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Agricultural Policies in India

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Foreword

This review of *Agricultural Policies in India* is one of a series of reviews of national agricultural policies undertaken by the OECD's Committee for Agriculture (CoAg). The study has been carried out by the Trade and Agriculture Directorate (TAD) of the OECD jointly with the Indian Council for Research on International Economic Relations (ICRIER). It examines the agricultural policy context and the main trends in Indian agriculture. The Review also classifies and measures the support provided to agriculture using the same method the OECD employs to monitor agricultural policies in OECD countries and a growing number of non-member economies, such as Brazil, China, Colombia, Costa Rica, Indonesia, Kazakhstan, the Philippines, Russia, South Africa, Ukraine and Viet Nam. Finally, the study includes a special chapter on the food security policy instruments used in India, with a particular attention to the Targeted Public Distribution System (TPDS). The review is the first stage in a process whereby India will be included in the annual OECD publication *Agricultural Policy Monitoring and Evaluation*.

The study was jointly led by Carmel Cahill (Trade and Agriculture Directorate, OECD) and Ashok Gulati (ICRIER). Members of the team who contributed immensely and prepared the final report are Florence Bossard, Annelies Deuss, Jared Greenville, Silvia Sorescu (Trade and Agriculture Directorate, OECD), Shweta Saini, Anwarul Hoda, Prerna Terway (ICRIER), and Lars Brink (consultant). Marcel Adenäuer (Trade and Agriculture Directorate, OECD) and Marta Kozicka (consultant) contributed to the thematic chapter on food security. Anita Lari, Jennifer Griffin (Trade and Agriculture Directorate, OECD) and Rahul Arora (ICRIER) provided administrative and secretarial assistance. Anita Lari and Michèle Patterson (Trade and Agriculture Directorate, OECD) provided publication support.

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The first complete draft of this document was discussed in October 2017 together with Indian officials and experts during a roundtable meeting at ICRIER headquarters in New Delhi. Inputs received from Shobhana K. Pattanayak (Union Secretary, Department of Agriculture, Ministry of Agriculture and Farmers' Welfare), Siraj Hussain (Former Union Secretary, Department of Agriculture, Ministry of Agriculture and Farmers Welfare), Pravesh Sharma (Former Principal Secretary Agriculture, Madhya Pradesh) and Hanish Yadav (OSD to Minister of Commerce and Industry) during the event were valuable. The study also benefited greatly from written comments provided by the Ministry of Agriculture and Farmers' Welfare and from discussions with Arvind Subramanian (Chief Economic Adviser to the Government of India) and T Nandakumar (Former Union Secretary, Department of Agriculture, Ministry of Agriculture and Farmers Welfare).

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Abbreviations

AAY	*Antyodaya Anna Yojana* (Poorest households category)
ACA	Additional central assistance
ADB	Asian Development Bank
ADWDRS	Agricultural Debt Waiver and Debt Relief Scheme
AEZ	Agri-export zones
AGEI	Agricultural Growth Enabling Index
AIC	Agriculture Insurance Company of India Ltd
APEDA	Agricultural and Processed Food Products Export Development Authority
APL	Above the Poverty Line
APLM	Agricultural Produce and Livestock Marketing
APMC	Agricultural Produce Market Committee
APMR	Agricultural Produce Marketing Regulations
ASEAN	Association of South East Asian Nations
ATMA	Agriculture Technology Management Agencies
BCD	Basic Customs Duty
BIS	Bureau of Indian Standards
BOP	Balance of payments
BPL	Below the Poverty Line
CACP	Commission for Agricultural Costs and Prices
CCEA	Cabinet Committee on Economic Affairs
CCI	Cotton Corporation of India
CHC	Custom Hiring Centre
CIP	Central Issue Price
CS	Central Schemes
CSE	Consumer Support Estimate
CSS	Centrally Sponsored Schemes
CWC	Central Warehousing Corporation
DACFW	Department of Agriculture, Cooperation and Farmers' Welfare
DAHDF	Department of Animal Husbandry, Dairying, and Fisheries
DAP	Di-ammonia phosphate
DBT	Direct Benefit Transfer

DFPD	Department of Food and Public Distribution
DGFT	Directorate General of Foreign Trade
DPPQS	Directorate of Plant Protection, Quarantine and Storage
ECA	Essential Commodities Act
E-NAM	Electronic National Agricultural Market
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FCI	Food Corporation of India
FDI	Foreign Direct Investment
FPC	Farmer producer companies
FPO	Farmer Producer Organization
FPS	Fair Price Shops
FRP	Fair and Remunerative Price
FSSAI	Food Safety and Standards Authority of India
FSSR	Food Safety and Standards Regulations
FTP	Foreign Trade Policy
GAO	Gross Agricultural Output
GDP	Gross Domestic Product
GEAC	Genetic Engineering Appraisal Committee
GHG	Greenhouse gas
GM	Genetically Modified
GNI	Gross National Income
GSSE	General Services Support Estimate
GST	Goods and Services Tax
GVC	Global Value Chain
HLC	High Level Committee on Restructuring the FCI
HS	Harmonised System
ICAR	Indian Council of Agricultural Research
IFPRI	International Food Policy Research Institute
IIM	Indian Institute of Management
ILO	International Labour Organization
IMF	International Monetary Fund
INR	Indian Rupee
IPCC	Intergovernmental Panel on Climate Change
IPPC	International Plant Protection Convention
ISAC	Integrated Scheme on Agriculture Cooperation
ISAM	Integrated Scheme for Agricultural Marketing
ISS	Interest Subvention Scheme

JCI	Jute Corporation of India
KCC	Kisan Credit Card
KGK	*Krishi Gyan Kendra* (Agricultural knowledge centres)
KVK	*Krishi Vigyan Kendra* (Agricultural science centres)
LHS	Land and Livestock Holdings
MAFW	Ministry of Agriculture and Farmers' Welfare
MBRT	Multi-Brand Retail Trading
MCAFPD	Ministry of Consumer Affairs, Food and Public Distribution
MEIS	Merchandise Exports from India Scheme
MEP	Minimum Export Price
MFN	Most Favoured Nation
MHFW	Ministry of Health and Family Welfare
MIDH	Mission for Integrated Development of Horticulture
MIP	Market Intervention Price
MNRE	Ministry of New and Renewable Energy
MOFPI	Ministry of Food Processing Industries
MOSPI	Ministry of Statistics and Program Implementation
MPD	Market Price Differential
MPS	Market Price Support
MRP	Maximum Retail Price
MSP	Minimum Support Price
NABARD	National Bank for Agriculture and Rural Development
NAC	Nominal Assistance Coefficient
NAFED	National Agricultural Cooperative Marketing Federation of India Ltd
NAIS	National Agricultural Insurance Scheme
NAP	National Agricultural Policy
NAM	National agriculture market
NARS	National Agricultural Research System
NBS	Nutrient-Based Subsidy
NCCF	National Cooperative Consumers' Federation of India Ltd
NCDC	National Cooperative Development Corporation
NCIP	National Crop Insurance Program
NDDB	National Dairy Development Board
NDP	National Dairy Plan
NFSA	National Food Security Act
NFSM	National Food Security Mission
NHB	National Horticulture Board
NHM	National Horticulture Mission

NITI	National Institution for Transforming India
NLM	National Livestock Mission
NMAET	National Mission on Agricultural Extension and Technology
NMMI	National Mission on Micro-Irrigation
NMOOP	National Mission on Oilseeds and Oil Palm
NMSA	National Mission for Sustainable Agriculture
NPBD	National Programme on Biogas Development
NPC	Nominal Production Coefficient
NPF	National Policy for Farmers
NPS	New Pricing Scheme
NSS	National Sample Survey
NSSO	National Sample Survey Office
OECD	Organisation for Economic Co-operation and Development
OIE	World Organisation for Animal Health
OMSS	Open Market Sales Scheme
OWS	Other Welfare Schemes
PDS	Public Distribution System
PPP	Purchasing Power Parity
PSE	Producer Support Estimate
PSF	Price Stabilization Fund
PSS	Price Support Scheme
RBI	Reserve Bank of India
RCEP	Regional Comprehensive Economic Partnership
RKVY	*Rashtriya Krishi Vikas Yojana* (National Agricultural Development Plan)
RPM	Rural periodical market
RWBCIS	Restructured Weather Based Crop Insurance Scheme
SAU	State Agricultural Universities
SBRT	Single Brand Retail Trading
SC	Scheduled caste
SCT	Single Commodity Transfers
SEB	State electricity board
SFAC	Small Farmers' Agri-Business Consortium
SIP	Sanitary import permits
SMAM	Sub-Mission on Agricultural Mechanization
SMP	Skimmed milk powder
SPS	Sanitary and Phytosanitary
ST	Scheduled tribe

STC	State Trading Corporation of India Ltd
STE	State trading enterprise
TFP	Total Factor Productivity
TPDS	Targeted Public Distribution System
TRIFED	Tribal Cooperative Marketing Development Federation of India Ltd
TRP	Tariff Reform Programme
TRQ	Tariff Rate Quota
TSE	Total Support Estimate
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
USAID	United States Agency for International Development
USD	United States Dollar
USDA	United States Department for Agriculture
UT	Union Territory
VAT	Value Added Tax
VKGUY	*Vishesh Krishi Gram Udyog Yojana* (Special Agricultural and Village Industry Scheme)
WB	World Bank
WBCIS	Weather Based Crop Insurance Scheme
WBNP	Wheat Based Nutrition Program
WDI	World Development Indicators
WEF	World Economic Forum
WFP	World Food Programme
WTO	World Trade Organization

Executive summary

India is one of the fastest growing G20 economies, largely reflecting an ambitious reform agenda under implementation since 2014. Against this background, agriculture is a key sector in terms of its contribution to both employment and GDP. Sustained by improved access to inputs such as fertilisers and seeds, as well as better irrigation and credit coverage, production has been increasing on average at about 3.6% annually since 2011. The sector has also been diversifying from grains towards pulses, fruit, vegetables and livestock products, largely driven by evolving demographics, urbanisation and changing demand patterns. India has achieved a significant fall in the proportion of the population that is undernourished, from around 24% in 1990-92 to 15% in 2014-16. Moreover, it has also emerged as a major agricultural exporter of several key commodities, currently being the largest exporter of rice globally and the second largest of cotton.

Despite these notable achievements, challenges remain; among them, the prevalence of very large numbers of smallholders, low productivity, climate change, pressure on natural resources such as water, persistent food insecurity, and an under-developed food processing and retail sector.

Agricultural policies in India are designed and implemented by a complex system of institutions. States have constitutional responsibility for many aspects of agriculture, but the central government plays an important role by developing national approaches to policy and providing the necessary funds for implementation at the state level. Nevertheless, no sufficiently strong mechanism exists to bring state and central level policy-makers together to discuss problems, design solutions, and monitor performance. At the central level, while the Ministry of Agriculture and Farmers' Welfare has responsibility for agricultural policy, many other ministries and agencies have important roles. There is, therefore, significant risk of fragmentation, overlapping and unclear attribution of responsibilities.

Throughout the last decades, agricultural policies have sought to achieve food security, often interpreted in India as self-sufficiency, while ensuring remunerative prices to producers and safeguarding the interest of consumers by making supplies available at affordable prices.

The level of support to producers, as measured by the share of transfers from consumers and taxpayers in gross farm revenues, averaged -6.2% in 2014-16. It is composed of budgetary spending corresponding to 6.9% of gross farm receipts and negative market price support of -13.1% of gross farm receipts. Together they generate a negative producer support estimate (PSE) overall, which needs careful interpretation, because it is composed of both positive and negative elements.

India contrasts with most other countries studied by the OECD because of the prevalence of negative market price support and its size. In the 2000 to 2016 period, producer prices – as measured for the purposes of this report – have remained for many years and for many commodities examined below comparable reference prices in international markets.

This implies that domestic producers were implicitly taxed. This is partly policy-induced and partly related to other inefficiencies in the marketing chain. Policy-induced inefficiencies are due to minimum support prices being set below international prices for several commodities at different periods between 2000 and 2016, to domestic regulations, and to trade policy measures. Policies that govern the marketing of agricultural commodities in India include the Essential Commodities Act (ECA) and the Agricultural Produce Market Committee Acts (APMCs). Through these Acts, producer prices are affected by regulations influencing pricing, procuring, stocking, and trading commodities. Restrictions stemming from both the ECA and APMC Acts also deter private sector investment in marketing infrastructure. Differences among the states in the status of their respective APMC Acts and in how these Acts are implemented add to the uncertainties in supply chains and drive up transaction costs. Overall, the combination of market regulations and infrastructure deficiencies has had a price depressing effect.

In addition, a variety of trade policy measures applied in 2000-16 – such as export prohibitions, export quotas, export duties, or minimum export prices – have impeded the export of several key commodities and further contributed to depressing producer prices. For example, export restrictions or export bans were applied to wheat, non-basmati rice, chickpeas, sugar and milk at different times over the course of the period studied.

Virtually all of the budgetary transfers to agricultural producers in India are subsidies for variable input use, with overwhelmingly subsidised fertilisers, electricity, and irrigation water. On the other hand, public expenditures financing general services to the sector have declined over the last decades. Most of this expenditure is in development and maintenance of infrastructure (particularly hydrological infrastructure), followed by the cost of public stockholding and expenditure on the agricultural knowledge and innovation system.

A corollary to the farm price-depressing effect of the policy set is the resulting support to consumers. Policies that affected farm prices, along with food subsidies under the Targeted Public Distribution System, reduced consumption expenditure by 24.7% on average across all commodities, compared to what consumption expenditure would have been in the absence of these policies and subsidies.

The sum of all agriculture and food related spending (i.e. budgetary transfers to producers, to agriculture as a whole, and transfers to consumers from taxpayers), without accounting for the negative market price support, amounts to 1.9% of India's GDP in 2014-16. This shows the high cost to the Indian economy and contrasts with the sector's poor performance in productivity growth, highlighting the need for resources to be applied more effectively. Many policy initiatives are already underway or in the pipeline and these should be continued or reinforced. Only by shifting scarce budgetary resources to investments that will increase resilience and sustainability, while allowing better functioning markets to determine farmers' remuneration to a much greater degree, can the potential of the sector to contribute to growth and jobs be fully realised.

Key policy recommendations

Rebalance the policy package to foster sustainable productivity growth

- strengthen the regulatory environment governing land issues
- reform market regulations and strengthen market functioning across states
  - build on and reinforce initiatives already underway (E-NAM, Model Acts)
  - support farmers to integrate in competitive markets and allow the private sector to play a greater role
- encourage efficient and sustainable use of variable inputs such as fertilisers
- enlist all concerned actors in developing collective-action groundwater and watershed management schemes and correcting perverse incentives to over-use of scarce water, including a review of electricity pricing
- strengthen the overall access to credit and particularly encourage long-term loans
- re-focus investments on fostering the agriculture enabling environment, such as infrastructure and education in rural areas
- harness innovation for sustainable productivity growth and climate change adaptation and mitigation
  - increase research intensity and strengthen priority setting processes
  - reform and refocus the extension system on today's challenges
  - invest in digital connectivity in rural areas

Strengthen the role of agriculture in enhancing food and nutrition security

- scale back the public distribution system as incomes and the share of the middle class in the population rises
- move gradually to targeted lump sum transfers (Direct Benefit Transfers) or food stamp type mechanisms
- allow the private sector to play a role in managing remaining stocking operations

Improve agricultural institutions and governance systems

- clarify roles and responsibilities at central level by bringing key policy areas under a single umbrella
- strengthen co-ordination among central ministries and agencies and between the centre and the states
- prioritise institutional reforms to allow development of a single market for agricultural products

Making trade work for Indian agriculture

- streamline and clarify trade policy roles and responsibilities across the different ministries and agencies to iron out inconsistencies and simplify procedures
- reduce tariffs and relax the other restrictions on imports which are applied from time to time, with a view to creating a more open and predictable import regime
- move away from the use of export restrictions in order to create a stable and predictable market environment
- address a range of supply-side constraints in the application of sanitary and phytosanitary measures

Chapter 1. Overview, policy recommendations and conclusions

This chapter presents an overview of the performance of the agricultural and food policies currently applied in India based on the analysis conducted within this review and sets out the possible changes that will make the overall policy set "fit for purpose"; that is, a policy set capable of providing the institutions and incentives that the sector needs to meet the challenges briefly outlined below.

1.1. Overview

Setting the scene: Economic, social and environmental context

India is a country of enormous diversity – geographic, economic and ethnic – that has made remarkable economic and social progress since the start of liberalisation reforms in the early 1990s. It is the seventh largest country by land area (2.97 million km^2) and the second most populous after China with over 1.3 billion people, accounting for 18% of the world's population. However, at just 0.15 ha per capita, agricultural land is very scarce. While the level of urbanisation increased from 27.8% to 31.1% over the past decade, two thirds of the population still live in rural areas (World Bank WDI, 2018).

Sustained reforms contributed to a much improved macroeconomic environment

Economic growth of around 7% over the last 5 years makes India one of the fastest-growing emerging economies (Box 1.1). The acceleration of structural reforms and low commodity prices since 2014 have boosted economic activity in India and improved the external current account position. In addition, continued fiscal consolidation, by reducing government deficits and debt accumulation, and an anti-inflationary monetary policy stance have helped consolidate macroeconomic stability (OECD, 2017a).

Important steps have also been taken to make India a less fragmented domestic market. In July 2017, the Goods and Services Tax (GST) reform – in the making for over a decade – came into force. The GST replaced various taxes on goods and services levied previously by the central government and states by a single tax on value added, with the potential to enhance the efficiency of production and movement of goods and services between Indian states. Nonetheless, implementation challenges remain, stemming from the different tax rates applied across product categories, exclusion of certain products, and other administrative complexities related to registration and payment.

Strong economic performance lifted millions of people out of extreme poverty

Strong growth since the mid-1990s has raised GDP per capita by over 5% per year and contributed to a substantial reduction in poverty incidence, from 45% in 1993 to 22% in 2011, measured at the national poverty line, as well as a reduction in the absolute number of people experiencing poverty.

