -249.1 | -214.3 | -210.1 | -190.6 | -84.3 | 0.0 | -130.5 |
| 2024 | -483.2 | -242.0 | -207.3 | -205.6 | -186.0 | -79.5 | 0.0 | -126.3 |

Source: OECD/FAO Medium-term Outlook Report 2015.

Assessment

Area: Despite a marginal downward trend, India is projected to rank third among countries having the largest area under coarse grain crops by 2024, after China and the United States, accounting for 7.6 per cent of total global coarse grain area.

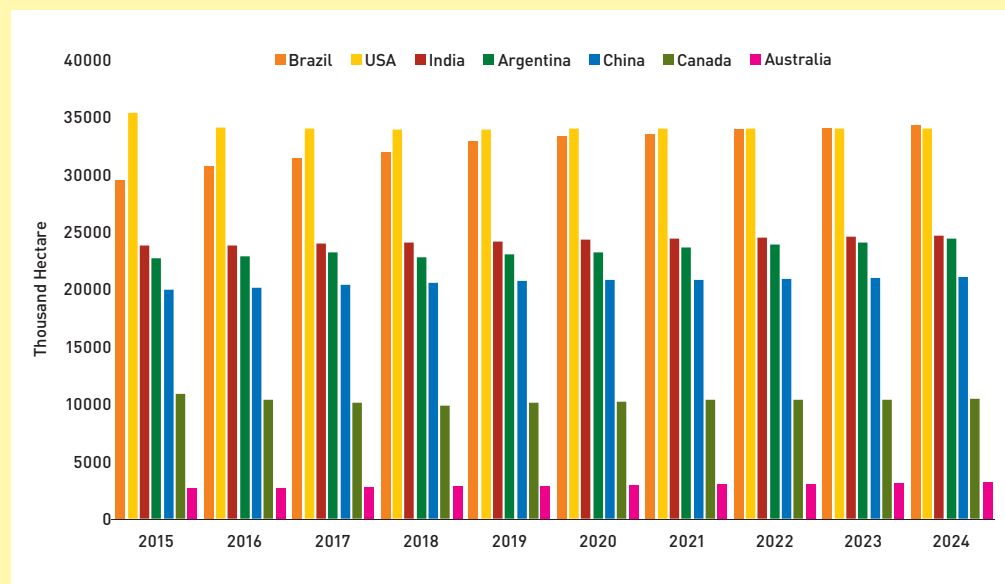
Yield: However, in per hectare yield, India is at the rock-bottom among major producing countries, and lags behind the world average.

Yield Gap: Although the colossal negative Indian yield gap vis-à-vis other major producing countries is shrinking albeit modestly, the gap is still projected to remain large – 483 per cent compared to the US, 242 per cent vis-à-vis China, and 126 per cent compared with the world average.

Despite a marginal downward trend, India is projected to rank third among countries having the largest area under coarse grain crops by 2024.

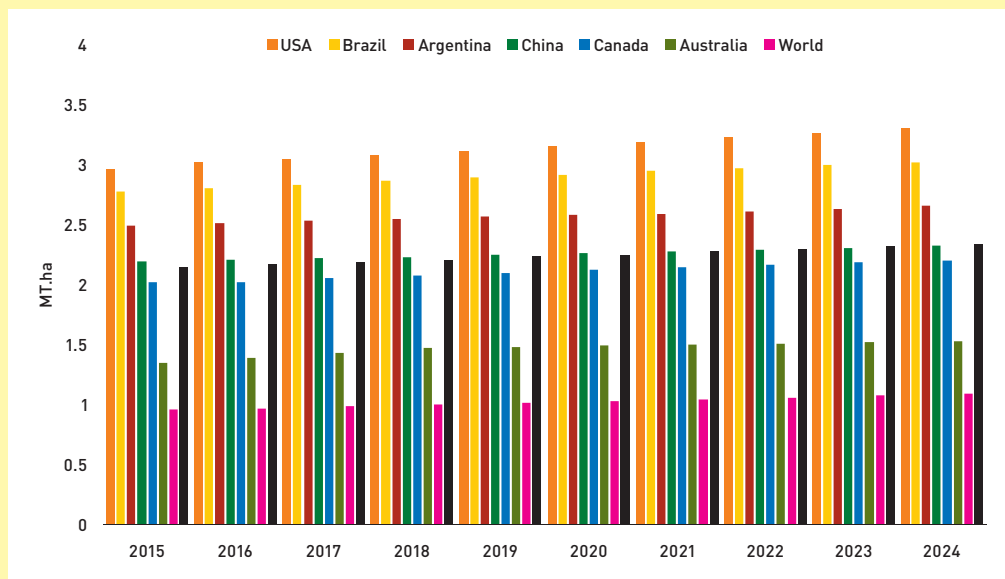
IV.1.4 Oilseeds

Figure IV.10: Oilseed Area Projection Comparison India vs. Major Players

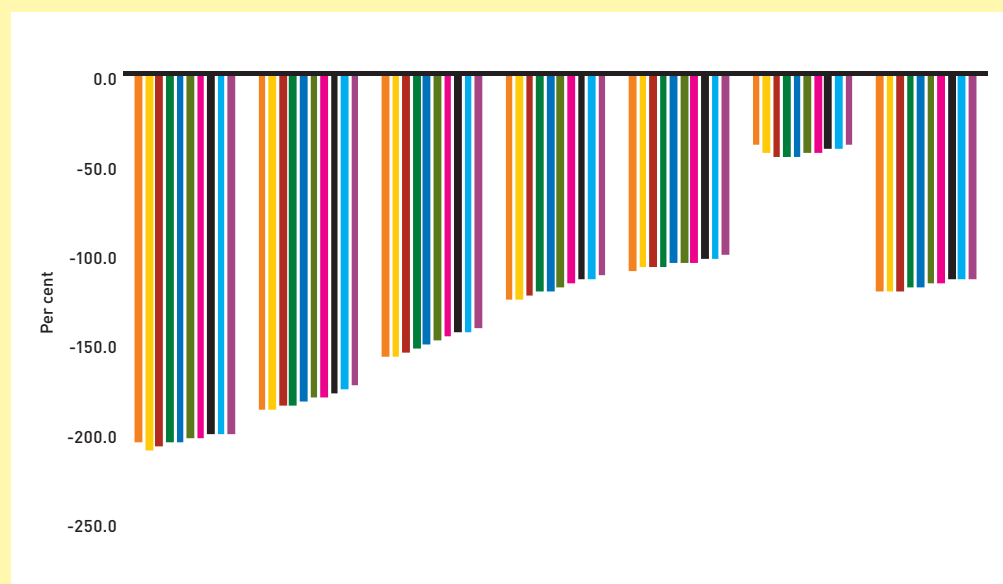


Source: OECD/FAO Medium-term Outlook Report 2015.

Figure IV.11: Oilseed Yield Projection Comparison India vs. Major Players



Source: OECD/FAO Medium-term Outlook Report 2015.

Figure IV.12: Oilseed Yield Gap Trend Comparison India vs. Major Players


| | USA | Brazil | Argentina | China | Canada | Australia | World |
|------|--------|--------|-----------|--------|--------|-----------|--------|
| 2015 | -208.8 | -189.6 | -160.0 | -128.3 | -110.9 | -40.5 | -123.3 |
| 2016 | -212.1 | -190.3 | -160.0 | -128.2 | -109.1 | -43.5 | -123.7 |
| 2017 | -210.3 | -188.0 | -157.8 | -125.9 | -108.9 | -45.2 | -122.4 |
| 2018 | -209.0 | -187.9 | -155.6 | -123.8 | -108.3 | -47.4 | -121.5 |
| 2019 | -207.6 | -185.8 | -153.9 | -121.8 | -107.0 | -46.3 | -120.4 |
| 2020 | -206.8 | -183.7 | -151.3 | -120.1 | -106.7 | -45.1 | -119.2 |
| 2021 | -205.9 | -182.7 | -148.7 | -118.2 | -105.6 | -43.8 | -118.1 |
| 2022 | -204.8 | -180.4 | -146.9 | -116.6 | -104.4 | -42.6 | -116.9 |
| 2023 | -204.1 | -179.3 | -145.0 | -114.8 | -103.5 | -41.5 | -115.8 |
| 2024 | -203.1 | -177.0 | -143.8 | -113.1 | -102.2 | -40.3 | -114.7 |

Source: OECD/FAO Medium-term Outlook Report 2015.

Assessment

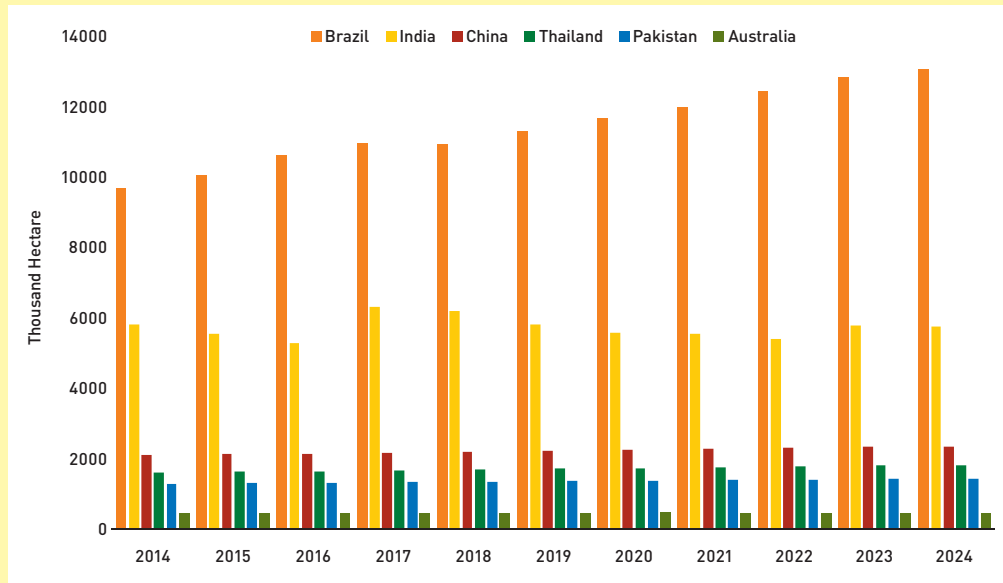
Area: In the case of oilseed crops too, India ranks third in area coverage, after Brazil and the United States and ahead of Argentina and China.

Yield: However, as in the case of most other crops, India's ranking in yield is the lowest, at 1,138 kg/ha, even below the world average of 2,442 kg/ha.

Yield Gap: The yield gap in oilseeds in India compared with other major players, although declining modestly over the years, remains high – yield in India is 203 per cent below the USA, 177 per cent below Brazil, 143.8 per cent below Argentina, and 113 per cent behind China.

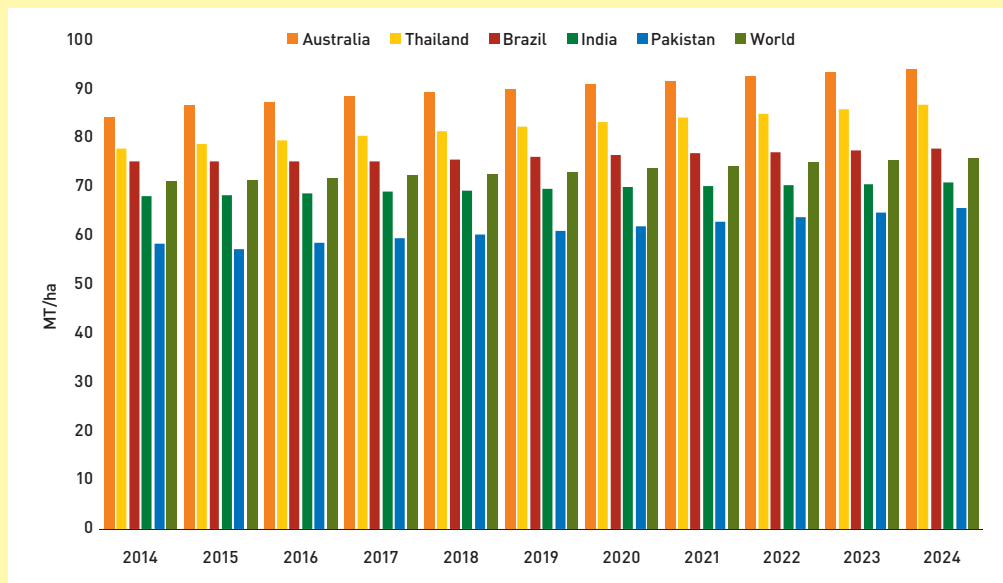
IV.1.5 Sugarcane

Figure IV.13: Sugarcane Area Projection Comparison India vs. Major Players



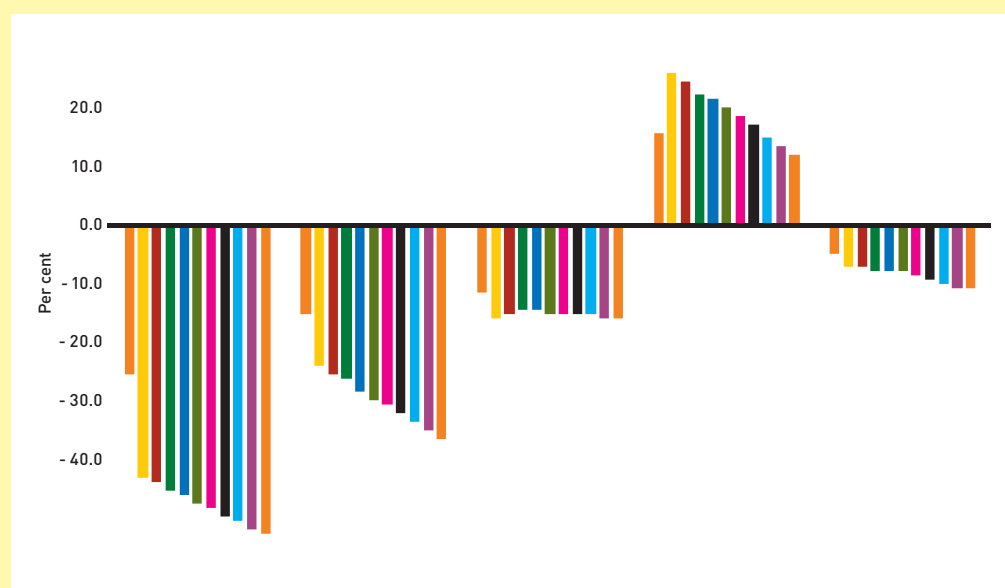
Source: OECD/FAO Medium-term Outlook Report 2015.

Figure IV.14: Sugarcane Yield Projection Comparison India vs. Major Players



Source: OECD/FAO Medium-term Outlook Report 2015.

Figure IV.15: Sugarcane Yield Gap Trend Comparison India vs. Major Players



| | Australia | Thailand | Brazil | Pakistan | World |
|------|-----------|----------|--------|----------|-------|
| 2014 | -15.9 | -9.7 | -7.1 | 9.6 | -3.1 |
| 2015 | -26.7 | -15.2 | -10.1 | 16.1 | -4.4 |
| 2016 | -27.3 | -15.9 | -9.6 | 14.8 | -4.4 |
| 2017 | -28.2 | -16.5 | -9.0 | 13.9 | -4.8 |
| 2018 | -28.8 | -17.6 | -9.3 | 13.0 | -4.9 |
| 2019 | -29.4 | -18.4 | -9.4 | 12.3 | -4.9 |
| 2020 | -30.1 | -19.2 | -9.4 | 11.4 | -5.5 |
| 2021 | -30.8 | -20.0 | -9.5 | 10.4 | -6.0 |
| 2022 | -31.5 | -20.8 | -9.7 | 9.3 | -6.5 |
| 2023 | -32.2 | -21.7 | -9.9 | 8.2 | -6.7 |
| 2024 | -32.8 | -22.6 | -10.0 | 7.3 | -7.0 |

Source: OECD/FAO Medium-term Outlook Report 2015.

Assessment

Area: India is projected to dominate in sugarcane area planting, ranking only 2nd after Brazil but well above China, Thailand, Pakistan and Australia.

Yield: Like most other crops, India lags in the fourth position in sugarcane yield, after Australia, Thailand and Brazil, and even the world average, but just ahead of Pakistan.

Yield gap: India's negative yield gaps with most other major players are significant – Indian yield is 32.8 per cent behind Australian yield, 22.6 per cent behind the yield in Thailand, 10 per cent behind Brazil and 7 per cent behind the global average but 7.3 per cent higher than in Pakistan, although Pakistan's yield is projected to catch up.

IV.2 Results Based on the Econometric Model

For medium-term forecasts of production, we have estimated supply response function using an econometric model of production that includes area and yield, exports and prices for major food commodities to obtain projections at the national level. Similarly, for the forecast of human consumption of major foodgrains and other commodities, a complete

Like most other crops, India lags in the fourth position in sugarcane yield.

demand system has been estimated using the 'Almost Ideal Demand System' for the calculation of income elasticities, which are used for predicting the future consumption of these commodities.

National Sample Survey data for various thick and thin rounds are used for the estimation. Thus, annual national-level data on a range of factors influencing supply and demand has been used in estimating this model. The indirect demand for seed, feed, wastage and other industrial uses for the foodgrains has been estimated by predicting the gap between net production and net consumption including net exports and adjustment of changing stock of the historical period of the above commodities. A brief description of the model is provided in APPENDIX 3.

The key relationships captured in the model are the following: Production is estimated using crop area and yield equations. The factors influencing area and yield were both price and non-price factors like the lagged yield and area under the crop, lagged price of the crop relative to the price of other commodities competing with it for land and other inputs, irrigated area, and prices of fertilisers relative to crop price. Net exports are modelled as a function of world income, export prices, domestic production, domestic prices and the exchange rate. Domestic price is estimated as a function of domestic production, MSP, export price and own lagged value.

Based on a set of assumptions relating to exogenous variables, the estimated set of equations have been used to project the values of production, net exports and prices in the case of rice, wheat, coarse cereals, pulses and oilseeds. Two sets of projections are done based on the growth of exogenous variables. The supply projections based on the econometric model are presented in Table IV.1.

The econometric model indicates that the scope for an increase in area is limited in the case of foodgrains except some small increase in area under oilseeds. The projected area up to the end of projection period (2023–24) will either remain the same or may undergo a slight decline in the case of foodgrains. However, the production of foodgrains is likely to increase in the coming year from the present level of 253 million tonnes to 265 million tonnes as the monsoon is predicted to be normal or above normal. The projected production by 2023–24 would be between 297 to 313 million tonnes. The major increase is likely to come from wheat and rice and a slight increase in coarse grains and pulses. Similarly, oilseeds production will also increase in the short and medium term, both because of expansion in area sown and yield increase.

Overall, growth in production for the predicted period in the case of foodgrains could be slightly less or more than the historical period but not very different than what has been achieved during the last one decade. On the other hand, given the price and other incentives for foodgrains (programme like ISOPOM, palm oil and so on) the predicted growth in production will significantly be higher than the observed growth in the historical period. The growth rates estimated from the econometric model are based on the projected pattern of prices of crops and other exogenous variables. The model also provides estimates of the post-harvest prices of food grains and oilseeds and exports of food grains, pulses and oilseeds. The prices of foodgrains and oilseeds are projected to increase annually by 5 to 7 per cent, well below the actual increase of 8 to 9 per cent per year during the past decade of 2004–2014.

The econometric model indicates that the scope for an increase in area is limited in the case of foodgrains except some small increase in area under oilseeds.

Table IV.1: Supply Projections

| | Actual | Projected (Range of two Scenarios) | Actual growth (%) | Projected growth (%) |
|----------------------------|---------|------------------------------------|-------------------|----------------------|
| | 2013-14 | 2023-24 | 2003-2013 | 2014-2023 |
| Area | | | | |
| Rice | 44.14 | 44.15 - 47.72 | 0.17 | 0.11 - 0.98 |
| Wheat | 30.47 | 29.91 - 30.94 | 1.51 | 0.40 - 0.66 |
| CC | 25.22 | 18.11 - 25.05 | -1.78 | -3.4 - -0.1 |
| Pulses | 25.21 | 26.90 - 27.85 | 0.87 | 1.04 - 1.44 |
| Foodgrains | 125.04 | 119.06 - 131.55 | 0.17 | -0.25 - 0.78 |
| Oilseeds | 28.05 | 33.67 - 34.71 | 0.5 | 1.57 - 2.13 |
| Production | | | | |
| | 2015-16 | 2023-24 | 2005-2015 | 2016-2023 |
| Rice | 103.6 | 130.3 - 133.3 | 1.53 | 2.46 - 2.75 |
| Wheat | 93.8 | 106.0 - 106.1 | 2.85 | 0.96 - 1.73 |
| CC | 38.4 | 38.2 - 50.0 | 1.78 | -0.41 - 3.3 |
| Pulses | 17.3 | 22.5 - 23.4 | 3.19 | 2.74 - 3.21 |
| Foodgrains | 253.2 | 297.0 - 312.8 | 2.14 | 1.53 - 2.51 |
| Oilseeds | 26.3 | 45.6 - 48.8 | 0.81 | 3.47 - 4.29 |
| Export | | | | |
| | 2014-15 | 2023-24 | 2004-2014 | 2015-2023 |
| Rice | 11.98 | 8.69 - 13.7 | 10.51 | 1.93 - 5.76 |
| Wheat | 2.92 | 1.89 - 2.20 | 43.57 | 5.63 - 16.09 |
| CC | 3.26 | 1.43 - 10.67 | 19.8 | -11.44 - 10.42 |
| Pulses | 0.02 | 0.00 - 0.01 | -29.45 | -3.12 - -14.92 |
| Foodgrains | 18.17 | 12.32 - 26.26 | 13.17 | 0.43 - 7.4 |
| Oilseeds | 1.38 | 0.83 - 2.43 | 12.55 | -3.08 - 7.74 |
| Farm Harvest Prices | | | | |
| | 2014-15 | 2023-24 | 2004-2014 | 2015-2023 |
| Rice | 1269 | 1812 - 2263 | 8.97 | 5.33 - 7.31 |
| Wheat | 1478 | 2330 - 2961 | 9.21 | 5.37 - 8.37 |
| CC | 1431 | 2069 - 2427 | 10.55 | 5.87 - 7.34 |
| Pulses | 4161 | 5495 - 7997 | 11.48 | 4.68 - 7.3 |
| Oilseeds | 3757 | 6416 - 6495 | 9.96 | 6.76 - 7.97 |

Table IV.2: Demand Projection Aggregate Food grain and Edible Oil (Direct + Indirect) – All India aggregates

| Period | Rice | Wheat | Other cereals | Total cereals | Pulses | Food grain | Edible oil | oilseeds (28 per cent oils from oilseed) |
|---|--------|--------|---------------|---------------|--------|------------|------------|--|
| Actual demand | | | | | | | | |
| 2011-12 | 89.73 | 80.64 | 32.27 | 202.64 | 16.83 | 219.47 | 10.65 | 38.04 |
| Projected demand (growth rate of NNP between 6.0 and 9.0 per cent per annum) | | | | | | | | |
| 2023-24 | 95.18- | 91.14- | 42.29- | 227.0- | 20.93- | 251.52- | 15.76- | 56.29- |
| | 100.22 | 95.38 | 43.97 | 238.93 | 22.91 | 260.51 | 19.75 | 70.55 |
| CAGR | 0.51- | 1.04- | 2.32- | 0.97- | 1.83- | 1.16- | 3.31- | - |
| 2012-2023 | 0.94 | 1.42 | 2.63 | 1.4 | 2.61 | 1.45 | 5.27 | |

The demand estimates for foodgrains predict a growth rate of around 1 to 1.5 per cent per annum for the coming decade that is fairly equal or slightly less than the predicted growth rate for food grains production of between 1.5 and 2.5 per cent per annum. The present level of demand for foodgrains of around 220 million tonnes is predicted to increase to around 238 million tonnes by the end of 12th Five Year Plan and further to 260 million tonnes by the end of projection period (2023–24). The domestic demand for cereals including that of wheat and rice (human consumption and indirect demand for other purposes) will remain well below domestic production, leaving a surplus of around 20 million tonnes or more for the export. The demand for pulses and oilseeds will exceed the production level leaving a huge deficit to be filled through imports in the future as well. Overall, the demand for pulses and oilseeds will far exceed that of demand for cereals. Pulses demand in the coming decade will grow at around 2 to 2.5 per cent per annum whereas oilseeds demand will grow at a rate of 3 to 5 per cent per annum.

The growth in demand for agricultural commodities, arising from a rise in income levels, population increase, increased urbanisation and increased use for feed will require a substantial expansion of production in coming decades. While cereals will continue to remain a key dietary component in India, rising protein consumption will require increased production of livestock and dairy products, which also implies greater demand for feed grain and oilseeds. In order to retain the comparative advantage India enjoys in the export of some commodities such as rice, wheat, maize, sugar, and oilseed meal and to minimise the increasing dependence on imports to meet the growing domestic consumption of pulses and vegetable oils would require a dramatic improvement in the production of these crops. Yield increases should drive production growth of most crops. Although Indian crop yields for most commodities has shown an increasing trend in recent years, yields of most crops in India with the exception of wheat are still significantly below world averages and yields in many other countries in the region. Hence, continued investment in research and development, and extension services remain critical to achieve the much needed productivity gains.

IV.3 Results based on Cosimo Model

Using the India stand-alone COSIMO model, the baseline estimates for forecasts the 10 years ahead have been obtained for rice, wheat, maize and other coarse grains, soybean and other oil seeds, sugar, vegetable oils, eggs, milk and poultry.

The model is a partial equilibrium demand and supply model featured by elasticities, technical parameters and policy variables. It is based on the behaviour of cost minimisation (or profit maximisation) on the production side and utility maximisation (given budget constraints) on the consumption side. It provides representations of national and global agricultural markets where all the major agricultural sectors are assumed to be connected.

The behavioural structure of the model is premised on the simple supply-demand interaction and price determination process. The functional relationships among the variables and a brief explanation on the parameters, solution procedures and exogenous variables are given in Appendix 4. The model, its parameters, data and solution procedures have been developed in collaboration with FAO.¹²

12. FAO and OECD have developed a partial-equilibrium world agricultural model, called COSIMO-AGLINK, currently encompassing 93 commodities. The goal of the AGLINK-COSIMO model, primarily, is to provide 'consensus analyses' on the future evolution of international commodity markets and to encourage policy debates. Using the AGLINK-COSIMO model, an integrated system can be developed to link up short, medium and long term projections. Subsequently, various scenarios can be generated to analyse emerging market and policy issues. (*OECD/Food and Agriculture Organization of the United Nations (2015), Aglink-Cosimo Model Documentation, <http://www.agri-outlook.org/abouttheoutlook/Aglink-Cosimo-model-documentation-2015.pdf>*)

The demand estimates for foodgrains predict a growth rate of around 1 to 1.5 per cent per annum for the coming decade that is fairly equal or slightly less than the predicted growth rate for food grains production of between 1.5 and 2.5 per cent per annum.

Continued investment in research and development, and extension services remain critical to achieve the much needed productivity gains.

The model provides explicit specification of the supply-demand equilibrium and interaction between domestic and international markets. Based on clearly defined assumptions, the model produces a measurement that can serve as the basis of comparison or the 'baseline', and enables forming expectations for the future. Such an equilibrium consistency framework is suitable for medium-term projections for India.

IV.3.1 Baseline Scenarios for Indian Agriculture: 2015–16 to 2025–26

Projections using the India standalone COSIMO model includes the key agricultural variables that is area, yield, production, trade and total food demand for each commodity for the years 2015–16, 2021–22 and 2025–26 and growth rates for the time period 2005 to 2015 and over the projected time period, from 2016–17 to 2025–26.

Rice

Table IV.3: Supply and Demand Balance Sheet for Rice (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005–06 to 2015–16 | Projected Annual growth rates from 2016–17 to 2025–26 |
|------------------------------|--------|--------|--------|---|---|
| Area Harvested (thousand ha) | 43300 | 44487 | 44563 | -0.08 | 0.21 |
| Yield (mt/ha) | 2.39 | 2.74 | 2.91 | 1.61 | 1.67 |
| Production | 103610 | 121673 | 129636 | 1.52 | 1.88 |
| Import | 1.00 | 2.89 | 6.64 | 31.60 | 20.24 |
| Beginning Stock | 14800 | 13833 | 14531 | 5.37 | 1.32 |
| Total Supply | 118411 | 135510 | 144174 | 2.06 | 1.82 |
| Food Consumption | 90971 | 101460 | 107856 | 1.37 | 1.78 |
| Feed Consumption | 440 | 517 | 582 | 1.48 | 3.10 |
| Other use | 7700 | 7511 | 7957 | 3.08 | 1.30 |
| Total Consumption | 99111 | 109488 | 116396 | 1.49 | 1.76 |
| Exports | 10700 | 12050 | 13043 | 13.36 | 1.98 |
| Ending Stock | 8600 | 13972 | 14736 | -0.02 | 2.31 |
| Total Demand | 118411 | 135510 | 144174 | 2.06 | 1.82 |

Area under rice is projected to increase marginally from the base-year level of 43.3 million hectare (mha) to 44.6mha by the year 2025–26.

Production of rice is expected to increase to 129.6 million tonnes from 103.6 million tonnes if present trend continues.

Area under rice is projected to increase marginally from the base-year level of 43.3 million hectare (mha) to 44.6mha by the year 2025–26 (Table IV.3). Since the scope of increasing area under cultivation of rice is limited, increases in production will mainly come from improvements in yield. A modest increase in yield of 1.67 per cent is projected over the 10-year horizon from 2.39 tonnes per hectare (t/ha) to 2.91 t/ha. Several government programmes and initiatives to increase productivity and increased focus on bringing more area under assured irrigation are factors likely to contribute to higher yield growth in India.

Production of rice is expected to increase to 129.6 million tonnes from 103.6 million tonnes if present trend continues. Total supply of rice is projected to increase by 1.82 per cent over 2016–17 compared to 2.06 per cent over the previous decade of 2005–06 to 2015–16. Total food demand in 2015–16 stands at 118.41 million tonnes and is projected to be at 144.2 million tonnes by 2025–26. Indian rice exports growths are projected to grow at 1.98 per cent during the projection period. The regular increase in the support price of paddy to compensate for the increasing cost of production could make Indian rice

non-competitive globally. Furthermore, the government's frequent ban on non-basmati rice exports will make India an unreliable supplier of rice in the world market.

Wheat

Table IV.4: Supply and Demand Balance Sheet for Wheat (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005-06 to 2015-16 | Projected Annual growth rates from 2016-17 to 2025-26 |
|------------------------------|--------|--------|--------|---|---|
| Area Harvested (thousand ha) | 30372 | 30555 | 30677 | 1.50 | 0.10 |
| Yield (mt/ha) | 2.85 | 3.43 | 3.64 | 1.72 | 1.59 |
| Production | 86530 | 104706 | 111692 | 3.21 | 1.69 |
| Import | 580 | 1035 | 1277 | -26.37 | 8.46 |
| Beginning Stock | 24300 | 19777 | 20009 | 11.53 | -0.98 |
| Total Supply | 111410 | 125518 | 132978 | 4.29 | 1.30 |
| Food Consumption | 77886 | 92658 | 98052 | 1.52 | 1.47 |
| Feed Consumption | 5192 | 6426 | 7249 | 15.50 | 2.91 |
| Other use | 5402 | 5588 | 5909 | 3.69 | 1.01 |
| Total Consumption | 88610 | 104729 | 111251 | 2.15 | 1.52 |
| Exports | 1000 | 1265 | 1480 | 62.93 | 3.92 |
| Ending Stock | 21800 | 19524 | 20247 | 15.79 | 0.00 |
| Total Demand | 111410 | 125518 | 132978 | 4.29 | 1.30 |

The cultivated area under wheat is projected to slightly increase at 0.10 per cent over the next decade from 30.3 mha in base year to 30.7 mha by 2025-26 (Table IV.4). Yield gains are modest 1.59 per cent over this period.

Total food demand for wheat will increase from 111.4 mmt in the base year to 133 mmt by 2025-26 at the rate of 1.30 per cent which is less than the rate of production increase over the same period at 1.69 per cent. Food consumption is expected to grow at an annual rate of 1.47 per cent. India's wheat export growth rate is estimated at 3.92 per cent during the projection period. Increasing domestic consumption of wheat in India will reduce the exportable surplus despite a higher expected production growth rate. India should establish grades and standards comparable with international standards to facilitate exports.

The cultivated area under wheat is projected to slightly increase at 0.10 per cent over the next decade from 30.3 mha in base year to 30.7 mha by 2025-26.

Total food demand for wheat will increase from 111.4 mmt in the base year to 133 mmt by 2025-26 at the rate of 1.30 per cent which is less than the rate of production increase over the same period at 1.69 per cent.

Maize

Table IV.5: Supply and Demand Balance Sheet for Maize (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005–06 to 2015–16 | Projected Annual growth rates from 2016–17 to 2025–26 |
|------------------------------|-------|-------|-------|---|---|
| Area Harvested (thousand ha) | 8600 | 8572 | 8634 | 1.16 | 0.10 |
| Yield (mt/ha) | 2.44 | 2.98 | 3.18 | 3.31 | 1.57 |
| Production | 21000 | 25557 | 27429 | 4.46 | 1.68 |
| Import | 4.00 | 3.89 | 3.77 | 8.71 | -0.62 |
| Beginning Stock | 5104 | 5552 | 6144 | 11.70 | 1.62 |
| Total Supply | 26108 | 31113 | 33576 | 5.40 | 1.66 |
| Food Consumption | 9108 | 11302 | 11939 | 1.31 | 1.67 |
| Feed Consumption | 7623 | 9762 | 10909 | 6.44 | 2.90 |
| Other use | 3556 | 3843 | 4035 | 4.53 | 1.06 |
| Total Consumption | 20500 | 25063 | 27018 | 3.56 | 2.01 |
| Exports | 800 | 405 | 258 | 8.07 | -15.31 |
| Ending Stock | 4808 | 5645 | 6300 | 13.93 | 1.74 |
| Total Demand | 26108 | 31113 | 33576 | 5.40 | 1.66 |

There is a slowing down of growth rates for maize over the next decade. While the growth rates for area under maize cultivation and yield were at 1.16 per cent and 3.3 per cent respectively during 2005–06 to 2015–16, they are projected to be much lower at 0.1 per cent growth rate for area and 1.6 per cent for yield during 2016–17 to 2025–26. Food consumption and production, however, will grow at a similar rate of 1.68 per cent in the next decade. Export of maize is projected to decrease by 15.3 per cent during the same period.

Other Coarse Grains

Table IV.6: Supply and Demand Balance Sheet for Other Coarse grains (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005–06 to 2015–16 | Projected Annual growth rates from 2016–17 to 2025–26 |
|-------------------------------|-------|-------|-------|---|---|
| Area Harvested (thousand ha) | 19440 | 19888 | 19917 | -0.75 | 0.17 |
| Yield (mt/ha) | 0.89 | 1.06 | 1.13 | -0.18 | 1.61 |
| Production | 17300 | 21051 | 22419 | -0.93 | 1.78 |
| Import | 5.0 | 80.6 | 106.0 | -0.12 | 29.37 |
| Beginning Stock | 540 | 545 | 603 | 9.87 | 2.76 |
| Total Supply | 17845 | 21676 | 23127 | -0.58 | 1.86 |
| Food Consumption | 16265 | 19490 | 20731 | -0.50 | 1.81 |
| Feed Consumption | 580 | 716 | 812 | 8.60 | 3.17 |
| Other use | 880 | 895 | 951 | -6.25 | 1.31 |
| Total Consumption | 17725 | 21101 | 22494 | -0.66 | 1.83 |
| Exports | 490 | 15 | 16 | 10.46 | -12.15 |
| Ending Stock | -370 | 560 | 617 | | 4.01 |
| Total Demand | 17845 | 21676 | 23127 | -0.58 | 1.86 |

The projections show a reversal in the sign of growth rates of most variables in the decades 2005–2015 and 2016–2025, with area under other coarse grains cultivation, yield and production going from -0.75 per cent to 0.17 per cent, -0.18 per cent to 1.61 per cent and -0.93 per cent to 1.78 per cent respectively. There is potential to expand production and exports of other coarse grains such as ragi (finger millet), with the rising awareness of the nutritive benefits of these grains globally. Besides being rich in nutrition, these crops consume less water.

Soybean

Table IV.7: Supply and Demand Balance Sheet for Soybean (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005–06 to 2015–16 | Projected Annual growth rates from 2016–17 to 2025–26 |
|-------------------------------|-------|-------|-------|---|---|
| Area Harvested (thousand ha) | 11600 | 11462 | 11510 | 4.63 | 0.02 |
| Yield (mt/ha) | 0.6 | 0.8 | 0.8 | -4.06 | 1.54 |
| Production | 7100 | 8827 | 9445 | 0.57 | 1.57 |
| Import | 1.0 | 1.0 | 1.0 | 0.00 | 0.86 |
| Beginning Stock | 100 | 97 | 107 | -2.34 | 0.02 |
| Total Supply | 7201 | 8925 | 9554 | 0.41 | 1.54 |
| Total Consumption | 7676 | 8806 | 9419 | 0.89 | 1.57 |
| Exports | 25 | 26 | 26 | 6.60 | -1.17 |
| Ending Stock | -500 | 93 | 109 | | 1.18 |
| Total Demand | 7201 | 8925 | 9554 | 0.41 | 1.54 |

In case of soybean, no area growth is projected during the projection period, so any increase in production will mainly come from improvements in yield. Yield gains are projected to increase modestly from 0.6 to 0.8 mt/ha during the period, with an increase in the production growth rate of 1.57 per cent from 2015–16 to 2025–26. The total food demand will increase from the base year value of 7.2 mmt to 9.6 mmt by 2025. The model projects India's net soybean export growth to decline at -1.17 per cent. The decline could be attributed to increasing domestic consumption, phytosanitary problems, and competition from other exporters.

Other Oilseeds

Table IV.8: Supply and Demand Balance Sheet for Other Oilseeds (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005-06 to 2015-16 | Projected Annual growth rates from 2016-17 to 2025-26 |
|-------------------------------|-------|-------|-------|---|---|
| Area Harvested (thousand ha) | 11920 | 11712 | 11747 | -2.84 | -0.11 |
| Yield (mt/ha) | 0.77 | 0.87 | 0.93 | 0.29 | 1.50 |
| Production | 9160 | 10245 | 10934 | -2.54 | 1.39 |
| Import | 300.0 | 300.8 | 284.8 | 29.92 | 4.50 |
| Beginning Stock | 112 | 114 | 123 | -14.39 | 0.96 |
| Total Supply | 9572 | 10659 | 11342 | -2.57 | 1.46 |
| Food Consumption | 1081 | 1166 | 1211 | -1.72 | 1.00 |
| Other use | 91 | 102 | 107 | -2.38 | 1.28 |
| Total Consumption | 9095 | 10181 | 10899 | -2.38 | 1.88 |
| Exports | 364 | 364 | 318 | 7.94 | -7.95 |
| Ending Stock | 113 | 115 | 125 | | 1.27 |
| Total Demand | 9572 | 10659 | 11342 | -2.57 | 1.46 |

Area under other oilseeds cultivation is indicated to marginally decrease by 0.11 per cent by 2025 to 11.7 mha. Yield gains are projected to modestly increase from 0.77 to 0.93 mt/ha during this period with an increase in production growth rate of 1.39 per cent during 2016-17 to 2025-26. As in the case of most other crops, yield of oilseeds crops in India is low as compared to other countries although area coverage is much higher. The total food demand for other oilseeds will increase from the base year value of 9.5 mmt to 11.3 mmt by 2025. The model projects India's net other oilseed exports growth to decline at -7.95 per cent.