While the overall share of the urban population remains low compared to countries at a similar level of development, demographic change will be an important factor driving the Indian economy in the long run: in 2020, the estimated average age of India's population at around 29 years is expected to be among the lowest in the world. Supported by the strong economic growth, the share of the middle class in total population and overall consumption has been increasing rapidly. Existing projections suggest that if India continues its growth path, the middle class could reach more than two thirds of the population towards the end of the following decade[1] (Brookings Institution, 2015). However, demographic dynamics have been insufficiently matched so far by job creation due to remaining structural bottlenecks in the labour and goods markets.

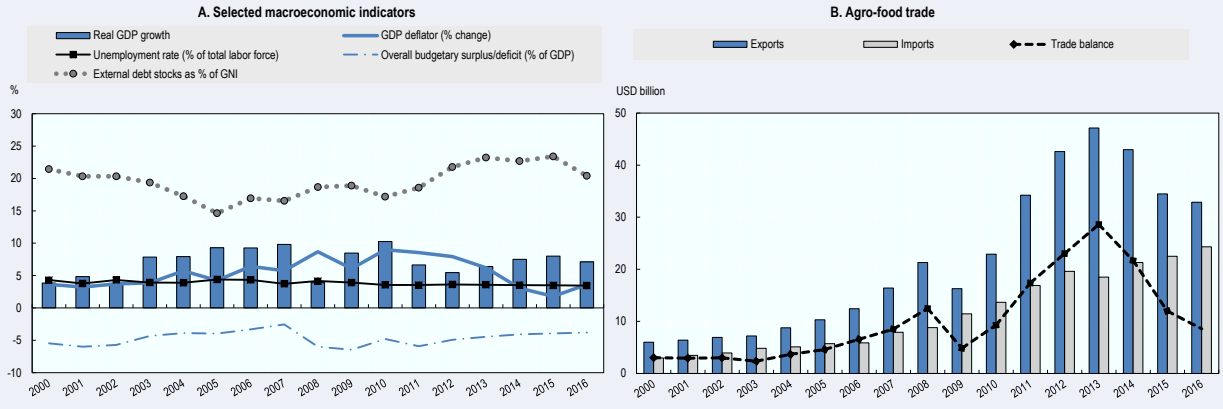
Box 1.1. India: Agriculture in context

Table 1.1. Contextual indicators, 1995-2016

	1995	2016[1]
Economic context		
GDP (billion USD in PPPs)	1 426	8 703
Population (million)	960	1 324
Land area (thousand km^2)	2 973	2 973
Agricultural area (AA) (thousand ha)	180 945	179 600
Population density (inhabitants/km^2)	323	445
GDP per capita (USD in PPPs)	1 485	6 572
Trade as % of GDP[2]	19	27
Agriculture in the economy		
Agriculture in GDP (%)	27	17
Agriculture share in employment (%)	61	47
Agro-food exports (% of total exports)	20	13
Agro-food imports (% of total imports)	6	7
Characteristics of the agricultural sector		
Crop in total agricultural production (%)	73	66
Livestock in total agricultural production (%)	27	34
Share of arable land in AA (%)	89	87

1. Or latest available year.
2. Ratio of the sum of goods exports and imports to GDP.
Source: Authors' calculations based on UN (2017), *UN Comtrade Database*; WB (2018), *World Development Indicators*; Ministry of Labour and Employment (2016).

Figure 1.1. Macroeconomic performance and agro-food trade, 2000-16



Note: Panel A: Agro-food trade includes fish and fish products.
Source: Panel A: WB (2018), *World Development Indicators,* IMF (2018), *World Economic Outlook Database*; Panel B: UN (2017), *UN Comtrade Database.*

Agriculture continues to play a major role in the Indian economy

The diversity of natural regions and climatic conditions in India allow for the cultivation of a wide range of crops and various livestock activities. While the contribution of the agricultural sector to GDP has continued to decline over the last two decades – from 29% in 1990 to 17% in 2016 – it remains a major source of employment, accounting for about 47% of the total national workforce[2] [Ministry of Labour and Employment, 2016; Ministry of Agriculture and Farmers' Welfare (MAFW), 2017a; OGD Platform India, 2018; WB WDI, 2018]. The green revolution in cereal production (late 1960s - early 1980s) was succeeded by the white revolution in milk production (starting in the 1970s), the gene revolution in cotton production (early 2000s) and the more recent diversification of production towards pulses, fruit and vegetables as well as meat and meat products. This has been largely in response to evolving demand patterns driven by rising incomes and urbanisation, but government encouragement of diversification has also contributed. The share of the livestock sector in total value of agricultural production has increased from 27% in 2000 to 34% in 2016. India is also the world's largest producer of pulses, accounting for about a quarter of global output. Moreover, with the advantage of diverse agro-climatic zones, India is the world's second largest producer of fruit and vegetables after China. Since the early 1990s, India's agricultural exports have also steadily grown and diversified. As a result India has transformed from a food deficit country to a major exporter of agriculture and allied products such as rice, meat and meat products, cotton, oilcakes, vegetable extracts, fish and fish products, and several others (including wheat in some years) (Gulati, 2009, 2016; MOSPI, 2017a; OECD, 2017d, 2018; FAOSTAT, 2018).

The strong growth in production has been sustained by an improved access to inputs such as fertilisers and seeds, increased irrigation coverage (including micro irrigation), as well as greater reach of institutional credit through branch expansion of public sector commercial banks in rural areas, the introduction of the *Kisan Credit Card* scheme – enabling a more timely access to credit – and the designation of agriculture for priority lending. In response to the fragmented domestic market, and to tax and other administrative inter-state barriers, agro-food marketing channels have also diversified, with successful examples of milk co-operatives or poultry contract farming.

The rural-urban supply chain has undergone significant changes over the last decade. First, the volume going through the supply chain has tripled in the past three decades: urban food expenditures are now three times higher in real terms than thirty years ago. Second, dietary patterns have diversified over the same period. The share of cereals in calorie intake decreased from 61% in 2000 to 55.7% in 2013, with livestock products increasing from 12.8% to 17.1% and fruit and vegetables from 24.5% to 28.7% over the same period (FAOSTAT, 2018). The beginning of structural change is underway due to the involvement of the private sector, going beyond the mainly traditional or unorganised private players (including *mandi* traders, private mills, village brokers, traditional retailers) to organised private entities, such as agribusiness and large food processing companies or supermarkets. Evolving demographics, increasing urbanisation, lifestyle changes, increasing preferences for branded items, as well as a modernising retail sector are increasing demand for processed food.

Key challenges

Productivity growth lags behind other countries in the region

Despite these successes, challenges remain. The large share of employment in agriculture compared to its GDP contribution reflects the slow pace of structural transformation and the relatively low labour productivity. This is one of the reasons for the low incomes of households dependent on farming, with farm incomes at around one-third of those of non-agricultural households[3] (NITI Aayog, 2017). There is wide variation in farm income growth between regions as well as between individual states (Government of India, 2017a). The government recently announced an objective to double farmers' income by 2022 (NITI Aayog, 2017).

The structural transformation in India has been atypical and less marked than in other Asian economies such as China or Viet Nam, with the fast growth of the services sector not preceded by strong growth of manufacturing and no notable transformation in the occupational structure of the economy accompanying the relative growth of the different sub-sectors. Agriculture has been slow to shed labour to other sectors in the economy partly due to the low level of education and skills of many of the workers in the sector, making it very difficult for them to find employment outside agriculture. Also contributing is the complexity and rigidity of labour laws which make the private, formal sector reluctant to create jobs.

As a consequence, farm labour productivity growth in India has been lagging far behind that of other Asian economies such as China, Viet Nam, Indonesia, and Thailand; and while land productivity has been increasing over the last two decades, a mapping of yield trends in 2011-14 highlights that this is stagnating for several key commodities. In addition to yield stagnation, gaps remain in yield potential. Average yields of most key crops in India are still low compared to other major producers and, in some cases, even world averages. For instance, current wheat and rice yields are approximately 3 times lower than the highest world yields, while yields for the main fruit and vegetables – including mango, banana, onion or potato – are between 2 to 7 times lower than the highest yields achieved worldwide. Therefore, vast untapped potential exists for yield growth across most crops and producing states; considering that the cultivated area is close to reaching its limit in India, yield improvements are key for any future output increase (Fuglie and Rada, 2015; FAOSTAT, 2018).

Fragmented land use patterns persist

What marks India out from other countries at a similar level of development is the continuing fragmentation of operational holdings, whose average size is now 1.15 ha and still falling. The sector is dominated by a large number of marginal and small scale operators: 85% of the operational holdings in India are of less than 2 ha and represent 45% of the total cropped area. In turn, only 5% of farmers operate on holdings larger than 4 ha, but they occupy nearly 32% of all arable land (Agricultural Census India, 2016).

Land tenure governance in India is very complex, both in terms of legislation and organisational framework. Rural land markets do not function efficiently as a result of several factors, including poor land records, tenancy restrictions and land ceiling laws leading to concealment of ownership status and impediments to transactions, limited mobility of potential buyers, lack of brokerage services and limited flow of information about buying and selling opportunities. India's land recordkeeping system includes a national level deeds registration system for any form of land transfer, as well as

state-level laws establishing cadastral-based records of land rights for revenue purposes. The records maintained by the deeds and cadastral systems can be, in many cases, inconsistent as periodic revisions are not co-ordinated. More significantly, the land records maintained do not constitute land titles, but only 'evidence of title', hampering the functioning of land markets. India imposes limits on the permitted size of farms (land ceilings) which vary widely across states – for instance, in the case of irrigated land with two crops, current ceilings vary by state from 12 acres (4.9 ha) in West Bengal or in Tamil Nadu to 18 acres (7.3 ha) in Haryana or Rajasthan. Restrictive land leasing laws have forced tenancy to be informal, insecure and inefficient (MAFW, 2017a).

Supply chains are long and fragmented

Physical infrastructure is a major bottleneck

Gaps in physical infrastructure and logistics hamper the establishment of efficient agro-food supply chains and drive up transaction costs, particularly for small and marginal farmers. While India's quality of roads, railroads, ports, air transport, and electricity supply is better than its neighbours in South Asia, it lags considerably behind the average of East Asian economies. Aside from road transport and freight services quality, inter-state checkpoints and other checks during transit add to delays and uncertainties in the supply chain. Market infrastructure also suffers from unintended impacts of regulations in domestic markets for agricultural products: many government-regulated wholesale markets (*mandis*) do not have the facilities needed for handling, grading and storing perishable agricultural products and the regulatory environment has deterred private sector involvement.

Limited connectivity and inadequate storage infrastructure lead to post-harvest losses and impact farmers' incomes as well as their incentives to produce. The highest post-harvest losses are registered for fruit and vegetables (ranging in 2015 between 4% and 16% of total output, depending on the state), followed by sugarcane, pulses, livestock, oilseeds, and cereals. Losses occur at all levels of the supply chain: at the farm gate, during transportation, wholesale, and retail. Moreover, the shares of high-value sectors in food processing are low: for example, fruit and vegetables and meat products account for less than 5% and 8% of total value of output respectively, compared to cereal-based products (21%) and oilseeds (18%). In the case of milk production, only 22% of cities and towns are served by organised milk distribution networks and only 15% of milk marketed is packed. Overall, India's food processing mainly involves primary processing which accounts for 80% of the value (ICAR, 2012; World Bank, 2014; Gulati and Saini, 2017; Government of India, 2017b).

Linkages to input markets are weak

Although the availability, access and quality of farm inputs and services (including fertilisers, seeds, and credit) have improved over the past decade, their distribution across the different size-categories of farmers remains an issue. Informal channels are still widely present in the seeds and fertilisers markets, for instance. While the involvement of the private sector is expanding rapidly in seeds, about 60% of food crops in India are still sown from seed stocks selected and saved by farmers; about 39% of operational holdings use certified seeds and 9.8% hybrid seeds (MAFW, 2016). The cost of high-yielding varieties in the formal channels is often too high for marginal and small farmers to afford, thus dis-incentivising them from purchasing these varieties. With respect to fertilisers, informal channels are still mainly used in the case of urea. With only three agencies

allowed to import urea into India and significant delays in procurement processes, addressing shortages through informal channels can also lead to production cost increases.

Regional disparities remain with respect to the reach of institutional credit. Moreover, provision of credit to small and marginal farmers is still inadequate compared to needs and there is a paucity of medium and long-term lending: in 2016-17, 65% of credit was short term, while only 35% covered fixed capital formation and longer-term investments. Access to agricultural credit is also linked to the holding of formal land titles, which makes many small and marginal farmers unable to access institutionalised credit and turn to informal sources of credit such as moneylenders that accounted for 36% of the total outstanding loans of cultivator households in 2012-13 (Hoda and Terway, 2015).

Linkages to domestic downstream sectors are also weak

Both the food processing and retail sectors have been growing rapidly over the past decade, supported by the reforms in the enabling environment for business and increased private investment and growing demand due to rising per capita incomes. Notwithstanding, both sectors still have a dualistic structure: food processing, with a relatively small (in number of units) but capital-intensive organised segment coexisting with a pervasive, mostly rural, and more labour-intensive unorganised segment; food retail, dominated by unorganised and semi-organised retailers like *kirana* stores (mom-and-pop stores), grocers and provision stores that account for 98% of food sales, while larger chains and stores are mostly reaching big cities and towns. Major constraints in the development and growth of both sectors include the absence of adequate connectivity infrastructure, inadequacy of information and marketing linkages, lack or quality of electricity supply, and the absence of cold chain systems. This problem is further exacerbated by the existence of large numbers of small and marginal producers.

Opportunities to participate in regional and global value chains are limited

Indian agriculture has increasingly become integrated with world markets: agro-food trade as a share of agricultural GDP was just 5% in 1990, when economic reforms started, but reached 16% in 2016. However, it is still low compared to the share of India's total merchandise exports and imports as a per cent of India's GDP, which increased from 14.7% to 42% over the same period (UN Comtrade, 2017). Moreover, India's participation in agricultural global value chains (GVCs) mirrors the constraints and challenges encountered at the level of domestic agro-food chains and is weaker than its engagement in manufacturing or services GVCs. In terms of sourcing inputs from value chains (buying from GVCs), India's strongest linkages are in wheat, beverages and tobacco products, bovine meat, and dairy products, but overall the sector has low global backward integration (selling inputs to GVCs), particularly for processed food products (OECD estimates based on Greenville et al., 2017).

Pressures on natural resources risk reducing long-term production growth

Environmental pressures are also starting to loom large. Land degradation is increasingly prevalent throughout the country: 37% of the total land area (about 120.4 million ha) appears to be affected by various types of degradation (Indian Council of Agricultural Research, 2010). Across many regions, inappropriate application of fertilisers – in terms of timing, quantity and place and the balance of N, P and K use – does not reflect actual

soil and crop nutrient needs. Chemical fertilisers contribute to greenhouse gas emissions as well as to water pollution and soil contamination when used inappropriately.

India also faces a severe water crisis due to a widening gap between water supply and demand, as well as poor water resources management, and changing precipitation patterns induced by climate change. Total water demand is expected to increase by 32% by 2050 due to population growth, urbanisation and industrialisation. A recent OECD study identifies India, along with China and the United States, as a future water risk hotspot for agriculture production (OECD, 2017b). More specifically, groundwater irrigation in the semi-arid region of Northwest India – known as India's breadbasket region, with large wheat and rice production – is creating worrying consequences for the water table as well as for the region's water quality, and these problems are expected to worsen. For instance, in the state of Punjab, water demand – largely from the agriculture sector – is almost twice as high as the total water availability, putting water reserves under pressure and causing groundwater depletion at a rapid pace.

Finally, India is likely to suffer significant impacts from climate change. By mid-century, impact of climate change would be felt as an increase in the average surface temperature, changes in rainfall during both monsoon and non-monsoon months, as well as an increase in the frequency and intensity of droughts, floods and other extreme weather conditions. This is likely to result in higher output volatility and yield growth for key crops being much lower than would have been expected in the absence of climate change. Further, by mid- century in some regions, if no mitigation and adaptation actions are taken, yields are actually projected to be much lower relative to a scenario with no water or climatic shocks. Cereals such as rice, wheat, and maize, as well as cotton, sugarcane and vegetables will be particularly affected. Production of livestock products, including milk, will also be affected.

Food and nutrition insecurity is persistent for a significant part of the population

Despite rapid population growth, particularly among the poor, India has achieved a significant fall in the proportion of the population which is undernourished, from around 24% in 1990-92 to 15% in 2014-16. But the incidence of poverty in India is persistently high, suggesting that an additional, significant proportion of the population is at risk of falling back into food insecurity under certain circumstances. In addition, while India has achieved much in terms of access to and availability of food, performance in terms of nutritional quality has been less strong, as evidenced by a still relatively high incidence of stunting and wasting.

Agricultural policy trends and evaluation

The institutional settings governing agricultural and food policy are complex

In India, states have constitutional responsibility for many aspects of agriculture, but the central government plays an important role by developing national approaches to policy and providing the necessary funds for implementation at the state level. The central government is solely responsible for some key policy areas, notably, for international trade policies. Recently, the fiscal autonomy of the states is being strengthened through implementation of the recommendations of the 14th Finance Commission (FFC). While this model has strengths, allowing policy to reflect needs and conditions at the more disaggregated state level, there are also drawbacks in that important initiatives designed at the central level may be only partially, or not at all, implemented at the state level. In

particular, joined-up approaches to market institutions and regulations are important if a "single market" for agriculture and food products is to develop across India. In practice, co-ordination is facilitated by the role of the centre in funding major agricultural programmes. From 2015, the National Institution for Transforming India (NITI Aayog) fosters greater involvement of the state governments in the economic policy process, and has constituted a Task Force on Agricultural Development which has the responsibility to co-ordinate with the State and UT Task Forces and the central ministries. Nevertheless, no sufficiently strong mechanism exists to bring state and central level policy-makers together to discuss problems, design solutions, and monitor performance. Steps need to be taken to fill this gap.