Sugar

Table IV.9: Supply and Demand Balance Sheet for Sugar (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005-06 to 2015-16 | Projected Annual growth rates from 2016-17 to 2025-26 |
|-------------------------------|--------|--------|--------|---|---|
| Beginning Stock | 12965 | 10872 | 11899 | 4.51 | 0.69 |
| Production | 27000 | 33711 | 39263 | 2.64 | 3.31 |
| Import | 900 | 327 | 245 | 34.78 | -4.60 |
| Total Supply | 40865 | 44910 | 51407 | 3.13 | 2.59 |
| Food Consumption | 25500 | 24181 | 25840 | 2.98 | 1.63 |
| Total Consumption | 25500 | 24181 | 25840 | 2.98 | 1.63 |
| Exports | 2900 | 9607 | 13473 | 3.50 | 5.44 |
| Ending Stock | 12465 | 11122 | 12094 | | 2.03 |
| Total Demand | 40865 | 44910 | 51407 | 3.13 | 2.59 |
| Sugarcane | | | | | |
| Area Harvested (thousand ha) | 5039 | 5106 | 5331 | 2.16 | 0.45 |
| Production | 353198 | 395739 | 438367 | 2.75 | 2.01 |
| Yield (mt/ha) | 70.09 | 77.50 | 82.22 | 0.59 | 1.56 |

Yield of oilseeds crops in India is low as compared to other countries although area coverage is much higher.

India's sugar production is expected to grow by 3.31 per cent per annum to 39.2 mmt in 2025 from 27 mmt in 2015–16 while consumption is expected to grow at a lower rate of 1.63 per cent per annum during the period 2016–17 to 2025–26. Sugar imports are projected to decrease by 4.6 per cent while exports are projected to grow at 5.4 per cent over the next decade.

Vegetable Oils

Table IV.10: Supply and Demand Balance Sheet for Vegetable Oils (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005–06 to 2015–16 | Projected Annual growth rates from 2016–17 to 2025–26 |
|-------------------|-------|-------|-------|---|---|
| Beginning Stock | 2185 | 2827 | 3382 | 7.97 | 3.61 |
| Production | 5734 | 6496 | 6999 | -0.93 | 1.88 |
| Import | 15363 | 24930 | 29715 | 10.62 | 4.60 |
| Total Supply | 23282 | 34253 | 40096 | 6.02 | 3.99 |
| Food Consumption | 20605 | 30127 | 35358 | 5.70 | 4.08 |
| Other use | 209 | 226 | 239 | 5.74 | 1.29 |
| Total Consumption | 20876 | 30999 | 36289 | 5.74 | 4.13 |
| Exports | 483 | 324 | 280 | 8.10 | -3.80 |
| Ending Stock | 1923 | 2931 | 3527 | 8.10 | 3.51 |
| Total Demand | 23282 | 34253 | 40096 | 6.02 | 3.99 |

In the case of vegetable oils, there will be a significant improvement in production by 1.9 per cent per annum during the period. According to the model's projection, net imports of total vegetable oil are projected to increase by 4.60 per cent per annum during the period. With increasing income and changes in diet patterns, vegetable oil consumption is projected to increase annually at a rate of 4.8 per cent. A widening of the demand-supply gap will lead to a 5.07 per cent annual increase in total vegetable oil imports. Strong demand for food and fuel is expected to push prices up, making imports costlier. India, therefore, should try to diversify its vegetable oil import basket, sourcing soybean oil, and sunflower seed oil from countries like the USA, Argentina and Ukraine and the Russian Federation.

Eggs

The model projects egg production at 6.7 million tonnes by 2025, implying an annual production growth rate of 3.66 per cent. Due to increase in per capita income and changes in diet pattern, egg consumption is projected to increase annually at 3.7 per cent, which is equal to the production growth rate.

Table IV.11: Supply and Demand Balance Sheet for Eggs (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005–06 to 2015–16 | Projected Annual growth rates from 2016–17 to 2025–26 |
|-------------------|------|------|------|---|---|
| Production | 4069 | 5751 | 6666 | 4.44 | 3.66 |
| Food Consumption | 4010 | 5693 | 6608 | 4.69 | 3.70 |
| Total Consumption | 4010 | 5693 | 6608 | 4.69 | 3.70 |

In the case of vegetable oils, there will be a significant improvement in production by 1.9 per cent per annum during the period.

Vegetable oil consumption is projected to increase annually at a rate of 4.8 per cent.

The projections indicate that the annual yield of milk would increase from the base year value of 1.21 mt/cow to 1.46mt/cow.

Milk

The projections indicate that the annual yield of milk would increase from the base year value of 1.21 mt/cow to 1.46mt/cow. Consequently, production will increase to around 226.31 million tonnes from 146 million tonnes during the period. After the lifting of the ban on export of dairy products in June 2012, India entered the export market exporting primarily skimmed milk powder. However, India is a very small player in the global dairy trade.

Table IV.12: Supply and Demand Balance Sheet for Milk (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005-06 to 2015-16 | Projected Annual growth rates from 2016-17 to 2025-26 |
|---------------|--------|--------|--------|---|---|
| Cow Inventory | 120322 | 144333 | 155493 | 1.90 | 2.15 |
| Production | 145953 | 196954 | 226309 | 4.19 | 3.71 |
| Yield | 1.21 | 1.36 | 1.46 | 2.29 | 1.56 |

Poultry

The model projects that production and consumption will increase at almost the same rate of 3.12 per cent and 3.16 per cent respectively. A huge increase in the import of poultry is projected from 0.10 thousand metric tonnes in 2015 to 3.4 thousand metric tonnes in 2025 registering a growth of 35.9 per cent over the next decade.

Table IV.13: Supply and Demand Balance Sheet for Poultry (Thousand Metric Tonnes)

| Variables | 2015 | 2021 | 2025 | Annual growth rates from 2005-06 to 2015-16 | Projected Annual growth rates from 2016-17 to 2025-26 |
|-------------------|--------|--------|---------|---|---|
| Live Inventory | 750002 | 987638 | 1111398 | 2.61 | 3.12 |
| Production | 2545 | 3352 | 3772 | 5.39 | 3.12 |
| Imports | 0.10 | 0.31 | 3.44 | 2.52 | 35.89 |
| Total Supply | 2546 | 3352 | 3775 | 5.39 | 3.13 |
| Food Consumption | 2537 | 3352 | 3775 | 5.35 | 3.16 |
| Total Consumption | 2537 | 3352 | 3775 | 5.35 | 3.16 |
| Exports | 8.51 | 0.71 | 0.04 | 23.94 | -62.52 |
| Total Demand | 2546 | 3352 | 3775 | 5.39 | 3.13 |

CHAPTER V

Livestock Sector in India: Status and Projections

V.1 Introduction

There are signs of changes in India's agricultural system as the potential for the emergence of mixed crop-livestock farming system is increasing. The livestock segment presents opportunities for supplementing farm incomes and provides employment to producers and nutrient-rich food products to consumers. Farm manure and fuel for farms and rural households may be an added output. The utility of livestock has been undergoing a steady transformation and non-food functions of livestock are becoming weaker, with machines replacing animal power for farm operations to a significant extent. The livestock sector has emerged as one of the major engines of agricultural growth in the country. The sector is very important for the rural economy as it provides a secondary source of income for nearly 70 million rural households and roughly 70 per cent of the workforce in the livestock sector comprises women. India has one of the largest livestock sectors in the world. It has 512.05 million livestock in 2012 consisted of 37 per cent cattle, 21 per cent buffaloes, 13 per cent sheep, 26 per cent goats and 2 per cent pigs.

The total bovine population (cattle, buffalo, mithun and yak) in 2012 was 299.9 million. It has 81 million cows and buffaloes in milk, the largest number in the world with exotic/crossbred milch cattle numbering 19.42 million. The total livestock population increased by 3 per cent in 2012 over the previous census in 2007 and the increase has been 5.5 per cent since 1997. The total bovine population increased by 3.8 per cent whereas total cattle population has fallen by 4 per cent over 1997. There has been a shift in favour of crossbred cattle and buffalo, which have increased by 98 and 21 per cent since 1997 while the indigenous cattle population has come down by over 15 per cent. Sheep and goat population has increased by 13 and 10 per cent during the period.

The changing profile of the livestock sector is also demonstrated in the rise in the production of livestock commodities (milk, eggs and meat). Rising levels of income, growing urbanisation, and changing dietary habits have led to a rise in demand for major livestock commodities. Table V.1 below presents the changing profile of livestock since 1997.

There has been a shift in favour of crossbred cattle and buffalo, which have increased by 98 and 21 per cent since 1997 while the indigenous cattle population has come down by over 15 per cent.

Table V.1: Changing Profile of Livestock Population since 1997 (Thousands)

| Category | 1997 | 2003 | 2007 | 2012 | Growth since 1997 |
|-------------------|----------|----------|----------|----------|-------------------|
| Crossbreed Cattle | 20,099 | 24,686 | 33,060 | 39,732 | 97.7 |
| Indigenous Cattle | 1,78,782 | 1,60,495 | 1,66,015 | 1,51,172 | -15.5 |
| Total Cattle | 1,98,881 | 1,85,181 | 1,99,075 | 1,90,904 | -4.0 |
| Buffaloes | 89,918 | 97,922 | 1,05,342 | 1,08,702 | 20.9 |
| Yaks | 59 | 65 | 88 | 73 | 23.7 |
| Mithuns | 177 | 278 | 264 | 298 | 68.4 |
| Total Bovines | 2,89,035 | 2,83,446 | 3,04,764 | 2,99,981 | 3.8 |
| Sheep | 57,494 | 61,469 | 71,558 | 65,069 | 13.2 |
| Goats | 1,22,721 | 1,24,358 | 1,40,537 | 1,35,173 | 10.1 |
| Pigs | 13,291 | 13,519 | 11,133 | 10,294 | -22.5 |
| Horses & Ponies | 827 | 751 | 612 | 625 | -24.4 |
| Mules | 221 | 176 | 137 | 196 | -11.3 |
| Donkeys | 882 | 650 | 438 | 319 | -63.8 |
| Camels | 912 | 632 | 517 | 400 | -56.1 |
| Total Livestock | 4,85,385 | 4,85,002 | 5,29,696 | 5,12,057 | 5.5 |

Source: Ministry of AHD&F, Govt. of India.

V.1.1 Sectoral Contribution to the Economy

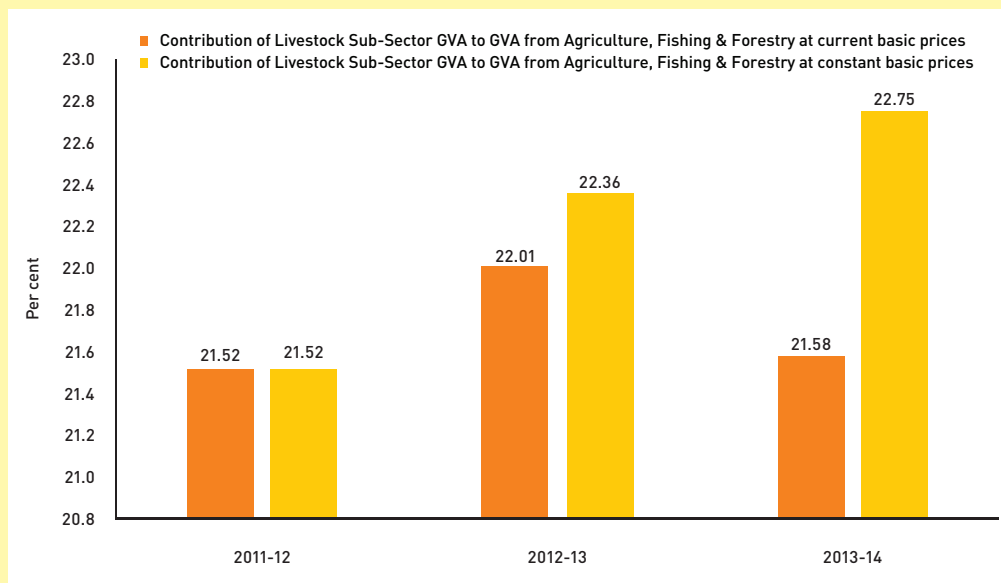
The livestock sector contributed nearly 22.8 per cent of the value of output at constant basic prices (2011–12 prices) to total value of output from agriculture, fishing and forestry during 2013–14 as against 21.7 per cent during 2011–12.

The contribution of GVA from the agriculture, fishing and forestry (AFF) sector has gone down in the overall economy from nearly 18.4 per cent during 2011–12 to 17.2 per cent during 2013–14 at constant basic prices (Table V.2). The falling share of agriculture GVA to total GVA from all sectors and the rising share of the livestock sector GVA in agricultural GVA indicates the increasing importance of the livestock sector for the Indian economy, particularly the rural economy.

Table V.2: Agriculture, Fishing and Forestry (AFF) in the Overall Economy and Livestock sub-sectors in Agriculture, Fishing and Forestry (AFF) Sector (2011–12)

| Year | Contribution of GVA from Agriculture, Fishing & Forestry (AFF) to total GVA from all Sectors (%) | | Contribution of Livestock Sub-Livestock sector GVA to GVA from Agriculture, Fishing & Forestry (%) | |
|---------|--|--------------------------|--|--------------------------|
| | At current basic prices | At constant basic prices | At current basic prices | At constant basic prices |
| 2011–12 | 18.37 | 18.37 | 21.52 | 21.52 |
| 2012–13 | 18.04 | 17.72 | 22.01 | 22.36 |
| 2013–14 | 17.95 | 17.22 | 21.58 | 22.75 |

Source: Statistical Year Book, India 2016. MOSPI.

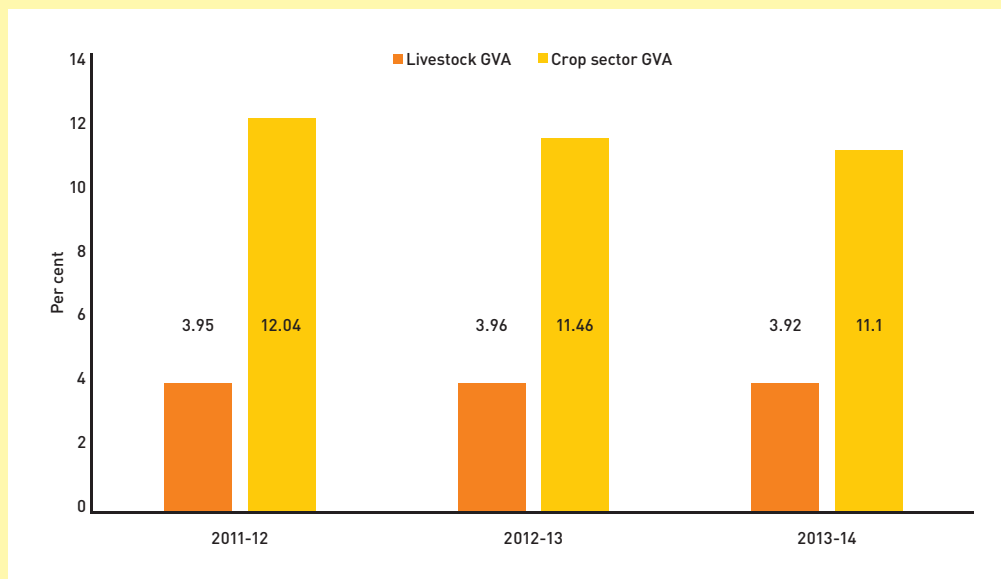
Figure V.1: Per cent Share of Livestock sub-sector GVA to total GVA from Agriculture, Fishing and Forestry (AFF)

Source: Statistical Year Book, India 2016. MOSPI.

Table V.3: Contribution of Gross Value of Output (GVA) from Livestock and Crops sub-sectors in terms of total GVA from all Sectors at Current and Constant basic prices (2011-12): Percentage Change

| Year | Contribution of Livestock sub – sector GVA to total GVA from all Sectors | | Contribution of Crops sub-sector GVA to total GVA from all Sectors | |
|---------|--|--------------------------|--|--------------------------|
| | At current basic prices | At constant basic prices | At current basic prices | At constant basic prices |
| 2011-12 | 3.95 | 3.95 | 12.04 | 12.04 |
| 2012-13 | 3.97 | 3.96 | 11.68 | 11.46 |
| 2013-14 | 3.88 | 3.92 | 11.77 | 11.1 |

Source: Statistical Year Book, India 2016. MOSPI

Figure V.2: Share of Livestock and Crops sub-sector GVA to total GVA from all sectors at Constant Prices (2011-12)

Source: Statistical Year Book, India 2016. MOSPI.

The sector contributed 4.1 per cent to the gross domestic product at current prices in 2012–13, whereas the crop sector contributed 11.0 per cent to total GDP

The sector contributed 4.1 per cent to the gross domestic product at current prices in 2012–13, whereas the crop sector contributed 11.0 per cent to total GDP. At constant prices, these shares were slightly lower. The livestock sector contributed 25 per cent to total GDP from agriculture and allied sectors in 2012–13, increasing from 14 per cent in 1980–81, while the agriculture and allied sector's contribution in total GDP, which was 34 per cent in 1980–81 decreased to 14 per cent in 2012–13. The contribution of all sectors under agriculture and allied activities to total GDP both at current and constant prices (2004–05) is shown in the below (Table V.4):

Table V.4: The Contribution of All Sectors under Agriculture & Allied Activities to Total GDP in 2012–13

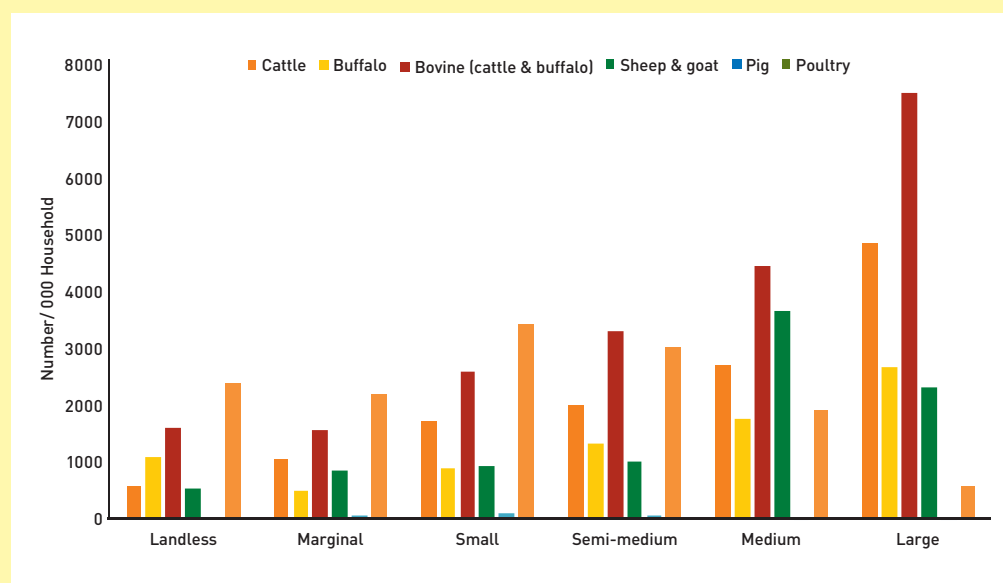
| Sector | Contribution to GDP (%) | |
|------------------------------|-------------------------|--------------------------|
| | At current basic prices | At constant basic prices |
| Livestock | 4.1 | 3.5 |
| Agriculture (crop sector) | 11.0 | 8.4 |
| Forestry & Logging | 1.6 | 1.3 |
| Fishing | 0.8 | 0.8 |
| Total (Agriculture & allied) | 17.5 | 14.0 |

Source: Ministry of AHD&F, Govt. of India.

V.1.2 Livestock and Operational Holdings

Traditionally, about every rural household in the country kept some livestock, often to meet its own farm or household requirements. It is seen that, generally, households with larger operational holdings (i.e. medium or large) have a larger number of bovines, sheep and goats compared to households with smaller operational land holdings (i.e., landless, marginal, small and semi-medium), while the situation is reverse in the case of ownership of pig and poultry in the country. Table 3 below present the average number of principal livestock /poultry owned per 1000 households by category of land holdings during 2012–13.

Figure V.3: Average Number of Principal Livestock /Poultry Owned per 1000 Household by Category of Operational Holdings, 2012–13



Source: Ministry of AHD&F, Govt. of India.

V.2 Dairy

V.2.1 Milk Production and Animals in Milk

India continues to rank first in milk production at the global level for the last almost two decades and has an estimated production of 146.3 million tonnes of milk during 2014–15 with a growth rate of 6.27 per cent over 2013–14. World milk production as estimated by FAO has reached 789 million tonne in 2014 as against 765 million tonne during 2013, with an increase of 3.1 per cent. India's share in world milk production is 18.5 per cent. Its significance is seen in the context of per capita availability, which has shown sustained growth since 1950–51.

The per capita availability of milk at 322 grams per day in India during 2014–15 is significantly higher than the world average per capita availability at 293.7 grams per day during 2014, a rare feat achieved in the last few years. Table V.5 below presents milk production and per capita availability of milk in India since 1951.

Table V.5: Milk Production and Per Capita Availability of Milk in India Since 1950–51

| Year | Production (Million Tonnes) | Per Capita Availability (gms/day) |
|---------|-----------------------------|-----------------------------------|
| 1950–51 | 17.0 | 130 |
| 1960–61 | 20.0 | 126 |
| 1980–81 | 31.6 | 128 |
| 1990–91 | 53.9 | 176 |
| 2000–01 | 80.6 | 217 |
| 2010–11 | 121.8 | 281 |
| 2011–12 | 127.9 | 290 |
| 2012–13 | 132.4 | 299 |
| 2013–14 | 137.7 | 307 |
| 2014–15 | 146.3 | 322 |

Source: Department of AHD&F, Govt. of India.

During 2014–15, 34 per cent of buffaloes in the country were in milk and contributed over 50 per cent in the milk production while 12 per cent of the exotic/crossbred cattle and 27 per cent of indigenous cattle were in milk, which contributed 45 per cent of the milk. The remaining 4 per cent or so of the milk was contributed by goat milk.

The average annual yield of milk of exotic/crossbred cattle is 2610 kg while for indigenous cattle, it works out to 927 kg during 2014–15. Overall, average annual yield of milk of Indian cattle was 1446 kg during the year, which is much lower than the global average and the average yield of cattle in New Zealand, Australia, UK, US and Israel. Table V. 6 below gives share of animals in milk, their share in milk production and average yield of animals.

Table V.6: Animals in Milk and their Share in Milk Production with Average Yield (2014–15)

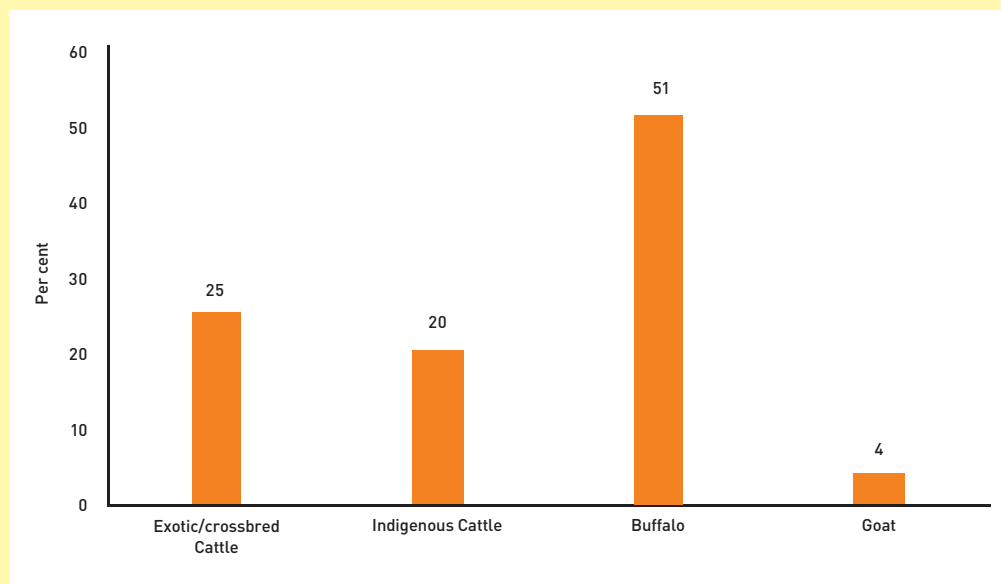
| Animals | Share of animals in milk (per cent) | Share in milk production (per cent) | Average yield in kg (per day) |
|-------------------------|-------------------------------------|-------------------------------------|-------------------------------|
| Exotic/crossbred Cattle | 12 | 25 | 7.15 |
| Indigenous Cattle | 27 | 20 | 2.54 |
| Buffalo | 34 | 51 | 5.15 |
| Goat | 27 | 4 | 0.46 |

Source: Ministry of AHD&F, Govt. of India.

Expenditure on consumption of milk and milk products and on egg, meat and fish is increasing at a faster rate as compared to the expenditure on total food items.

Consumption expenditure on livestock products in rural areas is increasing faster than in urban areas.

Figure V.4: Breed of Milk Animals and their Contribution in Milk Production (2014–15)



Source: Ministry of AHD&F, Govt. of India.

The Government of India and the National Dairy Development Board have been implementing a National Dairy Development Plan (NDP) since 2010. The plan proposes to nearly double the country's milk production by 2020 and seeks to increase milk productivity, improve access to quality feeds and improve farmer access to the organised market. The focus has been on increasing the membership of co-operatives and developing the network of milk collection facilities throughout the country to achieve these goals.

V.2.2 Consumption of Livestock Commodities

Per capita monthly consumption expenditure, based on the level and pattern of consumer expenditure surveys (various rounds) of the National Sample Survey Organisation of the Ministry of Statistics & Programme Implementation, Government of India, indicate that the expenditure on consumption of milk and milk products and on egg, meat and fish is increasing at a faster rate as compared to the expenditure on total food items. The per capita monthly consumption expenditure on milk and milk products has increased by 45 and 35 per cent respectively for rural and urban consumers and that of egg, meat and fish has gone up by 44 and 40 per cent in two years (during 2009–2011). Expenditure on total food has gone up by 25 and 27 per cent respectively during the period (Table V. 7). Another interesting fact is that consumption expenditure on livestock products in rural areas is increasing faster than in urban areas.

Table V.7: Per Capita Monthly Consumption Expenditure on Livestock Products and on Total Food based on the Level & Pattern of Consumer Expenditure Surveys (Rs.)

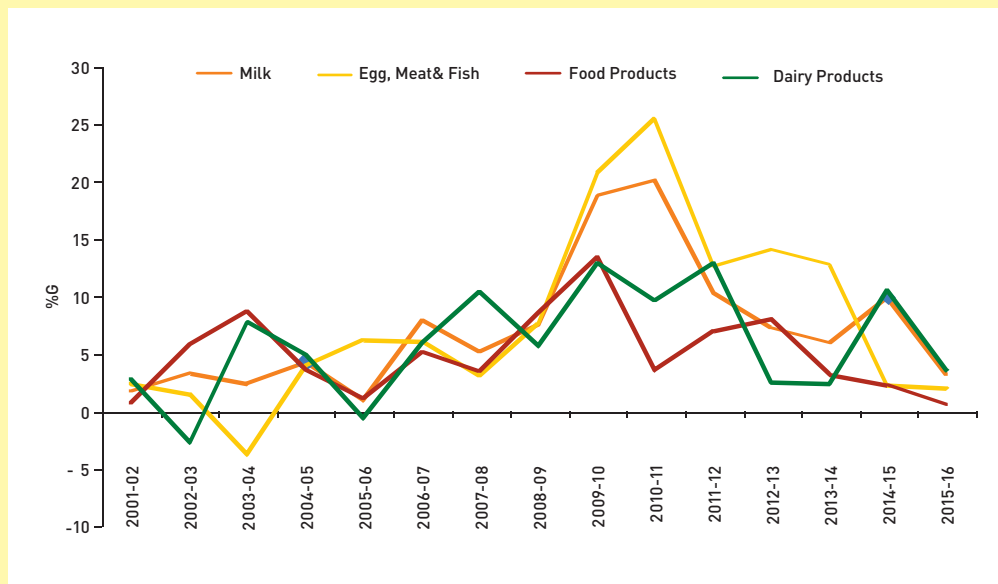
| NSS Round | Milk and Milk Products | | Egg, Meat & Fish | | Total Food | |
|------------------------------------|------------------------|--------|------------------|--------|------------|--------|
| | Rural | Urban | Rural | Urban | Rural | Urban |
| 56th Round (July 2000 – June 2001) | 42.97 | 75.90 | 17.78 | 27.71 | 278.57 | 400.57 |
| 61st Round (July 2004–June 2005) | 47.31 | 83.30 | 18.60 | 28.47 | 307.60 | 447.41 |
| | (10.1) | (9.7) | (4.6) | (2.7) | (10.4) | (11.7) |
| 66th Round (July 2009– June 2010) | 80.16 | 138.71 | 32.26 | 48.03 | 497.09 | 727.49 |
| | (69.4) | (66.5) | (73.4) | (68.7) | (61.9) | (62.6) |
| 68th Round (July 2011–June 2012) | 116.38 | 187.14 | 46.04 | 67.18 | 621.56 | 923.71 |
| | (45.2) | (34.9) | (43.8) | (39.9) | (25.0) | (27.0) |

Source: NSSO, (Figures in parenthesis indicate per cent increase in expenditure over the previous round).

V.2.3 Price Trends

WPI data show little volatility in the prices of the segments of food from livestock, viz., milk, dairy products and egg, meat and fish during the period 2001–02 to 2008–09. There has been wide variation since then until 2012–13. Prices have moved in a narrow range since 2012–13, but there was a positive trend in milk and dairy products, whereas the prices of egg, meat and fish as well as food product prices fell. Since 2015–16, even milk and dairy products prices have fallen. The y-o-y per cent change in WPI for milk, egg, meat and fish, food and dairy products is depicted in the Figure V.5 below:

Figure V.5: WPI for Milk, Egg, Meat and Fish, Food and Dairy Products (Y-O-Y% Change)



Source: Office of Economic Advisor.

V.2.4 Trade

Despite being the world's largest milk producing nation, India has been producing just enough milk and milk products to feed its growing population. It has little dairy surpluses for export and is an insignificant player in the world dairy trade. However, India has turned net exporter of dairy products since 2001, exporting primarily skimmed milk powder (SMP) and specialty products such as casein for food processing. It exported 159.2 million tonnes of dairy products and 11.5 million tonnes of casein during 2013–14, valued at Rs.3318.6 crore and 636.9 crore respectively, the highest so far. It was down by 64 per cent and 33 per cent respectively during 2014–15 at Rs.1205 crore and Rs.428 crore. During 2015–16, export of dairy products fell further to Rs.754 crore, the lowest in the last four years. Table V.8 below presents export of dairy products and casein from India since 2012–13.

Table V.8: Dairy Product Export from India

| | 2012–13 | | 2013–14 | | 2014–15 | | 2015–16 | |
|----------------|------------|-------------------|------------|-------------------|------------|-------------------|------------|-------------------|
| | Qty. (MMT) | Value (Rs. Crore) | Qty. (MMT) | Value (Rs. Crore) | Qty. (MMT) | Value (Rs. Crore) | Qty. (MMT) | Value (Rs. Crore) |
| Dairy Products | 87.8 | 1412.1 | 159.2 | 3318.6 | 66.4 | 1205.4 | 33.4 | 754.2 |
| Casein | 13.6 | 556.2 | 11.5 | 636.9 | 8.2 | 428.5 | 5.9 | 215.9 |

Source: APEDA.

The poultry industry has been growing at around 8-10 per cent annually over the last decade with broiler meat volumes growing at more than 10 per cent, while the demand for eggs has been growing at 5-6 per cent per annum.

While Tamil Nadu accounts for the maximum egg production among states, Maharashtra accounts for the highest poultry meat production.

Although import demand for dairy products has dried up, after the abolition of dairy produce quota by European Union, the imposition of an EU ban on exports to the Soviet Union and significantly lower demand from China has led to a glut of milk products in the international markets.

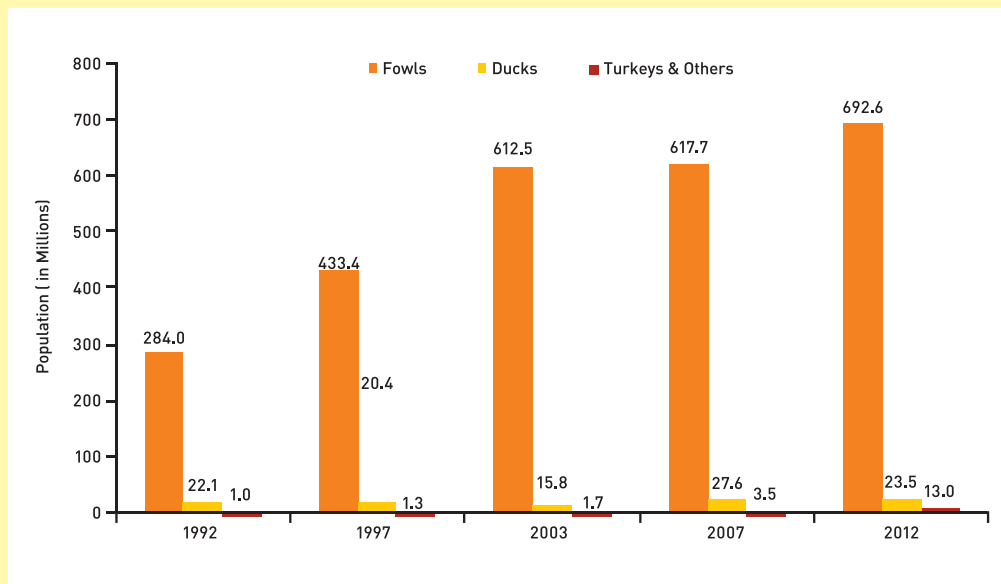
India has a comparative advantage and has been exporting milk products to deficient neighbouring countries such as Bangladesh, Pakistan, Nepal, Bhutan, and Afghanistan and to the UAE, South East Asia and Africa. It can look forward to continued access in these markets for its dairy products in the medium term.

V.3 Poultry Sector

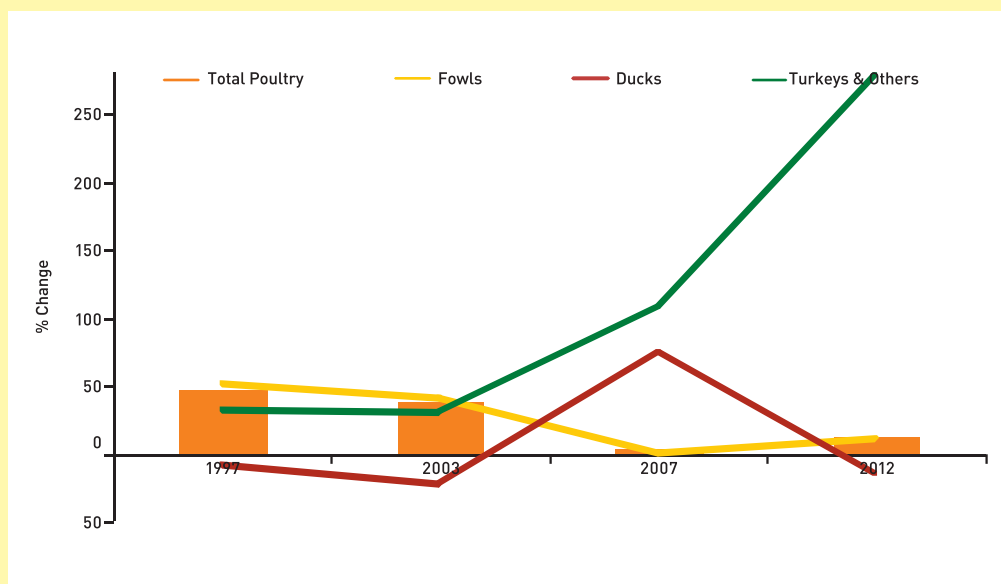
The poultry industry has been growing at around 8-10 per cent annually over the last decade with broiler meat volumes growing at more than 10 per cent, while the demand for eggs has been growing at 5-6 per cent per annum. The increasing demand for and production of poultry products has given a fillip to employment with over 6 million people being employed in the sector. Of this, about 80 per cent of employment has been generated directly by poultry farms while the remaining have been employed in feed, pharmaceuticals, equipment and other services required by poultry industry (FAO). The value of output from the poultry sector was US\$10 billion in 2012-13, which accounts for about one per cent of India's GDP and 11.7 per cent of GDP from the livestock sector. Within the poultry sector, two-thirds of the output is contributed by broiler sector, while the remaining is accounted for by egg production. The organised poultry sector contributes 70 per cent of the total output, with the rest from the unorganised sector. According to MOSPI and Ministry of Agriculture & Farmers Welfare data, while Tamil Nadu accounts for the maximum egg production among states, Maharashtra accounts for the highest poultry meat production.

V.3.1 Poultry Population

Poultry consists of generally three categories of birds, namely fowl, duck and turkey. The total poultry population in the country has increased by 12.4 per cent from 648.8 million as recorded in previous livestock census year, i.e., 2007 to 729.2 million numbers in 2012. This growth was just 3 per cent in 2007 over 2003. Of the total poultry population, fowls including chickens constitute 95 per cent of share, 3.2 per cent by ducks and the remaining 1.8 per cent by turkey & others (Figure V.6 and V.7). Although the percentage share is the highest for fowl in total poultry population, it has shown a decline in the last two census years. The share of ducks in total poultry population also registered a decline, while turkey and others show an increase in poultry population share in both 2007 and 2012.

Figure V.6: Poultry Population (Million) in India 1992 to 2012

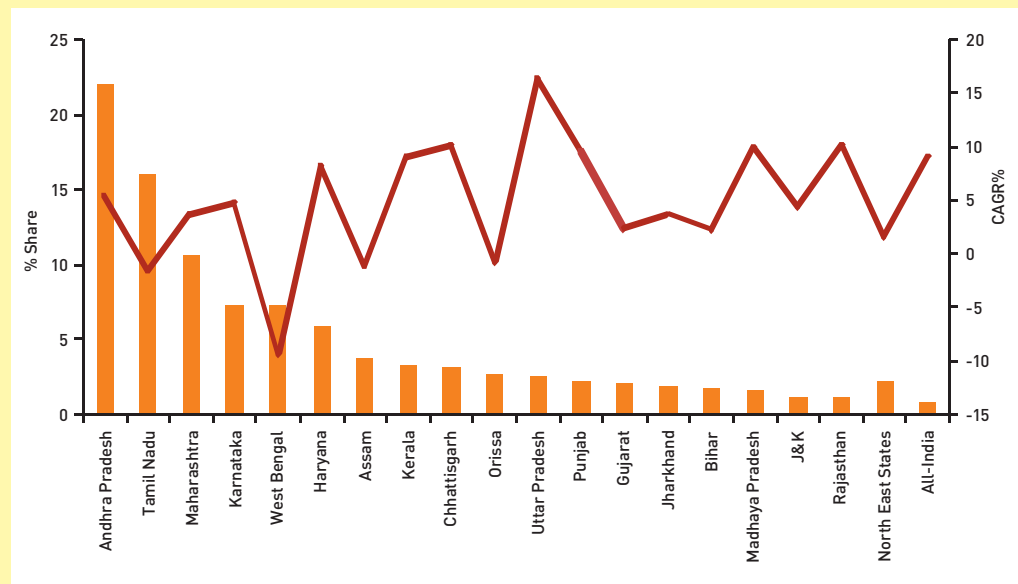
Source: Livestock Census 2012.