At the central level, the institutions involved in developing and implementing agricultural and food policy are numerous, and consequently there is a risk of fragmentation, overlapping, and of unclear attribution of responsibilities. While the Ministry of Agriculture and Farmers' Welfare has responsibility at the central level for agricultural policy, many other ministries and agencies have important roles. Among them the most important are the Ministry of Chemicals and Fertilizers, the Ministry of Water Resources, River Development and Ganga Rejuvenation, the Ministry of Consumer Affairs, Food and Public Distribution, and the Ministry of Commerce and Industry. A more or less similar structure is, in many cases, replicated at the state level (other than trade policy). While Inter Ministerial Committees are sometimes set up, consideration should be given to the establishment of a standing body for systematic coordination among the myriad agencies in all matters related to agricultural and food policies.

The policy emphasis has evolved as agriculture and food concerns have changed over time

From India's early years, seeking to achieve food security has been an important objective of agricultural policy. The policies applied in pursuit of food security have evolved over time. An explicit objective, to a large extent driven by the experience of food shortages in the early 1960s, has been to pursue self-sufficiency in food production. Recent objectives have been focused on seeking faster, more inclusive and sustainable growth more broadly by bringing macroeconomic imbalances under control and reversing the economic slowdown while also pushing for structural reforms.

The most recent and also final five-year plan (2012-17) identified the key drivers of growth in agriculture as comprising (1) the viability of the farm enterprise and returns to investment that depend on scale, market access, prices and risk, (2) the availability and dissemination of appropriate technologies that depend on quality of research and extent of skill development, (3) expenditure on agriculture and in infrastructure along with a policy aim to improve the functioning of markets and more efficient use of natural resources, and (4) governance in terms of institutions that make it possible to better deliver services like credit and animal health and quality inputs like seeds, fertilisers, pesticides and farm machinery. Certain regional imbalances would also be addressed: a national priority in terms of both food security and sustainability would be to fully extend the green revolution to areas of low productivity in India's eastern region.

In line with India's Constitution which states that a primary duty of the government is to raise the level of nutrition, India's public food distribution has shifted from household food security and freedom from hunger to nutrition security for the family and the individual.

The set of policies directly relating to agriculture and food in India has for a long time consisted of five major categories. They include:

1. managing the prices and marketing channels for many farm products
2. making variable farm inputs available at government-subsidised prices
3. providing general services for the agriculture sector as a whole (such as research and extension)
4. making certain food staples available to selected groups of the population at government-subsidised prices
5. regulating border transactions through trade policy.

More recently, environmental measures concerning agriculture have gained prominence.

Efficiency of agricultural marketing chain impaired by long-established rules and by absence of rules

In marketing regulation, the Essential Commodities Act, 1955 (ECA) provides for the control of production, supply, distribution, and pricing of essential commodities. They include foodstuffs and many kinds of seeds, and fertiliser. The ECA also provides for maintaining or increasing supplies of essential commodities and securing their equitable distribution and availability at fair prices. The motivation at the time was to restrict certain activities of some agents in the context of hoarding and black marketing. Under the ECA the central government makes orders regarding essential commodities, which are implemented and enforced by the state governments. In respect of food items, the ECA powers have generally been delegated to state governments except for sugar where the central government exercises some controls. Orders issued by the centre or the states regulate the production, storage, transport, distribution, disposal, acquisition, use or consumption of a commodity. Such orders can increase the cultivation of food grains, control prices, prohibit the withholding of a commodity from sale, or require a stockholder to sell a commodity to the government. Although the ECA is becoming a less pervasive factor in India's markets for agricultural commodities, the longstanding presence of the rules of the ECA is part of the foundation for today's structure of agricultural production and marketing.

While the ECA regulates transactions in the whole value chain from producer to consumer, the Agricultural Produce Marketing (Regulation) Acts in many individual states regulate only the point of first sale from the producer. The acts are often called APMC Acts since they regulate agricultural markets through Agricultural Produce Market Committees (APMCs). A state's APMC Act empowers the state to establish regulated wholesale markets, construct and manage agricultural markets and regulate all aspects of marketing, including the levy of user fees. The acts prevent private players from setting up markets and investing in market infrastructure. Major constraints on the agricultural marketing system include a highly fragmented market structure, insufficient number of markets, inadequate physical marketing infrastructure, high incidence of marketing fees and charges, high post-harvest waste, restrictions in licensing, low remuneration to farmers and high intermediation costs, market information asymmetry, and inadequate credit facilities. A series of moves to reform the marketing structures have been only partially effective, prompting the central government in 2017 to approve the Model Agricultural Produce and Livestock Marketing Act 2017 that encourages the states to end the monopoly of APMCs by allowing more players to set up markets and create greater competition. This would allow the establishment of private markets, direct marketing by farmers, the levying of the market fee only at the first wholesale purchase

from the farmer, and the exclusion of fruits and vegetables from the APMC Act. Many states have in fact removed perishables from the purview of the APMC Acts, and efforts are underway to strengthen the operation of rural markets and to link them to the electronic National Agricultural Market (E-NAM), a national electronic portal which aims to link APMCs and other market yards across the country. The E-NAM is intended to provide information on product arrivals and prices; the buy and sell offers made by traders; and allow responding to trade offers. These developments are creating the possibility for farmers to engage in direct sales to consumers or bulk purchasers.

Producers' prices often below international prices and even below support prices

Within the marketing structure defined by the ECA and the APMC Acts, the central government's price policy for major agricultural crops seeks to ensure remunerative prices to producers with a view to encouraging higher investment and production and to safeguard the interest of consumers by making supplies available at affordable prices. The Food Corporation of India (FCI) is the main agency for executing the food grain policies of the central government. The FCI (a) procures food grains from farmers at remunerative prices, (b) distributes food grains to consumers through public distribution, and (c) maintains buffer stock of food grains for food security and price stability.

The central government sets a Minimum Support Price (MSP) for 24 crops each year, as well as a bonus above the MSP for some crops. The FCI and state-level agencies operating on behalf of the FCI buy wheat, rice and coarse grains through open-ended procurement at MSP. A number of other agencies buy pulses, oilseeds and cotton at MSP, and some perishable agricultural and horticultural commodities without MSP are also procured. However, price support procurement effectively operates mainly for wheat, rice and cotton and only in a few states. Most farmers sell to other buyers at prices other than the MSP, especially in eastern India, where procurement is not effective and no alternative buyers are present.

Producer prices have for many years and for many crops remained below comparable reference prices in international markets. This is explained partly by policy-induced (i.e. domestic market regulations and export restrictions) and other inefficiencies (i.e. roads, electricity, cold storage, transport) in the marketing chain and partly by MSP having been set below the international reference prices. This has resulted in significant negative price gaps. However, in most years between 2000 and 2016, the producer price has risen above the MSP for commodities such as non-basmati rice, wheat, maize, soybeans, rapeseed, groundnuts, refined sugar, chickpeas, and cotton. Moreover, for maize and wheat, the MSP itself has been raised above the international reference price in 2015-16: the gap between the producer price and the reference price has thus turned positive for these two commodities as well as for other commodities for which producer prices have been above reference prices (for example, non-basmati rice since 2014 or chickpeas since 2015). Lately, the producer prices of milk have been very close to their international reference prices, while those for refined sugar have even exceeded their respective reference prices in some years.

The procurement of wheat and rice is of the order of 30% of production. Wheat, rice and coarse grains procured by the FCI and state agencies are issued to the relevant agencies for distribution under the Targeted Public Distribution System or other welfare schemes or disposed of through sales, including sales for exports.

Large subsidies for fertilisers, electricity, irrigation, credit and other variable inputs

On the input side major policies enable agricultural producers to obtain farm inputs at low prices. The largest input subsidies are provided through policies governing the supply of fertilisers, electricity, and water. Other inputs are also supplied at subsidised prices, as is the case for seeds, machinery, credit, and crop insurance.

The government provides domestic urea manufacturers with a subsidy to cover the difference between their production cost and their revenue from sales at the fixed selling price. Urea subsidies are a function of several subsidy calculations, which vary over time as a result of changes in international prices of urea and natural gas. The consumption of phosphatic and potassic fertilisers is met mostly or entirely by imports. For these fertilisers the government sets subsidy rates in rupees per kilogram of nutrient (nitrogen, phosphate, potash, sulphur), which translate into subsidy rates per tonne of phosphatic and potassic fertiliser.

Electricity is a major input in agricultural production in India, primarily for powering pumps for irrigation using ground water in tube wells. The state regulatory bodies are empowered to set the electricity rates the state electricity boards charge to different categories of customers, such as agriculture, industry, domestic and commercial. While the rates charged to agricultural customers are very low relative to the rates charged to other customers – and also much lower than the average unit cost of power supplies to all consumers – the electricity supply is erratic and the quality is low.

Surface water for irrigation is supplied to agricultural producers at prices lower than the costs incurred by the government agencies at central and state level that manage the supply. While groundwater as a source for irrigation has become relatively more important than surface water, government-funded projects for surface water involve building such infrastructure as canals and dams and operating and maintaining these facilities. Only a small portion of the operation and maintenance cost is recovered from the users of water in the form of an irrigation service fee.

Many kinds of seed are essential commodities under the ECA. Seed policies concern the balancing of incentives for plant breeding between the private and public sectors and encouraging farmers to use certified seeds. Several of the central government's missions in agriculture include subsidies for farmers' use of certain seeds and improved planting material. For example, assistance is available to upgrade the quality of farmer saved seeds and the government also provides training to farmers for seed production and post-harvest seed technology. The purchase or use of farm inputs of many other kinds – such as diesel fuel, pesticides, machinery and irrigation equipment – are encouraged by some form of government expenditure.

Most agricultural credit outstanding consists of short-term credit and the share has been growing. Interest subsidies in agriculture almost exclusively relate to short-term credit over six to twelve months, i.e. operating credit during the crop season, rather than subsidisation of investment in fixed inputs. The subsidy mostly takes the form of transfers to lending institutions to enable them to deliver credit to farmers at the subsidised rate. Debt relief in agriculture has applied through partial or full debt waivers, in which the government reimburses the lending institutions their cost of implementing the debt waivers. Occasionally, initiatives apply or are proposed under which a state government would provide funds for lending institutions to waive farmers' debts.

Earlier crop insurance schemes are from 2016 complemented or replaced with a scheme where no limit applies to the government's premium subsidy. The farmer's premium amounts to 2% or 1.5% of the sum insured for most crops. Buying crop insurance remains mandatory for farmers wishing to avail of credit.

Many kinds of support for producers are delivered by state governments with major funding from the central government under the heading of missions. The National Food Security Mission seeks to increase the production of wheat, rice and pulses and promote commercial crops like cotton, jute and sugarcane through financial assistance for improved technologies regarding, e.g. seed, micronutrients, soil improvement, pest management, machinery, and irrigation, as well as farmer capacity building. The National Agricultural Development Plan encourages the formulation of state and district level plans to induce the states to increase own spending on activities such as crop development, horticulture, mechanisation, natural resource management, marketing, animal husbandry, dairy development, and extension. There are missions on oilseeds and palm oil and for the integrated development of horticulture, for sustainable agriculture, and for livestock, among others. To promote a more balanced use of fertilisers and micro-nutrients, there are grants for setting up soil testing laboratories, demonstrations are organised and organic farming is encouraged. In addition, many states operate their own agricultural policies concerning, for example, improvements in irrigation, electricity supply, roads, rice varieties, crop and livestock diversification, drought proofing, marketing and procurement, land leasing, and downstream cold storage and food processing facilities.

General services to the sector focus on irrigation infrastructure, research and extension and on food safety assurance

In the area of general services, expenditures are dominated by development and maintenance of infrastructure, particularly capital expenditure on irrigation. Additionally, India has a long and venerable history of organised, state funded research and development in agriculture. Public funding for research has been increasing in real terms for decades, growing by 6% per annum during the 1990s and 2000s reflecting an exemplary level of sustained commitment for a country at India's level of development. During this period growth in central funding has outpaced state funding, reflecting the government's commitment to productivity growth and resilience in food production. The Indian Council of Agricultural Research (ICAR) is the main umbrella organisation for agricultural research in India. It has more than one hundred research institutions working under its administrative and funding control. In addition India has a long established system of state agricultural universities which play an important role in the research eco-system. India, through an open access policy to public research products, has paved the way for public-private partnerships and technology transfer (ICAR – NIAP, 2017).

The Food Safety and Standards Authority of India (FSSAI) administers the Food Safety and Standards Regulations. They apply equally to domestic and imported foods and require all food processors, manufacturers, exporters, and importers to have their products certified. The FSSAI establishes standards for food and regulates the manufacture, storage, distribution, sale and import of food, with a view to ensuring availability of safe and wholesome food for human consumption, and contributing to the development of international technical standards for food and sanitary and phytosanitary standards. The Ministry of Food Processing Industries provides assistance for the setting up and upgrading of food testing laboratories. The central government makes rules for grade designations to indicate the quality of the product and specifies grade designation marks.

Agricultural income enjoys tax concessions and indirect taxation of farm products is nil or low

The central government's income tax act specifically excludes "agricultural income" from central government taxation. While most farmers' incomes would not, in any event be sufficiently large to make them liable for income tax, this concession is significant for larger, commercial farmers. In keeping with India's constitutional distinction between agriculture and animal husbandry, agricultural income does not include income from selling livestock products, which is therefore subject to taxation. State governments, but not the centre, collect tax through a land based levy called "land revenue".

The supply of primary agricultural commodities, including food grains, is taxed at the nil rate and the supply of most other food items is taxed at low rates. By subsuming many kinds of taxes under the GST, introduced in July 2017, on the marketing of agricultural produce, the GST may ease the inter-state movement of agricultural commodities.

Large apparatus for distribution of cheap food to many, leading to major budget expenditure

Public distribution of food grains operates under the joint responsibility of the central and state governments. The central government, through the FCI and state agencies, is responsible for the procurement and storage of food grains. The central government allocates food grains to the state governments and the FCI transports food grains from surplus states to deficit states. The Targeted Public Distribution System (TPDS) operates under the National Food Security Act (NFSA) of 2013 in all states and union territories. A set of Other Welfare Schemes also operate under the NFSA. The state governments are responsible for distributing the food grain entitlements, i.e. allocating supplies within the state, identifying eligible families, issuing ration cards, and distributing food grains mainly through Fair Price Shops. State governments use their own criteria to identify families or households eligible for TPDS and NFSA entitlements, using estimates by the central government on the numbers of recipients. The centre determines the difference between the economic cost (sum of MSP, procurement incidentals, and distribution cost) and the central issue price (the price at which TPDS beneficiaries can buy food grains), which is passed on to the FCI or the state government as a food subsidy. Associated with the increase in the number of beneficiaries under the NFSA, as a greater number of states implemented the NFSA, the food subsidy increased rapidly in 2014-15 and 2015-16. Since the central issue prices are now fixed in the law and legislative changes to adjust them may be time-consuming while the procurement prices are increasing from year to year, the burden on the central budget is likely to continue to increase.

The ministry in the central government with the largest expenditure on agriculture and food is the Ministry of Agriculture and Farmers' Welfare. The Ministry of Chemicals and Fertilizers and the Ministry of Consumer Affairs, Food and Public Distribution also account for large shares of the central government's expenditures. About two-thirds of all expenditure on agriculture and food took the form of the four major items of fertiliser subsidies, agricultural power subsidies, expenditure on irrigation and flood control, and food subsidies. The steep increase in anticipated expenditure in 2016-17 by the department responsible for transferring funds to state governments is explained by expenditures on crop insurance and interest subsidies on short term credit.

Detailed and changing trade rules make for complex and uncertain export and import transactions

India's Foreign Trade Policy is announced every five years and reviewed and adjusted annually. The current policy applies until 2020. Largely driven by domestic supply considerations and also intended to attain short-term objectives, such as containing fluctuations in commodity prices, the policy requires constant adjustment through decisions by the relevant agencies, which reduces the predictability of the policy regime.

Tariffs apply to imports of most agriculture and food items (Table 1.2). Tariff rate quotas are scheduled on a few products. Import prohibitions or import restrictions apply to several products. India's Basic Customs Duty (BCD), known as its statutory rate, is approved at the time of approving the annual budget. It is in many cases lower than the WTO scheduled bound rate. For many products, the government applies tariff rates that are still lower than the statutory rates. The simple average applied customs duty of 32.7% in agriculture leaves a relatively large gap below the corresponding WTO bound rate of 113.5%. This allows India to raise its tariffs substantially while complying with its WTO commitments. India has scheduled tariff rate quotas on twelve lines at the HS 8-digit level. Imports of some products are subject to a licensing requirement, in some cases conditional also on, e.g. a sanitary or phytosanitary permit also being obtained. The FCI remains an importing state trading enterprise for wheat and rice. Imports of animal products into India require sanitary import permits issued by the relevant government department and which must be obtained prior to shipping from the country of origin.

Table 1.2. India's average and maximum applied Most Favoured Nation (MFN) tariffs, 2016

	Average (%)	Maximum (%)
Animal products	31.1	100
Dairy products	33.5	60
Fruit, vegetables, plants	29.4	100
Coffee, tea	56.3	100
Cereals and preparations	31.3	150
Oilseeds, fats and oils	35.1	100
Sugars and confectionery	35.9	60
Beverages and tobacco	68.6	150
Cotton	6.0	30
Other agricultural products	22.3	70

Source: WTO, ITC and UNCTAD (2017).

Some agricultural products are, or have in the past, been subject to export prohibitions, export quotas, and minimum export prices. State trading is required for some products, and export subsidies are provided. A WTO decision in 2015 puts an end to the subsidisation of agricultural exports, which for India would occur at the end of 2023. The government provides financial assistance to exporters for market development, infrastructure development, quality development and transport assistance.

India has for several decades managed its agricultural exports through a combination of export prohibitions, export licensing requirements, export quotas, export duties, minimum export prices, and state trading requirements. Export prohibitions and export quotas are imposed on an annual basis for a specific period, during which they may be subject to change. Goods subject to export restrictions and quotas must be accompanied by licences

from the government's foreign trade directorate and sometimes by other permits. In 2014, export prohibitions, with some exemptions, applied to pulses (not chickpeas) and to all edible oil, but have now been removed (except for mustard oil). Exporters of boneless meat of buffalo (the only bovine meat exports allowed) require a certificate from the veterinary authority of the state where the meat originates to show that the meat is from buffaloes not used for breeding and milch purposes. The recent tightening of the rules on marketing buffaloes for slaughter is likely to negatively affect the economics both of producing buffalo meat for exports and of producing milk. India has identified several exporting state trading enterprises in agriculture in its reporting to the WTO. Exports of onions have been carried out, except when prohibited, by state trading enterprises operating at the state government level.