Figure V.7: Percentage Change Y-o-Y in Poultry Population: All India

Source: Livestock Census 2012.

State-wise, Andhra Pradesh, Tamil Nadu and Maharashtra top the list with the maximum poultry population in 2012 accounting for 161.3 million, 117.3 million and 77.8 million respectively. In terms of percentage shares, these three states together constitute nearly 49 per cent of total poultry population in the country (22 per cent, 16 per cent and 10.7 per cent). Overall, 82.3 per cent of total poultry population is recorded in 10 major states in India (Figure V.8). Region-wise, states in the southern region account for 49 per cent of the total share in poultry population,

Figure V.8: State-wise Percentage Share in Poultry Population 2012 & Growth (2007-12)



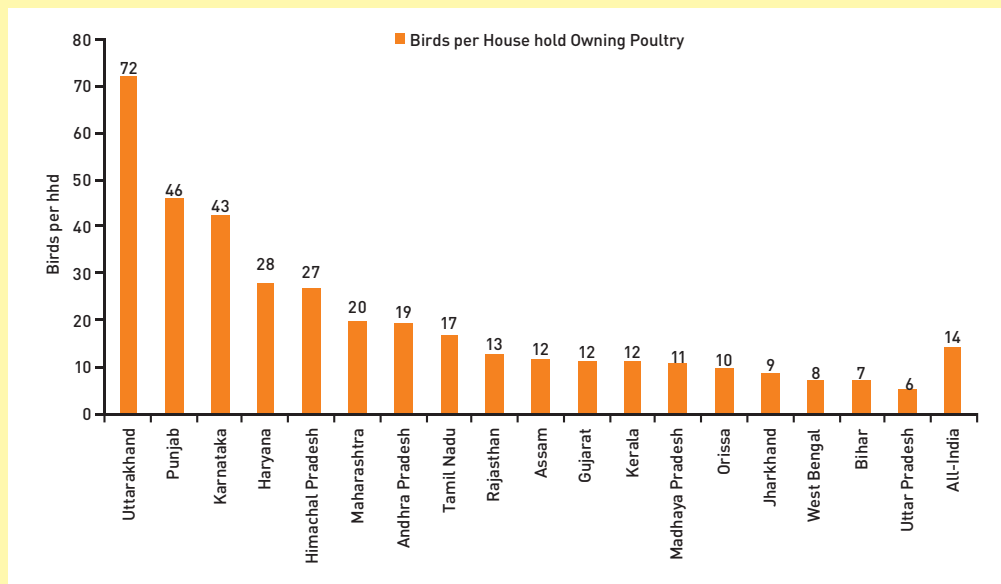
Source: Livestock Census 2012.

The highest compound annual growth rate in the period between 2007 and 2012 was registered in Uttar Pradesh (16.4 per cent), followed by Rajasthan (10.2 per cent), Chhattisgarh (10.2 per cent), Madhya Pradesh (10 per cent) and Punjab (9.2 per cent). Among top three states with highest poultry population, Andhra Pradesh and Maharashtra registered CAGR of 5.4 per cent and 3.7 per cent in 2012 over previous census while Tamil Nadu registered a negative growth of 1.7 per cent in 2012.

V.3.2 Poultry Stock

Nearly 19 per cent of the total households in India own poultry birds according to the Livestock Census 2012. Of these about 60 per cent of households own backyard poultry, while the remaining 40 per cent of households own poultry farms and hatcheries. The average number of birds per household with backyard poultry was about seven in 2012, while this was 26 in case of households who own poultry farm/hatcheries. On the whole, the average number of birds per household owing poultry in India was 14 in 2012. The top five states with highest the number of poultry birds per household are Uttarakhand, Punjab, Karnataka, Haryana and Himachal Pradesh (Figure V.9). The states of Maharashtra, Tamil Nadu and Andhra Pradesh, which account for the highest production of poultry products in India, come next with around 17-20 birds per household in 2012.

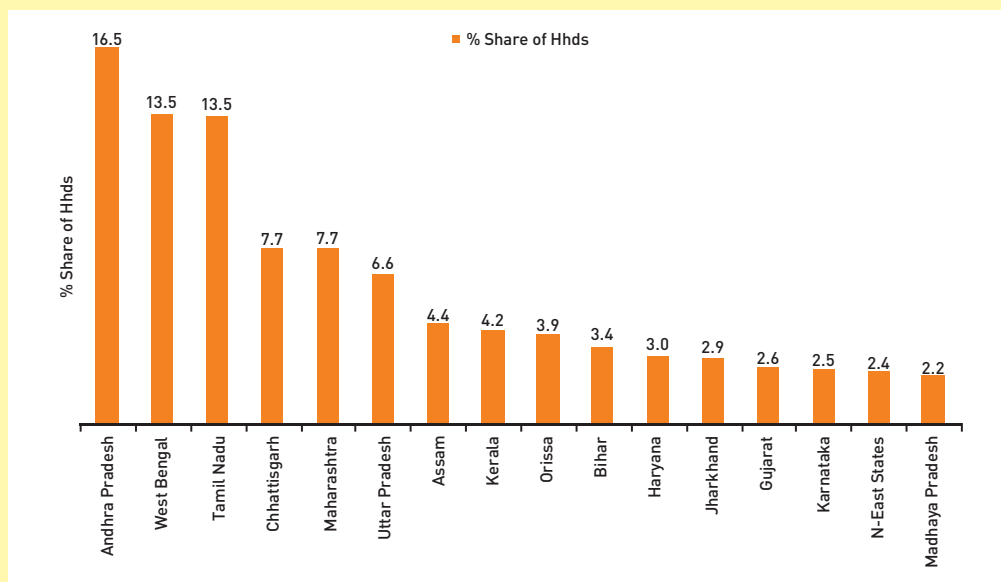
Figure V.9: Number of Birds per Households Owing Poultry in India: 2012



Source: Ministry of Agriculture, Govt. of India.

In terms of percentage share of households with maximum poultry birds, the state of Andhra Pradesh scored the highest rank in 2012. The other states having the highest percentage of households with poultry birds are West Bengal and Tamil Nadu with 13.5 per cent each; and Chhattisgarh and Maharashtra with 7.7 per cent share each (Figure V.10).

Figure V.10: Percentage Share of Households Owing Poultry Birds in India: 2012

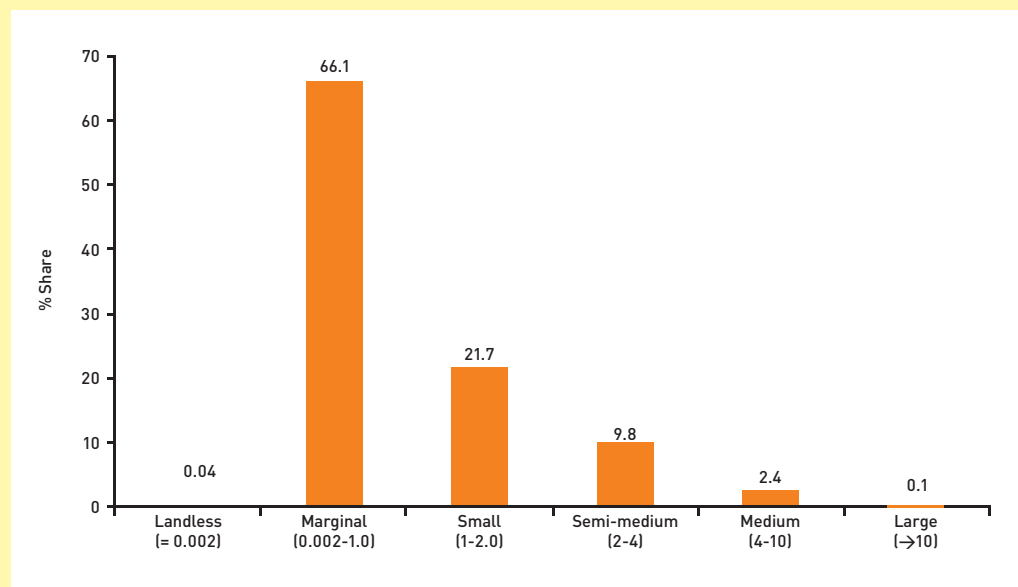


Source: Livestock Census 2012.

Note: Households includes households and households enterprises.

According to the last five LHS Surveys of NSS, the estimated stock of poultry of households having operational holdings, which is less than the total number of rural households, was higher at 254.6 million in 2012–13 as compared to 182 million registered in 2002–03, reflecting a growth rate of 3.4 per cent. The stock of poultry per 100 households across the last five LHS Surveys of NSS showed an increase from 123 in 2002–03 to 163 per 100 households in 2012–13, although this is lower than the 166 per 100 households as reported in 1991–92. The distribution of poultry by size of operational holding shows that households with marginal operational holdings (< 0.002 hectares) had the highest stock of poultry at 168 million (66 per cent share) in 2012–13, followed by households with small holdings (55.2 million households with an operational holding of between 1 to 2 hectares) and households with semi-medium land holdings (24.9 million with an operational holding of between 2 and 4 hectares) with 21.7 per cent and 9.8 per cent shares, respectively (Figure V.11).

Figure V.11: Percentage Distribution of Poultry by Size of Operational Holdings (ha)



Source: Livestock Ownership in India Report, NSS Round 70.

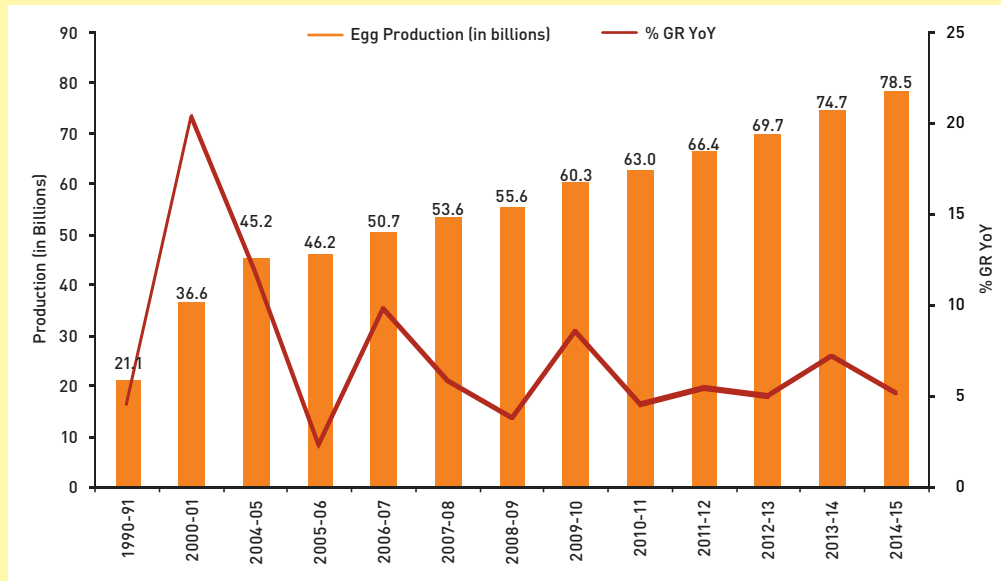
India is third largest producer of eggs in the world after China and the US, and the fifth largest poultry meat producer in the world.

Nearly 94 per cent of the production of egg is contributed by fowl in India and the remaining by duck and other poultry birds.

V.3.3 Production Trends

Poultry production is the most dynamic livestock sector worldwide. There has been a continuous rise in global poultry meat production. Chicken represents the biggest share of poultry produce accounting for about 87 per cent of world poultry meat production. World’s total production of poultry meat during 2011 was approximately 101.6 mmt. Egg production is also growing both in India and globally. Today, India is third largest producer of eggs in the world after China and the US, and the fifth largest poultry meat producer in the world.

Total egg production in the country was 1.8 billion in 1950–51 and since then, there has been a consistent increase in the production of egg. Total egg production in 1990–91 was about 21 billion 36.6 billion in 2000–01 and 63 billion in 2010–11. By the end of 2014–15, total egg production increased at a CAGR of 5.7 per cent from 45.2 billion in 2004–05 to about 78.4 billion in 2014–15. In 2000–01, India experienced a significant increase in egg production and was ranked fifth in the world in egg production. About 60 per cent of this rapid growth in egg production was because of productivity increase resulting from the introduction of hybrid birds. Nearly 94 per cent of the production of egg is contributed by fowl in India and the remaining by duck and other poultry birds (Figure V.12).

Figure V.12: Production of Eggs in India (in Billions) & Y-o-Y (%) Growth

Source: Basic Animal Husbandry & Fisheries Statistics 2013, DAHDF, MOAFW.

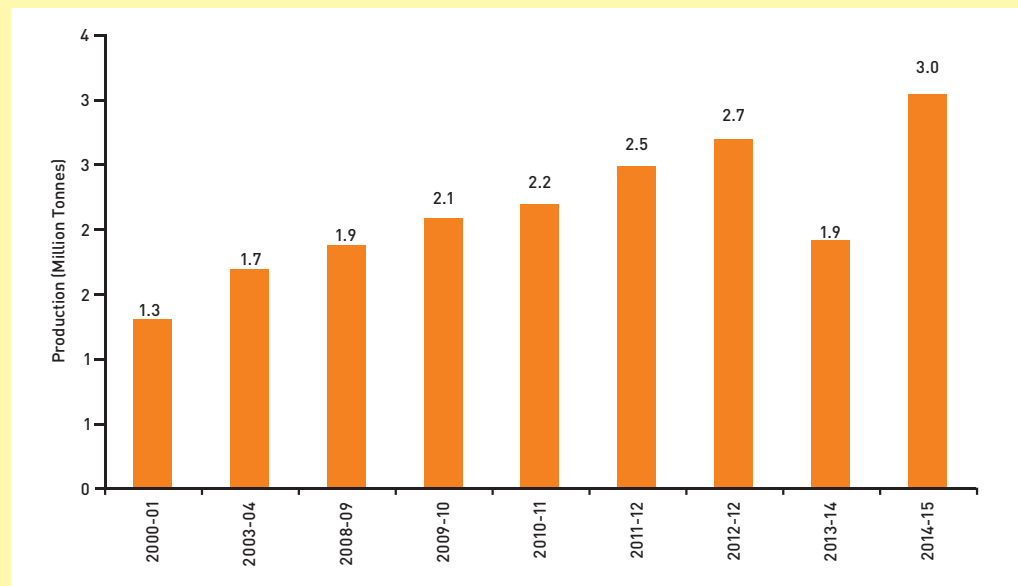
The per capita availability of egg was 5 eggs per annum during the period 1950–56. There was a steady increase in per capita availability of eggs since then until 1979–80 with marginal fluctuations. In 2000–01, there was a sudden jump in the per capita availability of egg to 36 eggs per annum from 30 eggs per annum in the year 1999–2000. Another significant jump took place in 2004–05, when per capita availability increased to 42 from 38 in 2003–04 registering a growth of 10 per cent. From 2004–05 onwards, there has been a substantially increasing trend in the per capita availability of eggs. As a result, per capita availability of eggs touched 63 eggs per annum in the year 2014–15.

The growth of the poultry sector in India is driven by several factors including rising incomes and a rapidly expanding middle class population, together with the emergence of vertically integrated poultry producers, which has reduced consumer prices by lowering production and marketing costs. Integrated production, market transition from live birds to chilled and frozen products, and policies that ensure supplies of competitively priced corn and soybeans are keys to the future growth of the poultry industry in India. Now, India has number of small poultry dressing plants that produces dressed chickens.

Nearly 45 per cent of production of all meat is contributed by poultry. Chicken is considered to be the preferred meat in India due to its lower price as compared to other meat sources, and is not subject to the same religious restrictions as other meat products. Poultry meat production in the country was just 0.4 million tonnes in the year 1991; in 2001, this has increased to 1.3 million tonnes. Since 2001, poultry meat production has continuously increased, except for the year 2013–14 when poultry meat production declined by 28 per cent from 2.7 million tonnes in 2012–13 to 1.9 million tonnes in 2013–14, mainly on account of climatic factors and the outbreak of disease. The domestic poultry sector has suffered losses during the past few years due to continuous increase in feedstock (mainly soya and maize) prices and oversupply of poultry products, coupled with untimely rains and drought in various parts of the country. But in 2014–15, the production of poultry meat picked up again to 3 million tonnes (Figure V.13). The annual per capita availability of poultry meat was 2.8 kg in 2014.

Chicken is considered to be the preferred meat in India due to its lower price as compared to other meat sources.

Figure V.13: Production of Poultry Meat in India (Million Tonnes)



Source: Basic Animal Husbandry & Fisheries Statistics 2013, DAHDF, MOAFW.

Meat production from poultry is the highest in the state of Maharashtra with 0.434 million tonnes per year, accounting for a 14.3 per cent share of all India production in 2014–15. The second and third highest average production of poultry meat is reported by Haryana (12 per cent) and Tamil Nadu (11.4 per cent) with 0.367 million tonnes and .346 million tonnes of production respectively (Table V.9). Nearly 70 per cent of the total poultry meat production takes place in 6 major states that includes, apart from the top three states, West Bengal, Andhra Pradesh and Uttar Pradesh. In contrast, the largest producer of eggs is Tamil Nadu, which produces 20 per cent of the total egg production in the country followed by Andhra Pradesh that produces 16.7 per cent of the egg production. Telangana, Maharashtra and West Bengal are the next three largest producers of eggs in country, which together constitutes 26 per cent of total egg production. The southern region accounts for about 46.5 per cent of India’s total egg production. The eastern and central regions of India account for roughly 20 per cent of egg production. The reason behind the increase in production levels in these states has been an increase in the size of poultry farms. In earlier years, broiler farms had produced on average a few hundred birds (from 200–500 chicks) per cycle. Today units with 5,000 to 50,000 birds per cycle are common. Similarly, in layer farms, units with a flock size of 10,000 to 50,000 birds have become common in India.

Table V.9: Production of Poultry Meat and Eggs in 2014–15: Top 12 States

| States/UTs | Poultry Meat (000 tonnes) | States/UTs | Eggs (billion) |
|----------------|---------------------------|----------------|----------------|
| Maharashtra | 434.4 | Tamil Nadu | 15.9 |
| Haryana | 367.2 | Andhra Pradesh | 13.1 |
| Tamil Nadu | 346.5 | Telangana | 10.6 |
| West Bengal | 338.1 | Maharashtra | 5.1 |
| Andhra Pradesh | 321.0 | West Bengal | 4.8 |
| Uttar Pradesh | 304.4 | Haryana | 4.6 |
| Telangana | 245.3 | Karnataka | 4.4 |
| Kerala | 163.6 | Punjab | 4.3 |
| Punjab | 108.5 | Kerala | 2.5 |
| Karnataka | 82.6 | Uttar Pradesh | 2.1 |
| Odisha | 73.8 | Odisha | 1.9 |
| Bihar | 43.2 | Gujarat | 1.7 |
| All India | 3045.2 | All India | 78.5 |

Source: Ministry of AHD&F, Govt. of India.

V.3.4 Demand and Consumption Patterns

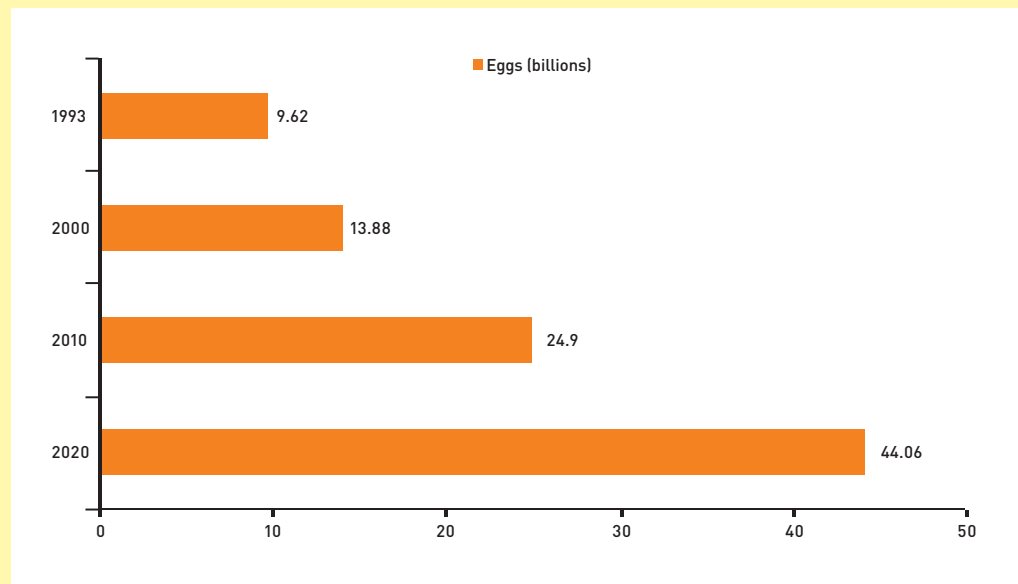
According to the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmer's Welfare (GOI) estimates, demand for poultry products is expected to rise by 2020. The demand for eggs is likely to go up to 44 billion by 2020 as compared to 25 billion recorded for 2010, growing at a rate of 5.9 per cent per annum (Figure V.14). The demand for poultry meat, on the other hand, is expected to reach 0.81 million tonnes by 2020 from 0.52 million tonnes in 2010, reflecting a compound annual growth rate of 4.5 per cent (Figure V.15). Demand within India's poultry sector has been galvanised by lower prices for feed and live birds, rising purchasing power, changing food habits, contract poultry farming and rapid urbanisation. Factors like a growing rural market, awareness of new technologies and specialised methodologies and techniques in hatching and bird rearing have also contributed to boosting growth and reducing wastage in recent years.

At present, urban markets account for about 80 per cent of total demand. However, demand in rural markets is expected to pick up significantly due to lower chicken prices, improved prosperity and changing lifestyles. Annually, the domestic poultry industry consumes around 12 million tonnes of maize and 4 million tonnes of soy-meal. Together, these account for some 85 per cent of total poultry feedstock. The expected lower prices of poultry meat will support an increase in demand.

The demand for eggs is likely to go up to 44 billion by 2020 as compared to 25 billion recorded for 2010, growing at a rate of 5.9 per cent per annum. The demand for poultry meat, on the other hand, is expected to reach 0.81 million tonnes by 2020 from 0.52 million tonnes in 2010, reflecting a compound annual growth rate of 4.5 per cent.

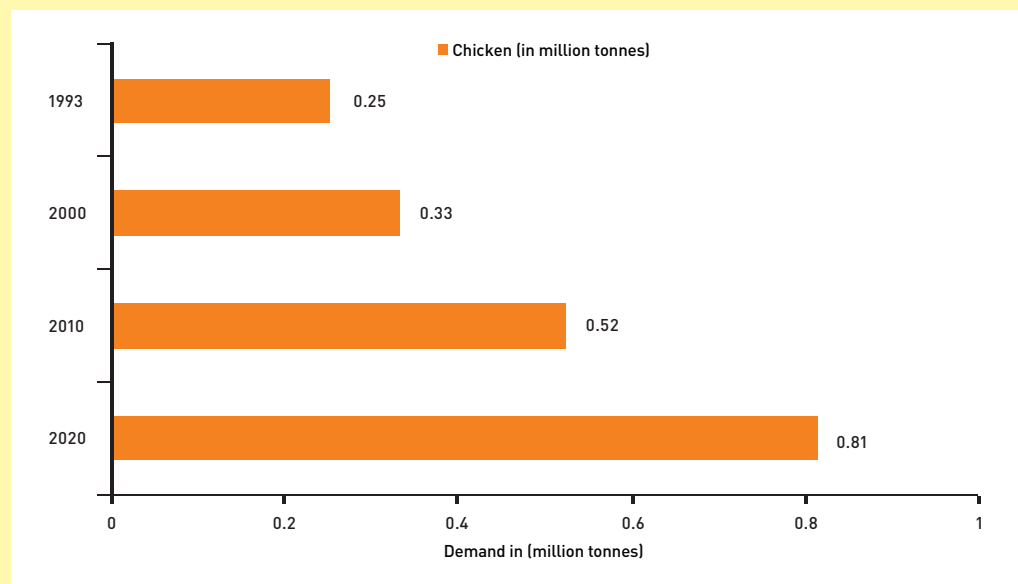
Despite local and global challenges, domestic consumption of poultry in India has been on the rise, primarily on account of changing eating habits in metro cities, stable feed prices and encouraging rural demand.

Figure V.14: Demand Projections for Eggs in India: 2020



Source: Dept. of Agricultural, Research and Education, Ministry of Agriculture, Govt. of India.

Figure V.15: Demand Projections for Poultry Meat in India: 2020



Source: Dept. of Agricultural, Research and Education, Ministry of Agriculture, Govt. of India.

In 2015, India reported three highly pathogenic avian influenza (HPAI) outbreaks to the Organisation for Animal Health (OIE). However, since the HPAI outbreaks were localised, the total poultry population was not largely affected, although the demand for chicken meat allegedly fell for a temporary period in some states. Despite local and global challenges, domestic consumption of poultry in India has been on the rise, primarily on account of changing eating habits in metro cities, stable feed prices and encouraging rural demand. According to USDA’s Foreign Agriculture Service report on poultry and poultry products 2015, the per capita consumption of poultry meat in India is estimated at around 3.2 kg per year, significantly lower than the world average of around 17 kg per year. Overall, consumption is growing as in 2016, total chicken meat consumption is forecast at

4.19 million tonnes, up by approximately eight per cent over the consumption of 3.89 million tonnes recorded in 2015. According to NSSO, the per capita consumption of eggs (in last 30 days) in both rural and urban areas has increased in 2011–12 since 2004–05 by 9–10 per cent per annum. The per capita consumption of chicken also increased by 20 per cent by 20 per cent in rural areas and by 16 per cent in urban areas (Table V.10) during this period.

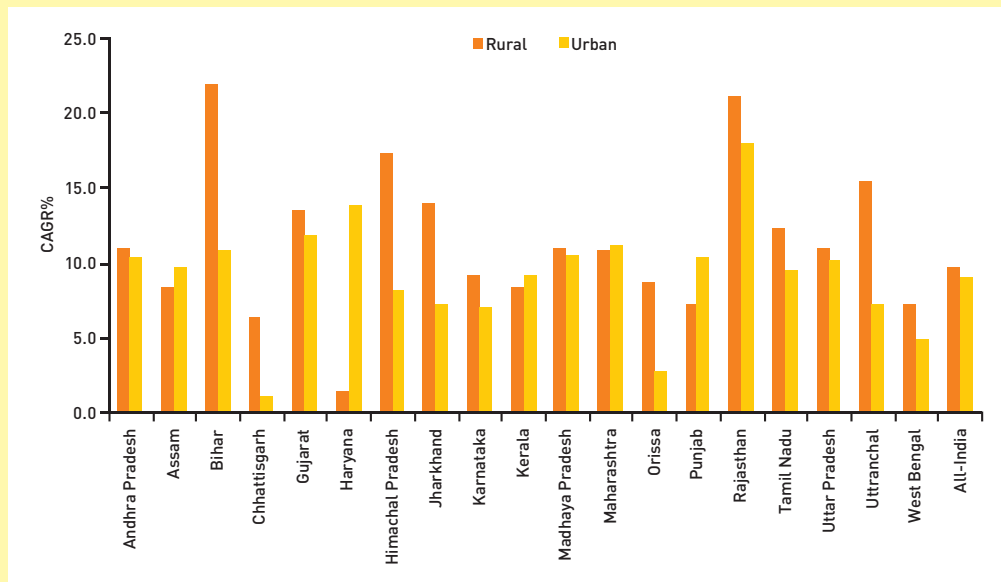
Table V.10: Per capita Consumption of Poultry Products (Qty) in Last 30 Days

| Rounds | Eggs (numbers) | | Chicken (Kg) | |
|---------|----------------|-------|--------------|-------|
| | Rural | Urban | Rural | Urban |
| 1993–94 | 0.64 | 1.48 | 0.020 | 0.030 |
| 1999–00 | 1.09 | 2.06 | 0.040 | 0.060 |
| 2004–05 | 1.01 | 1.72 | 0.050 | 0.085 |
| 2011–12 | 1.94 | 3.18 | 0.178 | 0.239 |

Source: NSS Rounds.

In urban areas, the monthly per capita consumption of eggs has grown at higher rates in Rajasthan, Haryana, Gujarat and Maharashtra, while in rural areas; the states with highest growth in egg consumption are Bihar, Rajasthan, Himachal Pradesh and Uttarakhand (Figure V.16).

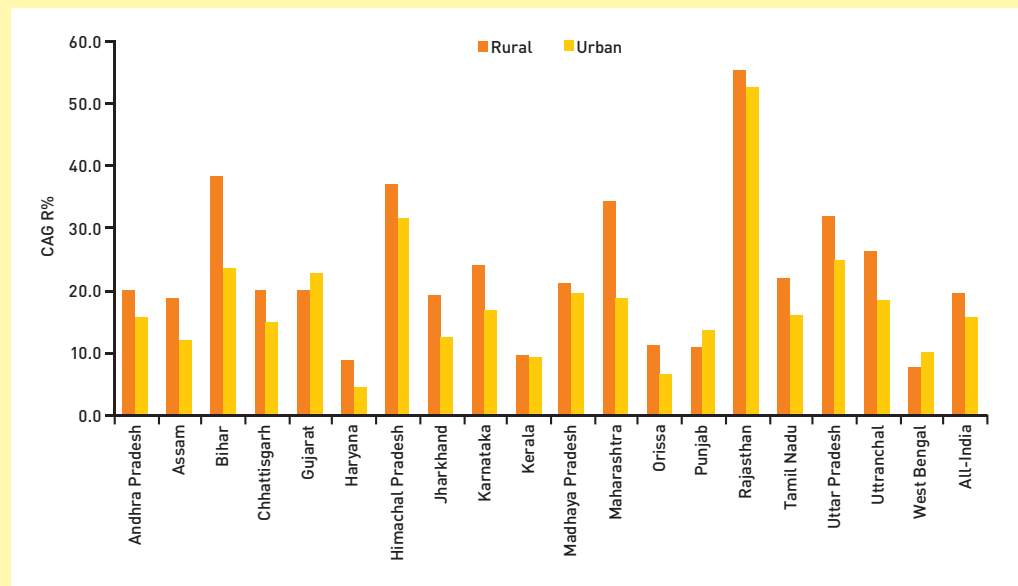
Figure V.16: State-wise CAGR of Monthly Per capita Egg Consumption (Qty): 2004–12



Source: NSS Rounds.

In case of poultry meat consumption, the states with the highest growth in consumption are Rajasthan, Himachal Pradesh, Bihar, Uttar Pradesh and Maharashtra for both rural and urban areas (Figure V.17).

Figure V.17: State-wise Monthly Per capita Chicken Consumption (Qty): per cent CAGR 2004-12



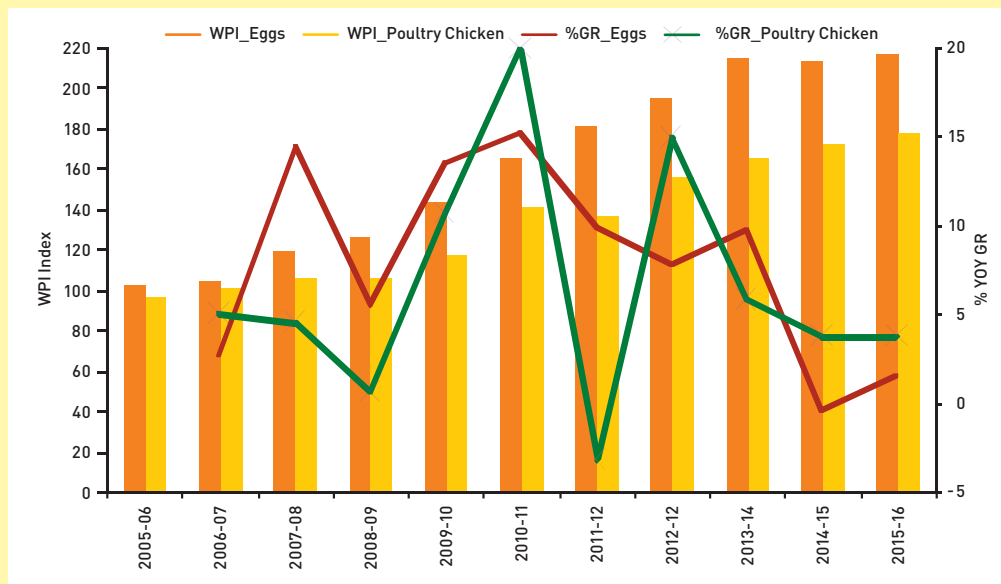
Source: NSS Rounds.

V.3.5 Prices

The annual rate of inflation, based on the wholesale price index (WPI), is lower at 3.3 per cent for the financial year 2015–16 for food articles, as compared to 6.1 per cent as recorded for the corresponding period last year. In comparison, the year-on-year inflation for poultry products (egg and chicken) together is lower at 2.1 per cent in 2015–16, although it is higher as compared to the inflation rate of 1.7 per cent recorded in the previous year, i.e., 2014–15.

Within poultry products, although the absolute index is higher in the case of eggs than for chicken, the rate of increase in prices is much higher for chicken than for eggs. The WPI for eggs has moved up from 214 in 2014–15 to 217 in 2015–16, recording a growth of 1.5 per cent now as compared to -0.4 per cent recorded in 2014–15. For chicken, the WPI has gone up from 172.1 in 2014–15 to 178 in 2015–16, showing a growth rate of 3.7 per cent, which is almost similar to that in the previous year, thus showing stagnancy in meat prices (Figure V.18). As seen here, chicken prices were higher in the last few years from 2009–10 until 2012–13 on account of increased feed prices and other costs. However, in recent years with lower prices of poultry feed, increased demand and new poultry methods, there has been an easing of inflationary pressures on poultry products.

Figure V.18: WPI Trends: Annual Index and Y-o-Y (%) Growth Rate for Poultry

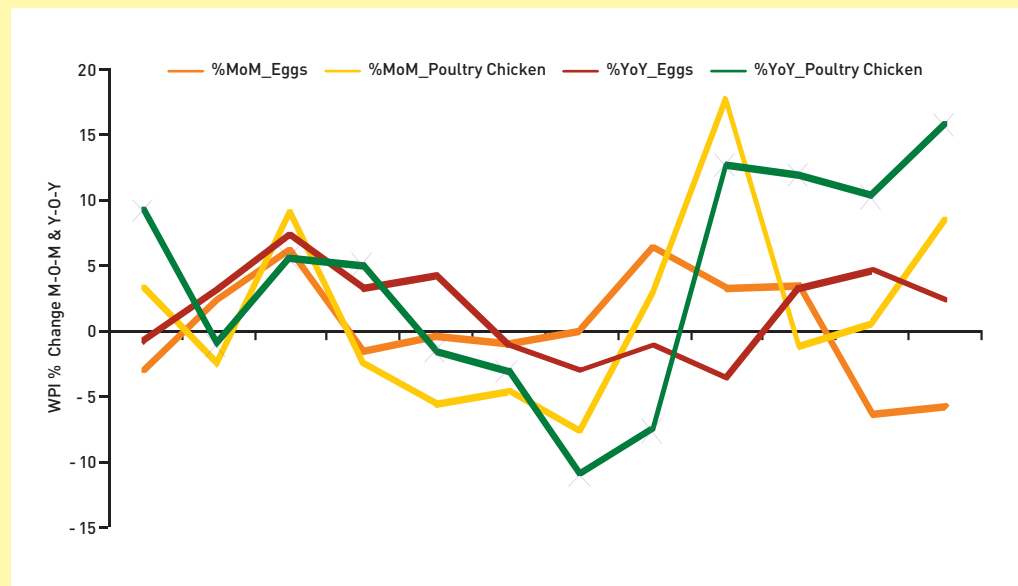


Source: Office of Economic Advisor, Government of India.

The monthly wholesale price index (WPI) stood at 300.8 for the month of March 2016 for egg, fish and meat category, higher than the previous month by just 0.8 per cent. In comparison, the M-o-M inflation for eggs is (-) 5.8 per cent in March 2016 over Feb 2016, while chicken shows a positive growth of 8.5 per cent in March 2016 over the previous month in same year.

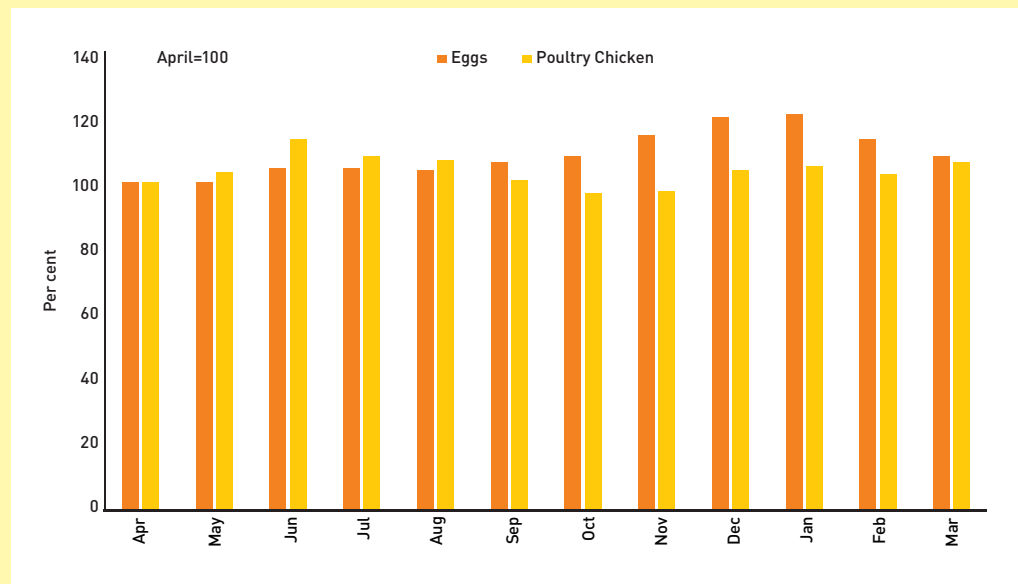
Y-o-Y inflation for eggs in March 2016 stood at 2.4 per cent, while for chicken, it is significantly higher at 15.8 per cent in March 2016 over March 2015 (Figure V.19). The rise in the chicken price was lower during the early months of last financial year, i.e., from August – November 2015, but after this period, it increased. However, in case of eggs, after slight ups and downs, the level of inflation has been almost moderate since last one year. The M-o-M inflation rate for eggs on the other hand, has declined since December 2015 till now, whereas for chicken, inflation was its peak in December 2015, after which it declined in Jan 2016, but started increasing again thereafter, recording an increase of 8.5 per cent in March 2016 over Feb 2016. Figure 20 presents the monthly seasonality in prices of eggs and poultry meat for last three years from 2013–14 to 2015–16. The figure shows higher seasonal fluctuations in prices of eggs during the months of November–February.

Figure V.19: WPI Trends:M-o-M (%) and Y-o-Y (%) Growth Rate for Poultry



Source: Office of Economic Advisor, Government of India.

Figure V.20: Seasonality in Poultry Prices for Last 3 Years (2013–2016)



Source: Calculations based on data from Office of Economic Advisor, Government of India.

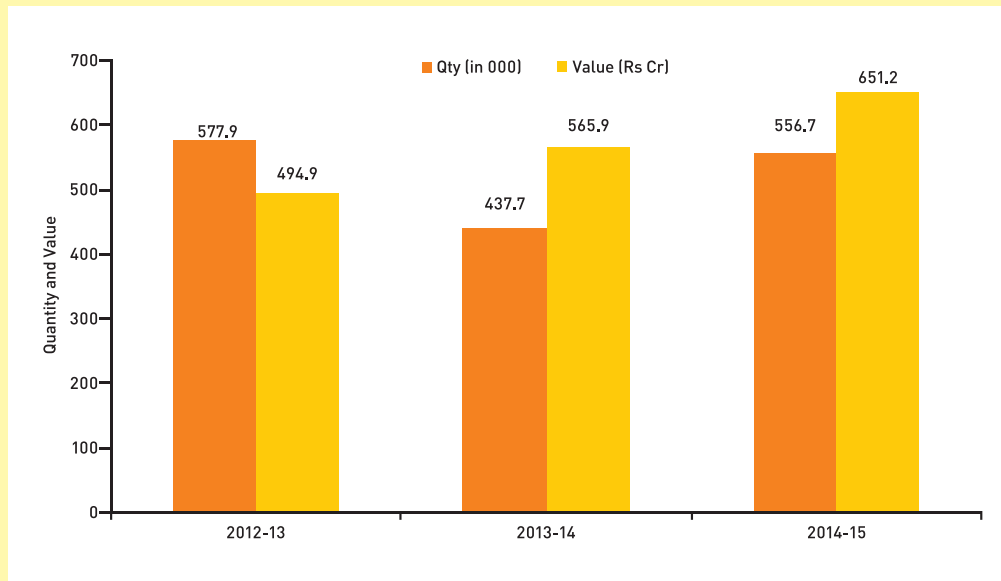
There has been considerable growth in the exports of Indian poultry products with good markets in Japan, Malaysia, Indonesia and Singapore.

V.3.6 Trade

There has been considerable growth in the exports of Indian poultry products with good markets in Japan, Malaysia, Indonesia and Singapore. The country has exported 556.7 thousand tonnes of poultry products to the world worth Rs.651.2 crore during the year 2014–15. This is 27.2 per cent higher in quantity terms as compared to the previous year, while in terms of exports value, the Y-o-Y growth rate is 15 per cent (Figure V.21). Overall, major export destinations for poultry products in 2014–15 were Oman, Germany, Japan, Saudi Arabia and Indonesia. India imposes no restrictions on poultry and egg exports; despite this, export of poultry meat are small due to limited slaughtering and processing

facilities and underdeveloped cold chain infrastructure. To expand the domestic poultry industry as well as to increase its presence in international trade, India needs to invest in the development of cold chain infrastructure and an efficient distribution system for transition from a predominantly live bird/wet market to a chilled/frozen market.

Figure V.21: Indian Exports for Poultry Products (Qty in 000 tonnes; Value in Rs cr)



Source: DGCIS.

V.3.7 Future Prospects

While crop output in India has been rising at a rate of 1.5-2 per cent per annum, the production of eggs and broilers has been rising at a rate of 8-10 per cent per annum over the past decade with an annual turnover of US\$7500 million. The domestic market has been buoyant due to a growing rural market and lower feed and poultry prices, increase in disposable incomes and increased awareness of new technologies and mechanisation in the sector. Within India, the southern region accounts for a large part of total poultry production and consumption.

Factors in India are favourable for the growth of the poultry business, including good climate favouring low cost poultry housing; low cost of labour; locally produced inland feed ingredients (corn, soybeans) and integrated production. Economic revival is further expected to stimulate the growth of the industry by at least 10 per cent, leading to growing confidence and added expansion among existing players. As domestic demand for broiler meat and eggs continues to grow, the future of the Indian poultry industry appears to be bright. According to USDA's Foreign Agriculture Service report on Poultry and Poultry Products Annual 2015, broiler production is projected to increase by approximately 8 per cent for CY 2016 to 4.2 million tonnes on rising demand from the growing middle class, while egg production is forecast at 80 thousand millions, up by 5 per cent from the last year. The consumption of chicken meat is also forecast at 4.19 million tonnes, up by approximately 8 per cent over 2015.

According to a study on Poultry Vision 2010: the Indian perspective, a report by the All India Poultry Breeder's Association, egg production will reach 101.8 billion by 2020 and poultry meat production will rise to 8.6 million tonnes by 2020. There are several factors driving the recent growth of the Indian poultry sector such as income growth, large share of population below the age of 25 that are high consumers of poultry products, gradual shift

India needs to invest in the development of cold chain infrastructure and an efficient distribution system for transition from a predominantly live bird/wet market to a chilled/frozen market.

While crop output in India has been rising at a rate of 1.5-2 per cent per annum, the production of eggs and broilers has been rising at a rate of 8-10 per cent per annum over the past decade.

As domestic demand for broiler meat and eggs continues to grow, the future of the Indian poultry industry appears to be bright.

The live poultry market constitutes 90-95 per cent of total sales since most consumers prefer freshly culled chicken meat.

2012 Livestock Census of India estimates India's buffalo population at 108.7 million in 2012, accounting for 58 per cent of the world's total buffalo population and a third of India's bovine stock.

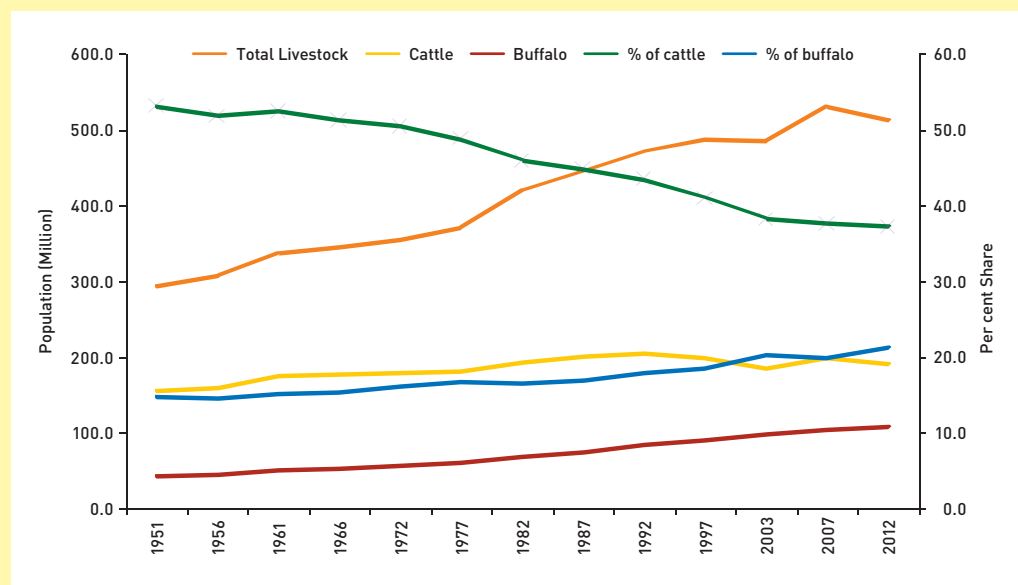
from vegetarianism to non-vegetarianism among youth and wider acceptance of poultry meat among various meat options. Integrators own all the hatcheries, feed mills and slaughter facilities and contract with multiple small farmers who raise the chicks to slaughter primarily in open air sheds; in a few cases, integrators may sell chicks or feed without requiring a contract. Some integrators also provide credit, extension services and veterinary medicine. At the end of the production cycle, the live birds are either purchased by the integrator for slaughter and further processing or by middlemen/wholesalers in the live bird wet market for local sale. The live poultry market constitutes 90-95 per cent of total sales since most consumers prefer freshly culled chicken meat. Processed chicken meat constitutes about 5-10 per cent of total chicken meat production. On the whole, future for poultry industry in India is optimistic and there is expectation that reduced risk from imports flooding the markets, improving demand and lower feed costs, hold promising prospects for the poultry industry in the medium term.

V.4 Buffalo Meat

V.4.1 Buffalo Population

The 2012 Livestock Census of India estimates India's buffalo population at 108.7 million in 2012, accounting for 58 per cent of the world's total buffalo population and a third of India's bovine stock. The country has witnessed a remarkable increase in the buffalo population from 43.4 million in 1951 to 108.7 million in 2012, at an annual growth of 1.52 per cent compared with 0.92 per cent growth in total livestock population. The share of buffaloes in the total livestock population has shown a steady growth from 14.8 per cent in 1951 to 21.2 per cent in 2012, whereas the share of cattle has declined from 53 per cent to 37 per cent during the same period (Figure V.22). In India, the cattle and buffalo population is dominated by female stock. The 2012 census indicates that 64.6 per cent and 85.1 per cent of the cattle and buffalo populations respectively are female.

Figure V. 22: Trend of livestock, Cattle and Buffalo (in Million) and Share to Total Livestock



Sources: Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture.

Uttar Pradesh (28.7 per cent), Rajasthan (11.94 per cent), Andhra Pradesh (9.8 per cent), Gujarat (9.6 per cent), Madhya Pradesh (7.5 per cent), Bihar (6.96 per cent) and Haryana (5.6 per cent) together account for 94 per cent of the total buffalo population in India with

over 96 per cent being concentrated in rural areas (Table V.11). The buffalo population has increased in Uttar Pradesh (5.16 per cent), Rajasthan (3.19 per cent), Gujarat (3.44 per cent), Bihar (2.49 per cent), Haryana (0.45 per cent) and Punjab (0.49 per cent) between the 2007 census to 2012 census. The buffalo population has declined in a few states, viz., Andhra Pradesh (4.35 per cent), Madhya Pradesh (2.15 per cent), Maharashtra (1.62 per cent) and Karnataka (4.33 per cent) during the same period.

Table V.11: State-wise Buffalo Population (in Million) Share and Growth (in per cent)

| States | 2007 | 2012 | % share | Annual Growth% |
|----------------|--------|--------|---------|----------------|
| Uttar Pradesh | 23.81 | 30.63 | 28.17 | 5.16 |
| Rajasthan | 11.09 | 12.98 | 11.94 | 3.19 |
| Andhra Pradesh | 13.27 | 10.62 | 9.77 | -4.35 |
| Gujarat | 8.77 | 10.39 | 9.55 | 3.44 |
| Madhya Pradesh | 9.13 | 8.19 | 7.53 | -2.15 |
| Bihar | 6.69 | 7.57 | 6.96 | 2.49 |
| Haryana | 5.95 | 6.09 | 5.60 | 0.45 |
| Maharashtra | 6.07 | 5.59 | 5.15 | -1.62 |
| Punjab | 5.06 | 5.16 | 4.75 | 0.39 |
| Karnataka | 4.33 | 3.47 | 3.19 | -4.33 |
| Others | 11.17 | 8.03 | 7.38 | -6.39 |
| Total | 105.34 | 108.70 | 100.00 | 0.63 |

Source: <http://dahd.nic.in/sites/default/files/Livestock%20%205.pdf>.

V.4.2 Meat production

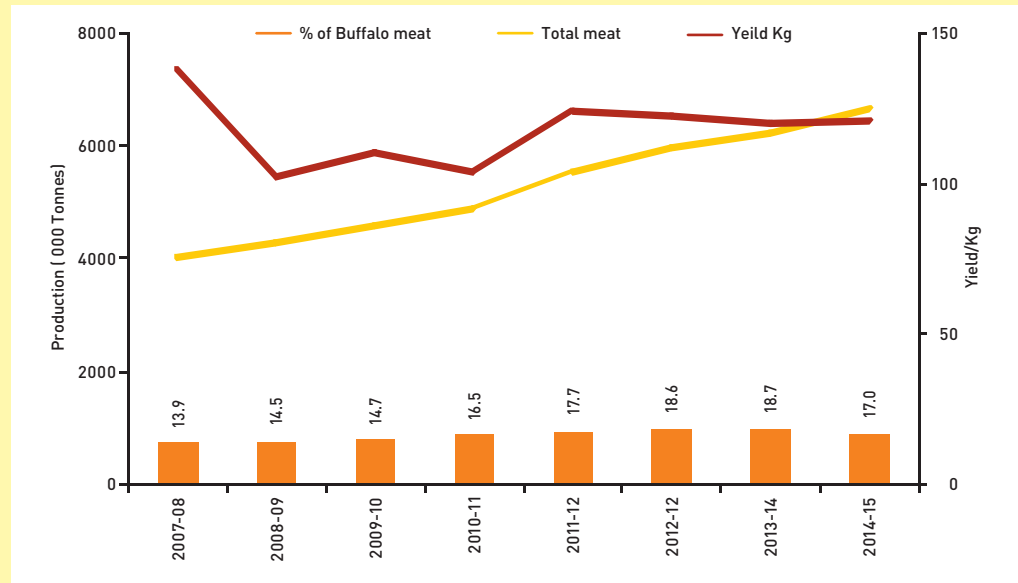
Meat production in India has increased from 4.01 million tonnes in 2007–08 to 6.6 million tonnes in 2014–15 at an annual growth rate of 6.6 per cent. India's share in total world meat production also increased from 1.4 per cent to 7.0 per cent during the period, emerging as the fifth largest producer after USA, Brazil, European Union and China.

Most of the increase in meat production has been in buffalo meat. Its share in total meat production increased from 13.9 per cent in 2007–08 to 17.0 per cent in 2014–15, despite a decline in the average yield of buffalo meat from 138 kg in 2007–08 to 119 kg in 2013–14 (Figure V.23). The increase in buffalo meat production is largely attributed to the increasing number of buffalos slaughtered in response to rising domestic and export demand.

India's share in total world meat production also increased from 1.4 per cent to 7.0 per cent during the period, emerging as the fifth largest producer after USA, Brazil, European Union and China. Most of the increase in meat production has been in buffalo meat.

The expenditure on meat, fish and eggs has been increasing both in rural and urban areas.

Figure V.23: Meat Production (in 000 tonnes), Share of Buffalo Meat(%) and Yield/per Buffalo (kg)



Sources: <http://dahd.nic.in/sites/default/files/Livestock%20%205.pdf>.

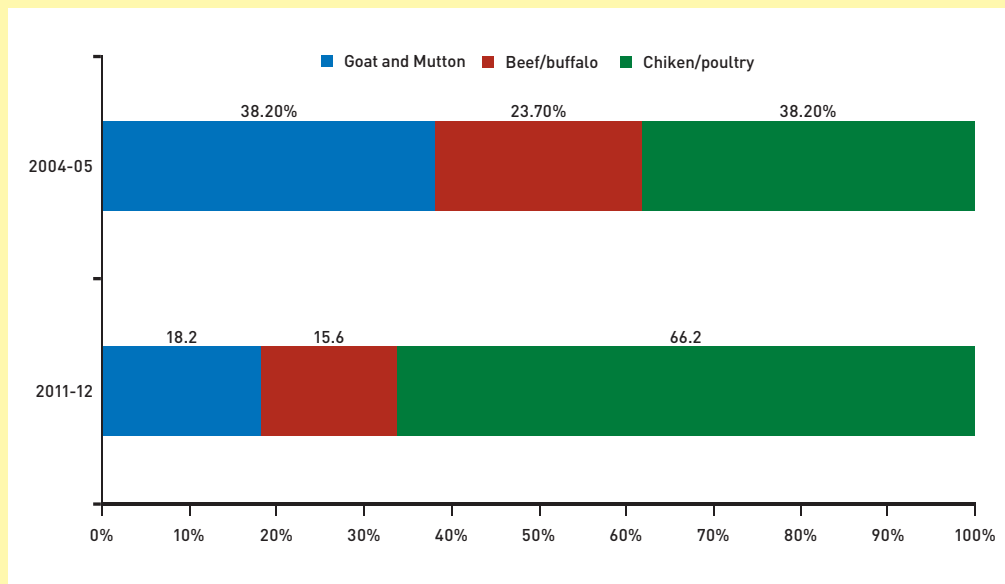
V.4.3 Consumption Trend

About one-third of the population in India is vegetarian resulting in a very low level of per capita meat consumption. As per National Sample Survey Office (NSSO) Consumer Expenditure Survey, 61st and 70th rounds, per capita monthly meat consumption, that includes mutton (goat and sheep meat), beef and buffalo meat, and poultry increased from 137 grams to 269 grams in rural areas and from 218 grams to 382 grams in urban areas during 2004–05 to 2011–12, registering an annual growth of 10.12 per cent and 8.34 per cent, respectively (Table V.12). The share of consumption of buffalo meat to total meat consumption has declined from 23.7 per cent in 2004–05 to 15.6 per cent in 2011–12 in rural areas (Figure V.24). Similarly, the share of consumption of buffalo meat to total meat consumption has also declined to 16.80 per cent from 26.40 per cent during the same period in urban areas due to increased consumption of chicken/poultry meat (Figure V.25). The expenditure on meat, fish and eggs has been increasing both in rural and urban areas (Table V.13). As projected, the per capita consumption of meat will be 500 gram per month by 2020 in India.

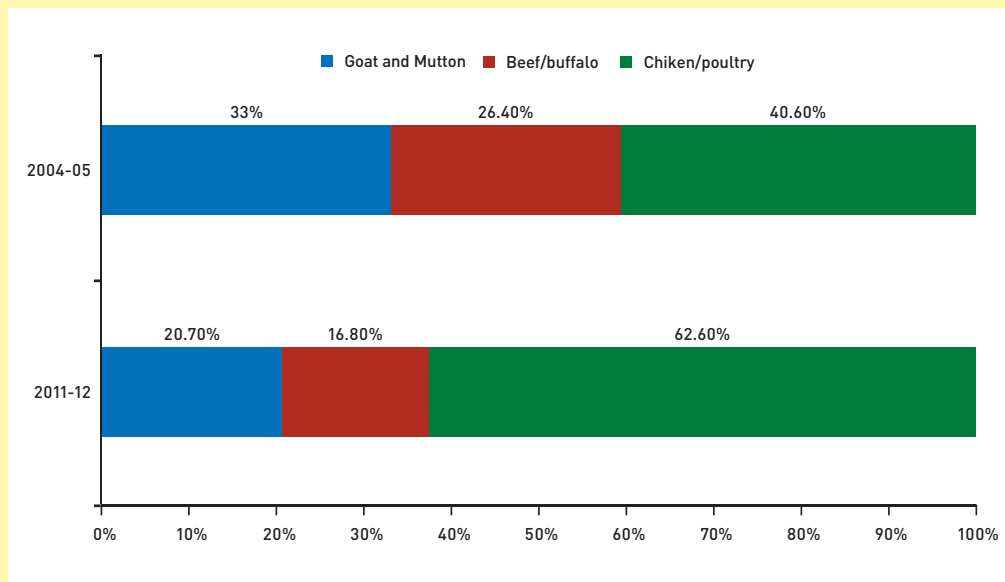
Table V.12: Per capita Consumption of Meat per Month (in gram)

| Years | Rural | Urban | Growth per cent | |
|---------|-------|-------|-----------------|-------|
| 2004–05 | 137 | 218 | Rural | Urban |
| 2011-12 | 269 | 382 | 10.12 | 8.34 |
| 2020* | 500 | | | |

Source: Government of India, NSSO’s 61th (2007) and 70th round (2014).

Figure V.24: Percentage Share of Consumption of Various Meats in Rural Areas

Sources: Government of India, NSSO's 61th (2007) and 70th round (2014).

Figure V.25: Percentage Share of Consumption of Various Meats in Urban Areas

Sources: Government of India, NSSO's 61th (2007) and 70th round (2014).

Table V.13: Monthly Per capita Expenditure on Meat, Fish & Eggs (Rs.) and Share to total Food Expenditure

| Particulars | 2004-05 | | 2011-12 | |
|---------------------------------------|---------|-------|---------|-------|
| | Rural | Urban | Rural | Urban |
| Expenditure on meat, fish & egg (Rs.) | 19 | 28 | 46 | 67 |
| Share of total Expenditure (%) | 6 | 6 | 7 | 7 |

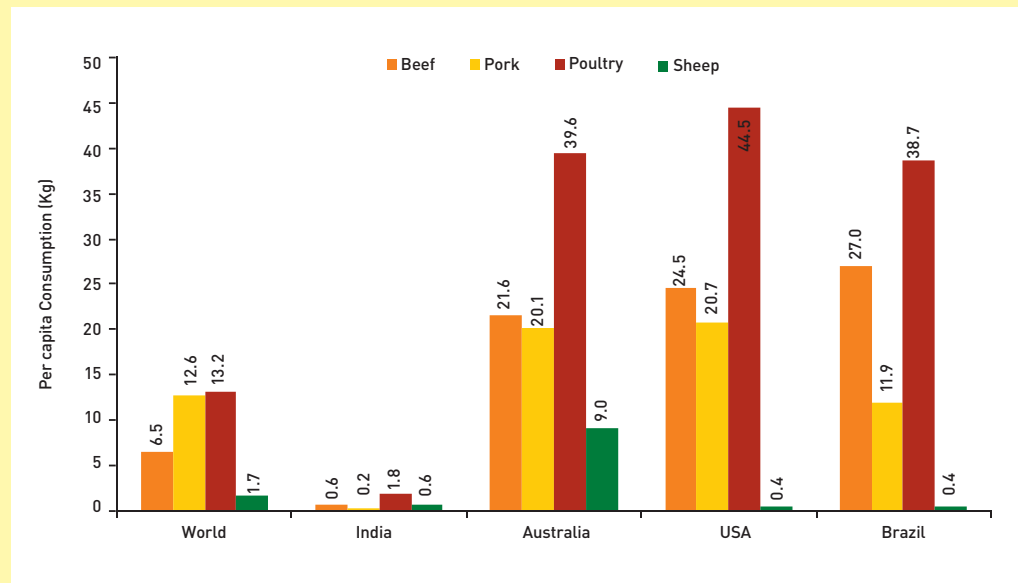
Source: Government of India, NSSO's 61st and 68th round.

Although India has emerged as one of the largest meat producing countries in the world, per capita meat consumption in India is much lower as compared to other major meat producing countries and below the global average (Figure V.26). However, OECD/FAO

Although India has emerged as one of the largest meat producing countries in the world, per capita meat consumption in India is much lower as compared to other major meat producing countries and below the global average.

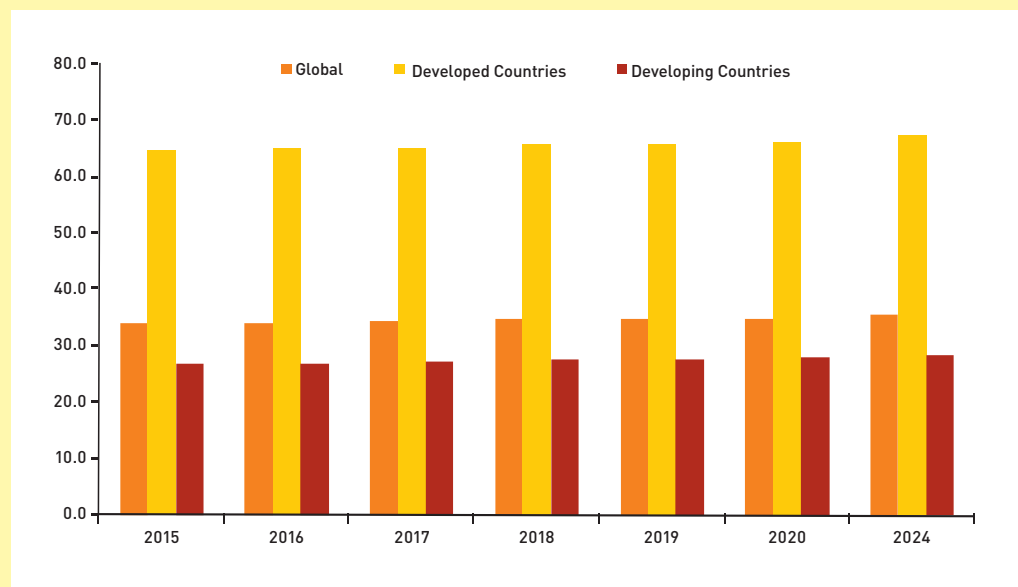
Agricultural Outlook report projects a much higher meat consumption growth rate in developing countries compared to developed countries during the projection period 2015 to 2024 (Figure V.27).

Figure V.26: Meat Consumption Per capita (Kg) for the year 2014



Source: OECD-FAO Agricultural Outlook-2015–2024.

Figure V.27: Projected Per capita Meat Consumption (kg, retail weight)



Source: "OECD-FAO Agricultural Outlook", OECD -2015–2024.

V.4.4 Demand and Supply of Meat in India

The demand and supply projections for various types of meats by NCAP for the year 2020, show that the supply of sheep and goat meat would be 14.57 million tonnes, beef and buffalo 7.79 million tonnes and poultry meat 4.20 million tonnes as against the demand of 12.72 million tonnes, 1.15 million tonnes and 0.81 million tonnes, respectively. This should enhance the export potential for beef and buffalo meat from India (Table V.14).

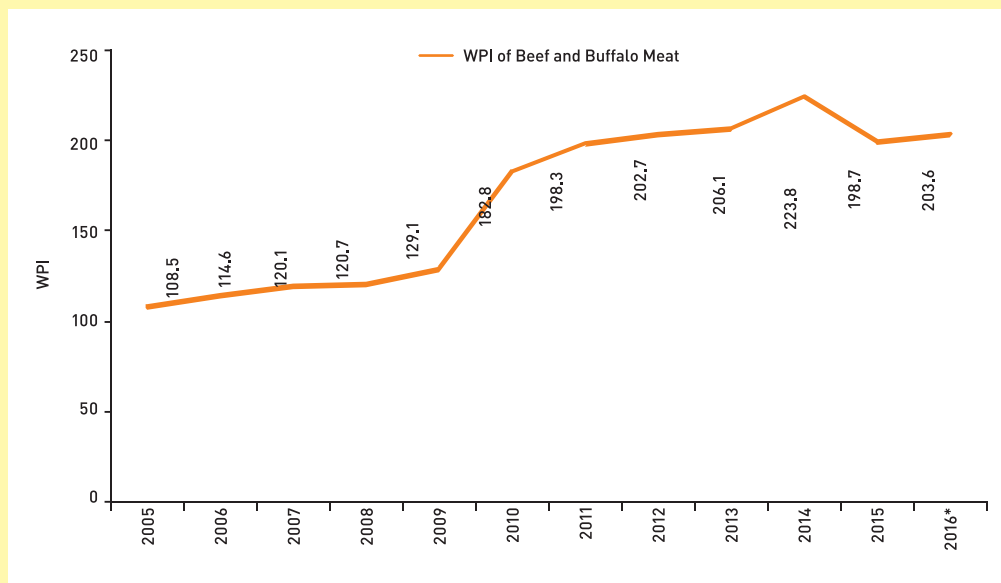
Table V.14: Projection of Demand and Supply of Meat in India for the Year 2020 (in Million tonnes)

| Meat | Supply | Demand | Surplus |
|-----------------------|--------|--------|---------|
| Mutton and Goat meat | 14.57 | 12.72 | 1.85 |
| Beef and Buffalo meat | 7.79 | 1.15 | 6.64 |
| Chicken | 4.20 | 0.81 | 3.39 |

Source: Demand and Supply of Projections for Livestock Products in India. Policy Paper-21, by M.B. Dastagiri, National Centre for Agricultural Economics and Policy Research (NCAP).

V.4.5 Price

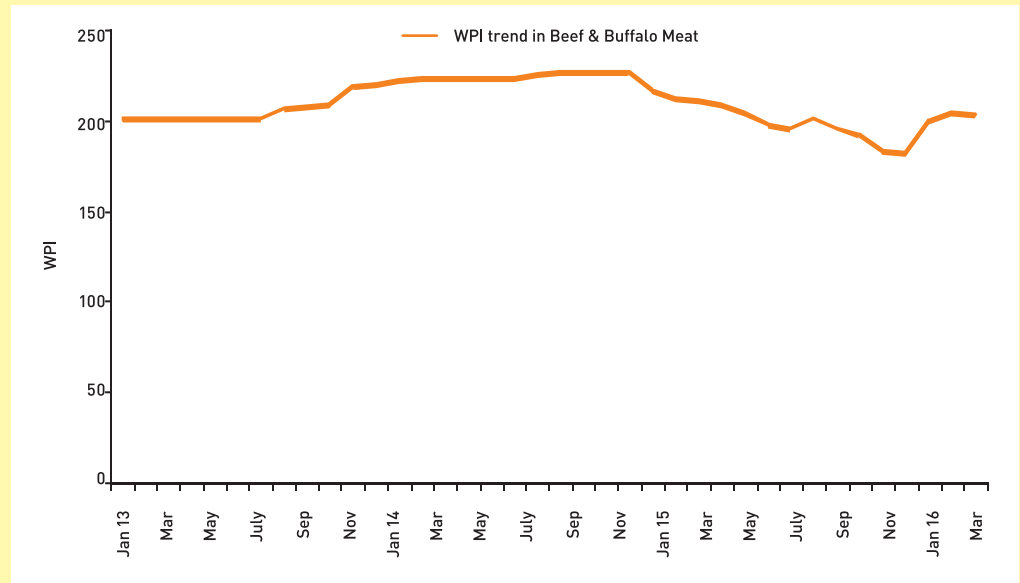
The annual average wholesale price index (WPI) of beef and buffalo meat has increased steadily from 109.5 in 2005 to 223.8 in 2014 but declined to 198.7 in 2015. During the first quarter of 2016, price measured by WPI has shown an upward trend (Figure V. 28).

Figure V.28: Annual WPI of Beef and Buffalo Meat

Source: Office of Economic Adviser, Government of India. * Average of January, February and March.

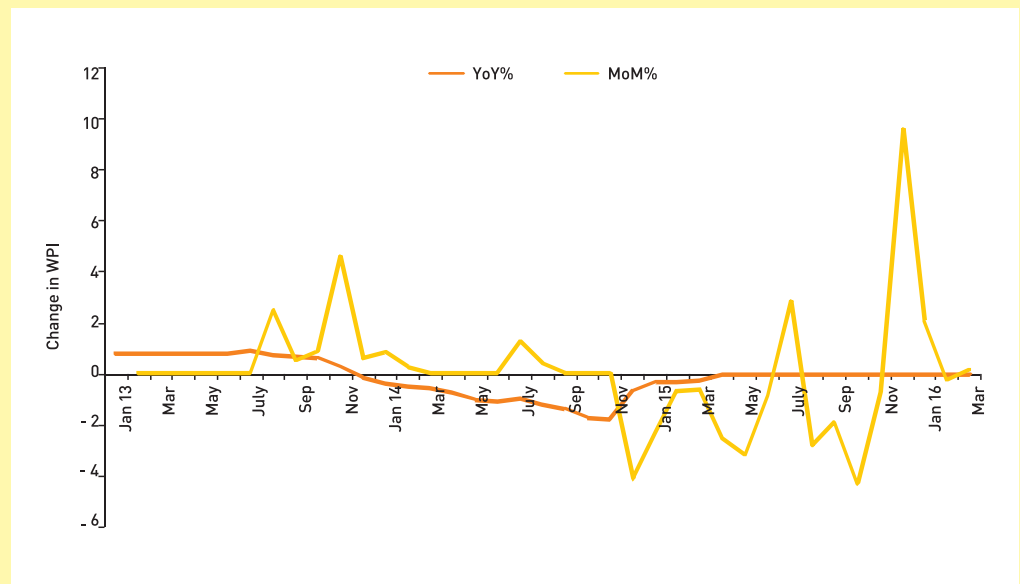
The average monthly WPI of beef and buffalo meat since January 2013 is shown in Figure V.29; the month-on-month and year-on-year change in WPI is shown in Figure V.30 and Figure V.31 shows the average annual export price of buffalo meat over the past fifteen years.

Figure V.29: Monthly WPI of Beef and Buffalo Meat



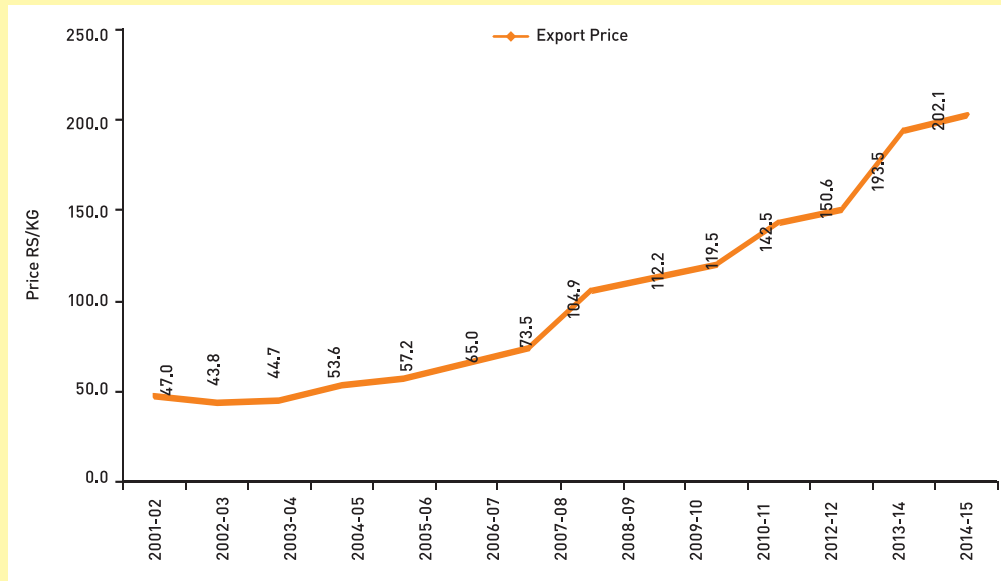
Source: Office of Economic Adviser, Government of India.

Figure V.30: Change in WPI of Beef and Buffalo Meat (MoM% and YoY%)



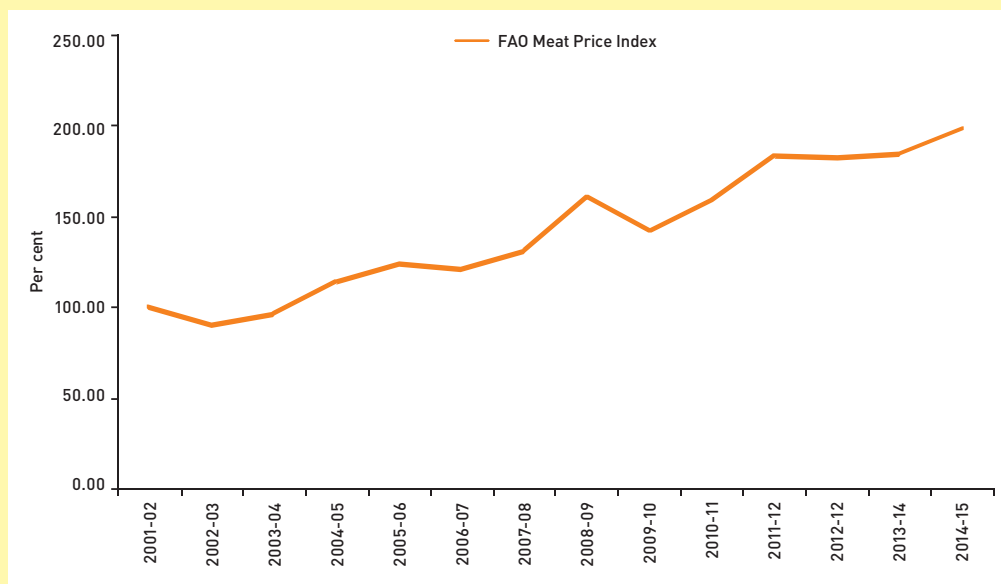
Source: Office of Economic Adviser, Government of India.

Figure V.31: Export Price of Buffalo Meat (Rs./kg)



Source: DGFT.

Figure V.32: FAO Meat Price Index



Source: DGFT; Note: FAO meat price index for calendar year.

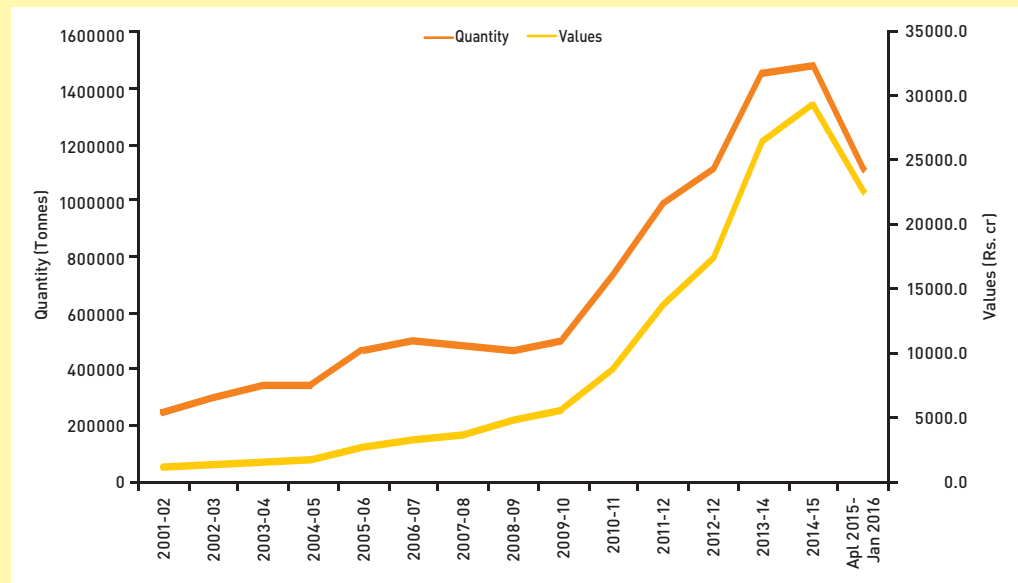
Buffalo meat exports from India increased from 243360 tonnes in 2001–02 to 1,475,530 tonnes in 2014–15, registering an annual average growth rate of 13.74 per cent.

In 2014–15, Vietnam accounted for 42.9 per cent of the total export of beef and buffalo meat from India, followed by Malaysia

V.4.6 Trade

India has emerged as a major player in the global meat market. Agricultural and Processed Food Products Export Development Authority (APEDA) data show buffalo meat exports from India increased from 243360 tonnes in 2001–02 to 1,475,530 tonnes in 2014–15, registering an annual average growth rate of 13.74 per cent. Export earnings from buffalo meat exports increased from Rs.1144.4 crore to Rs.29282.6 crore during the same period (Figure V. 33).

Figure V.33: Export of Beef and Buffalo Meat (Rs. Crore, Quantity in MT)



Note: Export figures of beef and buffalo meat from India seem to be under-reported as there have been reports of unaccounted illegal exports of beef and buffalo meat, mainly to neighbouring countries from various parts of the country.

Source: APEDA.

The Socialist Republic of Vietnam is the main importer of beef and buffalo meat from India. In 2014–15, Vietnam accounted for 42.9 per cent of the total export of beef and buffalo meat from India, followed by Malaysia (8.9 per cent), Angola (2.3 per cent), the Philippines (2.9 per cent), Saudi Arabia (5 per cent), UAE (2.8 per cent), Kuwait (2.2 per cent), and Jordan (1.4 per cent). In recent years, there has been a significant rise in the export of beef and buffalo meat from India to Kuwait (Table V.15).