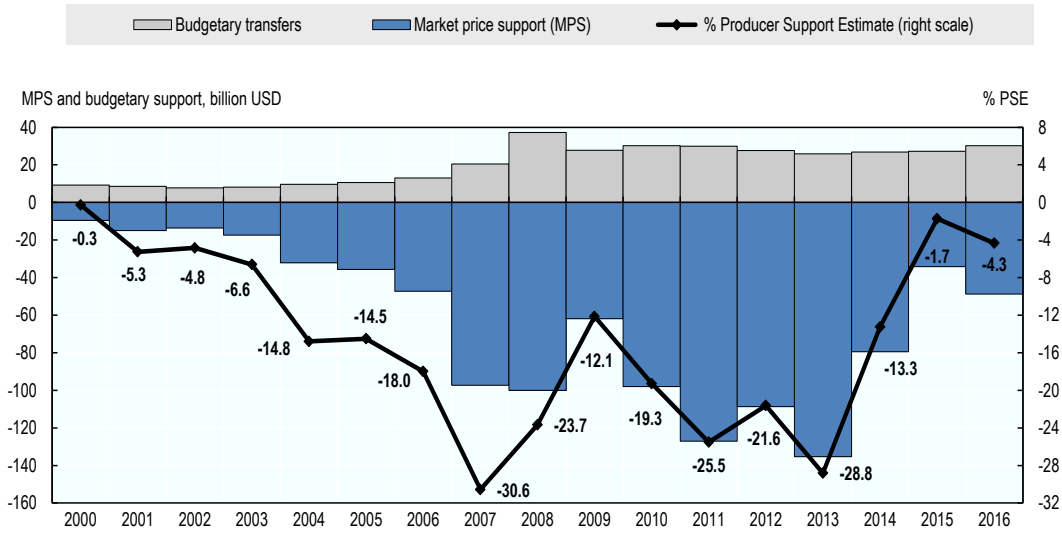
Input subsidies and negative price support combine to distort production in many ways

The OECD indicators of support to agriculture along with the underlying database give a comprehensive picture of the support delivered through a wide variety of policy instruments. The definitions of the key indicators are given in Box 1.2. Disaggregating support into three categories has proven useful both for the intuitive understanding of the full support picture and for further analysis:

- Market price support represents support to agricultural producers in the form of a policy-driven price gap between the producer price of an output commodity and a reference price (market price support can be positive or negative).
- Budgetary transfers include government payments to producers as well as revenues foregone.
- General services support is provided through policies that create enabling conditions for primary agriculture such as research, infrastructure and education.

India contrasts with most other countries studied by the OECD because of the prevalence of negative market price support and its size (Figure 1.2). Negative market price support indicates that the prices received by farmers, as measured for the purposes of this report, are lower than the prices prevailing on international markets for the comparable commodity. Almost all of the commodities studied individually experienced at least one year of negative market price support in the 2000 to 2016 period, and several commodities registered negative market price support in all years. The absolute amount of the negative market price support was considerably smaller in the earlier and later years than in the middle of the period. The absolute size of the negative market price support shrank particularly fast between 2013 and 2015, going from INR -8 190 billion to INR -2 239 billion in two years (from USD -135 billion to USD -34 billion). The reduction in the extent to which domestic prices fell short of the border reference prices in recent years coincides with increases in support prices and possible improvements in the marketing structure, infrastructure development, quality development and transport assistance.

Figure 1.2. Level and composition of Producer Support Estimate in India, 2000-16



Source: OECD (2017c), "Producer and Consumer Estimates", *OECD Agriculture Statistics Database*.

Box 1.2. OECD indicators of support to agriculture

Indicators of Support for Producers

Producer Support Estimate (PSE): The annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impacts on farm production or income.

Percentage PSE (%PSE): PSE transfers as a share of gross farm receipts (including support).

Consumer Support Estimate (CSE): The annual monetary value of gross transfers from (to) consumers of agricultural commodities, measured at the farm gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impacts on consumption of farm products. If negative, the CSE measures the burden (implicit tax) on consumers through market price support (higher prices), that more than offsets consumer subsidies that lower prices to consumers.

Percentage CSE (%CSE): CSE transfers as a share of consumption expenditure on agricultural commodities (measured at farm gate), net of taxpayer transfers to consumers.

General Services Support Estimate (GSSE): The annual monetary value of gross transfers to general services provided to agricultural producers collectively (such as research, development, training, inspection, marketing and promotion), arising from policy measures that support agriculture regardless of their nature, objectives and impacts on farm production, income, or consumption. The GSSE does not include any transfers to individual producers.

Percentage GSSE (%GSSE): GSSE transfers as a share of Total Support Estimate (TSE).

Indicators of Total Support to Agriculture

Total Support Estimate (TSE): The annual monetary value of all gross transfers from taxpayers and consumers arising from policy measures that support agriculture, net of associated budgetary receipts, regardless of their objectives and impacts on farm production and income, or consumption of farm products.

Budgetary support in India is mainly provided as subsidies for variable input use, such as fertiliser, electricity, and irrigation water. Having peaked temporarily in 2008, these subsidies have been rising again in the most recent years and reached INR 1 976 billion (USD 29 billion) in 2016.

The percentage Producer Support Estimate (%PSE) combines market price support and budgetary spending benefitting farmers and expresses the total as a percentage of gross farm receipts. India's %PSE has been negative over the entire period covered by the study. Due to the very rapid decline in the absolute value of the negative market price support in recent years, in combination with the increase in input subsidies, there has been a significant increase in %PSE, although it remains negative. It had been as low as -29% as recently as in 2013 before getting close to nil in 2015 and dropping back only slightly to -4.3% in 2016 (average of -6.2% in 2014-16). The similarity in the orders of magnitude of the negative market price support and the positive input subsidies means that they arithmetically more or less offset each other when combined to form the PSE. However, both support components are of the potentially most distorting type, and the distortions they create in the Indian economy do not cancel each other.

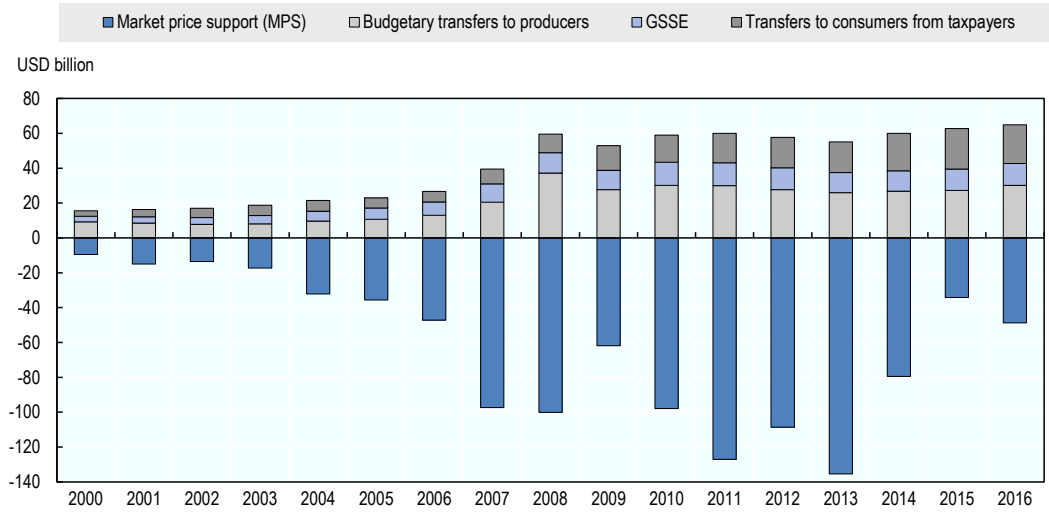
Support to the agriculture sector in the form of general services support (GSSE) amounts to only about one-third as much as support to individual producers (PSE). The dominant expenditure category in GSSE is development and maintenance of infrastructure, almost all of which relates to hydrological infrastructure, specifically capital expenditure on irrigation. Expenditure on the agricultural knowledge and innovation system (knowledge generation, education, and extension) has consistently amounted to about 10% of the GSSE expenditure. Most of this has in recent years been for knowledge generation and extension, leaving a very small share for education.

Food consumers in India benefit through two major kinds of support: low prices and government subsidies. Because producer prices for many commodities are below the border reference prices, consumers paying market prices pay less for food than they otherwise would do. This is in contrast to the situation in most other countries. An additional large component of consumer support in India is the food subsidy, which allows large segments of the population to purchase food grains at prices that are much lower than their already low domestic market prices. Altogether, these policies have resulted in a percentage Consumer Support Estimate (%CSE) of 24.7% on average across all commodities in 2014-16.

The sum of transfers to agricultural producers individually (PSE) and collectively (GSSE) and direct budgetary transfers to consumers indicate the cost that support to the agricultural sector places on the overall economy (Figure 1.3). However, the presence of large negative producer price support makes it difficult to interpret the indicator as the arithmetic offsets do not translate as offsets in the distortions associated with the

underlying policies. The positive transfers altogether (i.e. sum of budgetary transfers to producers, GSSE and transfers to consumers from taxpayers, and not counting the negative market price support) amounted to as much as 1.9% of GDP in 2014-16. The positive transfers to producers, to the agriculture sector and to consumers altogether corresponded to about 21% of gross value added in agriculture (crops and livestock) on average in 2014-16. The budgetary transfers to producers and to the agriculture sector (i.e. input subsidies and GSSE) were by themselves equal to 14% of gross value added in agriculture.

Figure 1.3. Level and composition of Total Support Estimate in India, 2000-16



Source: OECD (2017c), "Producer and Consumer Estimates", *OECD Agriculture Statistics Database*.

1.2. Policy recommendations

Fostering sustainable productivity growth

What role for smallholder agriculture?

In the long term, significant structural adjustment needs to occur in India involving the transition of significant amounts of labour to other activities, a reversal of farm fragmentation, and a process of consolidation towards farm operations sufficiently large to benefit from economies of scale. Without this, it will be impossible to boost productivity and generate incomes sufficient to provide a decent standard of living for those in agriculture relative to rising incomes of those employed in other sectors of the economy which are being fuelled by sustained growth. Improving relative incomes for agricultural producers is heavily dependent on the nature and dispersion of growth in the economy more widely, and on the nature of job opportunities which this generates. While education may permit later generations to aspire to more skilled jobs, many of the current generation of agricultural workers have relatively low levels of education and will only be able to transition out of agriculture if low skilled manufacturing, construction or services jobs become available. Thus, the nature of economic growth more generally and how and where it generates jobs will be key determinants of the performance of agriculture.

Resolving land issues to support productivity growth

Clarity about titles and security of tenure are essential to generate the sustainable productivity growth that India needs and to bring about decent farm incomes. Timely and accurate information and records about land ownership are needed. The current dual land recordkeeping system, with sometimes conflicting records, is a barrier to producer development and farm consolidation. In particular, lack of clarity about land title limits access to credit, diverting many farmers to the informal credit sector where very high interest rates are charged. Fragmentation of farms due to distress sales often results, in part explaining the rise in the share of landless labourers in the overall agricultural labour force.

Succession laws in India favour the fragmentation of holdings. One way to overcome this is to separate ownership and operation of a farm holding through legally secure tenancy and leasing regulations. Current arrangements in India do not permit this. Both owners and operators of land need legal security, the former that he will not lose his property if he allows someone else to cultivate it, the latter that he has the security of tenure needed to justify investment in human and physical capital. Significant steps have been taken already through the development of a model Land Leasing Law by NITI Aayog. Some states have already adopted the model and implemented new laws, in some cases going beyond what is contained in the model law, but others have not yet acted. Additionally, farmers with a formal tenancy under the Acts can access institutional credit, insurance, disaster relief and other support services. This is of crucial importance. Unless and until secure land leasing is provided for, fragmentation will continue and the sector will struggle to generate the needed productivity improvements.

This, together with the problems surrounding titles and the absence of secure tenancy arrangements, is impeding the emergence of economically viable farm units, whether operated by full-time or pluriactive farm households. There should be no need to define or legislate for what that viable farm size should be.

Recommendations

- Strengthen the regulatory environment governing land issues by:
  - Gradually loosening ceilings on farm size and harmonising across the states, with a view to eventual elimination.
  - Implementing strengthened leasing and tenancy regulations to protect the interests of both land owners and tenants with a view to fostering a better investment climate.
  - Accelerate efforts to clarify land titles and to keep them up to date, as well as the ongoing effort to digitalise records.

Reforming market regulations and strengthening market functioning

The Producer Support Estimate indicators (see section 5 of Chapter 3 and Figures 1.2 and 1.3 in this Overview) highlight one of the fundamental issues in Indian agriculture: namely that for many products and over most of the period reviewed, Indian farmers are receiving prices which are lower than the prices prevailing on the comparable international markets. This occurs despite the stated intention of the government to ensure that farmers receive remunerative returns and the myriad regulatory and other interventions which are made in support of that objective. Observed outcomes can be at least partly attributed to the fact that policies were designed in an era of scarcity to prevent hoarding and exploitation of farmers. They also point to the conflict inherent in

attempting to regulate markets both to provide remunerative prices to farmers and stable and fair prices for consumers. This has led to strict control of what private actors are allowed to do in markets rather than seeking to create the conditions and basic rules that give rise to a competitive market place that has the potential to deliver these outcomes organically. This prescriptive approach has been compounded by a lack of supporting infrastructure that raises the costs of participating in markets in the first place, and has, in some instances, misdirected policy attention from fixing development gaps and overcoming inefficiencies in favour of attempts to limit the actions of market players.

The Government of India is aware of these issues and has taken several important initiatives to remedy them. A new model APMC Act was developed in 2003 and model APMC rules in 2007. Some states took steps to implement some or all of the provisions of the Model Act bringing about some harmonisation and reductions in the 'red-tape' associated with participating in agricultural markets. A further step was taken in April 2017, when a reformulated APMC Act was sent from the central government to the states, although the fact that the previous model act had not been applied, or only partially, in many states suggests that implementation will continue to be difficult. Among other provisions, the reformulated Model Act proposes a single licence and single point of entry levy for wholesale markets. Other broader reforms are also seeking to simplify markets and the costs imposed by government. The introduction on 1 July 2017 of the GST is also an important step in the right direction harmonising and consolidating previously existing levies, fees and taxes to some extent, and clearing the way for the development of simplified inter-state trade. The recently established E-NAM is a promising effort to create an all-India market, using digital tools and permitting transactions to occur without physical inspection of the goods.

These measures have the potential to remedy many of the deficiencies of the current system and should be implemented vigorously throughout India. The pace and sequence of reforms needs to be carefully planned. Government involvement and control of the marketing of agricultural products has been pervasive. The process of bringing more private actors into the system and allowing beneficial competition has to be carefully managed and supported by transparent and continued regulatory reform. As private market actors come to the fore, government can step back. Farmers will be key actors in this transformation and modernisation process. Many of them do not currently have the skills to operate effectively in a more market oriented environment and will need support through reinforced development of farmer organisations, and more targeted education and extension services than are currently available. Deficiencies in market transparency will also need to be remedied, including, in the longer term, through the development of more accurate price reporting and futures markets which are currently not permitted in India.

Recommendations

- The central government could work closely with the states and UTs to thoroughly reform regulations to foster the development of more efficient and competitive markets. First and foremost efforts to deploy and implement reforms already designed, such as the new model APMC Act and E-NAM, could be reinforced including inter alia the rationalisation of levies and fees and the reduction of "red tape". States should be encouraged to avoid "cherry picking" and the new provisions should be adopted in a harmonised and consistent way across states.
- Sound competition policy arrangements need to be put in place to establish the 'rules of the game' and to provide recourse for both consumers and producers when faced with uncompetitive practices.

- Over time allow private actors to operate in the markets and abolish the monopoly granted to government controlled wholesale markets. Permit private storage and remove restrictions on intra and inter-state movement of agricultural products.
- Supply chain arrangements should be fostered which could help overcome deficiencies in the current market environment, including contract farming with transparent contracts and strengthened legal enforceability.
- Invest, and permit private investment in, market infrastructure for handling, grading and storage of agricultural products.
- Strengthen farmer involvement in co-operatives and in producer organisations to enable them to participate effectively in better functioning, more competitive markets, including through targeted education and extension efforts.
- Improve transparency on market conditions and prices and consider investing in a price observatory to do this; in the longer term allow the development of futures markets and invest in educating farmers and other market actors in how to use them for price discovery and reduced volatility.
- Provide a predictable and stable international trade regime, both for imports and exports, in order to foster the investment needed for the development of a modern, efficient supply chain from farm to retail distribution.

The future of the system of Minimum Support Prices

The government at Cabinet Committee level currently sets Minimum Support Prices (MSPs) for 24 agricultural commodities. The Commission on Costs and Prices recommends the level of the Minimum Support Prices each year. In doing so it is required to take into account costs of production, supply and demand conditions, international prices, inter-crop parity, the terms of trade between agricultural and non-agricultural goods, the likely impact on consumers and on the overall economy, and utilisation of scarce natural resources like water and land. No specific weights are applied.

For the level of price intended in the setting of the MSPs to materialise, import restrictions need to be in place and the government needs to act as buyer of last resort when and if prices fall below the announced levels. In practice, in India, the MSP plays a determinant role in prices only for wheat and rice, and to some degree for sugarcane and cotton. In operations closely linked to the public food distribution system, the government (Ministry of Consumer Affairs, Food and Public Distribution) procures very large quantities of food grains and in the major producing states observed producer prices correspond quite closely to announced MSPs. For most other commodities, no apparatus exists for the government to act systematically as buyer of last resort. Prices are thus determined by domestic supply and demand with domestic markets shielded from imports as a result of tariff and non-tariff restrictions. These arrangements have led to wide intra and inter-year price fluctuations with the prices received by farmers, for most products and in most years, below benchmark international prices for the same commodities.