Table V.15: India- Export of Beef and Buffalo Meat (Quantity 000 MT, Value Rs. Crore)

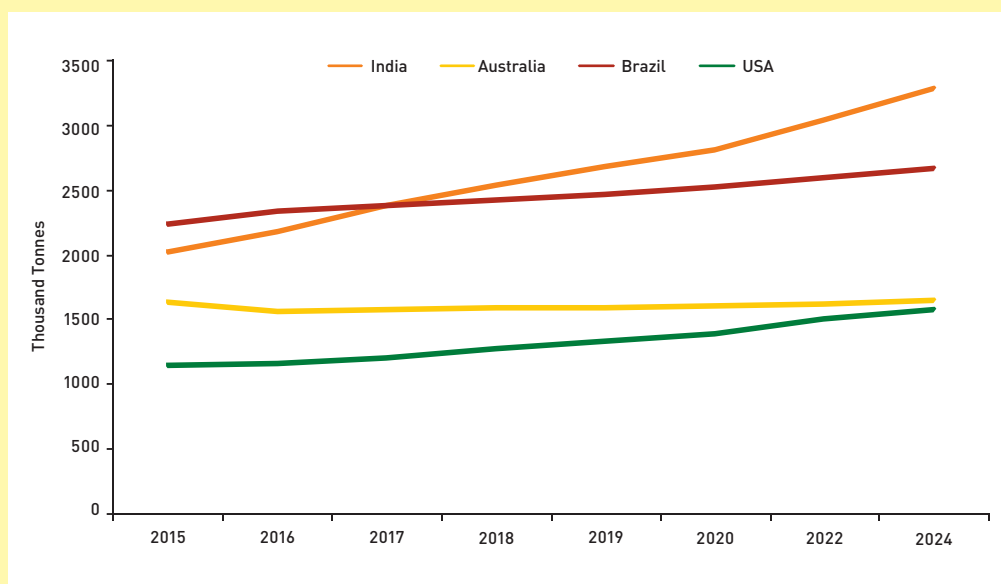
| Country | 2012-13 | | 2013-14 | | 2014-15 | | % growth over 2013-14 | |
|--------------|----------|----------|----------|-----------------------|----------|--------|-----------------------|-------|
| | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value |
| Vietnam | 330.11 | 5125.30 | 524.17 | 10971.6633.4 (42.9%) | 13200.6 | 20.83 | 20.32 | |
| Malaysia | 115.22 | 1943.70 | 121.74 | 2356.42130.9 (8.9%) | 2586.0 | 7.51 | 9.74 | |
| Angola | 31.85 | 460.13 | 35.49 | 604.8334.1 (2.3%) | 587.2 | -3.83 | -2.91 | |
| Saudi Arabia | 69.57 | 117.38 | 74.60 | 1493.5473.8 (5.0%) | 1585.4 | -1.04 | 6.15 | |
| UAE | 43.65 | 666.00 | 42.79 | 784.6840.9 (2.8%) | 801.0 | -4.47 | 2.08 | |
| Jordan | 49.86 | 751.34 | 51.18 | 910.7020.8 (1.4%) | 398.5 | -59.28 | -56.24 | |
| Iran | 45.29 | 696.12 | 37.84 | 714.928.1 (0.5%) | 159.1 | -78.70 | -77.75 | |
| Philippines | 43.68 | 569.82 | 45.24 | 723.2642.9 (2.9%) | 707.6 | -5.19 | -2.17 | |
| Kuwait | 18.65 | 286.75 | 20.62 | 374.8332.9 (2.2%) | 575.9 | 59.36 | 53.64 | |
| Others total | 359.6 3 | 6796.36 | 496.09 | 7523.08457.82 (31.0%) | 8681.30 | -42.06 | -63.61 | |
| Total export | 1107.50 | 17412.89 | 1449.76 | 26457.81475.5 (100%) | 29282.6 | 1.78 | 10.68 | |

Note: Figures in parentheses show the share of export.
Source: APEDA.

V.4.7 Export Outlook

India has emerged as the largest exporter of beef and buffalo meat in the global market. One of the major reasons for high demand for India's beef and buffalo meat in several countries is the lower price vis-à-vis other exporting countries. A meat and livestock report by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) estimates the average export price of buffalo meat from India in 2014 at US\$2.88 per kilogram, compared to US\$4.52 and US\$4.73 from Brazil and Australia, respectively.

As per USDA Long-term Projections – 2015, India's exports of beef and buffalo meat is projected at 2,379,000 tonnes in 2017, making India the largest beef and buffalo meat exporter in the world with it overtaking Brazil, Australia and USA (Figure V.34).

Figure V.34: Projections for Export of Beef and Buffalo Meat (000, MT)

Source: USDA Long-term Projections, February-2015 (<http://www.ers.usda.gov/publications/oce-usda-agricultural-projections/oce151.aspx>).

India has emerged as the largest exporter of beef and buffalo meat in the global market.

India has 98 approved plants that operate as both an abattoir and processing facility for the export of beef/buffalo meat from India.

V.4.8 Government Policy on Meat Hygiene and Storage

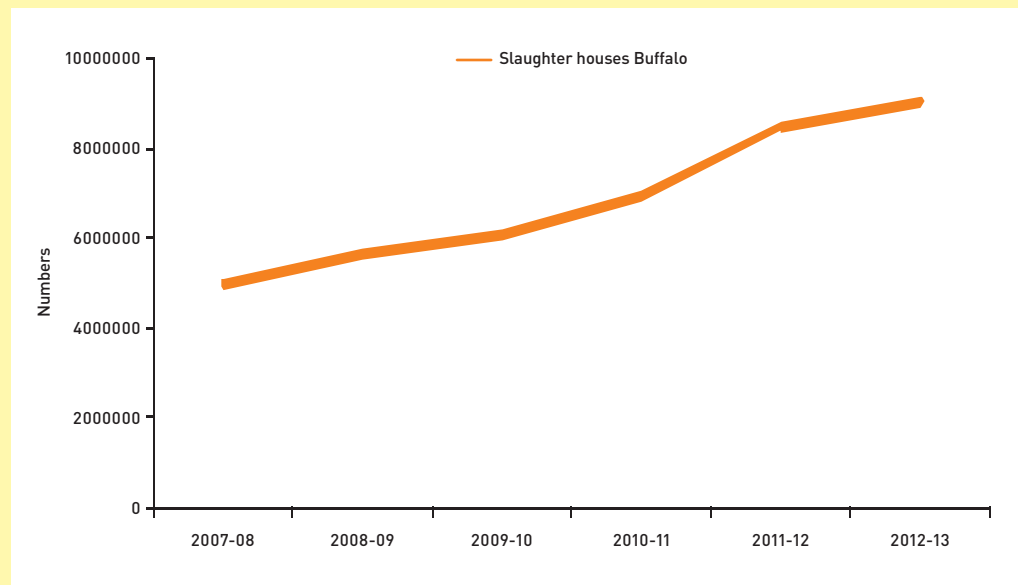
The department of Animal Husbandry, Dairy, and Fisheries (DAHDF) in the Ministry of Agriculture supports state governments on issues such as animal diseases, genetic resources, feed and fodder research, processing and marketing facilities, and meat production. To control major diseases such as foot and mouth disease (FMD), Peste Des Petits (PPR), and brucellosis, the Ministry of Agriculture has been implementing national level programmes. During the Twelfth five-year plan (2012–17), the MOA plans to spend about \$468 million on such programmes. The World Organisation for Animal Health has recognised that India has an official disease control programme for FMD.

The Agricultural and Processed Food Products Export Development Authority (APEDA), approves guidelines to export-oriented slaughterhouse/meat processing units and provides guidance to the industry on how to improve sanitary and hygiene standards for products destined for exports. India has 98 approved plants that operate as both an abattoir and processing facility for the export of beef/buffalo meat from India.

V.4.9 Growth of Slaughter Houses for Buffalo

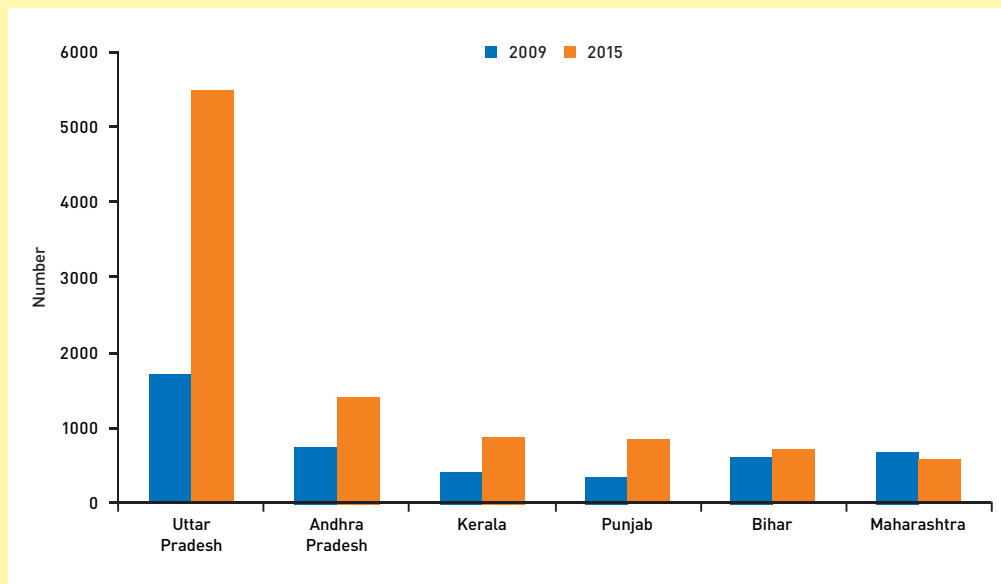
Slaughter takes place in slaughter houses. After slaughtering, the meat is examined by government appointed veterinary officers to check quality. Besides, these officers provide services for antemortem and postmortem inspection. In 2007–08, India had 49,46,000 slaughter houses; this increased to 90,15,960 in 2013, implying an annual growth of 10.5 per cent (Figure V.35).

Figure V.35: Trend of Number of Slaughter Houses for Buffalo in India



Source: Department of Animal Husbandry, Dairy and Fisheries; FICCI Report–2013 (<http://www.ficci.com/spdocument/20331/Overview-of-The-Indian-Buffero-meat-value-chain.pdf%20>).

The slaughters houses are concentrated in six states, viz., Uttar Pradesh, Andhra Pradesh, Rajasthan, Kerala, Punjab, Delhi and Maharashtra (Figure V.36).

Figure V.36: Number of Slaughter Houses (Buffalo)

Source: Department of Animal Husbandry, dairy and Fisheries.

V.5 Issues and Challenges

The significant growth of the livestock sector since the launch of the ‘Operation Flood’ programme has led to the uneven growth of the sector with unequal distribution of benefits to society at large. States like Punjab, Haryana, Rajasthan, Gujarat, Uttar Pradesh and Tamil Nadu have done well while States like Assam, Chhattisgarh, Jharkhand, Kerala, Orissa, West Bengal, and many smaller states lag in the field. This underlines the need for a differentiated approach at the regional level for development. Corporate and co-operative dairies need to direct their energies in such states.

Improving the productivity of a huge population of low-producing animals is one of the major challenges. Many poor rural households still depend on livestock for their livelihood, and share common property resources for feeds.

The use of concentrates remains very low and there is acute shortage of feed and fodder. The availability of good forage varieties and good quality seeds are also major constraints that need to be overcome. Crop residues, which are low in nutritive value, still represent the largest feed component. Large scale investments in animal feed should be promoted with particular attention to quality. The poultry industry also faces problems related to feed supply in terms of quantity and quality as well as the rise in price of feed in relation to product prices.

Production and marketing of livestock products in India to a significant extent is unorganised with high risk of transmission of diseases both from animals to animals and animals to humans. There is need to encourage livestock owners and producers to use modern practices to ensure quality standards. We also need to encourage production, processing and marketing of livestock products in the organised sector to meet international quality standards for the growing domestic and international markets.

Co-operatives have a strong presence in the procurement and processing space and in the retail dairy market in many states. They are also in a position to pose a challenge to growing corporate dairies. The government needs to provide level playing field to

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Crop residues, which are low in nutritive value, still represent the largest feed component.

As in the dairy sector, regional inequalities in development are also seen in poultry production.

Value addition in meat is limited to the extent it is meant for export. The same is the case for poultry and pork products.

corporate dairies for the healthy growth of the sector.

The incidence of major livestock diseases is high due to which farmers suffer significant economic losses. The preventive veterinary service infrastructure and disease reporting systems in many states needs to be modernised and strengthened in order to reduce the threat of trans-boundary animal diseases like bird flu.

As in the dairy sector, regional inequalities in development are also seen in poultry production. This has seriously limited the opportunities for creating a wider geographical impact through the participation of a larger number of smallholders, especially from laggard states.

Value addition in meat is limited to the extent it is meant for export. The same is the case for poultry and pork products. Given the strong and growing demand in the domestic and export markets, there is considerable scope to involve the corporate sector in the production, processing and marketing of livestock products.

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CHAPTER VI

Summary, Conclusion, and Policy Recommendation

VI.1 Progress and Challenges in Agricultural Development

Self-sufficiency in rice and wheat has been the major feature of India's progress on food production since the green revolution that began in the 1970s. Yields of oilseed, pulses, cotton, fruits, and vegetables have recorded a modest growth in recent years but overall, crop yields have plateaued even though immense potential remains for improvement in productivity and value addition. Although India has close to 45 per cent of cropped area under irrigation, one of the highest in the world, the country finds itself at the lower end of the spectrum in productivity of most crops in the world, measured as yield per hectare of land, with the exception of one or two crops like wheat. International agencies such as the FAO/OECD project India's yield gap with other countries to keep widening in coming years.

The widening yield gap between countries is because of factors such as differences in natural resource endowments, utilisation of available water resources and fertilisers and seed varieties that are suitable for specific countries and for specific regions, levels of access to technology, and management practices. Private investment in agriculture has also been poor in India. Country-specific factors that affect investments in agriculture (to improve land quality and yield and adopt improved technologies) include the shrinking holding size, extent to which property rights are protected, how inheritance and ownership of farm lands are handled and ambiguities surrounding government policy on the acquisition of farm land for non-agricultural purposes.

Rising productivity per unit of land and per drop of water will need to be the main engine of agricultural growth as virtually all cultivable land is farmed. Water resources are also limited and water for irrigation must contend with increasing industrial and population needs. All measures to increase productivity will need to be initiated – increasing yields, diversification to higher value crops, and developing value chains to reduce marketing costs. Significant yield improvement can be realised through better soil conditioning (with fertiliser and manure), water management, and better seed quality. Tailoring the use of inputs such as seeds, fertilisers, equipment, and other precision farming practices based on the specific conditions in a particular field can result in further yield gains.

Underscoring the vision of “doubling the income of farmers by 2022”, along with other objectives such as boosting agricultural GDP growth and ensuring food and nutrition security through sustainable agriculture, the government over the past two years has initiated various programmes. These include the Pradhan Mantri Krishi SinchayeeYojana (PMKSY) focused on irrigation development; issuing soil health cards (SHC) for soil health improvement, implementing the Paramparagat Krishi VikasYojana (PKVY), to encourage organic farming, establishing the Pradhan MantriFasalBimaYojana PMFBY) for extending wider and cheaper coverage of crop insurance, setting up of a price stabilisation fund, (PSF) to protect farmers' income when prices dip, particularly for onion, potato and pulses and the setting up of a National Agriculture Market (NAM) for electronic trading of agricultural produce to help farmers realise best prices for their

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The strong economic growth in recent years along with increasing urbanisation has led to change in food habits favouring high protein and high value food items.

produce. The effective implementation of these programmes could change the perspective on Indian agriculture by various agencies.

The strong economic growth in recent years along with increasing urbanisation has led to change in food habits favouring high protein and high value food items. Government policies and programmes, historically favouring the wheat and rice crops, which currently is the backbone of India's food security, has led to a decline in area under crops such as pulses and oilseed, keeping production more or less stagnant. To meet the population's evolving food needs, the output of non-cerealbased foods and food processing sectors needs to improve substantially.

Within India, there are significant variations among regions due to differences in climate as well as in the use of productivity-improving inputs such as irrigation, mechanised equipment, and fertilisers – and tailored responses are required to increase yields. The continued dependence on monsoon rains, which has been rather erratic in recent years, has further led to high volatility in the production of lessirrigated crops such as oilseeds and pulses, resulting in high prices and necessitating large imports. The country also faces occasional shortages of onions and potatoes, the basic food items of the common man, due to unfavourable growing conditions exacerbated by market distortions, such as speculative hoarding, resulting in price surges. Post-harvest distribution is hampered by lack of proper infrastructure, and poorly functioning private markets. Thus, securing ample food security requires progress on many fronts.

Agricultural commodities in some countries have experienced tremendous yield gains (for example, rice in China and maize in the United States), but in some instances, these gains have come at the expense of quality and taste. These two attributes of food commodities are important to many consumers. With increasing per capita incomes, farmers continue to cultivate lower yielding varieties in order to respond to consumer demand (both for domestic and international markets). In the Indian context, two examples are the consumer's dislike for hybrid rice and apprehensions about the use of GM technology, which remains controversial due to environmental and health concerns.

This report on the Medium term Agricultural Outlook provides an assessment of the prospects for India's agriculture in terms of output, demand, prices and trade, keeping in view both the domestic and global environment for the sector. We first summarise the results of the econometric analysis for medium term projections for India and then do a commodity wise analysis by various agencies for major commodities.

The econometric model indicates that the scope for an increase in area is limited in the case of foodgrains except some small increase in area under oilseeds.

The econometric model indicates that the scope for an increase in area is limited in the case of foodgrains except some small increase in area under oilseeds. The projected area up to the end of 12th Plan as well as 13th Plan will either be the same or may decline slightly in the case of foodgrains. However, the production of foodgrains is likely to increase in the coming year from the present level of 253 million tonnes to 265 million tonnes as the monsoon is predicted to be normal or above normal. The projected production by the end of the 13th Plan will be between 297 to 313 million tonnes. A major increase in production is likely in the case of from wheat and rice while coarse grains and pulses production will increase slightly. Similarly, oilseeds production will also increase in the short and medium term, because of both area expansion and yield increase.

Overall, growth in production for the predicted period in the case of foodgrains could be slightly less or more than the historical period but not very different from what has been achieved during the last decade. On the other hand, given the price and other incentives for foodgrains (programmes like ISOPOM, palm oil and so on), the predicted growth in production will be significantly higher than the observed growth in the historical period. The growth rates estimated from the econometric model are based on the projected

pattern of the prices of crops and other exogenous variables. The model also provides estimates of post-harvest prices of food grains and oilseeds and exports of food grains, pulses and oilseeds. The prices of foodgrains and oilseeds are projected to increase annually by 5 to 7 per cent, well below the actual increase of 8 to 9 per cent per year during the past decade of 2004–2014.

VI.2 Trade Prospects

The following is a commodity by commodity analysis of how the medium term global outlook presented by various agencies will affect India's trade outlook for major commodities.

Wheat: Global wheat supplies are forecast to remain ample in the medium term. The projected annual production growth rates by various agencies indicate that India's wheat production growth rate will be higher than the global growth rate. Wheat consumption growth rate in India is also projected to outstrip the global growth rate by most agencies. With the policy tilted towards increasing consumption of cereals to enhance food security through the National Food Security Act (NFSA) and other such programmes, India's per capita wheat consumption is projected at 69 kg/year in 2024 and will overtake the global per capita consumption of 66.9 kg/year.

India's net wheat exports growth is projected to be significantly negative by OECD/FAO at – 4.8 per cent p.a. and IGC projects India to be a net importer of wheat, albeit small, during most of the projection period. Other agencies, however, are somewhat optimistic about India's net wheat export outlook. As in the past decade, the five largest wheat exporters (the EU, United States, Canada, Russia, and Australia) are projected to account for 73 per cent of world trade in 2025–26. The Former Soviet Union FSU region, a major competitor for Indian wheat exports, exhibits the fastest growth in world export share, rising from 12 per cent in the late 1990s to 22 per cent over the past decade to a projected 27 per cent by 2025–26.

The growth in international prices is projected to be lower than that in India. Thus, India will have a tough time in exporting wheat in the medium term. However, because of its geographical proximity, India has the potential to export wheat to neighbouring countries such as Bangladesh and Sri Lanka, albeit in small quantities.

Rice: The projected annual rice production growth rates for India by all agencies are higher than the global production growth rate. Several government programmes and initiatives such as the National Food Security Mission (NFSM), Rashtriya Krishi Vikas Yojana (RKVY), and Bringing Green Revolution in Eastern India (BGREI) to increase production and productivity, supported by anticipated higher support prices to farmers in line with the cost of production, and increased focus on bringing more area under assured irrigation are factors likely to contribute to higher yield growth in India. The growth rate of rice consumption in India is also projected to be almost twice the global growth rate by all the agencies, mainly because of government policies such as the NFSA that focus on increasing consumption of cereals to enhance food security,

While global rice trade y-o-y growth is projected at a high rate by all the agencies, growth in India's net rice exports is projected at zero or at a negative rate for the projection period by all agencies. This is because of rising production costs, growing domestic consumption, and competition from other traditional exporting countries such as Thailand and Vietnam, and new emerging exporters such as Myanmar and Cambodia. Thailand is projected to regain its leadership from India as the world's largest rice exporter.

Global wheat supplies are forecast to remain ample in the medium term.

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The growth rate of rice consumption in India is also projected to be almost twice the global growth rate by all the agencies, mainly because of government policies such as the NFSA.

Thailand is projected to regain its leadership from India as the world's largest rice exporter.

Indian rice price in nominal terms is also projected to increase at a higher rate compared to the global price.

All agencies project Indian coarse grain production to grow at an annual compound growth rate well above the global total coarse grain growth rate from a low base, mostly driven by maize.

Widening demand supply gap, pulse imports are anticipated to grow further in coming years.

OECD/FAO projects total vegetable oil consumption by India to increase by 3.81 per cent per annum to 27.3 million tonnes by 2024, taking yearly per capita consumption to 19 kg, only marginally behind the global per capita consumption level of 21.0 kg.

Indian rice price in nominal terms is also projected to increase at a higher rate compared to the global price. The global rice price increase over the projected period is expected to be restrained, reflecting large supplies accumulated earlier in this decade, particularly in exporting countries in Asia, which will take at least a couple of years to offload on the market. The regular increase in the support price of paddy to compensate farmers for increasing production costs could make Indian rice non-competitive globally. Furthermore, the government's frequent ban on non-basmati rice exports will make India an unreliable supplier of rice in the world market.

Coarse Grains: All agencies project Indian coarse grain production to grow at an annual compound growth rate well above the global total coarse grain growth rate from a low base, mostly driven by maize, with increased coverage under hybrid corn. India's total coarse grain consumption growth rate is projected to outpace global consumption growth by all agencies because of the significant growth likely in the poultry and livestock sector. Although OECD/FAO is somewhat optimistic about India's total coarse grain export prospects, mainly consisting of maize and small quantities of barley and sorghum in the medium term, all the other agencies project India to be a growing importer of coarse grains during the projection period. OECD/FAO projects the world price of all coarse grains to increase steadily at 1.22 per cent per annum to reach US\$193.7/MT in 2024, whereas Indian indicative coarse grain price is projected to rise at around 4 per cent per annum to reach Rs.25,310 per tonne in nominal terms by 2024, which would make Indian exports less competitive in the world market, except perhaps in geographically proximate countries such as Bangladesh and Sri Lanka.

Pulses: None of the agencies have global projections for pulses, an important protein source in the largely vegetarian population in India. With increasing per capita consumption, total pulse consumption in India is expected to grow. India is now the world's largest importer of pulses with pulses ranking as the second largest agricultural commodity imported after vegetable oils in value terms. As a result of a widening demand supply gap, pulse imports are anticipated to grow further in coming years

Vegetable Oils: OECD/FAO projects India's total vegetable oil production at 9.4 million tonnes by 2024 at an annual growth rate of 2.05 per cent, higher than the global total vegetable oil growth rate of 1.83 per annum. USDA and FAPRI also projects India's vegetable oil production to grow at a fairly modest rate. However, consumption growth is projected to outstrip production growth. OECD/FAO projects total vegetable oil consumption by India to increase by 3.81 per cent per annum to 27.3 million tonnes by 2024, taking yearly per capita consumption to 19 kg, only marginally behind the global per capita consumption level of 21.0 kg. The rise is attributed to increasing per capita income and changes in dietary patterns.

According to OECD/FAO projection, net imports of total vegetable oil by India are projected to increase by 3.89 per cent per annum to 17.8 million tonnes in 2024, accounting for almost one-fourth of global vegetable oil trade by 2024. Increasing at a rate of 5.2 per cent per annum, India's indicative vegetable oil prices in nominal terms are projected to skyrocket to Rs. 115,865 per tonne in 2024, almost double the price level of Rs. 68,845 per tonne in 2015, a growth rate much above the global vegetable oil price growth rate of 1.4 per cent per annum. This would necessitate larger imports to contain the price rise. However, the price of protein meal is not projected to increase as much as vegetable oils, which will be disadvantageous to India, a major exporter of oil meals, particularly soybean meal. However, there is potential to export to neighbouring countries such as Pakistan, Bangladesh, Sri Lanka, and the Middle East, where India has a comparative advantage due to geographical proximity and India's ability to ship in small lots.

Sugar: OECD/FAO projects a growth rate of 0.32 per cent per annum in Indian sugar production, with production rising from 25.2 million tonnes in 2015 to 27.4 million tonnes in 2024, a growth rate significantly below the global sugar production growth rate of 2.1 per cent per annum. India's sugar consumption is projected by OECD/FAO to increase at an annual rate of 2.08 per cent per annum to 31.3 million tonnes from 26 million tonnes in 2015; India's consumption growth is higher than the rate of growth of global sugar consumption. Despite the increase in total consumption, India's per capita annual sugar consumption is projected by OECD/FAO to remain below world per capita consumption throughout the projection period.

According to OECD/FAO projections, India will remain a net exporter of sugar in some years and a net importer in others. However, from 2020, India is projected to become a growing importer of sugar with imports gradually rising to around 5 million tonnes by 2024. Indian sugar prices in nominal terms is projected to increase in a cyclical fashion to reach around Rs.44,531 per metric tonne in 2024, at an annual compound growth rate of 4.53 per cent per annum, significantly above the indicative global sugar price growth rate of 0.5 per cent per annum; the indicative global price is expected to touch \$434 per tonne in real terms. Over the coming decade, global sugar exports are projected to increase to 73 mmt in 2024 from 57 mmt in 2015. In the sugar market, Brazil is projected to remain the largest exporter with Thailand occupying second place. Australia is also projected to become a growing sugar exporting country. Because of the ever increasing cost of production of sugarcane in India, largely due to unrealistic farm support price fixation by states, the cost of production of sugar in India will continue to remain high unless the pricing policy for sugarcane is rationalised by revising the existing arrangement regarding the price to be paid to sugarcane farmers. The existing arrangement has resulted in the accumulation of payment arrears of cane dues when prices are high and a low price for farmers in other years.

VI.3 Livestock

The livestock sector has emerged as one of the major engines of agricultural growth in the country. The sector is very important for the rural economy as it provides a secondary source of income for nearly 70 million rural households and roughly 70 per cent of the workforce in the livestock sector comprises women. India has one of the largest livestock sectors in the world. Of a total livestock of 512.05 million in 2012, 37 per cent consisted of cattle, 21 per cent of buffaloes, 13 per cent of sheep, 26 per cent of goats and 2 per cent of pigs.

The total bovine population (cattle, buffalo, mithun and yak) was 299.9 million. Of this, 81 million animals in milk in cows and buffaloes, the largest number in the world with exotic/crossbred milch cattle numbering 19.42 million. The total livestock population increased by 3 per cent in 2012 over the previous census in 2007 and the increase has been 5.5 per cent since 1997. The total bovine population increased by 3.8 per cent whereas total cattle population has fallen by 4 per cent over 1997. There has been shift in favour of cross bred cattle and buffaloes, which has increased by 98 and 21 per cent since 1997 while the indigenous cattle population has come down by over 15 per cent. Sheep and goat population has increased by 13 and 10 per cent during the period.

VI.4 Conclusions

India needs a productivity- and efficiency-led transformation. If India can raise the productivity of its crops even marginally, the country could not only become self-sufficient in food (not just in cereals but pulses, vegetable oils and sugar) but also a major global

Despite the increase in total consumption, India's per capita annual sugar consumption is projected by OECD/FAO to remain below world per capita consumption throughout the projection period.

Concerted policy efforts to deploy technology in agriculture and the food distribution sector can transform virtually every part of the value chain, benefiting both producers and consumers.

In addition to facing a productivity challenge, Indian agriculture needs to diversify its crop mix to meet changing food habits and nutrition needs.

India should also strive to meet international sanitary and phytosanitary standards to make Indian products acceptable worldwide.

And extension efforts such as encouraging growing pulses in rice fallows, could make India not only self-sufficient but even an exporter.

player in exports of these items. The production increase will be tremendous because India has one of the largest cultivable areas for most crops and the yield gap with other major producing countries is enormous (see Chapter IV).

In India, the agriculture sector is at a very early stage of technology adoption. Concerted policy efforts to deploy technology in agriculture and the food distribution sector can transform virtually every part of the value chain, benefiting both producers and consumers. Technology-based applications and services can yield a number of benefits not only in increasing farm income but also in improving the nutrition content of food that we consume. Public private partnerships between agricultural universities and the private sector may be forged to encourage precision farming and technology-enabled farm extension and advisory services.

In addition to facing a productivity challenge, Indian agriculture needs to diversify its crop mix to meet changing food habits and nutrition needs. This can be achieved through better processing and marketing infrastructure, and technological support for crops with superior nutrition content.

India should establish international level grades and standards for the country's major exportable agricultural products, such as wheat, rice, maize, groundnut, fruits and vegetables, meat and poultry products, soybean meal, etc. to make exports attractive to global buyers and to realise better prices. India should also strive to meet international sanitary and phytosanitary standards to make Indian products acceptable worldwide. Quality control and inspection bodies should be modernised and strengthened, so that export rejection by importing countries could be avoided or minimised.

There is also a potential to expand exports of other non-conventional food products such as ragi (finger millet), given the rising awareness of the nutritive benefits of these grains globally. Ragi, described as a "smart crop", is making a slow but steady comeback, with international research institutes such as ICRISAT focusing on millets. These crops are also considered the life-line of small and marginal farmers in semi-arid areas. Besides being rich in nutrition, these crops consume less water.

Like most other countries, Indian Embassies in major countries should set up a separate office focused on agriculture intelligence collection and market promotion and development for Indian agricultural products.

Efforts should be made to resolve phytosanitary disputes with other countries for various food items. Efforts should also be made to market Indian rice in non-traditional markets such as China, Indonesia, and South Korea through diplomatic initiatives. India's comparative advantage in the basmati rice trade needs to be further exploited by expanding the area under this variety and improving yields. There is also need to improve the milling quality of rice in India for it to remain competitive in the global market.

As India is the largest producer of pulses in the world with the largest area under this crop, a modest increase in yield through better seed distribution, technology (short duration and drought resistant varieties), and extension efforts such as encouraging growing pulses in rice fallows, could make India not only self-sufficient but even an exporter.

The existing conditions in the sugar sector in India have not led to high sugarcane productivity and modernisation of sugar mills. To remain competitive and a reliable supplier of sugar in the global market, a freer international trade policy with fewer quantitative controls and time restrictions on exports and imports should be introduced. The policies need to ensure a positive environment for investments on the farm and in the processing sectors.

Mixed-crop livestock farming systems have increasingly emerged in India. The livestock segment presents opportunities for supplementing farm incomes and providing employment to producers and nutrient-rich food products to consumers. Farm manure and fuel for farm and rural households may be an added output. There has been a steady transformation in the utilisation of livestock; the non-food functions of livestock are becoming weaker with machines replacing animal power for farm operations to a significant extent.

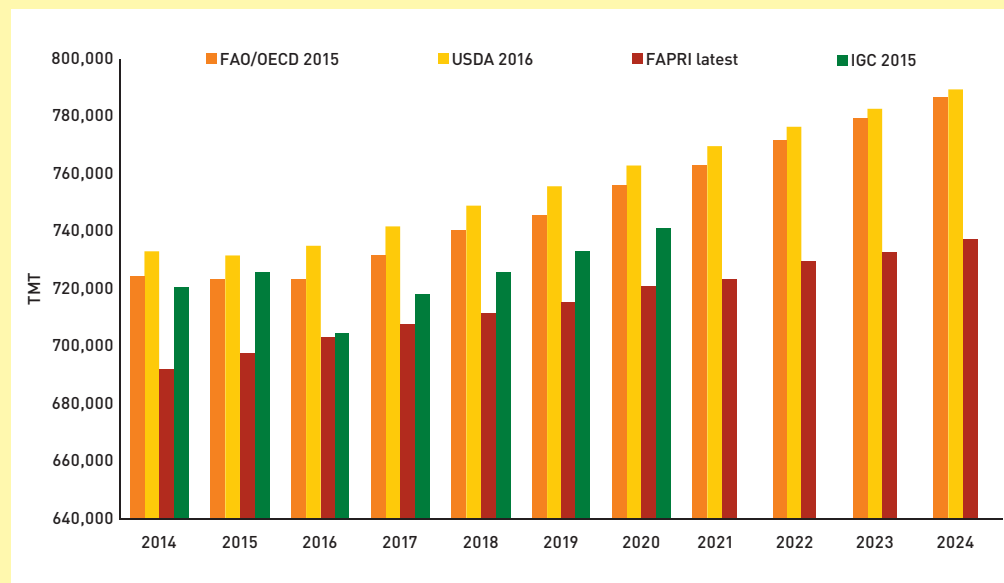




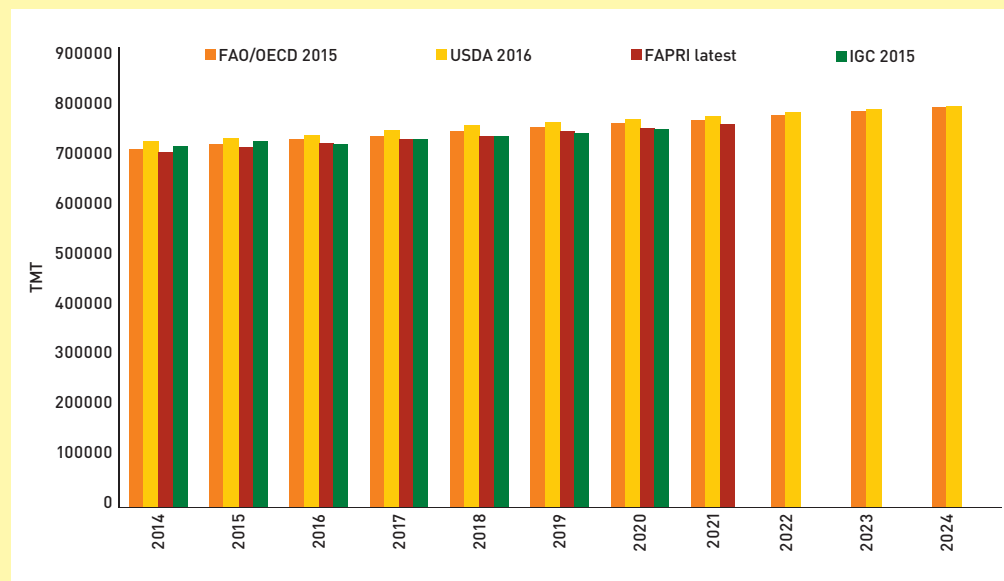
APPENDIX I

Global Food Commodity Outlook

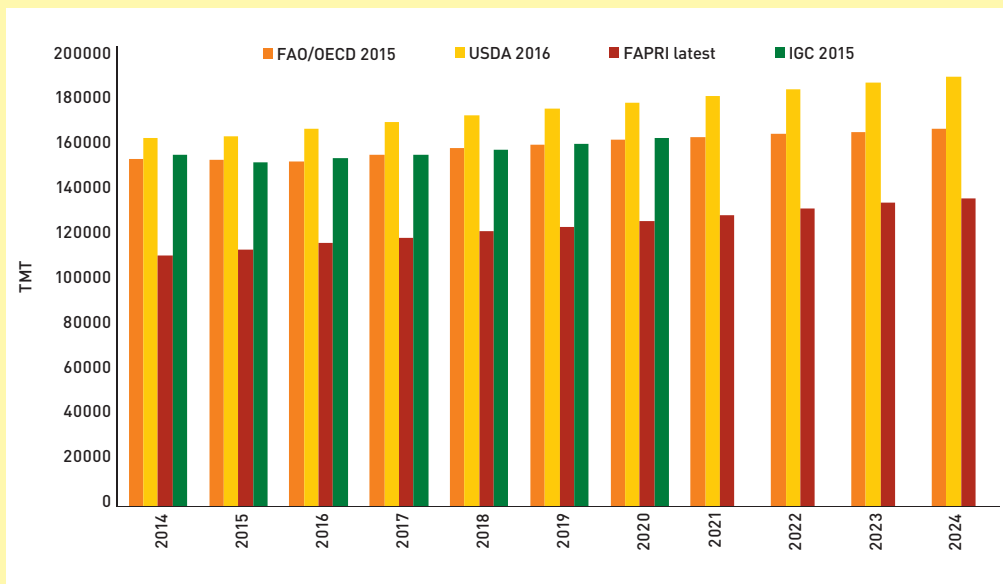
IIA.1: Global Wheat Production (Thousand Metric Tonnes)



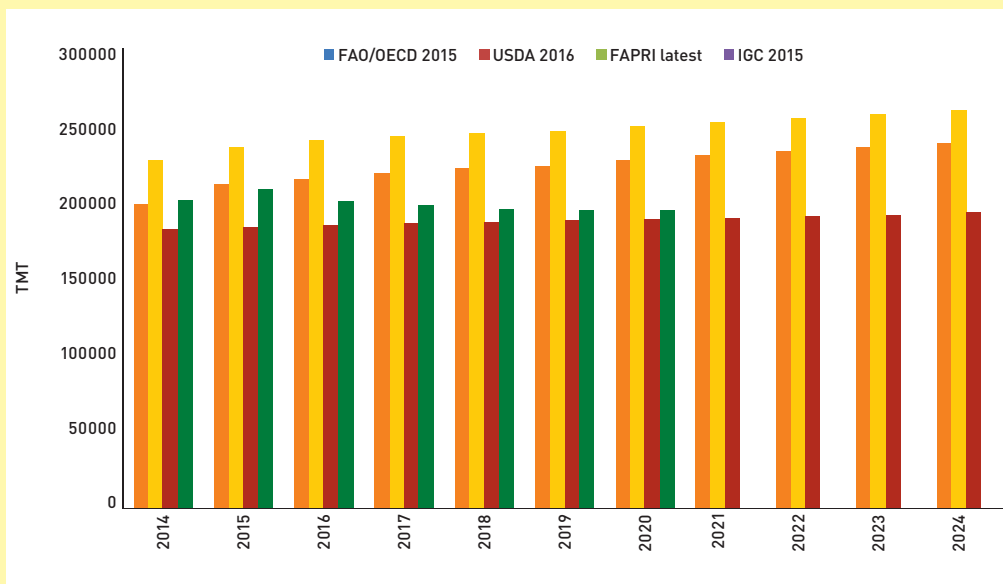
IIA.2: Global Wheat Consumption (Thousand Metric Tonnes)



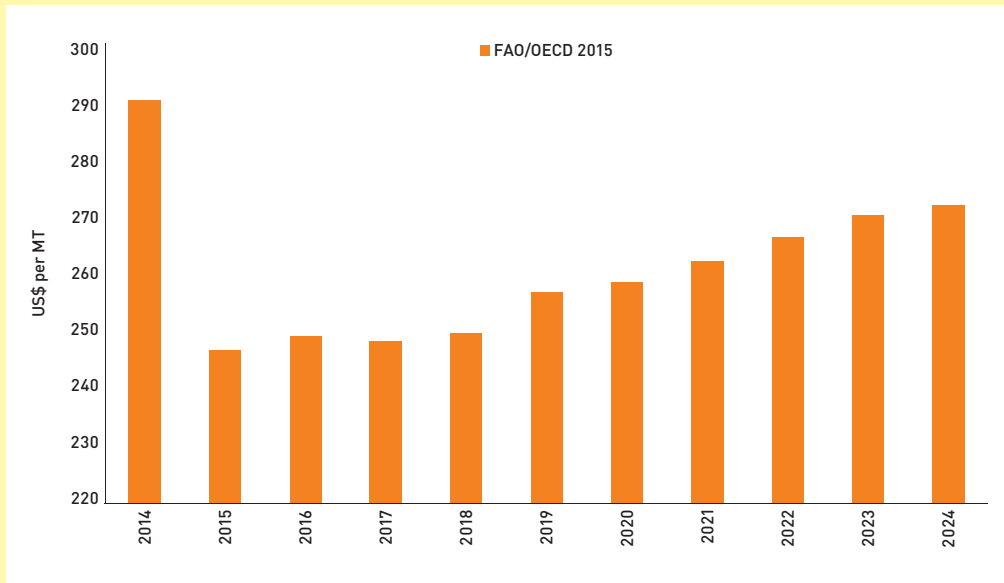
IIA.3: Global Wheat Trade (Thousand Metric Tonnes)



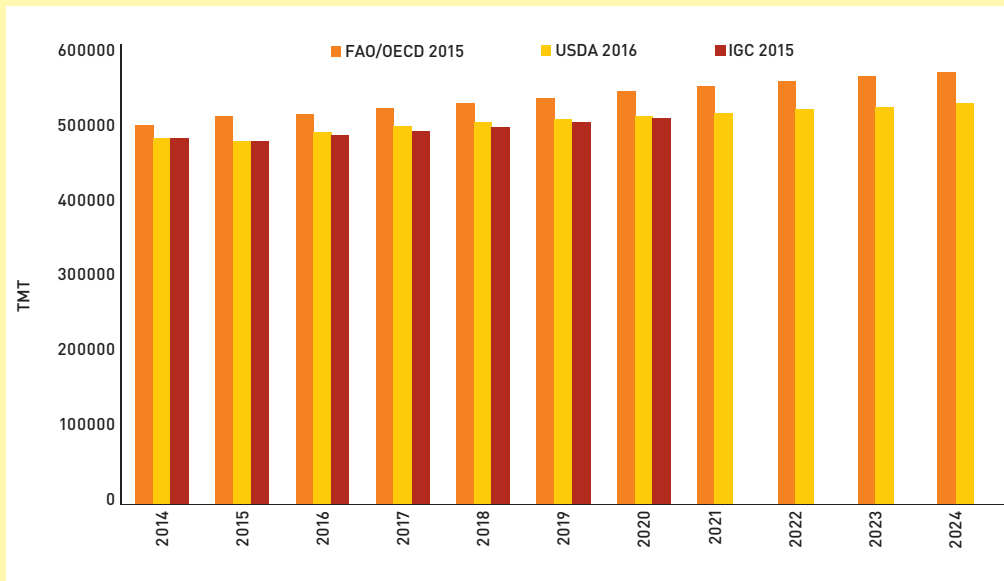
IIA.4: Global Wheat Stocks (Thousand Metric Tonnes)



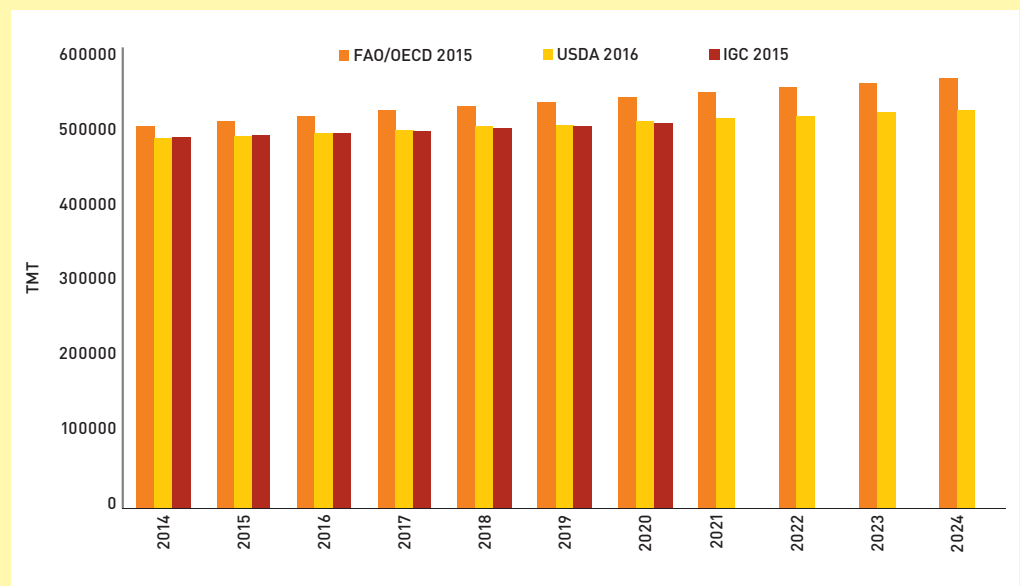
IIA.5: Global Wheat Price (US\$/MT)



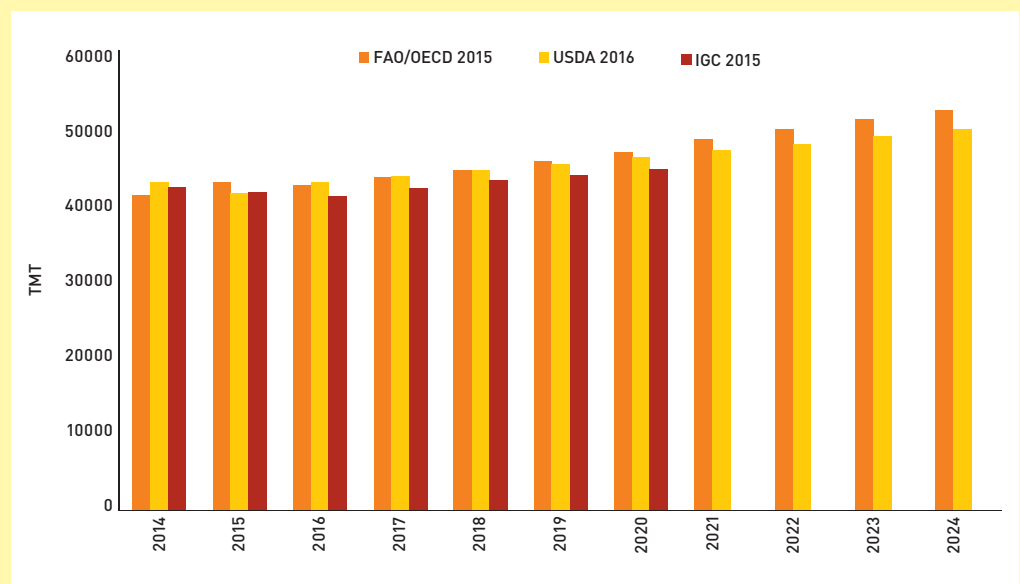
IIA.6: Global Rice Production (Thousand Metric Tonne)



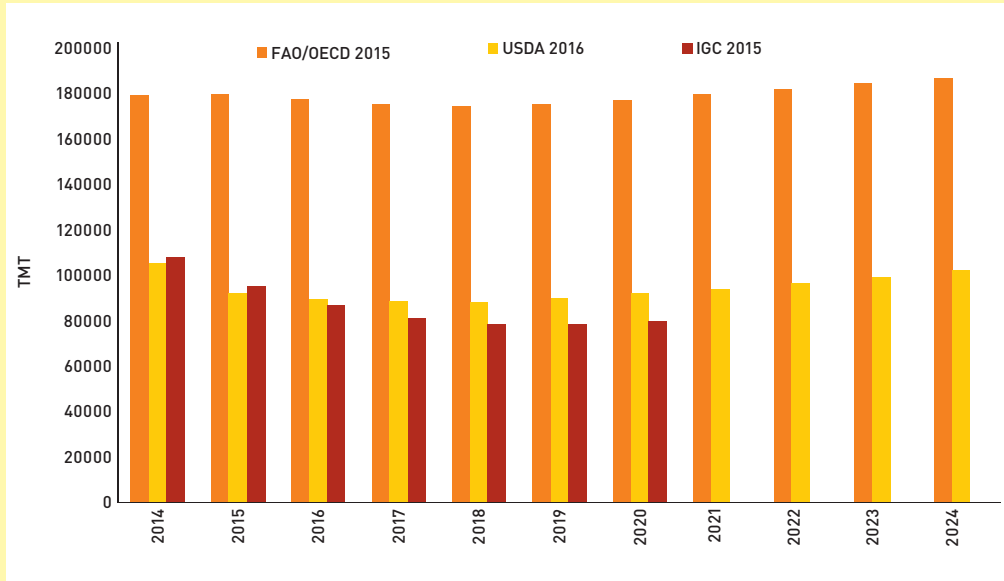
IIA.7 Global Rice Consumption (Thousand Metric Tonnes)



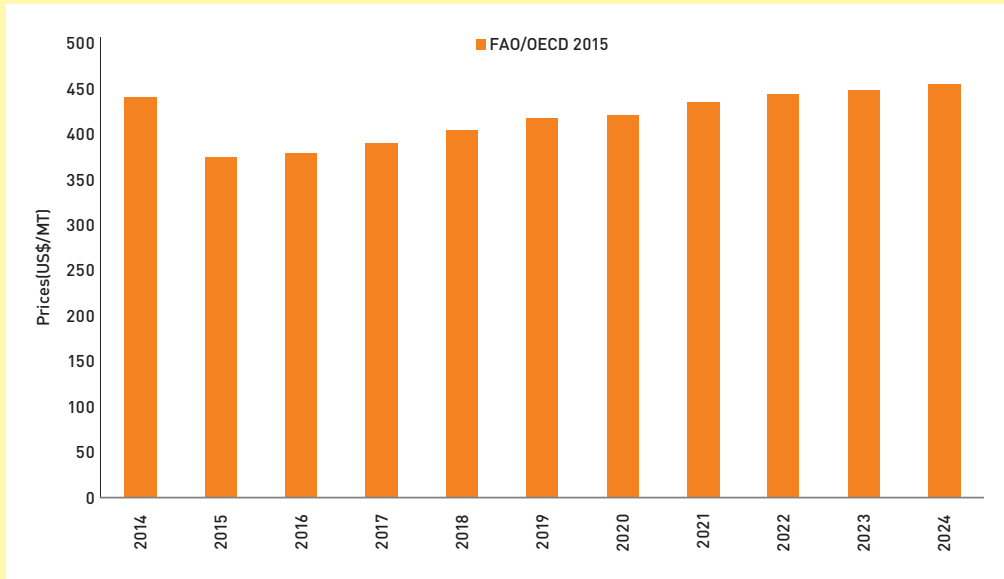
IIA.8: Global Rice Trade (Thousand Metric Tonne)



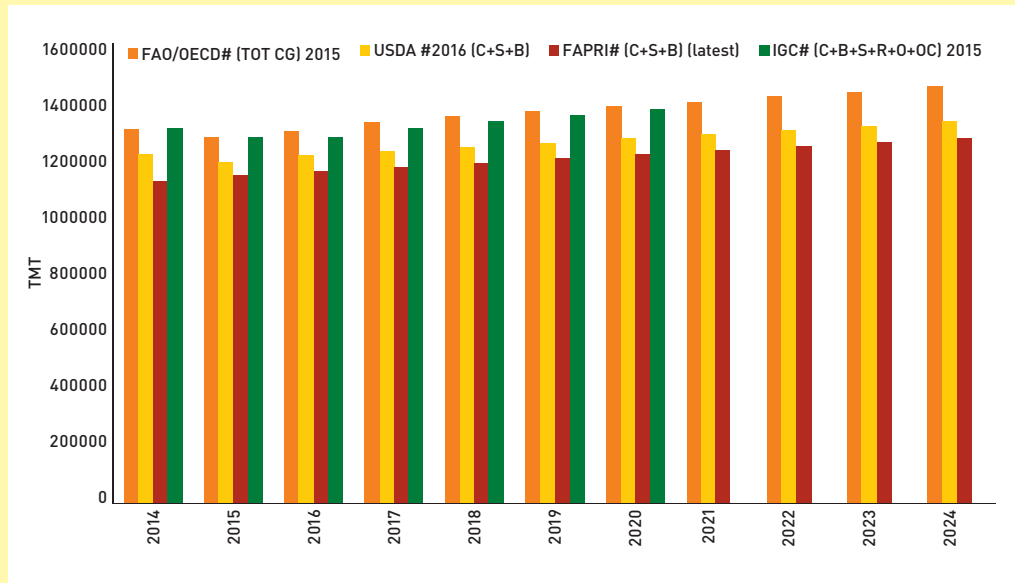
IIA.9: Global Rice End Stocks (Thousand Metric Tonne)



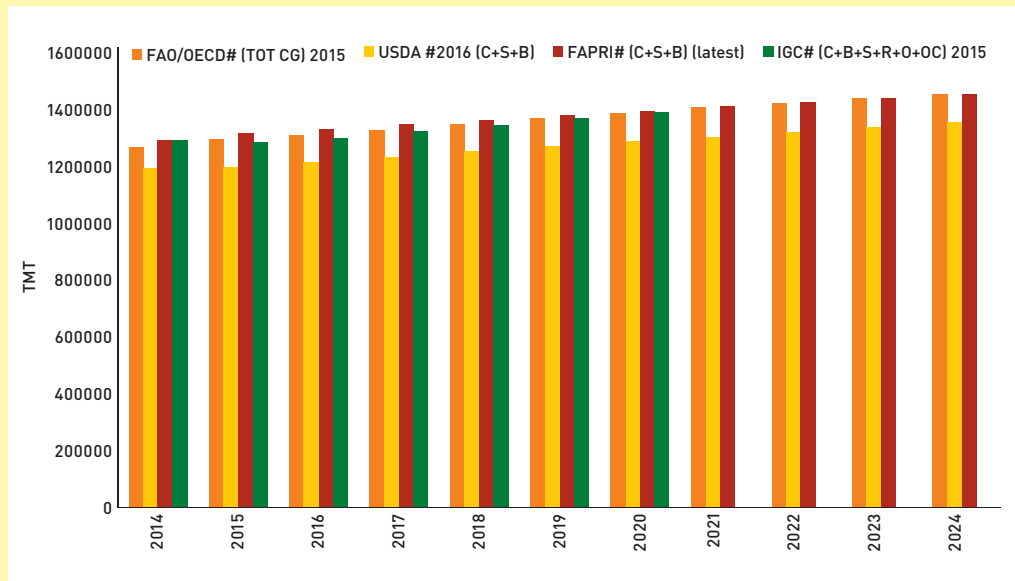
IIA.10: Global Rice Price (US\$/MT)



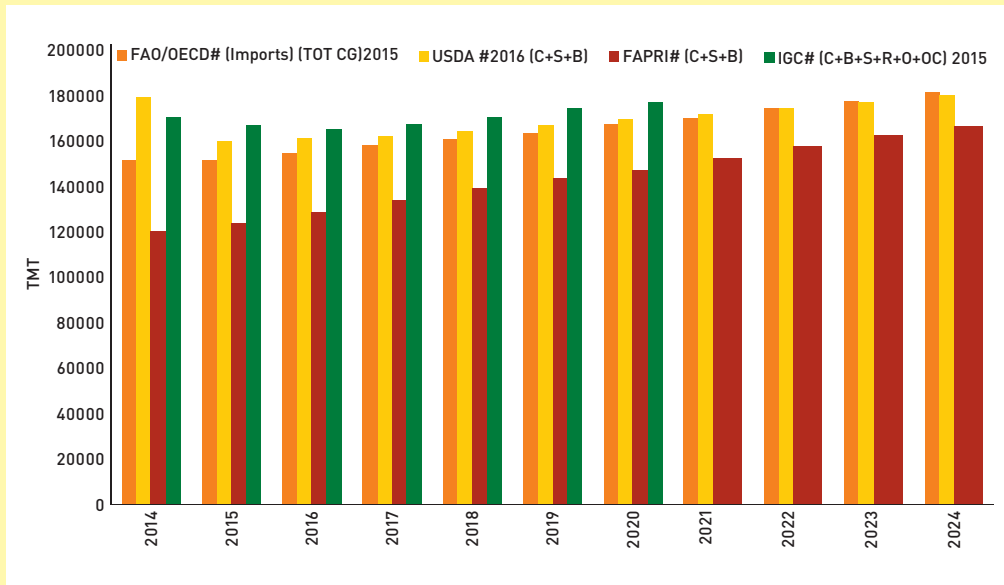
IIA.11: Global Coarse Grain Production (Thousand Metric Tonne)



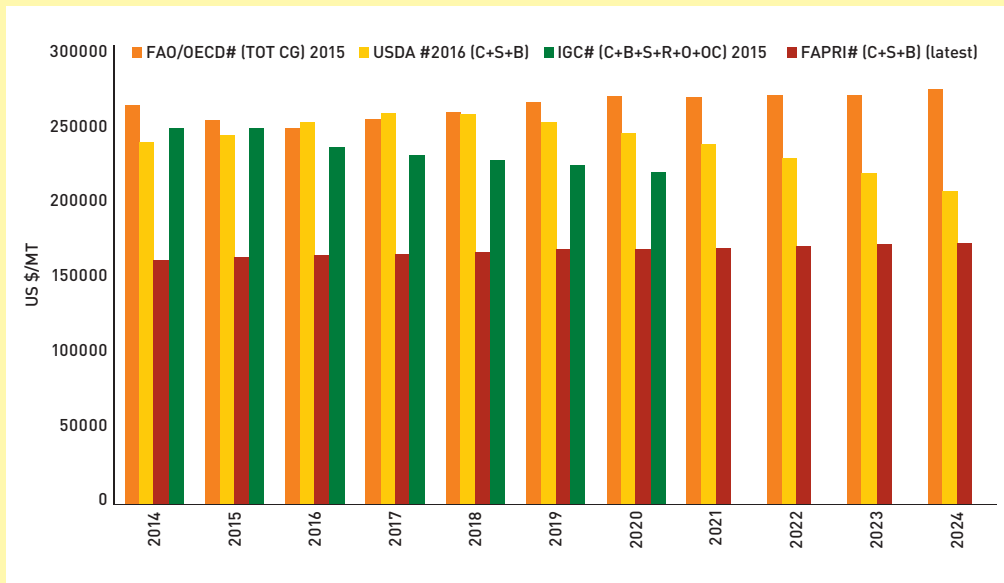
IIA.12: Global Coarse Grain Consumption (Thousand Metric Tonne)



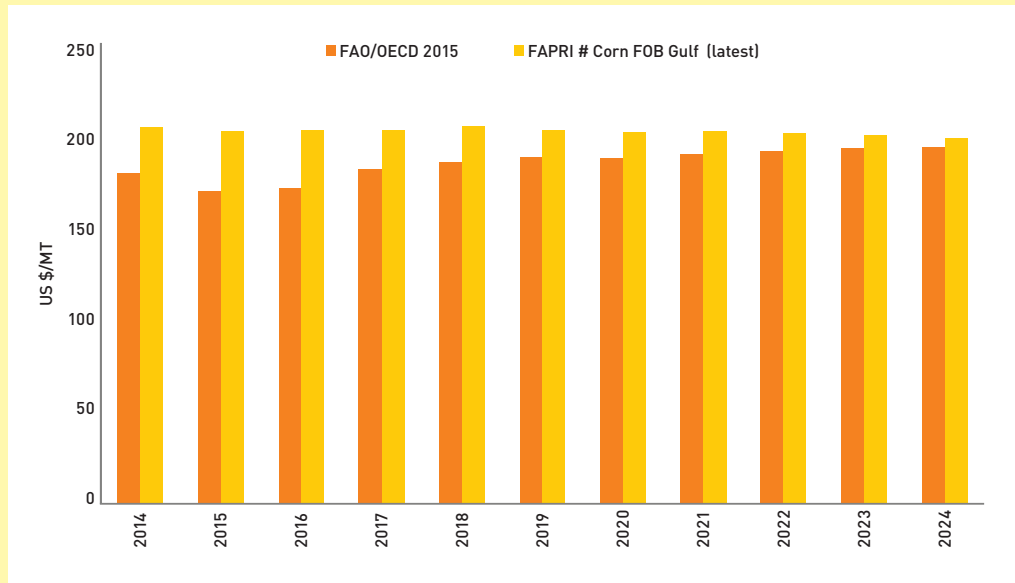
IIA.13: Global Trade in Total Coarse Grains (Thousand Metric Tonne)



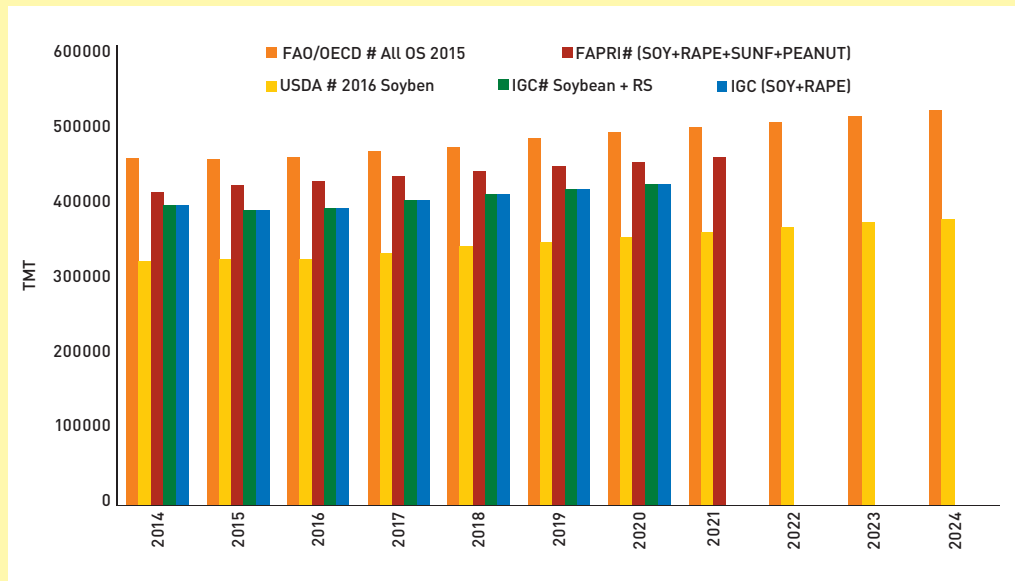
IIA.14: Global Coarse Grain Ending Stocks (Thousand Metric Tonne)



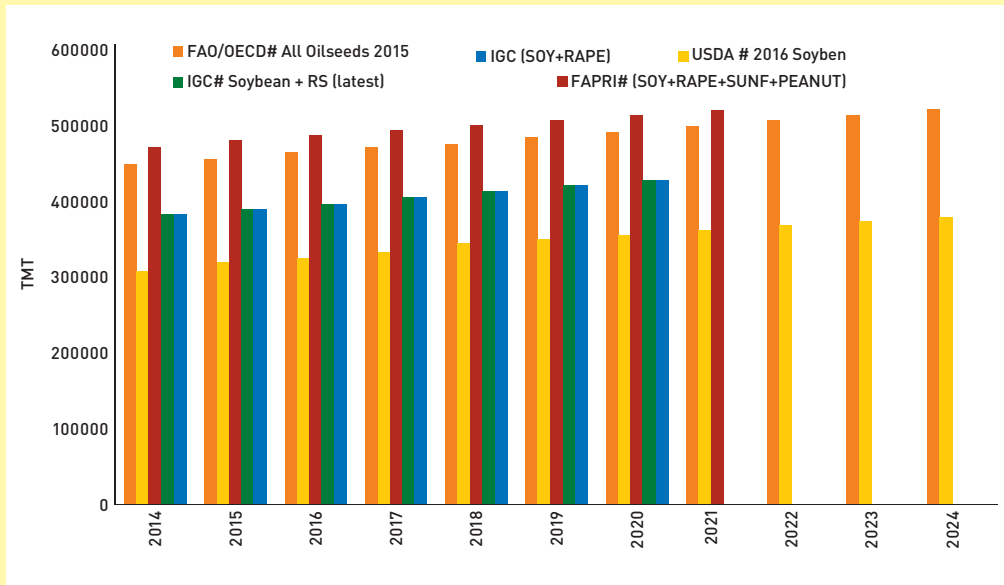
IIA.15: Global Coarse Grains Price (US\$/MT)



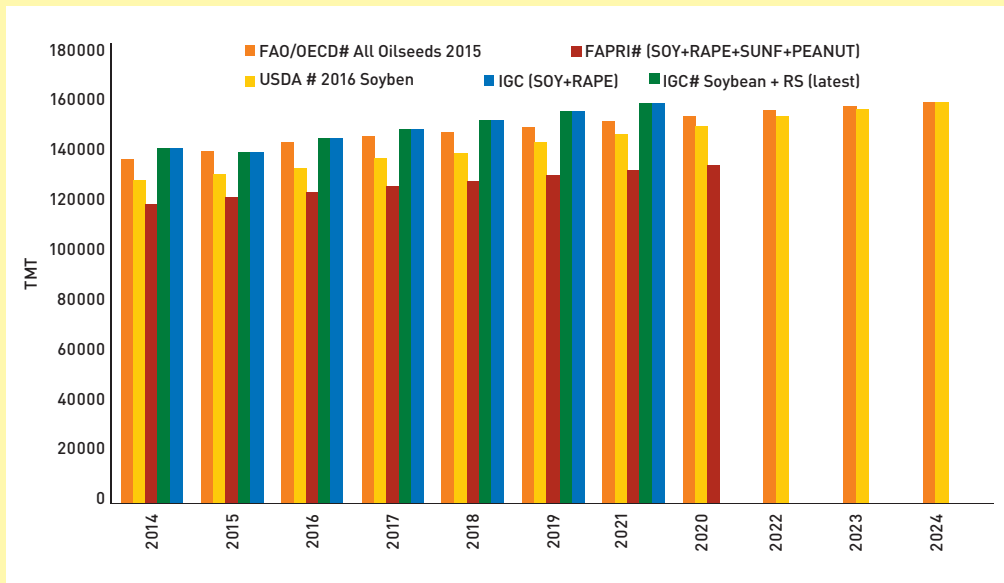
IIA.16: Global Oilseed Production (Thousand Metric Tonne)



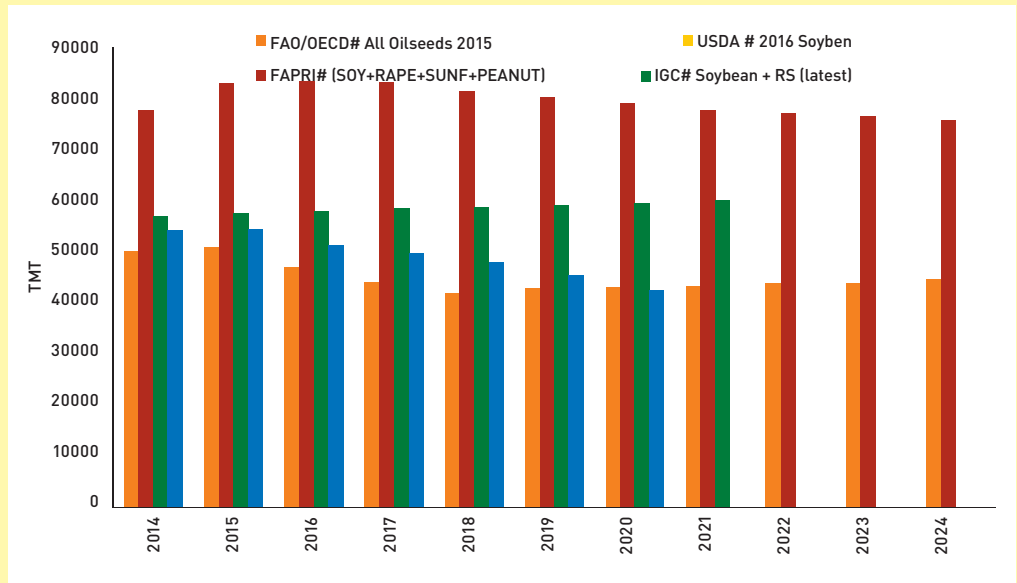
IIA.17: Global Oilseed Consumption/Crush (Thousand Metric Tonne)



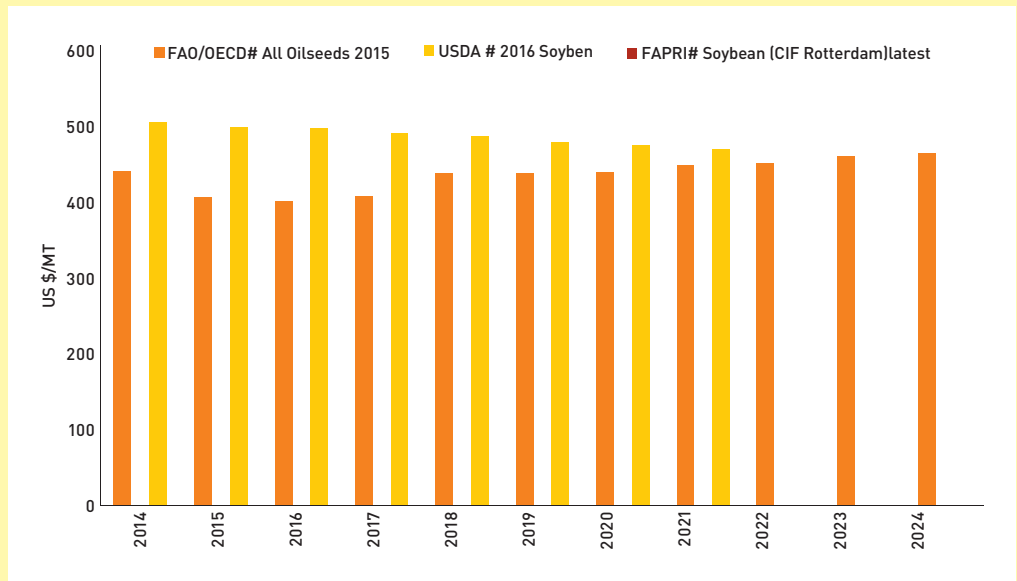
IIA.18: Global Oilseed Trade (Thousand Metric Tonne)



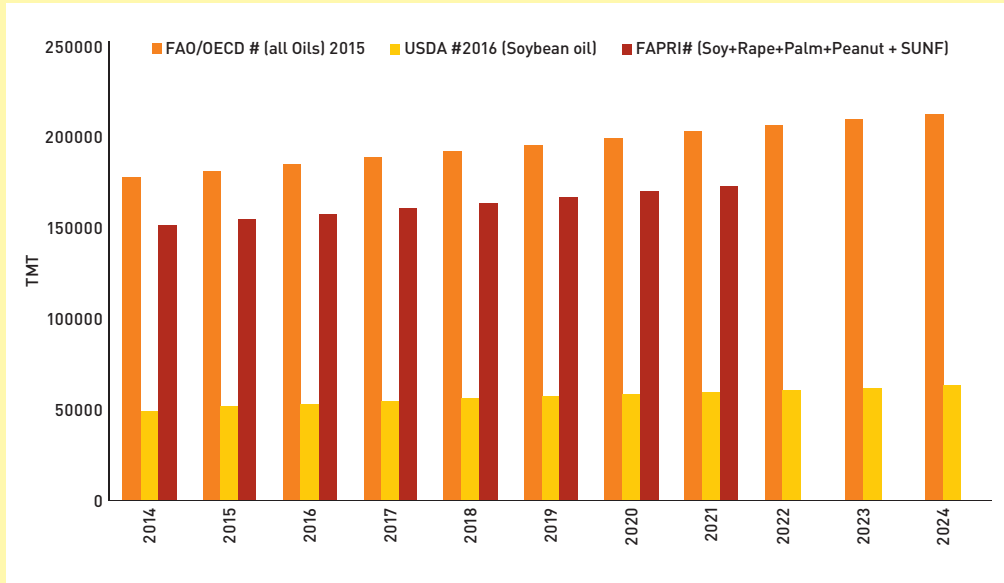
IIA.19: Global Oilseed Stocks (Thousand Metric Tonne)



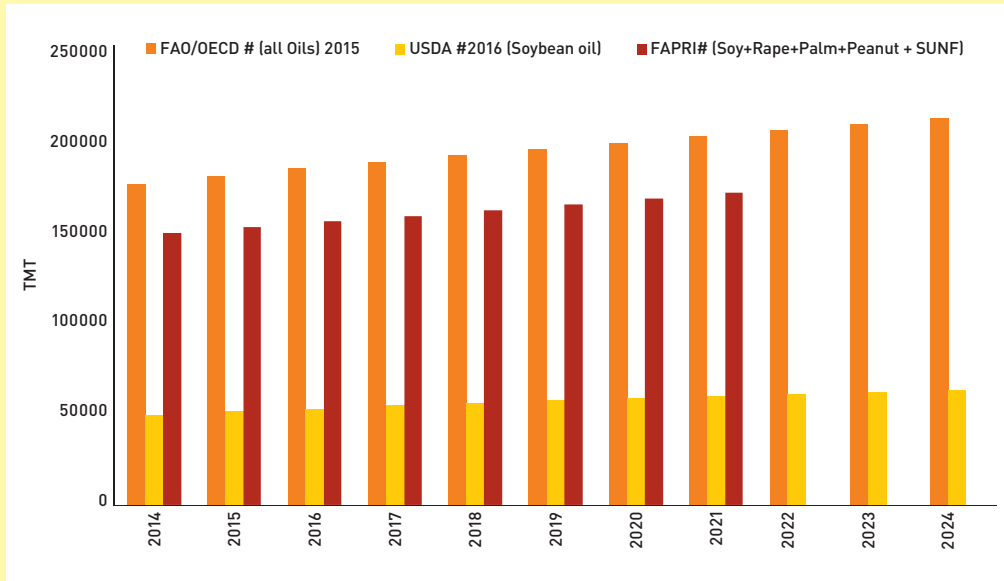
IIA.20: Global Oilseed Prices (US\$ per MT)



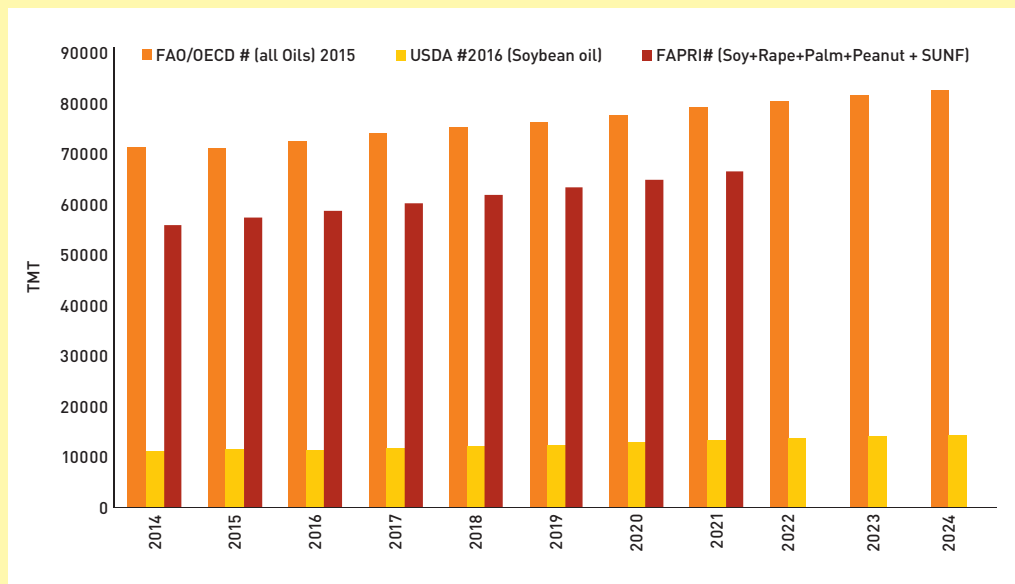
IIA.21: Global Vegetable Oil Production (Thousand Metric Tonne)



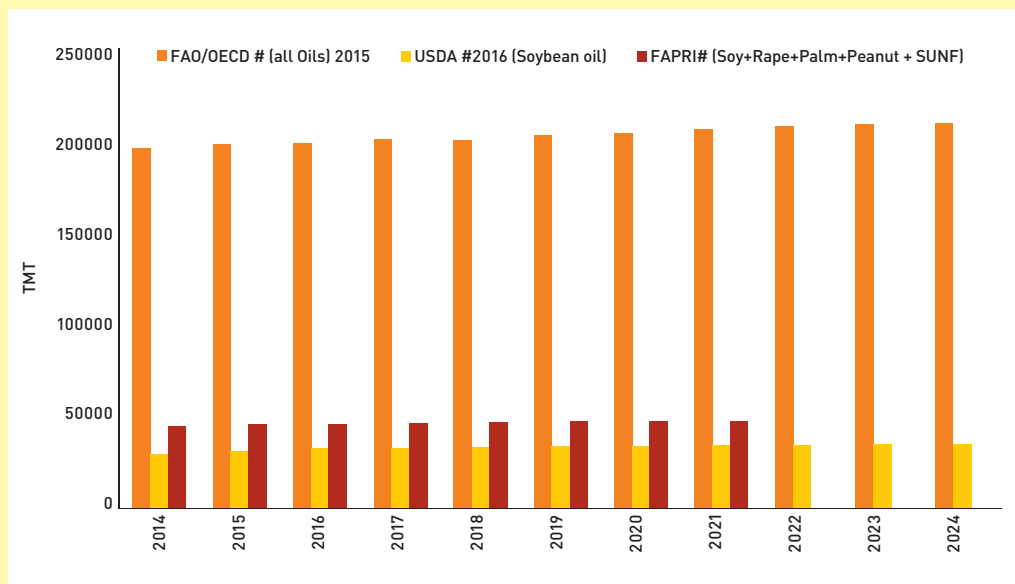
IIA.22: Global Vegetable Oil Consumption (Thousand Metric Tonne)



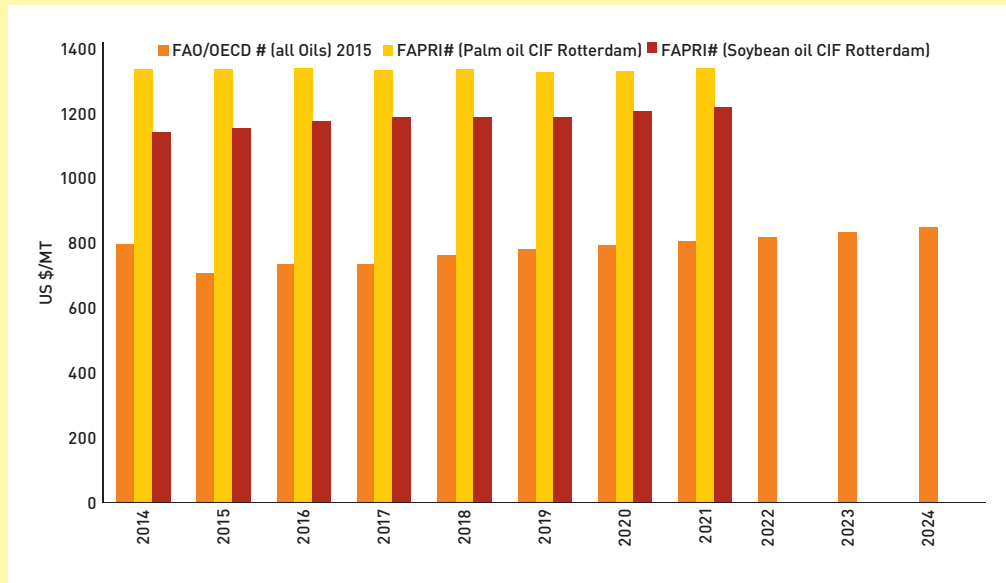
IIA.23: Global Vegetable Oil Trade (Thousand Metric Tonne)