The MSP system is nevertheless significantly influencing the production choices being made by farmers in India – in so far as it encourages production of wheat and non-basmati rice. This has created large exportable surpluses in these two crops as farmers have responded to the relative price incentive offered, as well as to the security and stability of access to a sure market for their product. This may be hampering diversification into production of higher value products and is exacerbating the pressures on natural resources such as water, in the major producing states.

MSPs of many commodities have been increased sharply in recent years, while international prices of the same commodities have been falling. Most recently, the discussion has centred around the idea of setting the MSPs at 50% above the cost of production in an effort to spur achievement of the goal to double farmers' incomes by 2022. Domestic prices have already been converging to international prices and in the case of wheat and maize now exceed them. This threatens the competitiveness of Indian exports, and places the continuation of the system at risk in a situation where export subsidies are not permitted (WTO, 10th Ministerial Conference decision made in Nairobi in 2015). As has been seen in other countries, keeping administered prices above world levels will force the accumulation of stocks, increasing market uncertainty for producers and costs for the government.

If adopted, cost-plus pricing raises several issues. It removes incentives to reduce costs and improve efficiency and allows the least efficient producers to stay in business. It also raises prices for consumers, increasing pressure on family budgets especially of the poorest households who spend a very high share of their budget on food, notwithstanding the PDS. Finally, cost-plus pricing may not be effective in bringing about the desired increase in farmers' incomes as the least efficient incur the highest production costs.

Recommendations

The overarching objective should be to allow market signals to be the main determinant of the production choices that farmers make. Ultimately this would make the system of MSPs obsolete, with some immediate steps which could be taken as follows:

- Ensure that MSPs do not exceed international benchmark prices for the commodities covered. To protect the export competitiveness of Indian agricultural production, ensure explicit consideration of this in the price setting process.
- Review the process whereby MSPs are set in relation to production costs, to avoid locking in inefficient high-cost production and raising prices for consumers.
- Improve farmers' remuneration through market reforms and more competitive practices and not by creating or expanding potentially costly and wasteful procurement systems.
- Increase the incomes of the poorest farmers through targeted direct cash transfers, rather than through raising prices above market levels.
- Synchronise market regulation and MSP reforms in a coherent plan communicated in advance, with a view to avoiding disruption as governments gradually give way to the private sector.

Encouraging efficient and sustainable use of variable inputs such as fertilisers

The combination of market regulations and development deficiencies has a price depressing effect in Indian agriculture, as government grapples with the conflicting aims of ensuring low prices to consumers and remunerative prices to farmers. In part to compensate for lower prices, the government intervenes to lower input prices in agriculture, across a broad range of inputs from fertilisers and power, to water, seeds and credit. OECD analysis suggests that these types of subsidies are generally more production and trade distorting than price supports, that they are not very effective in raising farmers' incomes due to leakages, and can contribute to environmental damage and resource pressures (Dewbre et al., 2001; OECD, 2001; Martini, 2011).

Undoubtedly, access to subsidised fertilisers has significantly increased their use and contributed to the strong growth in production achieved by India. However, several

problems have been identified suggesting that it may be timely to review the operation of the system. Firstly, there is considerable leakage with significant benefits accruing to unintended beneficiaries both within and outside India. Waste occurs at the farm level, as fertilisers are not necessarily applied correctly and they contribute to greenhouse gas emissions, and water and soil pollution. Finally, public monies currently spent on fertiliser subsidies would achieve a higher return for farmers and for the Indian economy, if diverted to longer term investments in infrastructure, education, and research, to increase resilience and sustainability.

Recommendations

Fertiliser subsidies should be scaled back and, in the long term, eliminated. First steps could be as follows:

- Put an end to the system whereby the subsidy rate varies with international prices by setting a fixed, nominal subsidy rate and gradually phase out over a period to be decided and communicated in advance.
- Devote the savings generated to educating farmers in efficient and sustainable use of fertilisers and other chemical inputs, to accelerate development of the soil card system and to research and development efforts to promote responsible and sustainable fertiliser use adapted to specific conditions and crops.
- Broaden the pilot programme to replace fertiliser subsidies with a direct benefit transfer (DBT) allowing farmers to make their own decisions about the best use of the available funds, and continue to adjust the scheme in light of experience in implementation.

Avoiding a major water crisis

Despite growing awareness of the severity of the problem, over-exploitation has continued, and diversification to other, less water thirsty crops, or the development of micro-irrigation in some regions, has not been sufficient to redress the problem. Farmers, partly responding to the incentives provided by the MSPs continue to grow predominantly rice and wheat. Irrigation is still dominated by tube wells which are highly suited to fragmented holdings, but which, by their nature, allow uncontrolled access to increasingly scarce groundwater. Highly subsidised or free power exacerbates the problem as it enables farmers to continue pumping from these wells, even when the underlying aquifer has reached worryingly low levels. The associated fiscal burden on many state governments is huge (such as in Punjab and Haryana). In some states, expenditure on the power subsidies alone exceeds the combined state expenditure on education and health. Additionally, the water rates fixed for supply of water from many major, medium and small projects funded by the government cover only a small fraction of the operating and maintenance costs, thus diminishing the capacity of the states to maintain these projects.

In view of the extreme sensitivity around water issues, any radical changes from current approaches will require strong leadership and extensive consultation with stakeholders in agreeing clear long-term directions and in mustering the needed long-term investments. The negative effects on production and productivity of failure to undertake significant water reforms will be exacerbated by climate change, which is expected to result in greater variability in rainfall, decline in river flows as well as higher temperatures.

Recommendations

In addition to correcting the perverse incentives to continue to produce water-intensive crops created by the MSP and PDS systems, specific short and long-term actions are needed, as follows:

- Generalise the introduction of restrictions on hours during which free electricity for pumping water is provided, particularly in areas where withdrawals are already in excess of recharge capacity.
- In parallel, continue the effort already underway to improve the reliability of electricity supply to ensure that electricity is actually delivered during the allotted periods, and to separate the feeders for irrigation water supply.
- Launch a massive campaign of awareness raising and education among farmers to alert them to the risks associated with a "business as usual" scenario.

In the longer term, more careful use of water while preserving the current production structure and practices will not be sufficient.

- Electricity pricing will also need to be reviewed to correct the perverse incentive currently created by the power subsidies.
- Accelerate research in crop varieties (and breeds of livestock) needing less water, more drought resistant and adapted to the climatic and agrological conditions in the areas under stress.
- Enlist all concerned actors, public and private, upstream and downstream in developing collective-action groundwater and watershed management schemes encompassing infrastructure development, new technologies and new institutions.
- Put in place overall water management schemes that cap agriculture water use according to available water resource, and, where appropriate,[4] invest in efficient irrigation technologies such as drip irrigation and precision agriculture, including in rain-fed areas where water is plentiful and irrigation, to date, little used.
- In areas facing the most important water risks, consider stronger measures such as limiting extraction or introducing water charges which reflect the opportunity cost of the resource before investments in water use efficiency.

Strengthening access to credit

In India, short term credit predominates and there is a persistent problem of arrears due to poor repaying capacity of farmers. There is a need for a better analysis by banks on where the risks lie in the extension of agricultural credit, and to then find market oriented solutions for mitigating such risks. Banks could adopt a more specialised approach to the characteristics of different agricultural sectors and regions in order to achieve a better understanding of agricultural credit needs and risks on a disaggregated basis. Clearing issues around land titles will be essential to support collateral and contract issues; restrictive tenancy laws have also hampered credit flow. Information technology needs to be used to facilitate transformation in various processes of rural credit.

Since the mid-2000s the policy-driven stimulus to use of variable inputs has increased substantially as a result of interest rate subsidies on short-term credit. The concentration of credit and credit subsidies on short-term input use diverts capital away from the long term capital investment required to raise productivity in India's agriculture. In addition to ongoing interest rate subsidies, policy decisions have written off many farmers' debts in some years. Some state governments wrote off large amounts of farm debt in 2017, and write-offs have been proposed in several other states. The moral hazard implications of

debt relief can be significant as write-offs can affect both borrowers and banks behaviour. Repeated write-offs may encourage wilful default under the expectation of future waivers. This may make banks more conservative in terms of credit allocation. In addition, such measures may further encourage farmers to borrow in order to purchase and use such operating inputs as fertiliser, electricity and irrigation water, the prices of which are already heavily subsidised.

Recommendations

- Continue to improve the reach and accessibility of public sector commercial banks in rural areas and improve their capacity to assess risk and payment capacity.
- Take measures to restrict the activities of informal lenders; a stronger formal sector would be helpful in this regard.
- Encourage long-term loans by diversifying the package of financial services available to farmers in order to support investments in sustainable productivity growth on farms.
- Reduce and eventually eliminate recourse to debt forgiveness which is encouraging behaviours by borrowers and by banks that undermine the development of a viable commercial farm lending sector.

Agriculture Enabling Environment

Increasing agricultural productivity and scaling up the participation of farmers in value chains requires good governance through laws and regulations that are conducive to private-sector economic activity while addressing market failures, strong and effective institutions through which policies can be operationalised, as well as an adequate provision of public goods across all economic sectors. Collectively, these elements create an enabling environment for innovation at the farm level and for other businesses in agro-food value chains, by building economic capacities and by shaping incentives for investment and sustainable use of natural resources. The Agricultural Growth Enabling Index (AGEI) developed by OECD and IFPRI – which covers all of the above-mentioned components – highlights that political stability, financial markets and trade facilitation in its economy-wide blocks are areas of relative strength in India, when compared to other economies at similar levels of developments (Diaz-Bonilla et al., 2014). In turn, India performs below-average with respect to institutions, the stock and quality of infrastructure, as well as goods and labour markets efficiency. The AGEI also points to areas of relative weakness in agriculture – and the rural sector more broadly – including capital intensification (measured by the capital stock per person employed in agriculture), land market rights and access, and sustainability aspects such as pressure on water resources, issues dealt with in detail throughout this report.

Recommendations

- Invest in infrastructure in rural areas, both general, such as roads and health care, and specific infrastructure facilitating development of the agro-food sector. Digital connectivity could be particularly important in this respect.
- Invest in education in rural areas with a view to improving the employment prospects of those whose long-term future will not be in agriculture.
- Ensure that job-creating development is spatially dispersed so as to create income-generating opportunities for those whose land holdings are too small to alone generate a decent family income.

Harness innovation for sustainable productivity growth and climate change adaptation and mitigation

Innovation has been central to the major transformations that have characterised Indian agriculture. Innovation also holds the key to how India will respond to the new and multiple challenges now facing the food and agriculture sector. Demand for food and for a more diverse diet will grow as population grows and more and more people transition from poverty to the middle classes. Natural resources are under stress, particularly water in some parts of the country and climate change is projected to hit India hard. At the same time, strategies need to be deployed to increase productivity on the small, resource poor and largely subsistence farms which dominate the agriculture sector.

The challenges facing India are multiple and complex and amplified by the dominance of smallholder farmers and landless labourers in the work force. Without significantly increased investment in the agricultural knowledge system and in the institutional framework needed to ensure a systems approach (that is appropriate concertation and consistency among the different actors) India will find it difficult to deliver on food and nutrition security for its own people and to further develop as an agricultural exporting nation. High priority should therefore be given to a much strengthened agricultural innovation system. Returns to this investment in the long run, if it is effectively carried out, are enormous.

Prioritising and reinforcing research and development

Research intensity in India, at about 0.4% of agricultural GDP during 2012-14 and growing, remains relatively low compared to Brazil (1.8%) and high income countries (at around 3.0%), although it sits close to China (0.6%). The government, cognisant of the importance of research for the future of the sector, has committed to increasing the research intensity to 1%. Achieving this target will be crucial.

Strengthening extension services and education

The extension service is widely credited as having been a key factor in the spread of the green revolution in India, but public commitment to the system and its effectiveness have been erratic over the intervening period. Public funding was increased strongly in recent years and extension intensity, as measured by spending as a percentage of agricultural GDP, rose quite sharply from 0.14% at the beginning of the century to 0.18% during 2011-13. If the living standards of India's large smallholder population are to be improved, extension services will need to go beyond the traditional areas of technology transfer to encompass business skills, facilitate the diversification needed to overcome resource scarcities and provide farmers with the skills to operate in and deliver the products demanded by the development of agro-food value chains. Regions and states with agricultural potential but with currently very low levels of commitment to extension services should be specifically targeted. While the public sector will need to continue to play a major role, participation of many different actors should be actively encouraged, and the role of the private sector in particular should be much increased.

Investing in improved seeds

The development, production and distribution of improved seeds should be a key priority of both the central and state governments in the inputs area, with about two thirds of farmers not using certified or hybrid seeds. The rapid increase in cotton yields from the

early 2000s demonstrates the potential for private efforts to contribute significantly to the availability of improved seeds also for other crops. While issues can arise with regard to the balancing of public and private interests in this critical inputs area, sound market-oriented policies that allow both for competition and for remuneration of effort would have the potential to ensure the ongoing funding of research, development and innovation needed to increase the availability of seeds that are adapted to the local conditions and to climate change challenges in various parts of India, as well as generating much needed yield improvements.

Harnessing the potential of the digital economy

Modern technologies such as ICT have enormous potential to overcome deficiencies in personnel and infrastructure for the delivery of new knowledge and skills to farmers. For this reason investment in the infrastructure needed for a well-functioning digital economy will be an important prerequisite, both for agricultural and for rural development more generally. More specifically, the full potential of ICT, big data, and precision agriculture will need to be harnessed to the task of generating sustainable productivity growth, including resolving the water crisis, and coping with climate change.

Ensuring that intellectual property protection supports needed innovation

Appropriate protection of intellectual property rights is essential to foster the private development of new technologies, whether by domestic actors or through accessing technologies developed internationally. While India has enacted legislation to conform with international obligations such as under the WTO TRIPS (Trade Related Aspects of Intellectual Property Rights), India has been reluctant to go beyond such provisions and there have been some issues in implementation. For India to be able to access the technologies it needs to achieve sustainable productivity growth including many already developed or under development, it must be able to guarantee appropriate protections. Otherwise, India's agriculture may have to forego key technologies which the current research system is not in a position to generate by itself. More generally, in India, there is resistance in both official and farmer circles, to exclusive reliance on technologies from abroad due to a perception that dominant firms will extract excessive rents from a captive farm clientele.

Recommendations

The overarching need is to secure increased funding for the agricultural innovation system, including potentially through the diversion of funds from programmes which have been identified in this report as inefficient, wasteful and harmful for the environment.

Specifically:

- Provide the funds needed to increase the research and development intensity of the agricultural sector, while paying attention to the appropriate balance between strong central priority setting and co-ordination, and more bottom-up regional and local approaches, to the quality of research personnel, and to systematic monitoring of outcomes.
- Encourage inter-disciplinary and systems approaches to innovation, and strengthen the focus on current challenges such as sustainability, climate change and diversification needs.

- Continue and intensify reforms of the extension system, focusing on the needs of smallholders unable to access commercial services, and going beyond classic approaches to focus more on climate change, sustainability, and on business and digital skills. Pay attention to the quality of extension personnel and to systematic monitoring of outcomes.
- Invest in digital connectivity in rural areas, to enhance the potential to deliver education and extension services, as well as market information, and facilitate broad agricultural and rural development.
- Ensure that intellectual property protections are supportive of needed innovations, and accompanied by appropriate competition policy settings.
- Launch a wide awareness-raising campaign explaining the needs for, and benefits of, new technologies to the Indian public.

The role of agriculture in enhancing food and nutrition security

Achieving food security ranks as one of the key, if not the first, priorities of the Indian government. Such is the importance of food security that the most recent legislation, the National Food Security Act (NFSA), creates a legal entitlement to food covering 75% of the rural population and 50% of the urban population. Looking to the future, while the nature of the problem is shifting, food security will continue to be a key focus of government policy. The main challenge will be to adjust the public distribution system to changing needs as the economy grows and higher incomes make more households food secure, while ensuring that the most vulnerable segments of the population continue to be taken care of. This will need to be done while coping with resource pressures, which in the case of water are already severe, and adapting to climate change, the impacts of which are also projected to be severe. Finally, with huge competing demands for scarce fiscal resources, the governments, state and central, will need to ensure effectiveness and value-for-money in how food security programmes are implemented.

India has made significant progress in recent years in eliminating waste and inefficiencies in the current system and these efforts should be continued. Problems, nevertheless, persist. The costs of the programme have risen dramatically and constitute a huge burden on the country's limited fiscal resources – currently 0.86% of GDP and 6.6% of total government spending. Waste and leakage continue to be significant. The current programme is too centred on food grains and may be slowing down or preventing the diversification in diets needed for better nutrition outcomes in India. Finally, India's use of closely intertwined policies to, at the same time, provide producer incentives and reduce consumers' outlays on certain foods has attracted scrutiny by trading partners and, more important, narrowed India's options in seeking to make international trade rules more supportive of a market-oriented domestic agenda for the longer term. Simultaneous efforts on both the domestic and international fronts present the best hope for an enduring solution (Box 1.3).

Reforms to market regulations are a prerequisite to, and an intrinsic component of any reform of the food distribution system. Reducing public food distribution necessarily means reducing government purchases of food grains, which would limit government involvement on the producer side as a buyer. Over time and in tandem with those reforms, reforms to MSP as proposed and investments in market infrastructure would be required to prevent a fall in producer returns.

Box 1.3. Food security and self-sufficiency

Different countries have taken different approaches to solve issues of food security for their populations. Some have leveraged development and income generation as the key tool to allow consumers to access food supplies that have been underpinned by access to supplies on international markets. Others, among them India, have sought food security through policies that seek to enable a country to become self-sufficient in particular staple crops. However, recent work by the OECD has found that self-sufficiency policies are not the most effective policy in dealing with issues of food security. Indeed, unless self-sufficiency is back by comparative advantage, such policies may be counter-productive for food security and increase the exposure of domestic populations to food insecurity – that is temporary falls into food insecurity caused by natural (such as droughts) and economic (such as macro events or adverse world price movements) shocks.