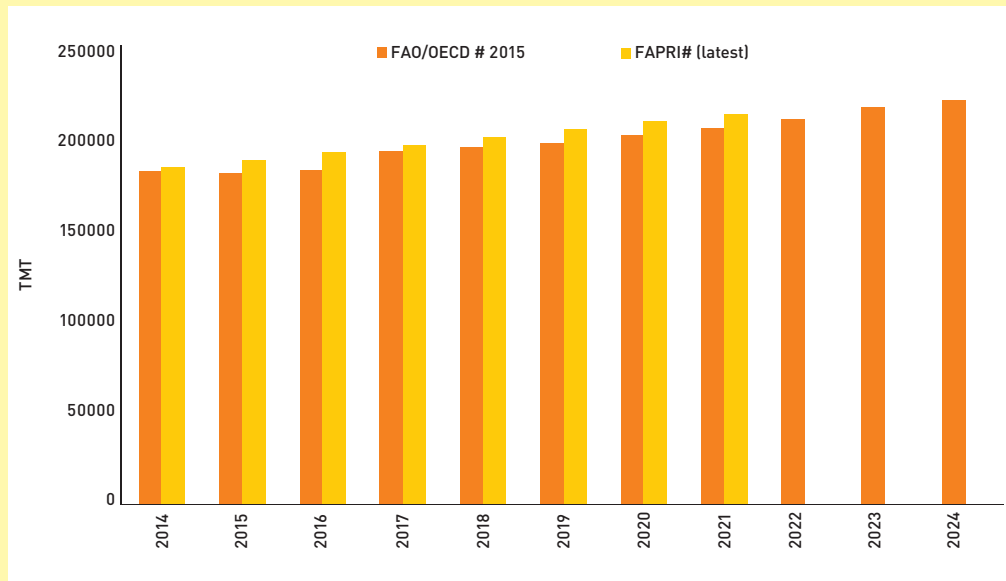
IIA.24: Global Vegetable Oil Ending Stocks (Thousand Metric Tonne)



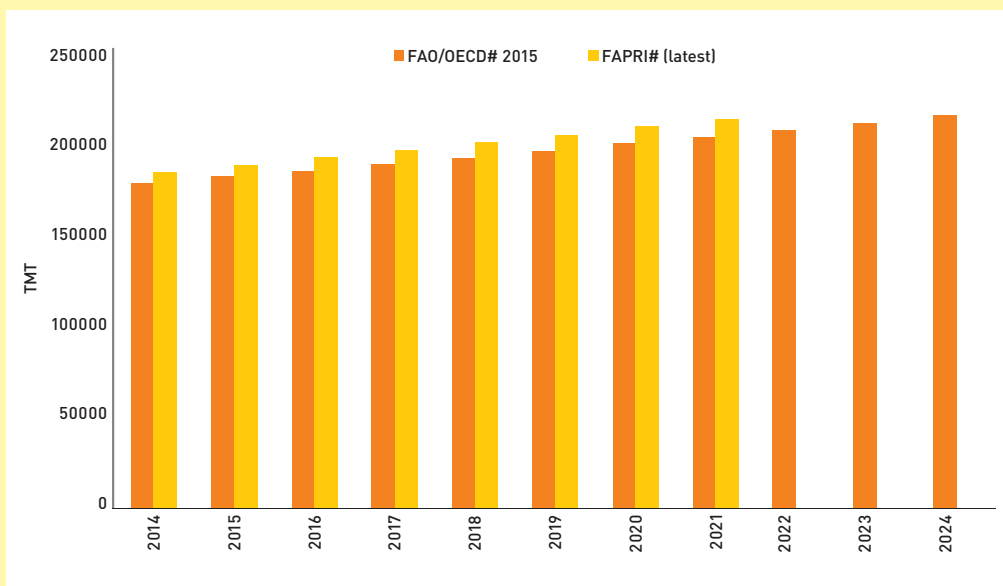
IIA.25: Global Vegetable Oil Price (US\$/MT)



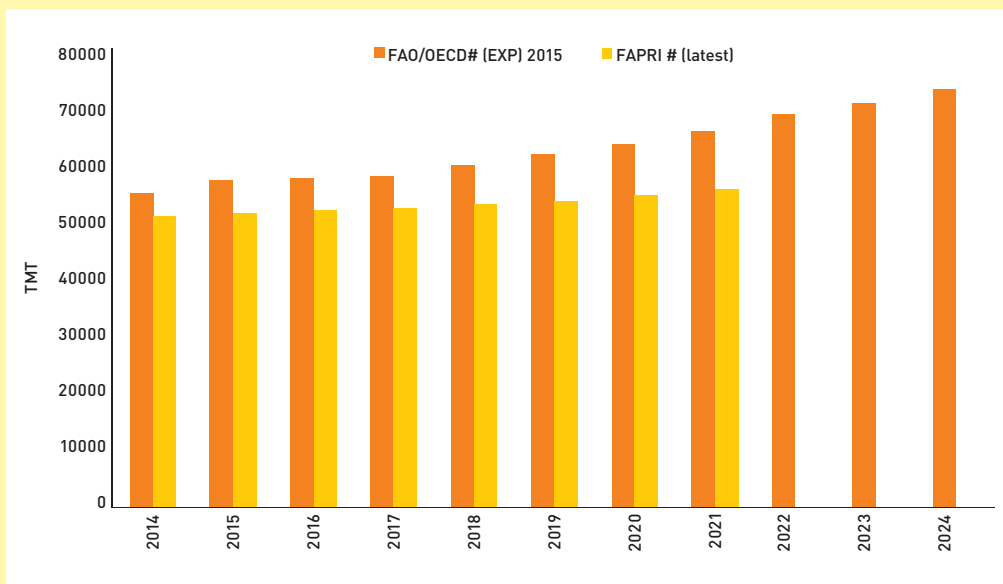
IIA.26: Global Sugar Production (Thousand Metric Tonne)



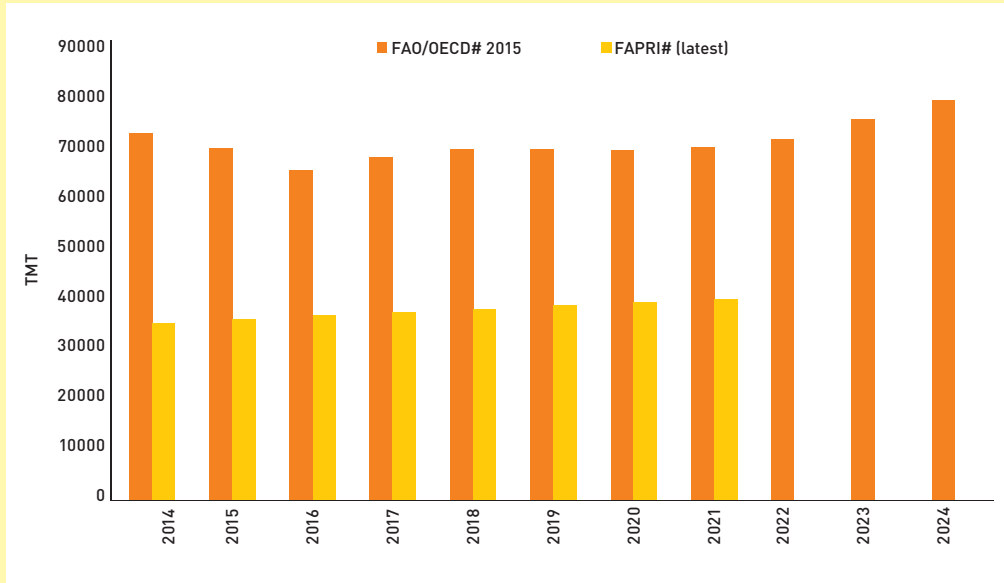
IIA.27: Global Sugar Consumption (Million Metric Tonne)



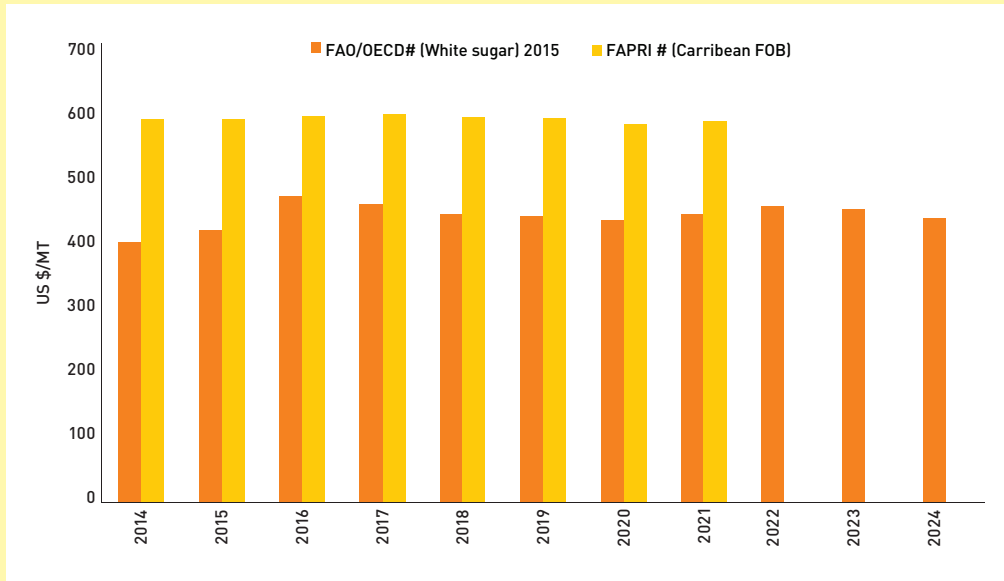
IIA.28 Global Sugar Trade (Thousand Metric Tonne)



IIA.29: Global Sugar Stocks (Thousand Metric Tonnes)



IIA.30: Global Sugar Price (US\$/MT)

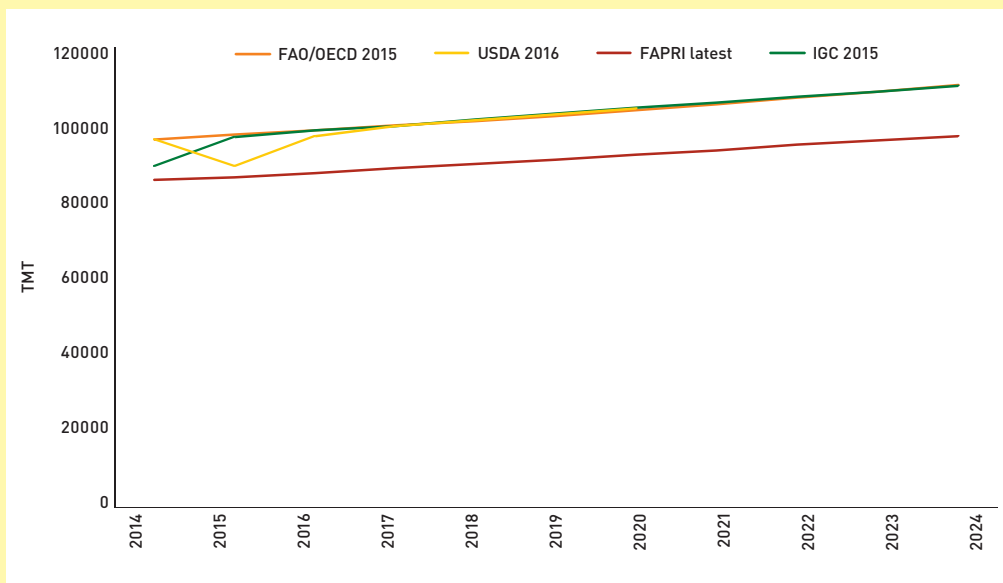




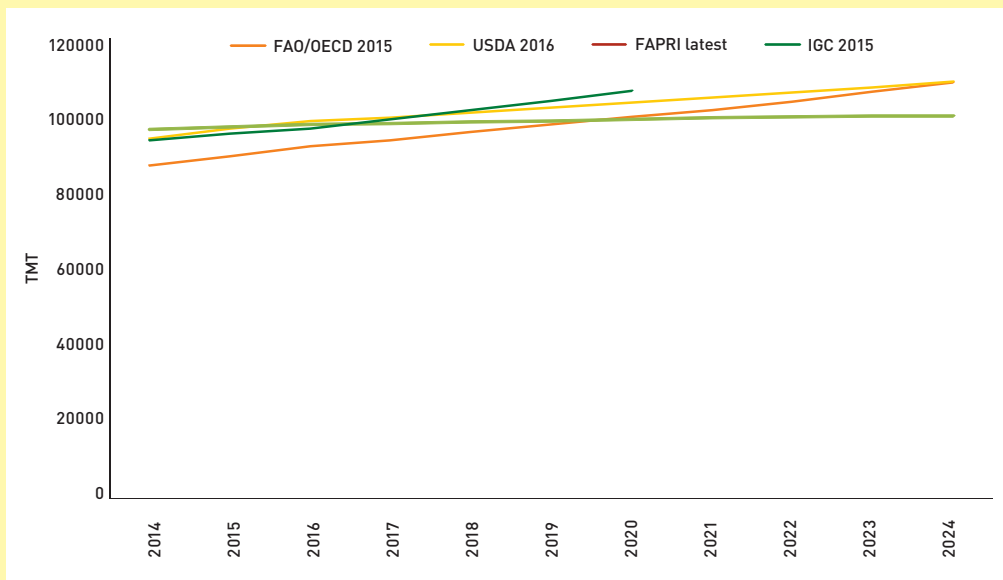
APPENDIX II

Medium-term Projections by Various Agencies

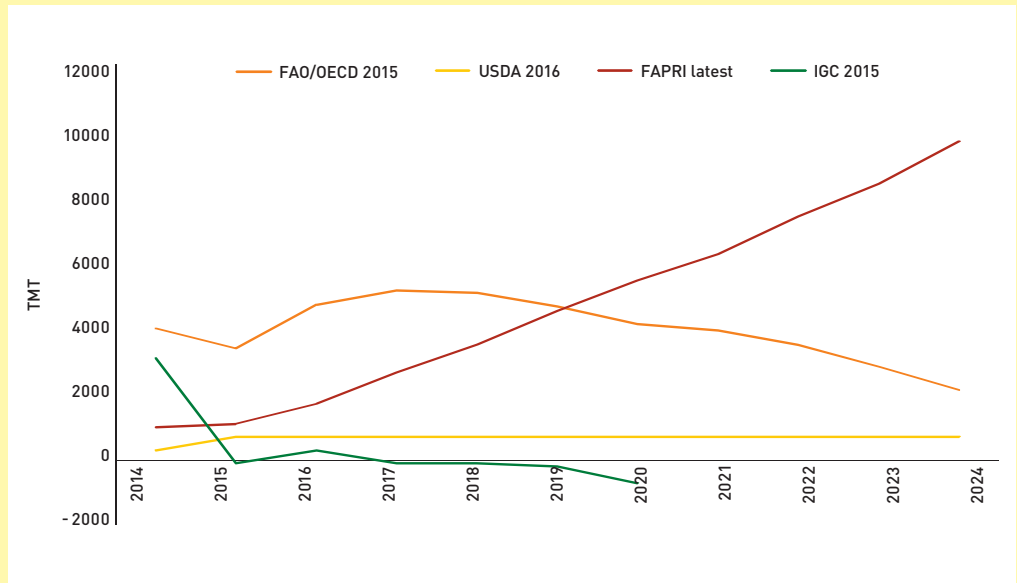
III.A.1: India: Wheat Production



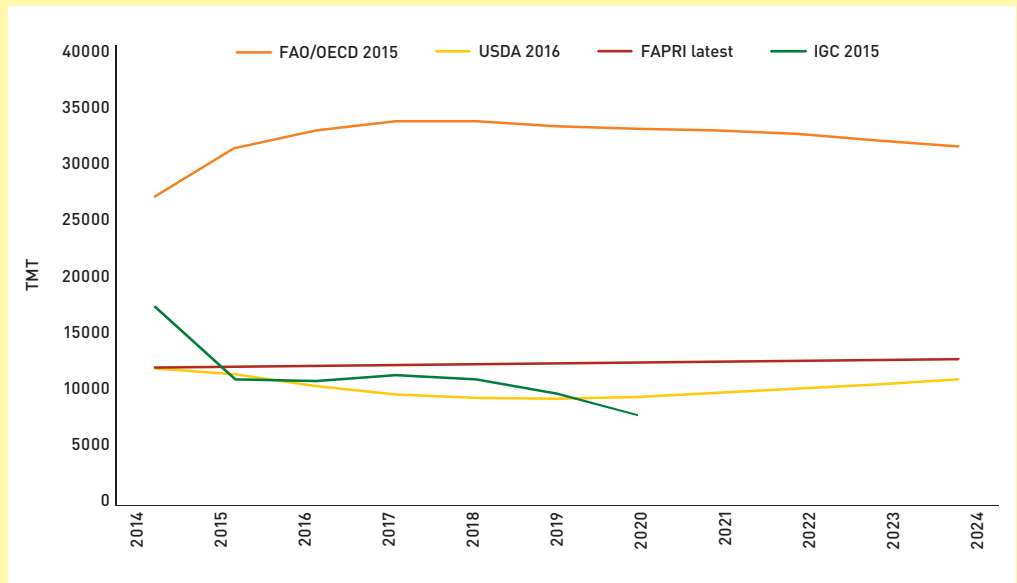
III.A.2: India: Wheat Consumption



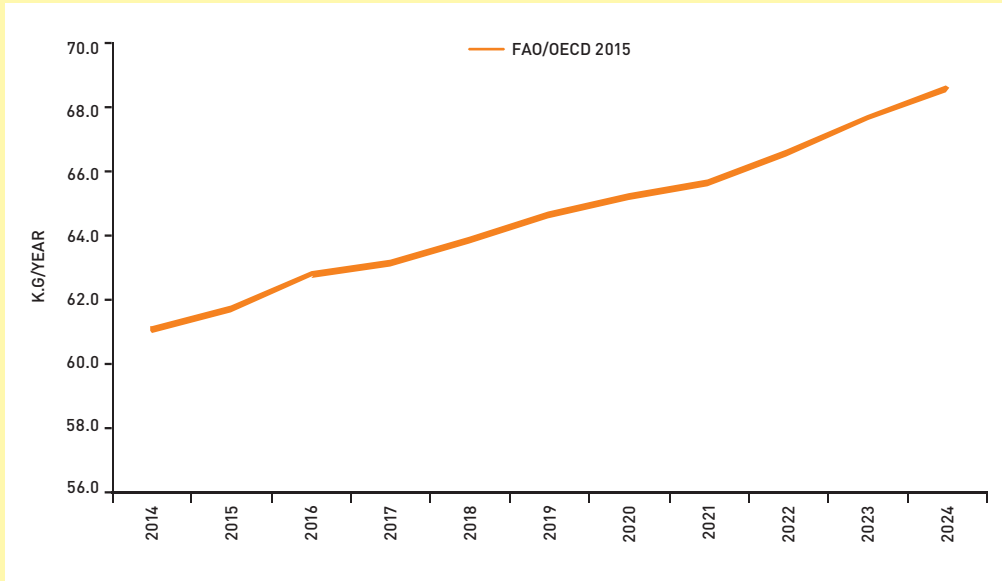
III.A.3: India: Net Wheat Exports



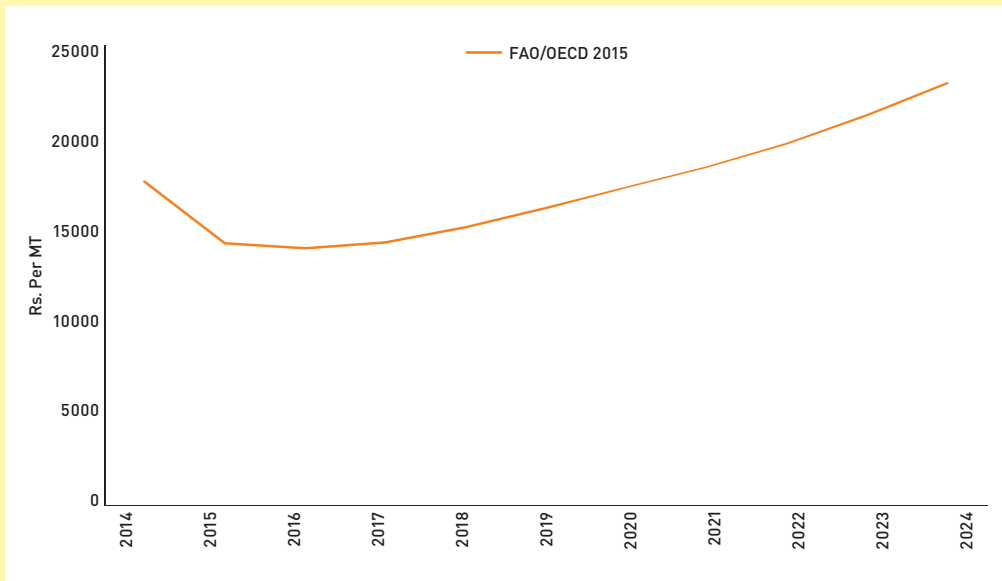
III.A.4: India: Wheat End Stocks



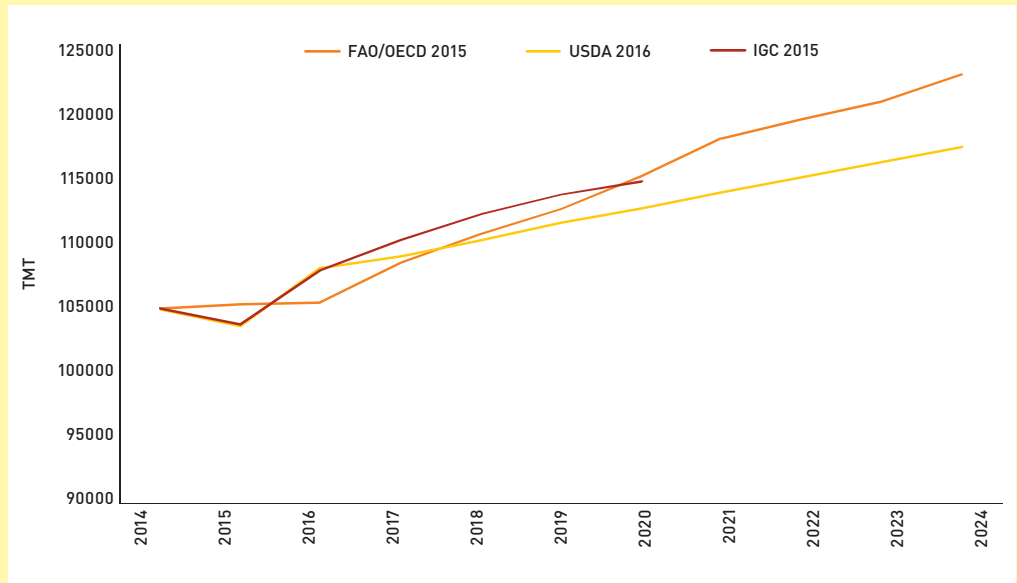
III.A.5: Per capita Wheat Consumption



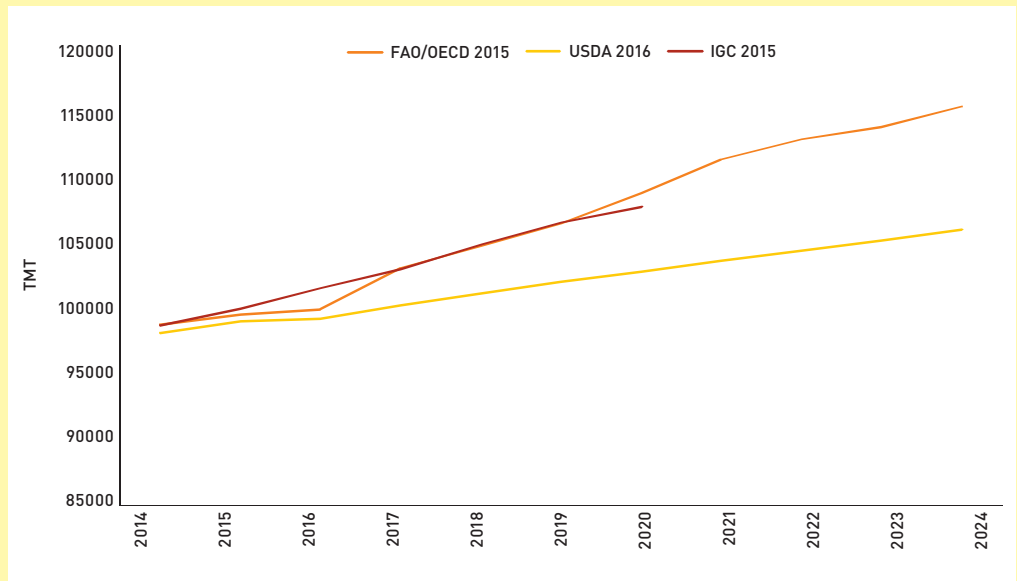
III.A.6: India: Wheat Producer Price



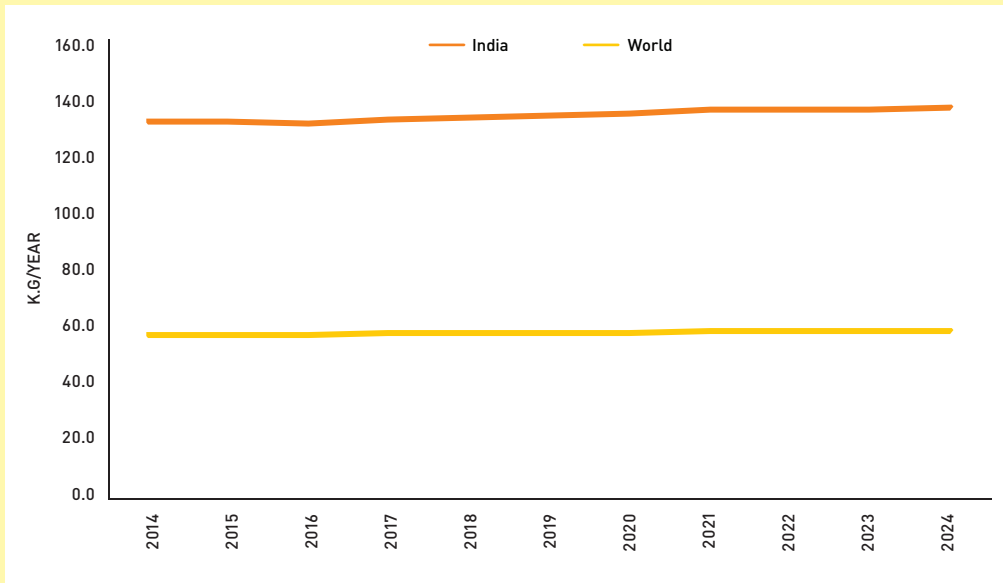
III.A.7: India: Rice Production



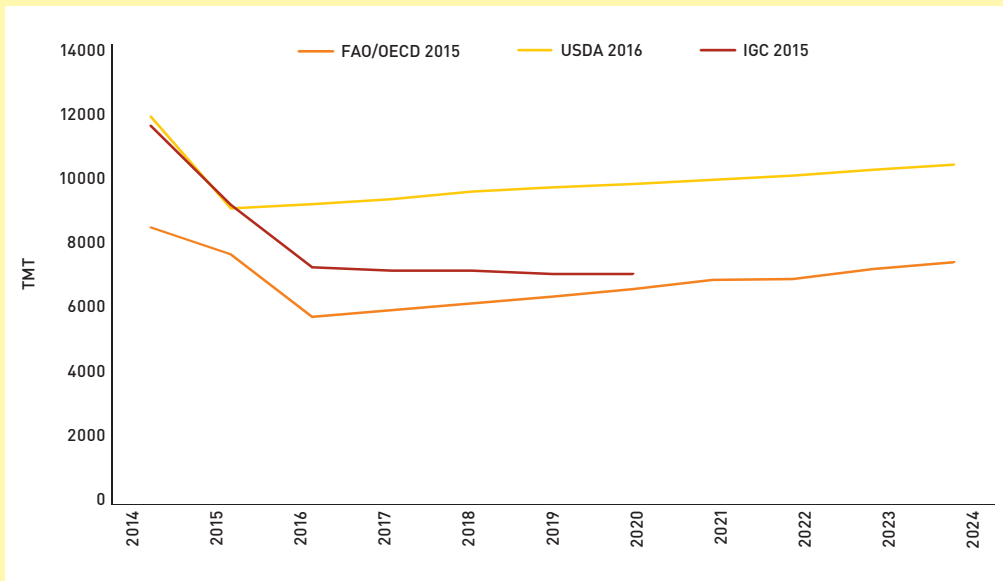
III.A.8: India: Rice Consumption



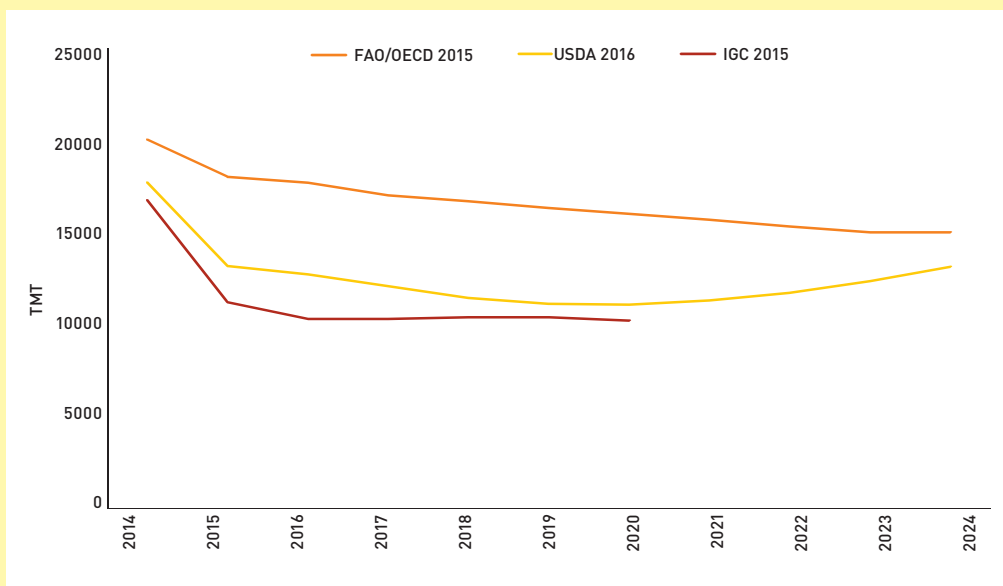
III.A.9: Per capita Rice Consumption-India Vs. World



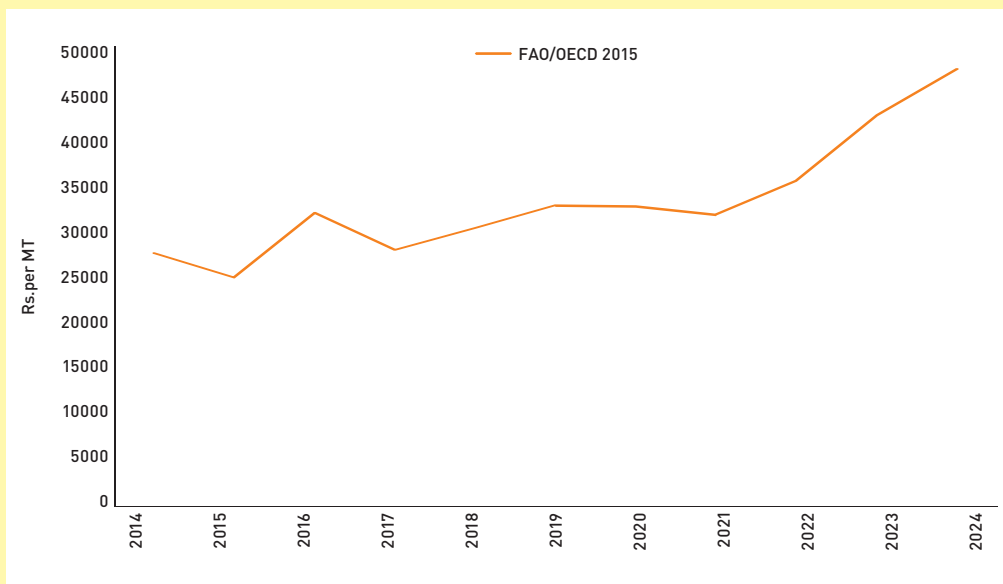
III.A.10: India: Rice Exports Net



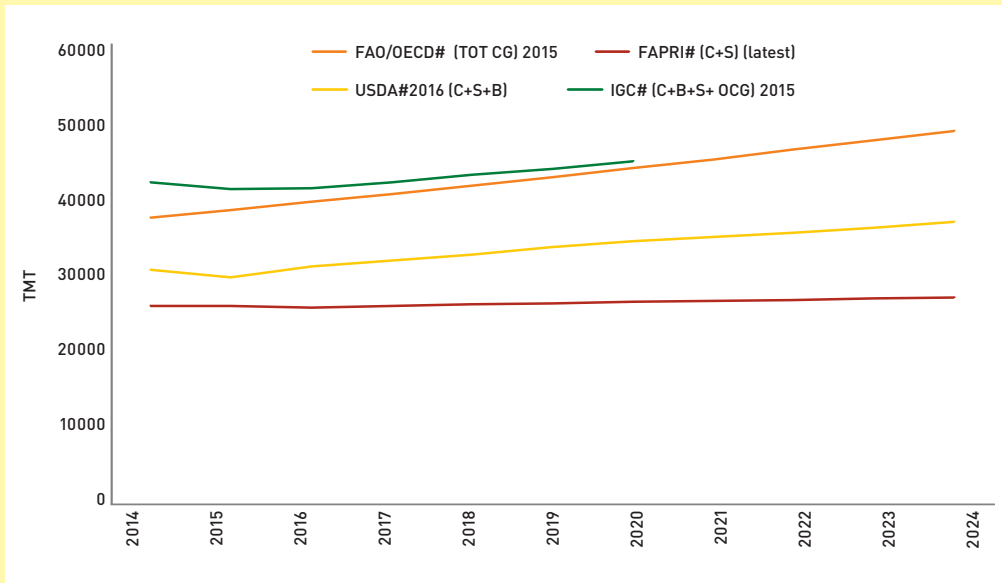
III.A.11: India: Rice Ending Stocks



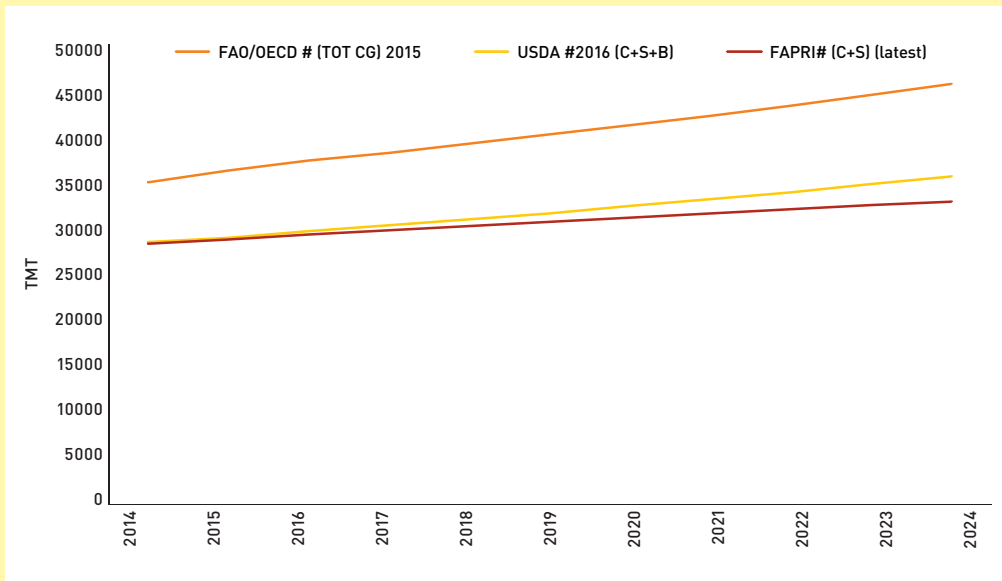
III.A.12: India: Rice Producer Price



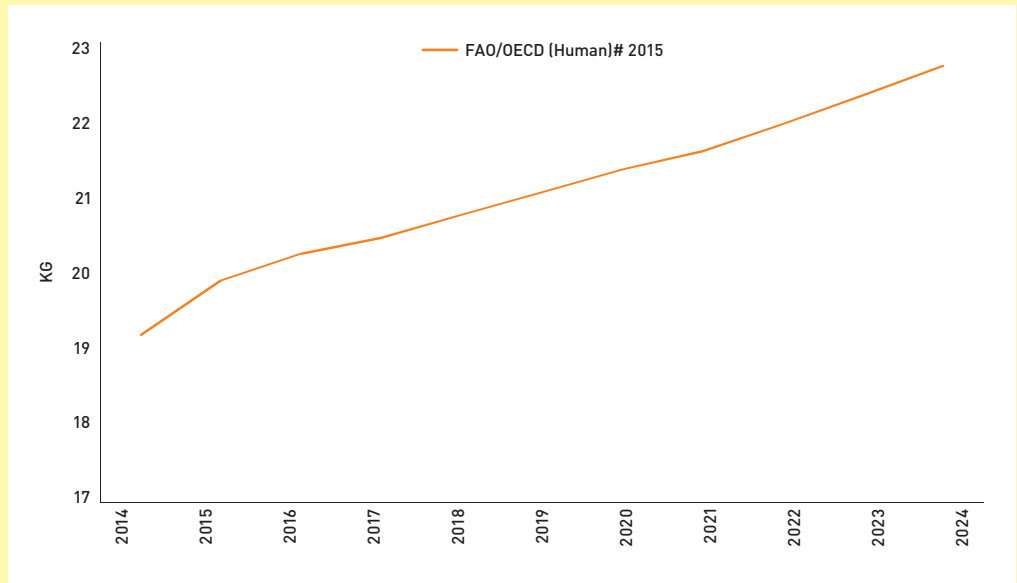
III.A.13: India: Total Coarse Grain Production



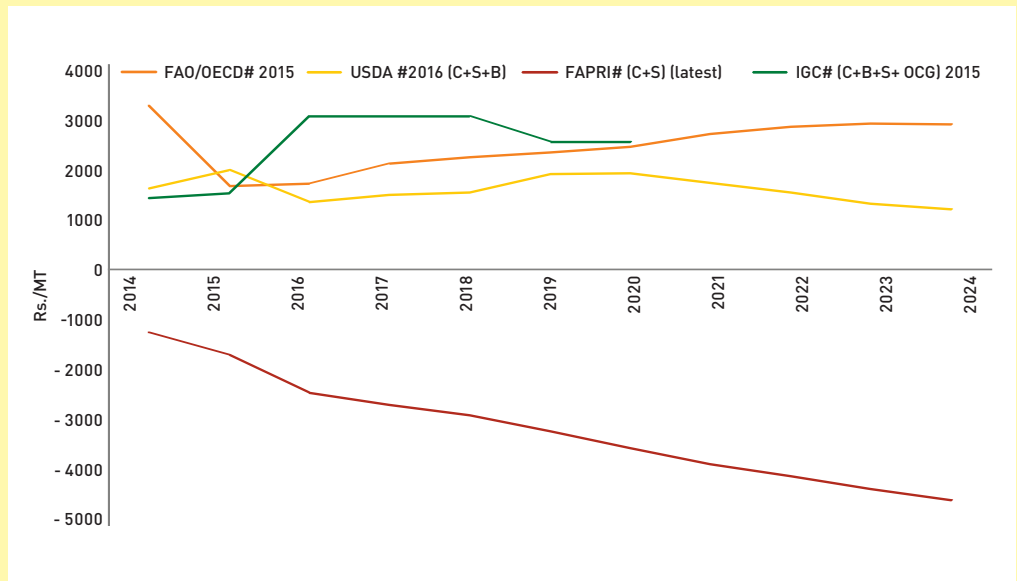
III.A.14: India: Total Coarse Grain Consumption