A recent study exploring food security in Southeast Asia has found that opening domestic staples markets – in this case rice – to international and regional supplies can significantly enhance food security. The gains possible are particularly strong in those countries where the use of self-sufficiency policies have contributed to significantly higher domestic prices than those seen on international markets. As food insecurity is concentrated among lower-income households, the net impact of these policies on food security is negative. In Indonesia, for example, the gap between domestic and world prices has been widening in recent years, and in 2012-14, domestic prices rose to 70% above comparable world prices (OECD, 2015). As poorer households tend to spend a greater proportion of their income on food – in the case of Indonesia, Myanmar, the Philippines, Thailand and Viet Nam – the overall price increases have serious consequences for food security, albeit to a lesser extent in Thailand. For example, removing price support measures through rice market integration would improve access to rice and reduce undernourished populations in Indonesia and the Philippines by 10% and 54% respectively (OECD, 2017d). Overall, across the five countries examined, regional integration of rice markets was found to have the potential to reduce undernourishment by around 5%. Moreover, the higher prices resulting from these policies increase not only the levels of undernourishment overall, but also the vulnerability of households, leaving them less able to cope with the impacts of more frequently occurring domestic production disruptions. Outside the sector itself, other policies such as restrictions on inward foreign investment have had similar effects on prices.

The linkages between food trade and food security relate to both the supply side (producers) and demand side (consumers). On the supply side, participation in international markets and through agro-food global value chains (GVCs) has the potential to provide opportunities for income growth (via higher prices than would be received in the absence of trade) and may help in transformation towards a more productive and higher value production set. More broadly, the location of production in areas where resources are used relatively efficiently contributes to higher per capita incomes and faster economic growth. However, sector and overall policy settings are important in enabling producers to get the most out of these markets and thus trade openness itself is unlikely to be enough. Further, trade openness will also cause adjustment if barriers are removed, having direct impacts on individual households, highlighting the importance of transitional measures and safety nets in this process.

On the demand side, trade can directly help in providing access to safe, accessible and stable supplies of food. Trade is a critical element in balancing food deficit and surplus regions, thereby increasing the availability of food by enabling products to flow from surplus to deficit areas. In terms of access, open markets can help consumers through lower prices for food than would otherwise be paid. Open trade can also improve utilisation and nutrition by increasing the diversity of national diets (OECD, 2013). Finally, open markets generally improve the stability of availability and access, for the simple reason that the risks associated with own food production, exceed those of pooled production on international markets (OECD, 2017d).

Source: OECD (2017d, 2015, 2013).

Central and state governments alike in India are aware of the need for constant re-assessment of needs and monitoring of the effectiveness and efficiency of outcomes. Many researchers, commentators and official bodies, among them the High Level Committee on Restructuring the FCI (known as the HLC), propose a gradual and progressive move away from the current mass distribution system to a system of direct benefit transfer (DBT). Scenarios developed for the purposes of this report confirm that significant benefits would accrue, across many dimensions of policy performance, and therefore also support this course of action (Box 1.4). But, in this area, as in others where government has been the principal actor, the process of change needs to be planned carefully, implemented progressively and communicated consistently to avoid any risk of disruption to the food security of vulnerable segments of India's vast population.

Box 1.4. The medium term market and food security impacts of implementing direct cash transfers

The final chapter in this report examines what would happen over the medium term if the NFSA remains in place compared to a situation where the public grain distribution is gradually and partially replaced by cash transfers. The scenarios are developed and examined using the OECD-FAO Aglink-Cosimo model.

The cash transfers are modelled to be introduced gradually over the course of five years because not all states are equally ready to implement cash transfers. In addition, it is assumed that the cash transfers are only implemented partially and that 30% of the NFSA is maintained in the rural areas. This accounts for the fact that cash transfers are not feasible in areas where people have limited or no access to markets or banks and for the fact that certain people prefer physical grains instead of cash.

The analysis distinguishes between four groups of consumers: urban low income, urban high income, rural low income and rural high income. The low income groups correspond to the population that is eligible for public grain distribution and that could hence receive the cash transfer under the alternative scenario.

There are four key findings. First, the scenario results show that the NFSA beneficiaries are at least as well off under the cash transfer programme as under the food distribution programme in terms of per capita availability. Second, diets are projected to be more varied when consumers receive cash than when they can buy rice at subsidised prices. Third, the cash transfer programme will be less costly than the public distribution programme. Fourth, a move towards cash transfers will perform better, in terms of food security outcomes, in the face of high international prices.

Recommendations

- Gradually reduce the share of the population covered by the NFSA 2013 as economic growth and associated standards of living increase, allowing some households to be omitted as they reach higher levels of income. At the same time, the central issue prices at which entitled households purchase food grains from fair price shops could be increased, as provided for by the legislation but not implemented since 2002.
- Continue experimental replacement of physical grain distributions by direct cash transfers or DBT and expand and adjust in the light of experience gained. As suggested by the HLC, start with cities with populations in excess of 1 million, followed by grain surplus states. In grain deficit states and for the foreseeable future, enable entitled families to retain their preferred option as between direct distribution and a cash transfer.
- Continue to provide a food security reserve to be available in case of a food security crisis or incident. As parallel market reforms are implemented, procure at market prices.
- Allow the private sector to play a role in the constitution and management of stocks.
- Ensure that the amount of the NFSA benefit delivered through DBT is sufficient to fully compensate families now in receipt of the highest level of benefit under the TPDS.
- Construct the system to be able to increase payments quickly to the poorest families in the event of a sharp price rise and consider targeting payments to females.
- Where private markets are thin or non-existent and there is a risk that switching to DBT could worsen social outcomes, maintain the current food distribution system. Where leakages of payments might occur, an alternative food coupon system could be developed (along the lines of the US SNAP programme, previously food stamps), but conditional on it allowing recipient families to choose from a wider range of food items.

The research done for this report and much of the research done in India point in the same direction, as do the reflections of several commissions, government agencies and think tanks. Moving to a direct benefit system would bring savings, improve targeting, generate better nutrition outcomes, and could be designed to react more quickly than physical distribution to exceptional circumstances. It would also allow market signals to play a stronger role both in determining farmers' production choices and consumers' dietary choices. Reforms along the lines proposed would bring the added advantage that they would open some avenues for a satisfactory resolution of the "public stockholding" issue that has been an important factor impeding progress in the multilateral trade negotiations at the WTO. As with other reforms suggested in this report, timing and sequencing will be crucial, as changes will need to be carefully planned and gradually and progressively implemented over a period of time.

Making trade work for Indian agriculture

As with domestic market regulations, India's trade policy was designed with scarcity in mind and at a time when India's level of economic development was much lower than it currently enjoys. India is now a major agro-food exporter in a number of commodities. With growing imports and exports, a well-functioning and rules-based international

trading system is increasingly in India's interest – particularly if domestic productivity improvements are realised. The international food system is also changing, with a growing importance of global agro-food value chains. Agricultural trade policies more appropriate to the opportunities and challenges currently facing India are now needed to allow India to reap the benefits of further developing exports where it has comparative advantage and tapping into the potential of imports to contribute to diversification of diets, and as an important component of a multi-dimensional food security policy. Actions are needed on both the import and export side to enable India to participate in the development of value-chains in the agro-food sector.

India's growing participation in international markets for agriculture and food is making the role of international rules for sanitary and phytosanitary (SPS) measures and technical barriers to trade more important for the country. Aligning its policies throughout the value chain with those rules enhances India's access to foreign markets for its agriculture and food products. Applying the international rules on sanitary and phytosanitary measures and on technical barriers to trade in a transparent and consistent way to India's imports from other countries helps to ensure the safety of food for domestic consumption. It also enables international suppliers to contribute to the availability of food in the Indian market, thus moderating domestic price swings.

India adjusts the applied tariffs downward and permits imports when domestic supplies are tight, with a view to limiting price rises. Such decisions are made on a case-by-case basis. A more stable and open regime governing imports would permit the emergence of a multi-dimensional food security strategy combining domestic production in line with India's comparative advantage, an appropriate level of food security stocks and imports. In addition, it would accommodate demand for more diversified dietary patterns, in response to the needs of the growing middle class.

India's agricultural exports are also managed with a view to maintaining the domestic supply-demand balance and avoiding volatility. Many markets are subject to export restrictions of different kinds, or face the threat of restrictions if market developments, in the government's view, warrant it. These measures have been moderately effective in the short term in preventing sharp rises in prices, but have had detrimental effects on producers over the medium and longer term, as their prices have been lower than they would have been in the absence of restrictions. In essence, such policies have proved to be an expensive insurance against international price movements. In addition, India's reputation as a reliable source of rice and wheat, of which it is a major exporter, may have been damaged. Under the agreement made at the 2015 WTO Ministerial Conference in Nairobi, India will not provide export subsidies beyond the end of 2023. India should also renounce the use of, or strictly limit, any future recourse to export restrictions. Without a stable and predictable market environment, farmers and private traders will be unwilling to invest in the supply chains needed to ensure that India is a competitive, reliable exporter of agricultural products.

India's agricultural trade policy as implemented is characterised not just by relatively high barriers to imports and exports, but also by a significant degree of uncertainty. This explains, at least in part, why value chains in the food sector remain relatively under-developed. For India to develop a more sophisticated domestic processing and distribution industry and to more fully exploit its comparative advantage to export certain agricultural commodities, a more open and stable trade policy regime is essential, in the absence of which, the needed investment will not occur. State trading enterprises should be reformed as part of this process to make room for private sector development. Finally,

for India, as well as for many other countries whose food production is likely to be threatened by climate change, openness to trade will be a necessary component of the response, alongside the adaptation and mitigation strategies described elsewhere.

Recommendations

- Streamline and clarify trade policy roles and responsibilities across the different ministries and agencies to iron out inconsistencies and simplify procedures.
- Address a range of supply-side constraints in the application of SPS measures, including effective mechanisms for dissemination of SPS-related information among stakeholders in the value chain, as well as appropriate infrastructure and technologies.
- Reform state trading enterprises where they exist and make room for private sector actors.
- Reduce tariffs and relax the other restrictions on imports which are applied from time to time with a view to creating a more open and predictable import regime.
- Move away from the use of export restrictions in order to create a stable and predictable market environment, within which farmers and private traders will be willing to invest in the supply chains needed to ensure that India is a competitive, reliable exporter of agricultural products.

1.3. Conclusion

India's agro-food sector is at a critical juncture, facing multiple challenges and multiple opportunities. The policy directions embarked on now and in the next few years will play a huge role in determining how successful India is in creating food security for its vast population, improving the quality of life of its millions of smallholders, overcoming severe resource and climate pressures, while generating sustainable productivity growth and creating a modern, efficient and resilient agro-food system which can contribute to inclusive growth and jobs economy-wide.

First and foremost the fate of the agro-food sector will rely on supportive, predictable macroeconomic and structural policy settings and not exclusively on sector-specific interventions. Quality infrastructure, education and skills, well-functioning financial markets, strong market institutions, rule of law, excellence in innovation systems, and integration in global markets will be needed to create the sustained growth that will draw labour out of the sector, and create the conditions for the development of the sector itself. Particular attention may need to be focused on rural areas, which lag behind urban areas, according to many indicators of development and well-being. Agriculture and food policy settings also need re-alignment to reflect the changing nature of the sector's role in a fast growing economy with a significant and growing middle class, and India's expanding role and influence regionally and globally.

This report has revealed some incoherence in policy settings – some of them inherent in the way goals have been articulated, others in the way policies have been designed and implemented. This is starkly reflected in the PSE indicator estimated for the purposes of this study. It comprises significant positive transfers to producers mainly in the form of input subsidies and significant negative transfers to producers as a result of the prices for many commodities being lower than international benchmarks. While these transfers tend to cancel each other arithmetically in the value of the PSE indicator, they are cumulative in their distortive effects on the economy. There is a fundamental difficulty in trying to keep prices low for consumers while ensuring remunerative returns to farmers. Another

example relates to measures to resolve water scarcity which co-exist alongside subsidies for the electricity used to pump water which is wasteful use of scarce budgetary resources and may exacerbate the underlying problem. If the overarching goals of achieving sustainable productivity growth in the sector and ensuring food security are to be achieved, ineffective and wasteful interventions will have to be scaled back, and scarce public resources applied where they are capable of generating the highest returns for farmers and for the economy as a whole.

The costs and risks associated with a failure to align policies, and associated scarce budgetary resources, to the goals of food security, sustainable productivity growth and climate change adaptation are potentially large. Co-ordination towards a common vision is vital, so that shared priorities and policy efforts that respond to them can be developed. Governance arrangements around policy-making for agriculture and food are not very conducive to the creation of consistent and joined-up policy frameworks. In this respect, efforts could be stepped up to clarify roles and reduce fragmentation and overlapping. Stronger co-ordination mechanisms among Ministries, Departments and agencies would also be helpful, and between States and UTs and the central government.

Because of India's federal structure, the weight of the agricultural population in the total, the vibrancy of India's democracy, the pervasive nature of government intervention to date, and many other economic, social and cultural factors, particular attention will have to be paid to the political economy of efforts to change the focus of policies for the agricultural and food sector. *Inter alia*, this would require strengthening the institutional framework to eliminate duplication and fragmentation, considerable investment in forging consensus about shared goals and how to achieve them, including between the centre and the states, gradual and progressive dismantling of obsolete or inefficient policy instruments and implementation of new ones with careful sequencing, the development of strong transparency and consultation mechanisms involving a broad range of stakeholders, strong political commitment to maintain new policy directions once changes have been set in motion, continuous communication about intended next steps and monitoring and reporting of outcomes.

Against this background, this report suggests a series of reforms which, if implemented, would: create a modern institutional and regulatory environment in which market actors would play a much stronger role; would remove obstacles to structural adjustment and to the modernisation of processing and distribution; would enable the agro-food sector to respond to evolving market needs; would achieve food security more effectively and at lower cost; and would ensure that publicly funded programmes do not exacerbate environmental damage and climate change, or add to pressure on scarce resources such as water. Available resources would instead be devoted to (i) investments in innovation, climate change adaptation, resource conservation and infrastructure for sustainable productivity growth; (ii) transitional (digressive) direct support to farmers which could be integrated into the evolving DBT system using the Aadhar system for disbursement; and (iii) disaster programmes with triggers and payment conditions defined in advance and capable of rapid deployment.

The Government of India's own assessment concurs with many of the conclusions that have emerged from this report. In particular there is keen awareness of: the need to reform and modernise market regulations; to improve the prospects of smallholders including through adjustment out of the sector for some; improve the effectiveness of food security measures; and to deal with looming water and environmental degradation issues. Many policy initiatives are already underway or in the pipeline and are mentioned

throughout this study which endorses many of them and simply suggests that they should be continued or reinforced. Additional recommendations focus on shifting scarce budgetary resources to investments that will increase resilience and sustainability, while allowing better functioning markets to determine farmers' remuneration to a much greater degree. Finally, a less restrictive and more stable international trade regime covering both imports and exports is suggested, without which – in a world of global value chains – the potential of the sector to contribute to growth and jobs will not be fully realised.

Notes

[1] Different definitions can yield different sizes, income shares, or characteristics of the middle class population. Brookings Institution's middle class estimates consider the number of people living in households earning or spending between USD 10 and USD 100 per person per day (USD 2005 PPP). These are available for more than 130 economies. The share of the middle class population in India was estimated at 5% in 2010, 51% in 2020, and up to 79% in 2030.

[2] National data on employment are available from the National Sample Survey Office (NSSO), the Census, and the Labour Bureau of the Ministry of Labour and Employment. Some differences can exist between estimates across these sources, due to differences in the definitions used for compiling data. Most recent estimates (2015-16) are available from the Labour Bureau. When needed, for time and cross-country comparisons in this study, agriculture value added may include the primary sector, forestry, hunting and fishing.

[3] NITI Aayog estimate for 2011-12 based on data from the NSSO for farm income per cultivator and non-farm income (NITI Aayog, 2017).

[4] The 2016 Recommendation of the OECD Council on Water stresses that "the promotion of water use efficiency to alleviate pressure on all surface and groundwater resources, especially where water is scarce and competition between sectors intensifies, whilst taking into account the need for groundwater recharge and environmental flows" (OECD, 2016).

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Chapter 2. The policy context

The chapter examines the key issues that have shaped the development of India's agricultural sector over the last two decades. A brief overview is provided on the political, demographic, macroeconomic and social characteristics of the country. The chapter then evaluates the performance of agriculture in terms of production, productivity and trade; discusses its social impacts in terms of employment, incomes and food consumption; outlines its environmental consequences; and finally analyses structural changes in the sector, including in upstream and downstream sectors.

2.1. Introduction

India is a country of enormous diversity: geographic, economic and ethnic. It has made remarkable economic and social progress since the start of liberalisation reforms in the early 1990s. India is now among the fastest-growing G20 economies and its strong performance has lifted more than 160 million people out of extreme poverty over the last 25 years. Despite the declining contribution of agriculture[1] to India's GDP, the sector continues to have a pivotal role in the economy as it remains the first source of employment and thus a key driver of growth and poverty reduction. Spearheaded by the 'green revolution' in the 1960s-70s, the agricultural sector overcame productivity stagnation and food grain production improved. This period was followed by the 'White Revolution', which transformed Indian milk production and marketing. In comparison, over the last decade, the sector's overall performance in terms of growth on a sustainable basis has been much more modest. The main objective of the chapter is to provide a deeper understanding of the current constraints on agricultural productivity growth – the central challenge facing agriculture in India – by examining the key issues that have shaped the development of the sector and that have conditioned policy responses over the last two decades.

The following sections thus provide a brief overview of the political, demographic, macroeconomic, and social characteristics of the country. The chapter then evaluates agriculture's performance in terms of production, productivity and trade; discusses socio-economic impacts in terms of employment, incomes and food consumption; outlines environmental consequences; and finally analyses structural changes in the agricultural sector, including in agriculture's upstream and downstream sectors.

2.2. The big picture: Overall performance of the Indian economy

India is the seventh largest country by land area (2.97 million km^2) and the second most populous after China with over 1.3 billion people, accounting for 18% of the world's population. Its territory spreads over the distance of 3 214 km from north to south and 2 933 km from east to west, while its coastline is 7 517 km long. The country is a federation composed of 29 states and 7 Union Territories (UTs) (Box 2.1). Table 2.1 provides a selected configuration of India's North, East, North-east, West-central, and South regions (National Portal of India, 2016).

Table 2.1. Selected configuration of main regions in India

Region	States and Union Territories (UTs)
North	Delhi (UT), Chandigarh (UT), Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Uttarakhand, Uttar Pradesh
East	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura
North-east	Bihar, Jharkhand, Odisha, West Bengal
West-central	Chhattisgarh, Goa, Gujarat, Dadra and Nagar Haveli (UT), Daman and Diu (UT), Madhya Pradesh, Maharashtra, Rajasthan
South	Andaman and Nicobar Islands (UT), Andhra Pradesh, Karnataka, Kerala, Lakshadweep (UT), Puducherry (UT), Tamil Nadu, Telengana

Note: This regional configuration has been selected for the purpose of the current study.
Source: Own tabulation based on National Portal of India (2016).

Box 2.1. Overview of the political and administrative system

India is a federal parliamentary democratic republic in which the President is the head of state and the Prime Minister is the head of government. There is a bicameral legislature consisting of an Upper House (*Rajya Sabha*), which represents the states, and a Lower House (*Lok Sabha*), which represents the people of India as a whole. The administrative structure is divided between the union government in Delhi (also called central government) and state governments, with significant autonomy granted to states. State executive branches are headed by governors appointed by the central government.

Indian states were organised during the post-independence period, based on linguistic and ethnic considerations. Several regions were considered unique in these respects – together with the size of population and area, administrative importance, and strategic location – and therefore could not fit within the states category or merged with them; these were thus designated as "Union Territories". Unlike states, which have their own elected governments, UTs are ruled directly by the union government (hence the name "Union Territory"). In general, the President appoints an administrator or lieutenant-governor for each UT. The current 7 UTs represent less than 2% of India's surface. The states and UTs are further subdivided into districts, followed by smaller administrative divisions. The Constitution provides for an independent judiciary which is headed by the Supreme Court.

The Constitution defines the organisation, powers and limitations of both central and state governments. It also provides a classification of their areas of responsibility, grouped under three broad dimensions: the Union List, the State List, and the Concurrent List which includes the topics that are subject to joint governance. The constitutionally assigned responsibilities of the central government are those related to monetary and financial policies, international trade, and those having implications for more than one state due to economies of scale or spillovers (including defence, communications, atomic energy, oil and mining, inter-state trade). The major subjects assigned to states comprise public order, public health, agriculture, irrigation, land tenure, fisheries, and industries. The Concurrent list includes areas such as education, transportation, or social security.

Source: National Portal of India (2016).

Macroeconomic performance: an economy of many parts

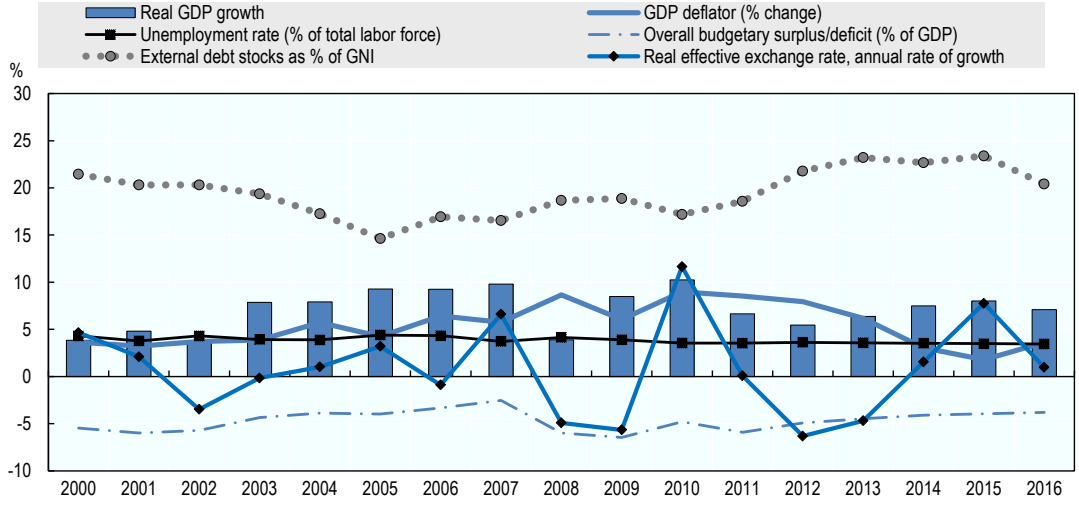
The economic reforms initiated in the 1980s and accelerated in the early 1990s – under the pressure of a balance of payments crisis largely driven by fiscal expansion – were a stepping stone in achieving a rapid rate of economic growth. Key components of the reforms included: liberalising measures (significant tariff reductions, elimination of all quantitative restrictions starting with non-consumer goods, relaxation of foreign direct investment policy); abolition of industrial licensing; exchange rate policy and introduction of current account convertibility; as well as fiscal consolidation which led to greater efficiency in resources allocation (Panagariya, 2004; OECD, 2014).

During the liberalisation period of the 1990s, fewer direct interventions were made in the agricultural sector. Import licensing was liberalised on sugar and cotton and state trading monopoly given up on edible oils. The reduction of protection to industry, and the accompanying depreciation in the exchange rate, tilted relative prices in agriculture's

favour and supported agricultural exports. Spillover effects of liberalisation were also expressed through changes in the demand side of agricultural markets. Diversification of diets resulting from urbanisation, rise in per capita incomes, and increased female participation in the workforce enhanced demand for higher value and processed agricultural products, stimulating the emergence of organised retail in India. The liberalisation process was continued in the 2000s and quantitative restrictions on imports were eliminated on all goods, except where necessary to protect human, animal or plant life or health. Peak tariffs were reduced on non-agricultural products, albeit with a few exceptions (Singh, 2011).

India's GDP per capita more than doubled over the last two decades and the economy is currently the tenth largest in the world by nominal GDP. Having recorded GDP growth of less than 5% prior to 2003, the Indian economy registered since 2013 four consecutive years of growth above 6% and recently became one of the fastest-growing G20 economies (Figure 2.1) (Government of India, 2016; OECD, 2014, 2017a; IMF WEO, 2018; WB WDI, 2018).

Figure 2.1. India: Selected macroeconomic indicators, 2000-16



Source: World Bank (2018), *World Development Indicators*; IMF (2018), *World Economic Outlook Database*; Bank for International Settlements (2018).

The rapid growth in the economy in 2003-07 enabled a sharp fall in its overall budgetary deficit, from 4.3% of GDP in 2003 to 2.5% in 2007. However, relatively little was done during this time to widen the tax base and thus the country's fiscal capacity remains limited. India currently has one of the narrowest tax bases in the G20 and among BRIICS[2] economies, with total tax revenues amounting in 2015 to about 17% of its GDP. As exemption thresholds for income taxes have been consistently raised, an estimated 5.5% of people in the working age group currently pay taxes, with the individual income tax representing 2.1% of GDP. The cyclical nature of the improvement in the budget over these years was exposed by the speed of fiscal deterioration in 2008 as the economy slowed in the aftermath of the global economic crisis. The pace of fiscal consolidation has proven slow and the wide fiscal deficit thus remains a key macroeconomic challenge, resulting in limited policy space to adopt countercyclical policies (Government of India, 2016; OECD, 2014, 2017a; IMF WEO, 2018; WB WDI, 2018).

Fiscal federalism has been evolving in India along three broad directions in recent years: first toward greater transparency, second toward rationalisation and simplification of transfers, and finally a relative shift towards untied transfers. India's system of fiscal transfers includes devolution of taxes from the central divisible pool as well as a number of grants. The implementation in 2014-16 of the 14th Finance Commission's (FFC) recommendations has marked a shift in the fiscal architecture by enhancing the fiscal autonomy of states. The FFC has radically boosted the share of the states in the central divisible tax pool from 32% to 42%, which resulted in a substantial increase of untied transfers from centre to states[3]. However, to ensure that its fiscal space is secured, the central government sought a commensurate reduction in tied Central Assistance to States (CAS) – known as "plan transfers" – and in the number of Centrally Sponsored Schemes (CSS) financed by CAS (Kotia and Chowdhury, 2016; World Bank, 2016).

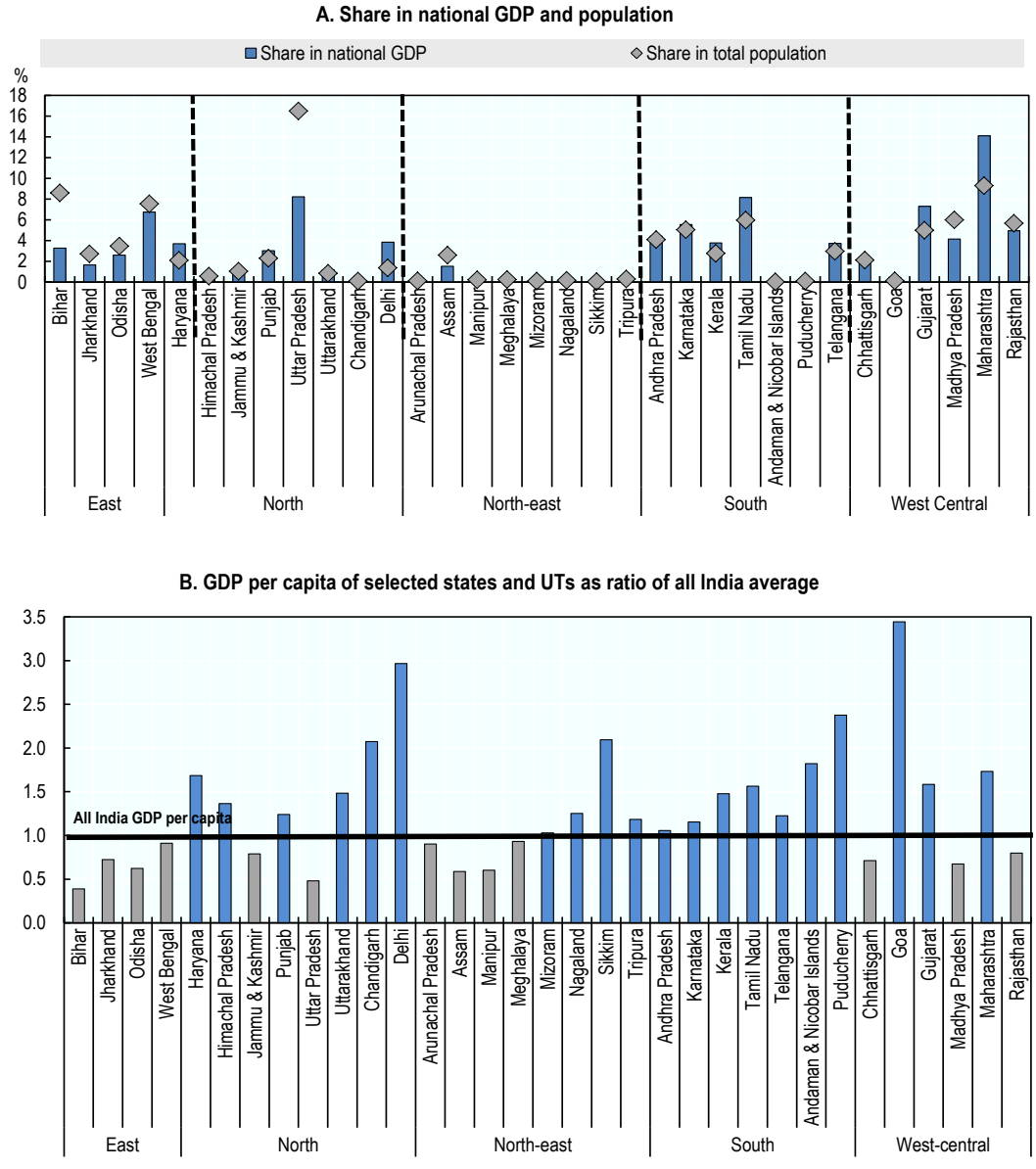
Unemployment is currently at 3.6%[4] (Figure 2.1). However, this low number hides significant degrees of informal employment – which is as high as 87% of total employment – and under-employment[5]. The resulting strong segmentation of the labour market, with many workers left outside the reach of social protection schemes and labour market regulations, is an important source of income inequality. Moreover, the rate of employment creation has been too low to prevent a decline in the employment to working-age population ratio, partly because of low female participation. The central government has recently taken steps to make labour regulations friendlier to job creation by reducing several burdensome administrative requirements and strengthening transparency (OECD, 2017a). In this sense, as part of labour laws reforms, the Code on Wages Bill 2017 was introduced in the *Lok Sabha* in August 2017, seeking to streamline four existing Laws, namely: the Minimum Wages Act, 1948; the Payment of Wages Act, 1936; the Payment of Bonus Act, 1965; and the Equal Remuneration Act, 1976. The Codification of the Labour Laws aims to remove the multiplicity of definitions and authorities and lead to ease of compliance without compromising wage and social security (Ministry of Labour and Employment, 2017).

Inflation was high in 2007-13, ranging between 5% and 10%. It has since then dropped to 4% in 2016 and is expected to average 4.2% in 2017-21, in part due to relatively low global commodity prices. Food inflation has a significant impact on cumulative inflation in India, as food and beverage products account for 46% in the consumer price index. Indeed, with annual food inflation exceeding non-food inflation by about 3.5 percentage points on average since the 2007-08 global crisis, its direct contribution to annual cumulative inflation was of around 1.75 percentage points (Anand et al., 2016; IMF, 2015; OECD, 2014, 2017a; Ministry of Labour and Employment, 2016; EIU, 2017).

India applies a floating exchange rate regime, allowing the Indian Rupee (INR) value against other currencies to adjust to changing market conditions. In nominal terms, the INR depreciated from INR 46 per USD in 2010 to INR 67 per USD in 2016; its real value has however been steadily appreciating due to the persistent inflation differential between India and its main trading partners (Figure 2.1). This means that Indian produced goods are becoming more expensive relative to its competitors. Therefore, further appreciation of the real effective exchange rate may affect the competitiveness of the economy, including the agricultural sector (World Bank, 2016).

India's demographic and economic configuration is very heterogeneous, with large regional disparities across states and UTs. Southern and western states are the country's economic powerhouse, while the large majority of northern and eastern states lag behind (with the notable exception of the national capital region, UT of Chandigarh, Haryana, Himachal Pradesh, Sikkim, Uttarakhand, and Punjab). In 2014, the GDP per capita in the poorest state, Bihar, was just 15% of the level of UT of Delhi, one of the richest territories (Figure 2.2) (OGD Platform India, 2017; NITI Aayog, 2017a).

Figure 2.2. Economic configuration of selected states and UTs, 2014-15

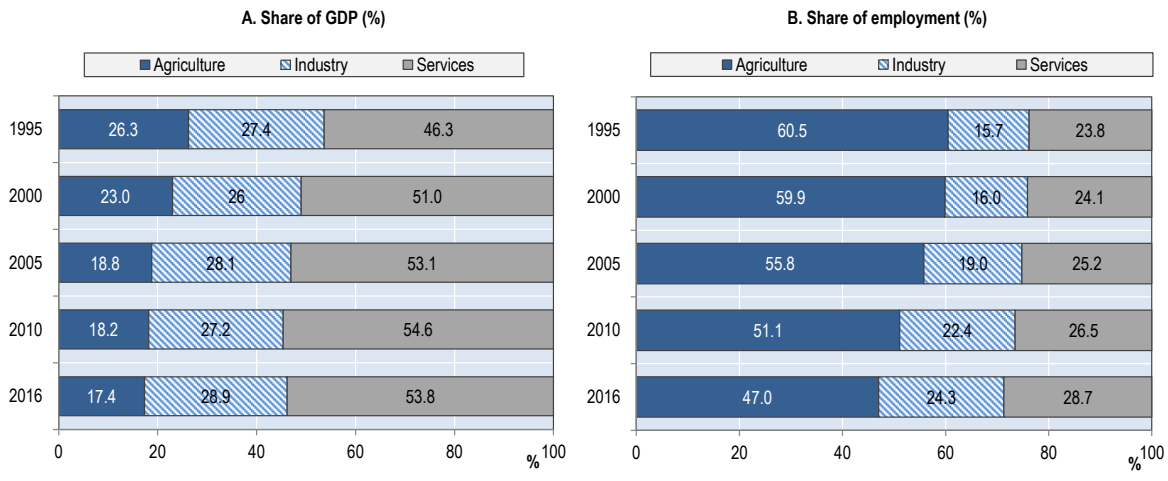


Source: OGD Platform India (2017); NITI Aayog (2017a).

Changing structure of the economy

The contribution of the agricultural sector to GDP has continued to decline over the last two decades, while that of other sectors – particularly services – has been increasing (Figure 2.3). This pushed down agriculture's share in GDP from 26.3% in 1995 to about 17.4% in 2016[6]. Agriculture remains nevertheless a major source of employment, accounting for about 47% of the total national workforce[7] (Ministry of Labour and Employment, 2016; MAFW, 2017a; OGD Platform India, 2018; World Bank WDI, 2018).