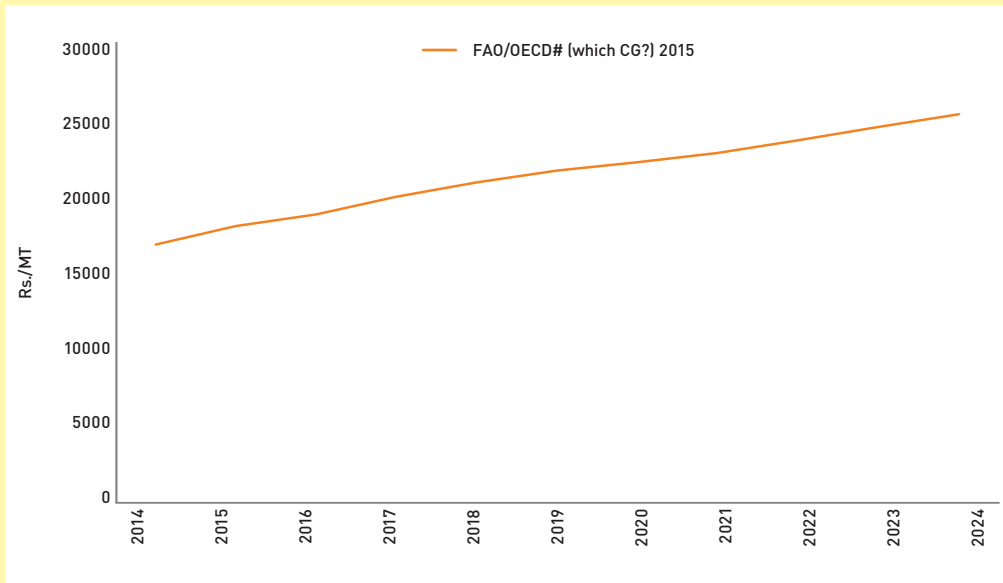
III.A.15: Per capita Coarse Grain Consumption - India Vs. World



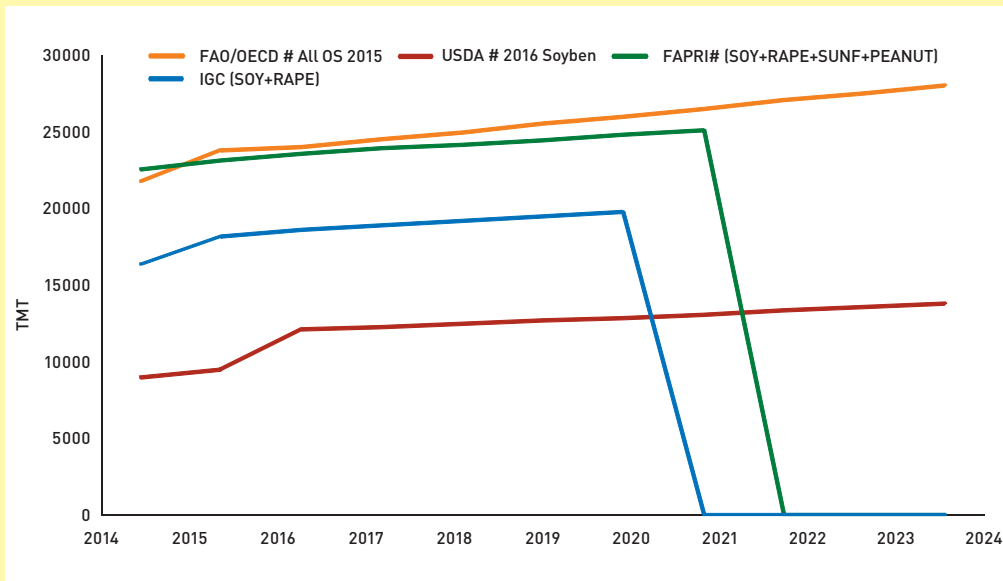
III.A.16: India: Coarse Grain Net Exports



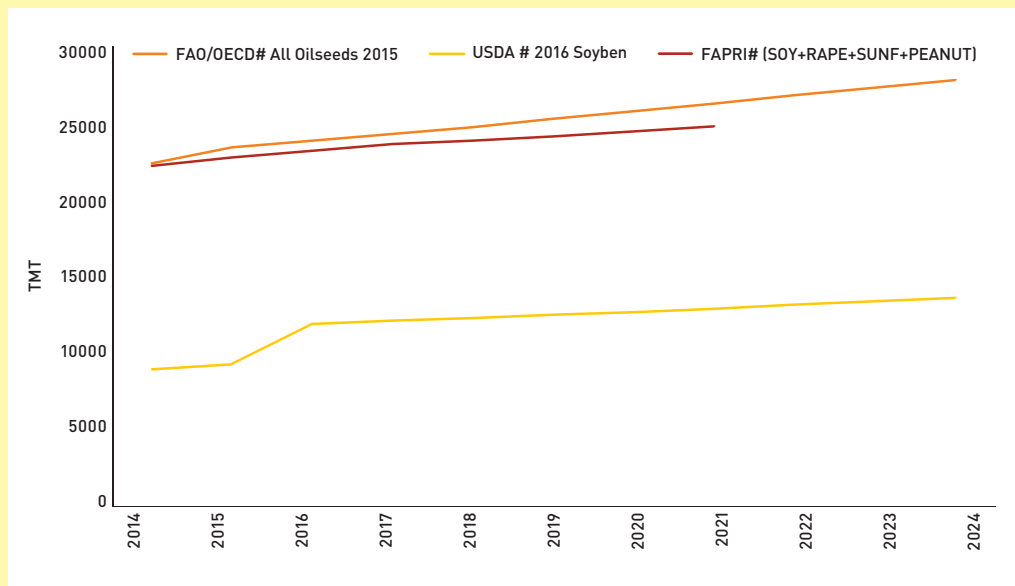
III.A.17: India: Coarse Grain Producer Price



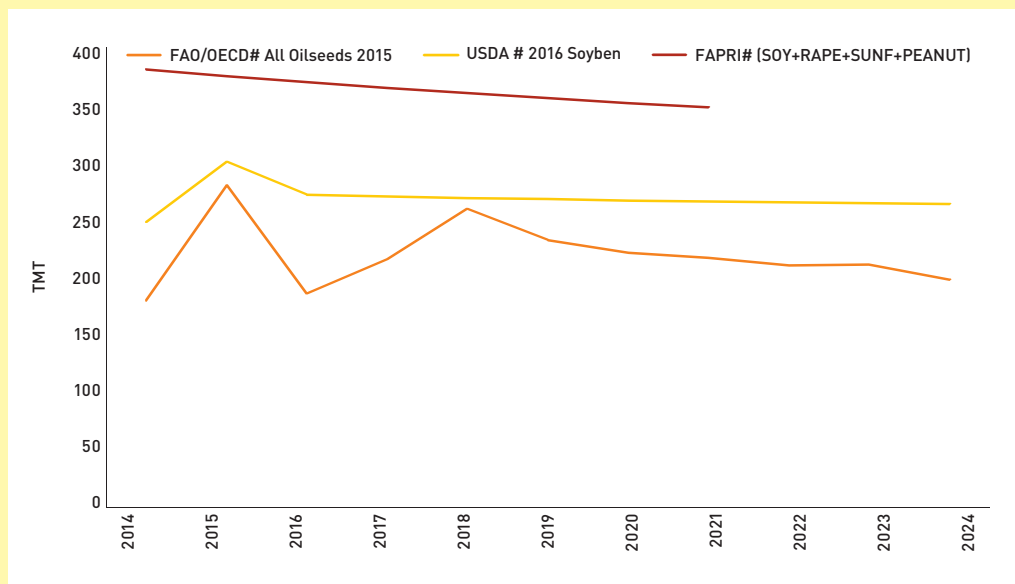
III.A.18: India: Oilseed Production



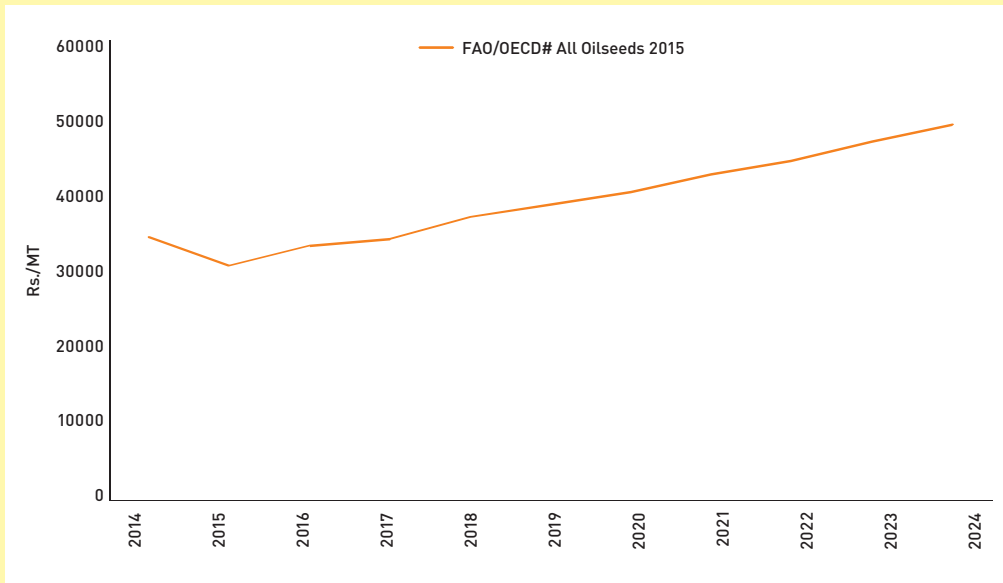
III.A.19: India: Oilseed Consumption



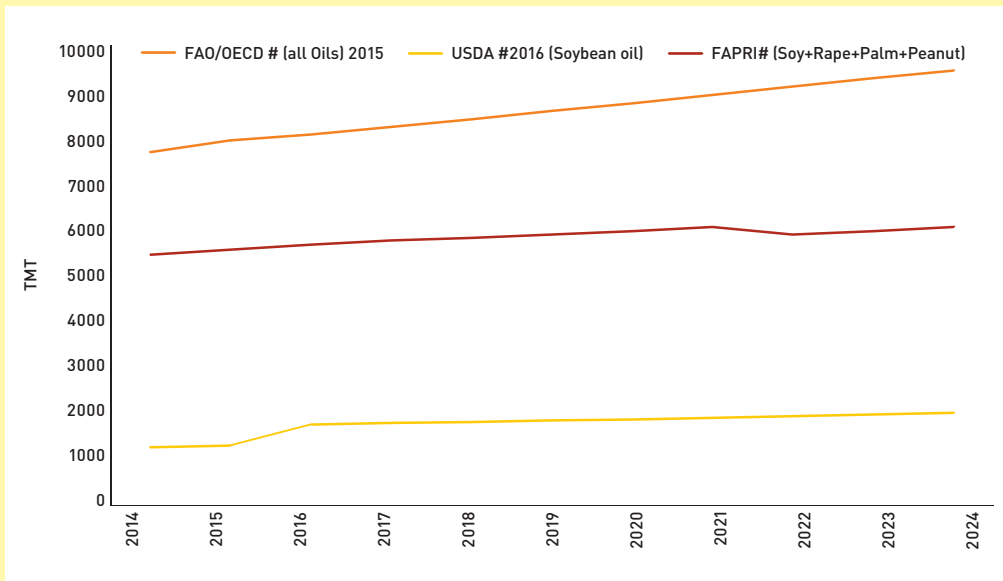
III.A.20: India: Net Exports of Oilseeds



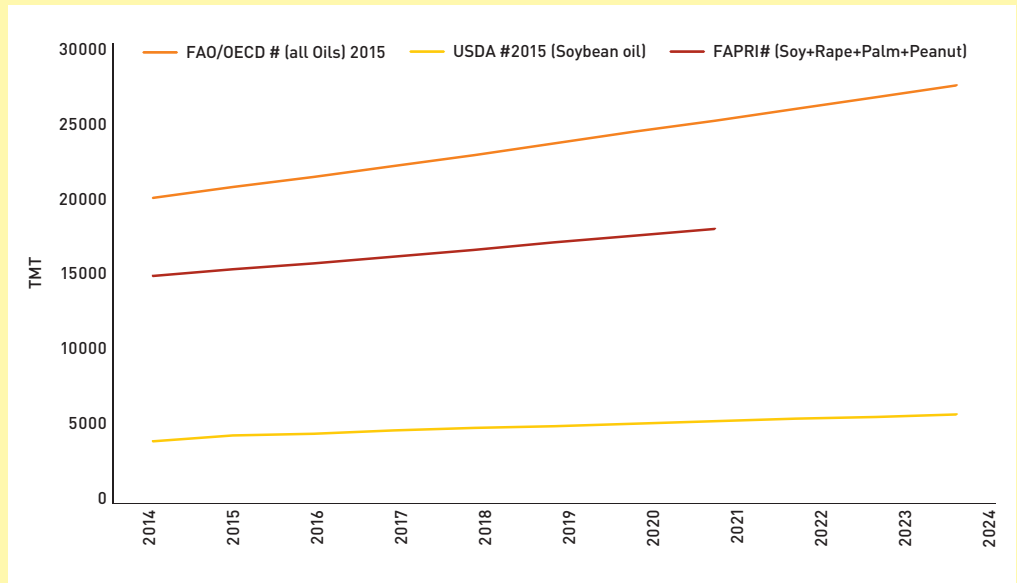
III.A.21: India: Oilseed Producer Price



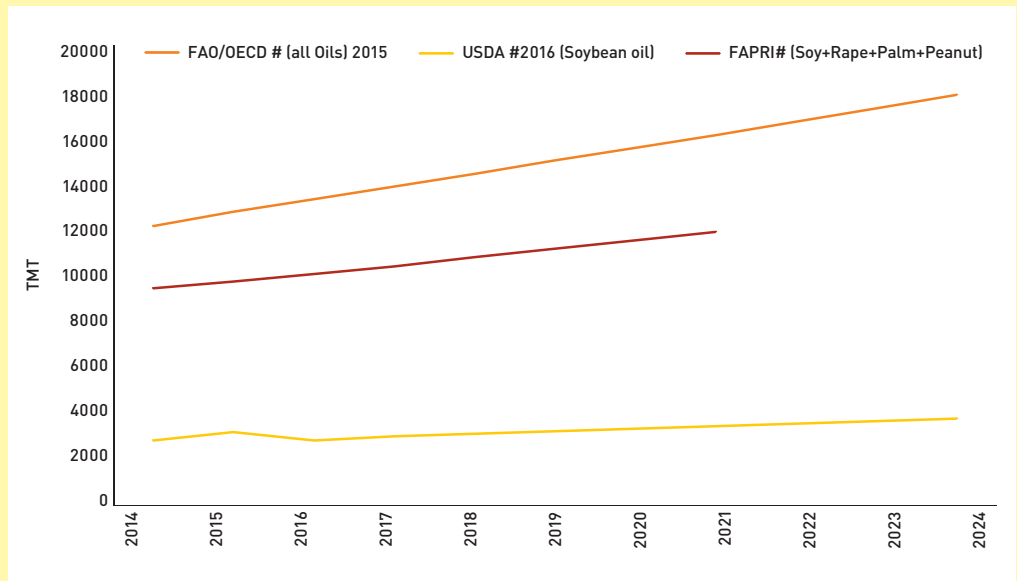
III.A.22: India: Vegetable Oil Production (TMT)



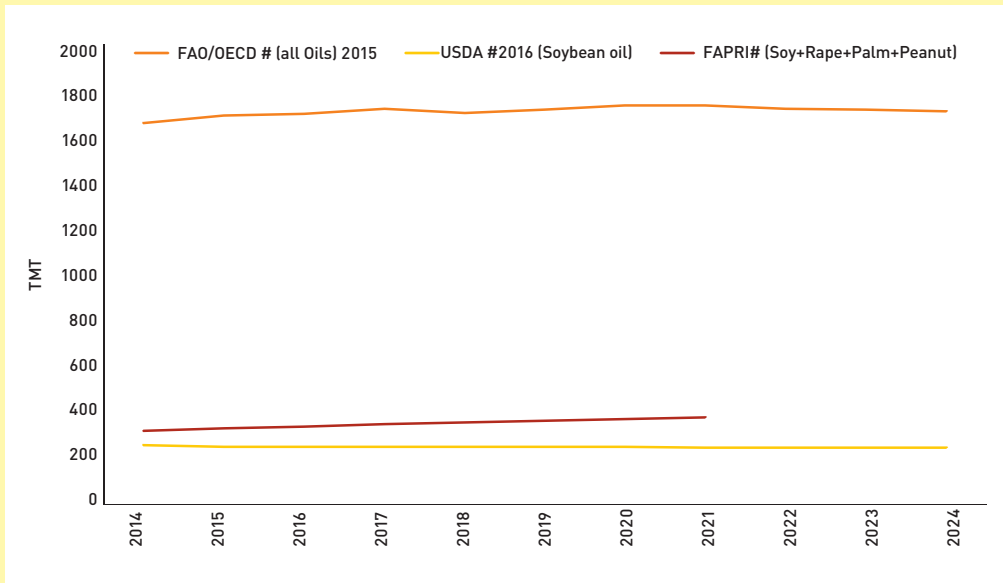
III.A.23: India: Vegetable Oil Consumption



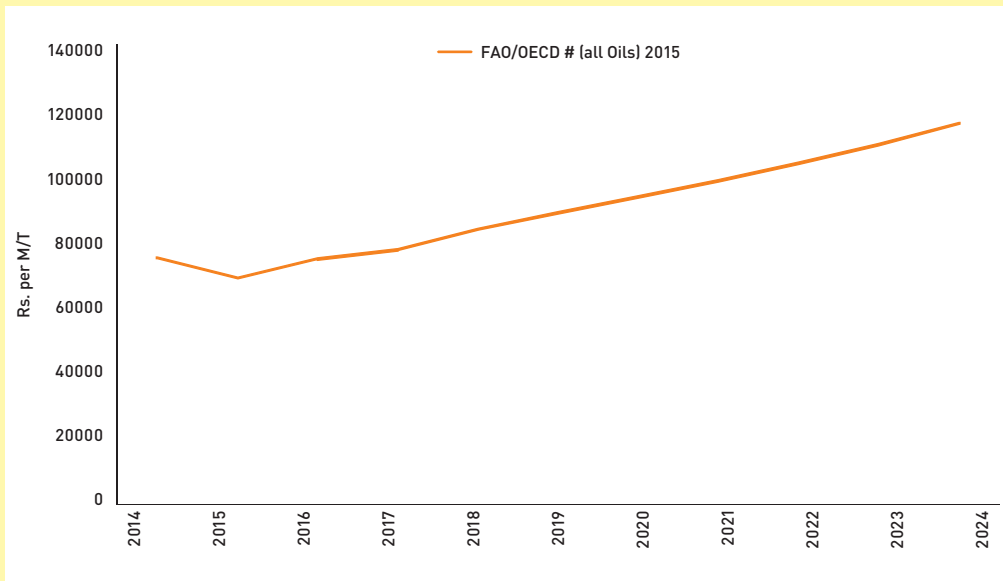
III.A.24: India: Vegetable Oil Imports



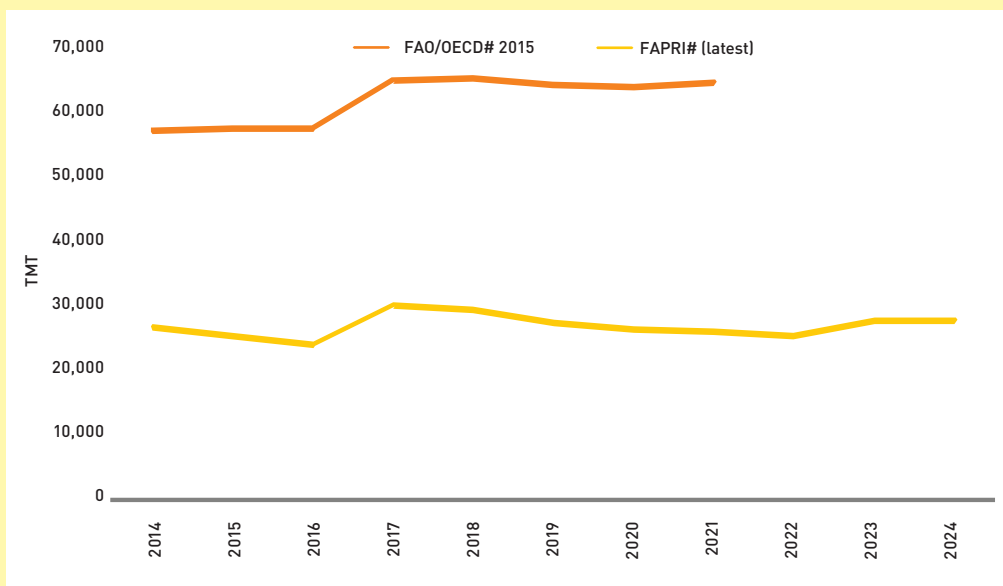
III.A.25: India: Vegetable Oil Ending Stocks



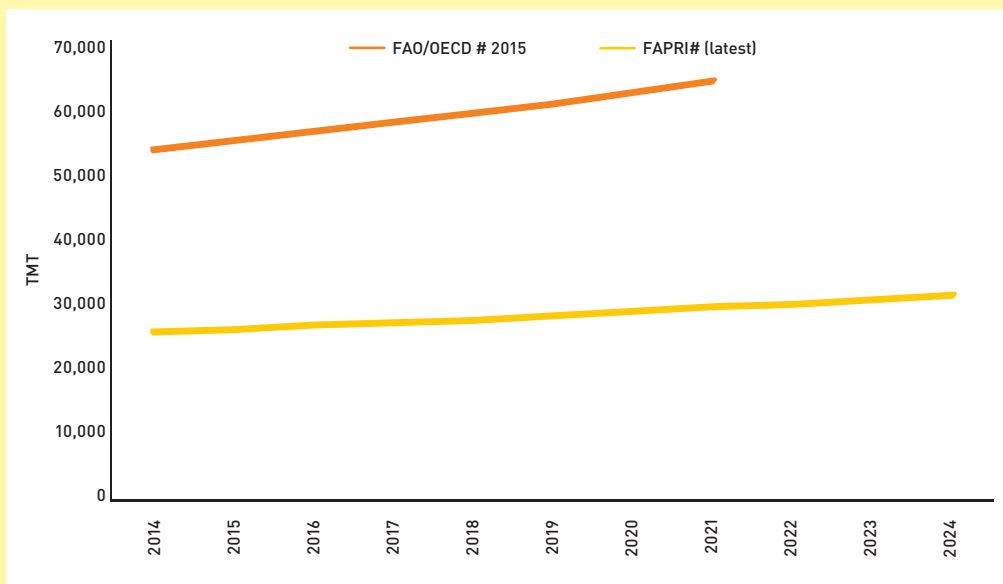
III.A.26: India: Vegetable Oil Price



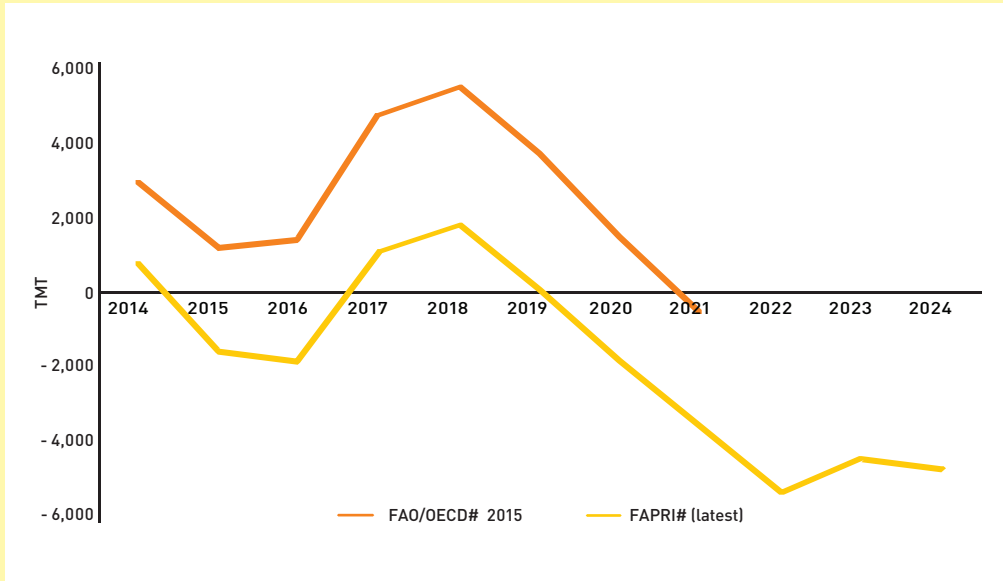
III.A.27: India: Sugar Production



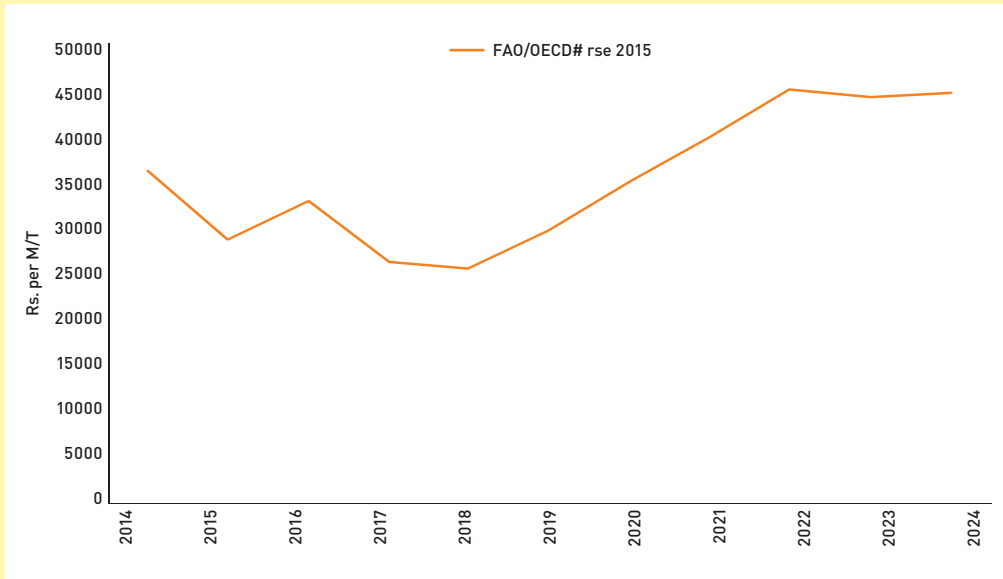
III.A.28: India: Sugar Consumption



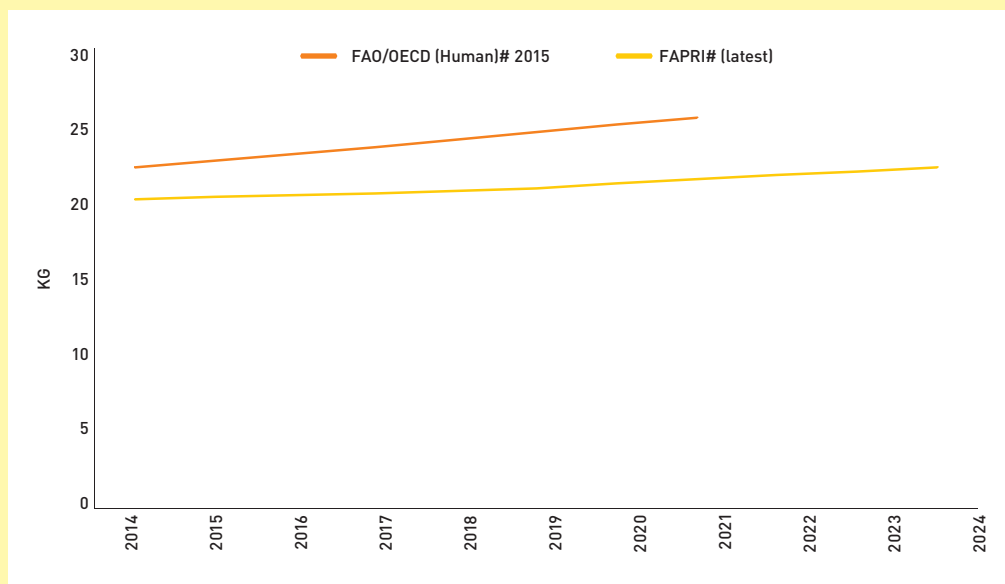
III.A.29: India: Net Sugar Exports



III.A.30: India: Sugar Price



III.A.31: Per capita Sugar Consumption - India Vs. World



APPENDIX III

Methodology on Demand and Supply Forecasts

We make an attempt to forecast demand and supply of foodgrains and edible oils beginning from 2016–17 up to the year 2023–24. Demand forecasts are based on expenditure elasticities that are estimated using Almost Ideal Demand System (AIDS) model with the help of NSS unit level data from 43rd to 62nd Round by using baseline consumption expenditure for the period 2011–12, i.e., the latest quinquennial 69th round data on consumption available. Supply forecasts are based on elasticities derived from simultaneous equation model estimated for the period 1980–2015. The demand projections for any commodity are mainly based on three factors, viz., projected population, growth rate in per capita income, and the income elasticity of demand. The demand for any commodity at any given point of time might differ across different groups (for example, rural or urban), different regions of the country, and different income groups (for example, rich versus poor). The demand projections are done for rural and urban households in the baseline and one more scenario. The baseline assumes a national income growth rate of 6 per cent per annum for the forecast period, that is, 2012–13 to 2023–24. The medium-term growth scenario imposes a much more ambitious growth rate of 9 per cent per annum for the forecast period. Finally, by adding the predicted rural and urban sectors' demand, we arrive at the national demand for various foodgrains and non foodgrain items for human consumption. To arrive at the aggregate demand we add the indirect demand for foodgrains to the forecast demand for human consumption.

For supply projections, a simultaneous equation model has been used for the historical data period from 1980–81 to 2015–16. The set of equations include four simultaneous equations to estimate the parameters for the dependent variables. These four determined variables were area, yield, farm harvest price (in real terms), and quantity of exports. The estimated equations are:

- (i) Area = $f(P_i, P_j, \text{Rain}, \text{Irrg}, \text{Fert}, \text{Fertp}, \text{Trend}, \text{Lagged})$
- (ii) Production = $f(P_i, \text{Rain}, \text{Irrg}, \text{Fert}, \text{Fertp}, \text{Trend}, \text{Lagged})$
- (iii) Real dom price = $f(\text{MSP}, \text{WP}, \text{Prod}, \text{WI}, \text{PD}, \text{Trend}, \text{Lagged})$
- (iv) Exports = $f(P_i, \text{WP}, \text{Prod}, \text{Open}, \text{PD}, \text{WT}, \text{WI}, \text{REER}, \text{Trend}, \text{Lagged})$

where

P_i is real domestic (farm harvest) price;

P_j is real price of a competing crop;

Rain is rainfall – annual, monsoon or winter months as applicable in different cases;

Irrg is percentage of area under irrigation

Fert is fertiliser use in kgs per hectare;

- Fertp is real fertiliser price;
- MSP is real minimum support price;
- WP is real world price or real unit value of exports;
- WI is real world income;
- PD is a policy dummy;
- Open is openness in terms of the share of Indian exports in world exports commodity wise;
- WT is volume of world trade in a particular commodity.
- REER is the real effective exchange rate

The estimated elasticities are then used to forecast area, yield, farm harvest prices and exports for the forecast period. Two scenarios of agricultural growth are worked for the supply projections as well, i.e., if agriculture grows at a trend growth rate of 1980 to 1994 (scenario 1); and if it grows at a rate achieved during 1995 to 2009.

APPENDIX IV

Description of COSIMO Model

AIV.1 Description of Supply Side

For any given year, we have:

1. Crop production

Cropped Area = f [{Absolute Return/ha, {Effective Payment/ha (-1)}, Cost Index} of
Alternative cropping}, Area (-1), Residual Factor]

Absolute Return/ha = f {Own Producer price (current & previous period), Own Yield
(current & previous period)}

Yield = f [{(Producer's Price/t (-1)), {Effective Payment/t (-1)}, Cost index, Trend,
Residual Factor]

Production = Area * Yield

2. Oilseed Production

Oilseed Meal production = Meal yield * Oilseed crush

Protein meal production = Oilseed meal + others

Oilseed oil production = Oil yield * Oilseed crush

Vegetable oil production = Oilseed oil + Palm oil + others

3. Meat production

Livestock Inventory of Pork, Poultry & Sheep = f (Quantity Produced, Trend, residual
Factor)

Bovine Livestock Inventory = f [{(Producer price of Meat, Effective Payment/head) of
Bovine & Milk}, Feed Expenditure Cost index, Meat & Dairy Production Cost Index,
Inventory (-1), Trend, Residual Factor]

Indigenous meat production = f {Producer price of Meat, Effective Payment/t, Feed Cost
Expenditure Index, Meat & Dairy Cost index, Inventory (-1), Production (-1), Trend,
Residual Factor}

4. Milk production:

Cow Inventory = f {Producer prices of Milk & Bovine meat/t, Effective Payment/head for
Milk Cow & Bovine meat, Feed Cost Expenditure Index, Meat & Dairy Cost Index,
Inventory (-1), Trend, Residual Factor}

Milk Yield = f (Milk Producer price, Effective Payment/head, Meat & Dairy Cost Index,
Ruminants Feed Expenditure Cost Index, Trend, Residual Factor)

Milk production = Inventory * Yield

5. Exports

Exports = f {(Own Producer price /Export price * (1 - Tariff rate)), Residual Factor}

Export price = World Reference price * Nominal Exchange rate

AIV.2 Description of Demand Side

1. Food Demand

Food Consumption = f (Own Consumer price, Consumer prices of other commodities, Price deflator, Per capita Income, Population size, Trend, Residual Factor)

Note: Demand constraints apply in log linear relationship

2. Crop Feed Demand

Feed demand = f (Own Consumer price, Consumer prices of other prices, Non-ruminant production, Ruminant production, Trend, Residual Factor)

3. Crop Other Use

Other Use = f (Own Producer price, Consumer Price Index, GDP, Trend, Residual Factor)

4. Stocks

Crop Stocks = f {Stock (-1), (Own Producer price, Own Minimum Support Price, Own Food Consumption / Production), Trend, Residual Factor}

Meat & Dairy Products Stocks = f {Stock (-1), Own Producer price, Production, Trend, Residual Factor}

5. Imports

Imports = f {(producer price/import price * (1 + Ad-Valorem Import Tariff)), Residual Factor}

Import price = World Reference price * Exchange rate

Producer prices have been derived using the domestic market clearing condition, which is as follows:

Production + Stocks (-1) + Imports = Consumption + Exports + Stocks

AIV.3 In case of Consumer prices

Consumer price = f (Producer price, GDP Deflator, Residual Factor)

Parameters

The parameters of the model capture interrelationships among the variables. They determine the properties of the model and ensure stability of the solution. Using available estimates and given system constraints, the model is calibrated. For the rest of the parameters, estimation procedure is used with help of historical data.

Data Requirements

Annual time series for the endogenous (1983–2014) and exogenous variables are used (1983–2014 are historic and 2015–2025 are projected). The dataset of the endogenous variables are prepared by historical data on prices, supply side constituents (such as, area, yield, animal numbers), demand side constituents (food, feed, crush) and trade (exports and imports). Besides, data on exogenous variables like macroeconomic variables (GDP, exchange rate, GDP deflator) and policy variables (tariff, CAP) are also put together in order to generate projections.

Solving the Model in TROLL

We solve the India COSIMO model in TROLL software based on data on endogenous and exogenous variables, parameterisation, and the model specification.

Design of the Template Code of India COSIMO Model

India COSIMO model is solved in TROLL software. The architecture of the template code is composed of major steps, such as uploading historical data, model creation, creating special variables, policy variables, data calculation, estimation and calibration, forecasting, simulating the model and documenting output.

AIV.4 Exogenous Variable

Macro Variables

| Variables | 2014 | 2015 | 2021 | 2025 | Annual growth rate from 2005–6 to 2015–16 | Projected annual growth rate from 2016–17 to 2025–26 |
|------------------------|----------|----------|----------|----------|---|--|
| Area Harvested | 146933 | 146603 | 147404 | 147986 | 0.65 | 0.09 |
| Calories | 2024 | 2049 | 2365 | 2491 | 0.98 | 1.38 |
| Food Expenditure Index | 147968 | 155058 | 260708 | 340729 | 8.64 | 6.84 |
| Food Expenditures | 30576454 | 30815712 | 41011427 | 56856917 | 9.81 | 8.27 |
| Returns per hectare | 48565 | 45975 | 76068 | 101855 | 11.09 | 8.23 |
| Consumer Price Index | 1.41 | 1.48 | 2.00 | 2.43 | 8.48 | 4.85 |
| GDP Deflator | 1.25 | 1.32 | 1.78 | 2.16 | 6.47 | 4.85 |
| GDP Index | 1.29 | 1.38 | 2.14 | 2.89 | 7.08 | 7.43 |
| Population | 1295292 | 1311051 | 1403883 | 1461625 | 1.36 | 1.08 |
| Exchange rate | 61.14 | 64.66 | 78.31 | 87.64 | 4.24 | 2.89 |

World Reference Price USD/t

| Variables | 2014 | 2015 | 2021 | 2025 | Annual growth rate from 2005-6 to 2015-16 | Projected annual growth rate from 2016-17 to 2025-26 |
|---------------------------|------|------|------|------|---|--|
| World Maize | 172 | 167 | 178 | 191 | 3.77 | 1.92 |
| World Other Coarse grains | 207 | 184 | 178 | 194 | 2.80 | 2.33 |
| World crude oil | 99 | 54 | 64 | 83 | 3.36 | 8.33 |
| World Oilseeds | 417 | 415 | 415 | 456 | 2.36 | 1.64 |
| World Poultry | 1940 | 1656 | 1481 | 1583 | 4.38 | 1.02 |
| World Rice | 435 | 395 | 411 | 429 | 3.55 | 0.88 |
| World Raw sugar | 296 | 303 | 352 | 381 | 2.01 | 2.54 |
| World White Sugar | 376 | 390 | 431 | 471 | 1.51 | 2.58 |
| World Vegetable oils | 737 | 695 | 759 | 819 | 0.69 | 2.30 |
| World Wheat | 272 | 223 | 226 | 243 | 2.35 | 1.96 |

Disclaimer: The information and projections contained in this report are result of study conducted by NCAER and the views expressed do not necessarily reflect those of Ministry of Agriculture and Farmers Welfare.

The findings, interpretations, and conclusions expressed are those of the authors and do not necessarily reflect the views of the Governing Body or Management of NCAER.



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