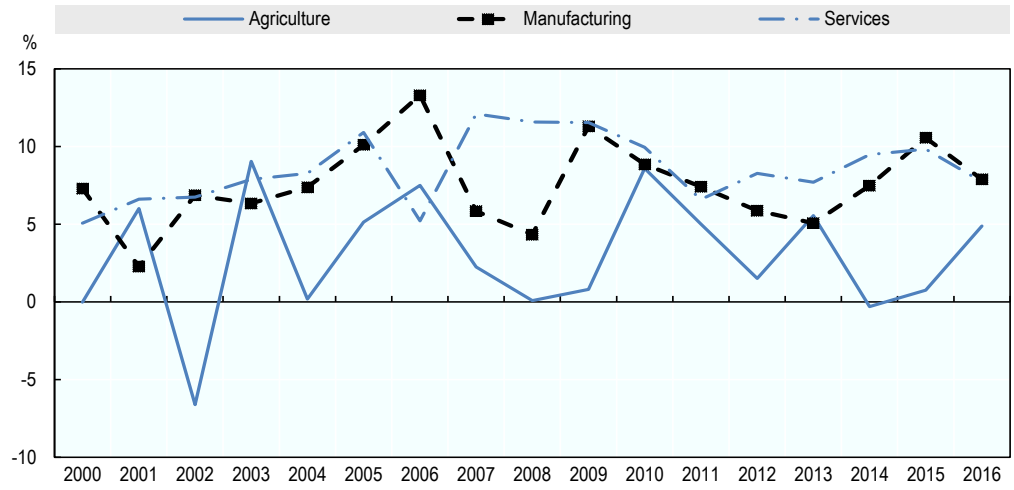
Figure 2.3. Economy structure, 1995-2016



Note: For time comparison purposes, available data on agriculture value added includes the primary sector, forestry, hunting, and fishing.
Source: Ministry of Labour and Employment (2016); Ministry of Agriculture and Farmers' Welfare (MAFW) (2017a); OGD Platform India (2018); World Bank WDI (2018).

Production has been shifting away from agriculture, but mostly into services rather than manufacturing. Services led economic growth over the last 15 years and played a more important role in India's economic development than in most other major emerging economies (Figure 2.4). Despite the important product market reforms in the early 1990s (as discussed above) the share of manufacturing in GDP has remained stagnant and low in the past decades (13% of GDP in 2014-16), unlike in other Asian economies such as Indonesia (23.7%) or China (31.8%). Productivity of the manufacturing sector is also low: measured in value added in PPP per hour worked, manufacturing productivity in China and Indonesia is approximately 2.9 and 5.2 times higher than in India (OECD, 2014; World Bank WDI, 2018).

Figure 2.4. Annual percentage growth by sector value added, 2000-16

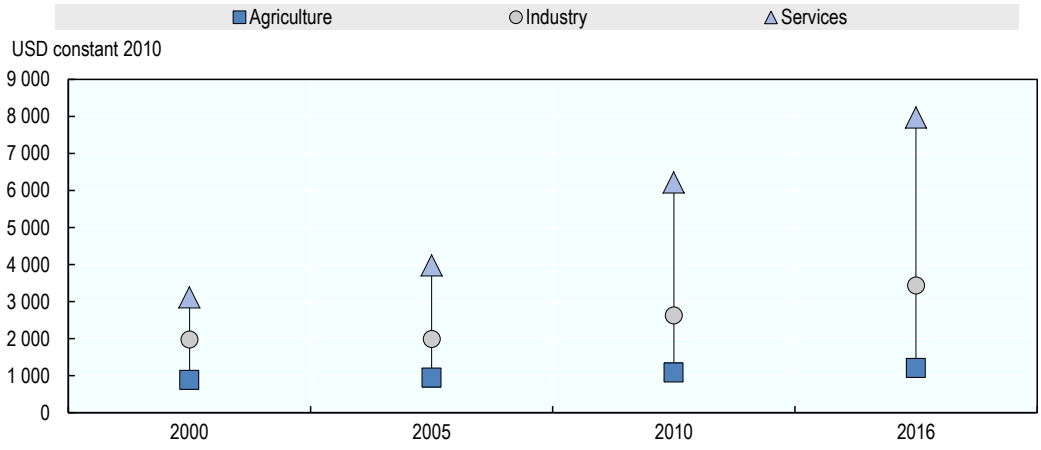


Source: OGD Platform India (2017); WB WDI (2018).

Variations in worker productivity and wage rates have been an important factor influencing labour movements across the different sectors of the economy. Productivity per worker is almost four times higher in services and two times higher in manufacturing than in agriculture (Figure 2.5). While this has prompted rural labour to move away from agriculture, the transition is progressing at a very slow pace. This largely reflects the poor technical skills and education status of the rural workforce, as well as a limited capacity of the non-farm sector to ensure sufficient employment opportunities to incoming workers (OECD, 2017a).

Figure 2.5. Labour productivity by sector, 2000-16

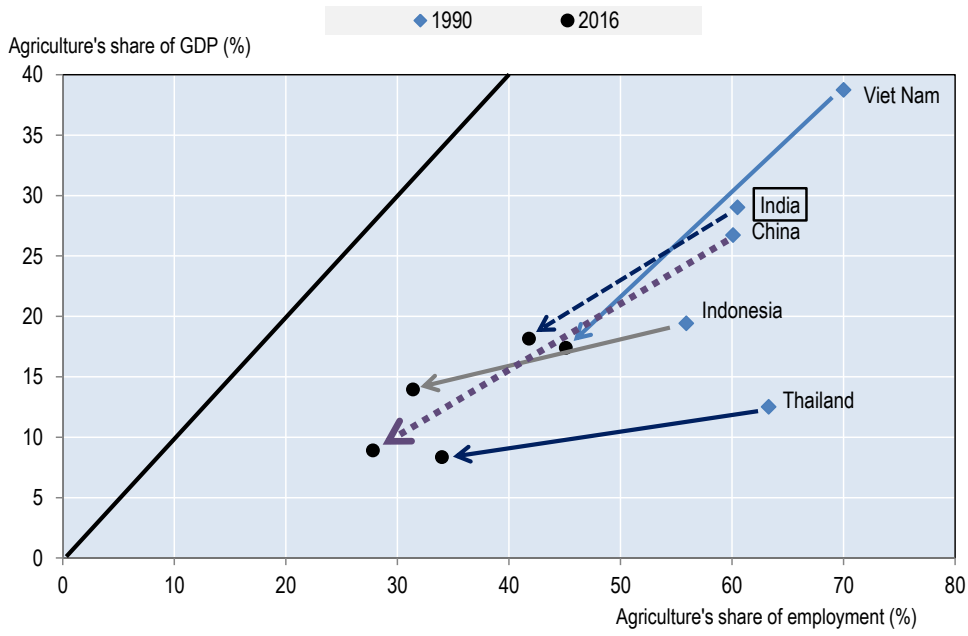
Value added per worker (USD constant 2010)



Source: World Bank WDI (2018).

The structural transformation in India has thus been atypical, with the fast growth of the services sector not preceded by any remarkable growth of manufacturing and no notable transformation in the occupational structure of the economy accompanying the relative growth of the different sub-sectors. The transformation has also been less prominent in 1990-2014 than in other Asian economies such as China or Viet Nam (Figure 2.6) (Rada and von Arnim, 2012; World Bank WDI, 2018).

Figure 2.6. Evolution of agriculture's share in GDP and in employment in selected Asian countries, 1990-2016

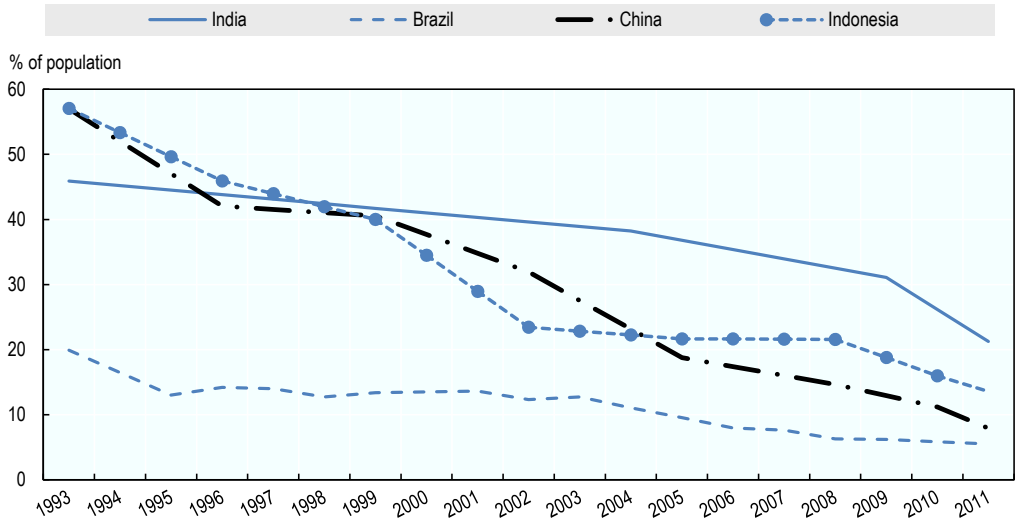


Note: For time and cross-country comparison purposes, available data on agriculture value added includes the primary sector, forestry, hunting, and fishing.
Source: World Bank WDI (2018).

Demographic and socio-economic aspects

Economic growth helped diminish the poverty incidence from 45.9% in 1993 to 21.2% in 2011, as measured by the World Bank definition of absolute poverty of USD 1.90 at PPP/day/person (Figure 2.7). If a broader definition of poverty is applied – USD 3.10 at PPP/person/day – poverty rates declined from 79.6% in 1993 to 58% in 2011. These rates show that even if progress in poverty reduction has been significant, one-fourth of the total population, currently just above the absolute poverty line, remains vulnerable to falling back into absolute poverty. As in most developing countries, poverty incidence is much higher in rural than in urban areas: at the national poverty threshold[8], the rural poverty rate of 26% in 2011-12 was almost twice the rate in urban areas, despite a faster decline since the mid-2000s (OECD, 2017a).

Figure 2.7. Poverty headcount ratio at USD 1.90/day (2011 PPP), 1993-2011

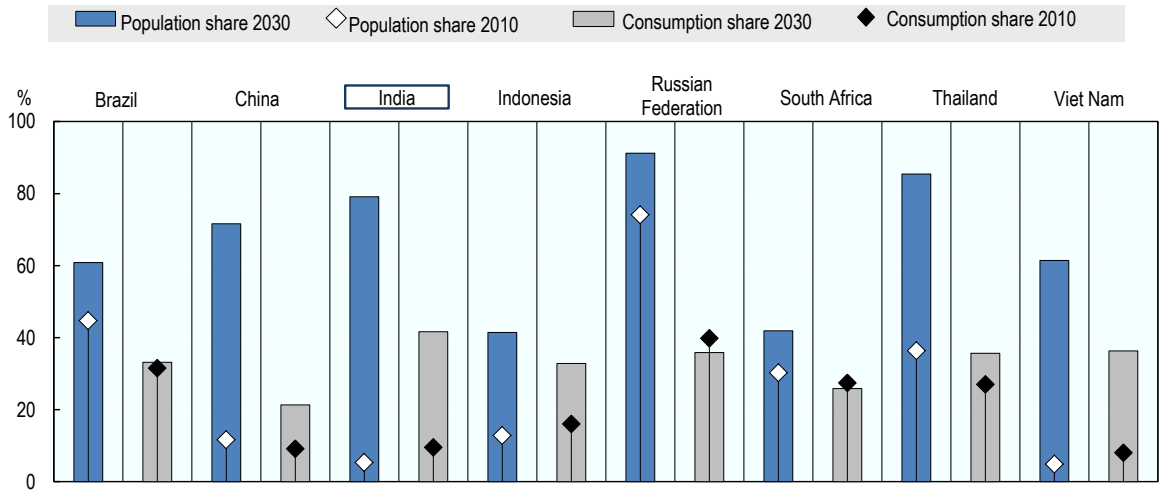


Note: For the years data are not available, population was estimated by linear interpolation and extrapolation.
Source: OECD (2017a) based on World Bank WDI.

Moreover, the rapid economic growth has not been sufficiently inclusive: income inequality is high, spatial inequalities are large, and regional development remains unbalanced. Income inequality has been rising: according to the Gini index of regional GDP per capita,[9] India's regional disparities are large compared with the OECD average (0.28 versus 0.16 in 2013), as is the case in many other emerging economies. Although the regional Gini index for India is broadly at par with China, the share of the population living in low-income regions in India is much higher. Not only are regional disparities pronounced, they have also increased since the 1990s: states with a low GDP in 2000 have tended to grow less rapidly than those with a higher GDP per capita (OECD, 2017a).

The share of the middle class population has been rising rapidly, supported by the strong economic growth. A wide range of factors can be used to identify "middle class" – including income, socio-economic status, aspirations, material deprivation or multidimensional approaches, with different definitions yielding different sizes, income shares, or characteristics of the middle class population. For instance, according to Brookings Institution estimates available for more than 130 economies[10], if India continues on its growth path, its middle class could reach more than two thirds of the population towards the end of the following decade (Figure 2.8). With the average household income set to triple by 2025 compared to its current level, India would also consolidate its position among the largest consumer economies (Brookings Institution, 2015).

Figure 2.8. Middle class population and consumption in key emerging economies, 2010-30



Note: Middle class population and consumption as a share of total population and GDP in each of the selected countries. Middle class variables estimate and provide forecasts of the number of people living in households earning or spending between USD 10 and USD 100 per person per day (USD 2005 PPP), and the consumption expenditure of this group. There is no standard definition of India's middle class. India's National Council of Applied Economic Research (NCAER) defines the middle class as households with a disposable income of 200 000 to 1 000 000 rupees (USD 4 380 to USD 21 890) a year in real 2000 terms.
Source: Brookings Institution (2015), *Development, Aid and Governance Indicators* (DAGI).

The level of urbanisation increased from 27.8% in 2001 to 31.1% in 2011. In the early 2010s, the fastest growing states tended to be those with a large urban population and at present, the richest states are also the most urbanised. While the overall share of urban population remains low compared to countries at a similar level of development, demographic change will be an important factor driving the Indian economy in the long run. India's population is projected to continue growing for several decades to 1.4 billion in 2022 and 1.7 billion in 2030, thus exceeding China's population. Moreover, in 2020, the estimated average age of India's population at around 29 years is expected to be among the lowest in the world. The percentage of the population living in urban areas is also estimated to reach 41% by 2030, putting pressure on the already heavily burdened urban infrastructure. Rural-urban linkages have been less dynamic than in other economies in the region, such as China or Indonesia, both in terms of temporary and permanent migration (Box 2.2) (Denis and Zérah, 2014; UN, 2015).

Access to core public services is highly unequal and spatially concentrated. Public services are essential for improving working conditions and economic opportunities for the rural population, including farm workers. India's population coverage for water provision, sanitation and electricity has improved but remains low compared to other major emerging economies. While almost 20% of the Indian population has no access to electricity, some states have nonetheless succeeded in achieving near universal provision, including Gujarat, Karnataka and Maharashtra. Despite government efforts aimed at improving public services in rural areas, such as the National Health Mission or the *Pradhan Mantri Sahaj Bijli Har Ghar Yojana-Saubhagya* ("Easy access to power for every house") scheme, deficiency in core public services remains much higher in rural than urban areas, with a particularly marked rural/urban divide for electricity, sanitation and drinking water (OPHI, 2015; OECD, 2017a).

Box 2.2. Rural-urban linkages

Labour migration flows in India include permanent, semi-permanent, and seasonal migrants. Net rural to urban migration is estimated to have accounted for 21% of urban population growth in 1991-2001 and for 22% in 2001-11. Residential migrations within the rural environment continue to be by far the most important flow. Internal migrants have been mostly moving over short distances, within their own district (62.6% in late 2000s), then between districts of the same state (24.1%), and only 13.3% attempted long distance migration to another state. Inter-state labour mobility averaged 5-6 million people per year between 2001 and 2011, yielding an inter-state migrant population of about 60 million.

Small towns and peri-urban areas[1] have become the key intermediary point in the convergence of rural population to urban areas. Most rural workers migrate from rural to urban only for temporary periods, particularly in lean periods of agricultural-related work. The rural-urban linkages are characterised by a growing role of small towns in services provision, such as education, health or financial services. A total of 32 million individuals, accounting for 4.3% of India's rural population, live in households where one or more workers commute from rural to urban areas. Scheduled tribes (STs) and scheduled castes (SCs)[2] – population groups explicitly protected in India's Constitution due to their historical socio-economic background – are over-represented in short-term migration flows.

1. There are two different sets of criteria to define an urban locality: Statutory Towns (ST) and Census Towns (CT). STs generally include government-designated municipalities. CTs comprise all settlements that fulfil the following three conditions: (i) the population must be 5 000 or more, (ii) the density must be at least of 400 persons per km^2, and (iii) 75% of the male workforce should be employed outside the agricultural sector. The population of all settlements which are not classified as urban is included in the total rural population.
2. The caste system is a system of social stratification in India. Hindu society is stratified into four hierarchical classes or varnas (the Brahmins, Kshatriyas, Vaishyas, and Shudras), with a large sub-population of untouchables excluded from this system entirely (Dalits). Within each of these classes, and among the untouchables, are thousands of castes or jatis. The term "Scheduled Tribes" refers to specific indigenous peoples whose status is acknowledged to some formal degree by national legislation, and are also considered as socially disadvantaged. "Scheduled Caste" is the official name given to the lowest caste, considered 'untouchable' in orthodox Hindu scriptures and practice, and officially regarded as socially disadvantaged. SCs and STs comprise about 16.6% and 8.6%, respectively, of India's population.
Source: Denis and Zérah (2014); Government of India (GoI) (2017a).

Competitiveness and structural challenges

Economic growth is projected to remain robust, at around 7.3% a year in 2016-21. These projections are supported by increased political certainty; several market-oriented reforms initiated by the government elected in 2014; improved business confidence; lower commodity import prices; sustained private consumption; and services sectors growth (EIU, 2017; IMF, 2015; OECD, 2014, 2017a).

More recently, important steps have been taken to make India a less fragmented domestic market. For instance, the Government of India introduced the Goods and Services Tax (GST), which came into force on 1 July 2017. The GST replaces various taxes on goods and services levied previously by the central government and states[11] by a single tax on value added. This has the potential to reduce tax cascading, facilitate a common

national market, encourage voluntary tax compliance, reduce tax collection costs, support investment, and improve competitiveness. The GST, unlike the previous system, will allow the supplier at each stage to set-off the taxes paid at preceding levels in the supply chain and ease inter-state movement of goods. Nonetheless, challenges remain in terms of its implementation stemming from the different tax rates applied across product categories, exclusion of certain products, and other administrative complexities related to registration and payment (Government of India, 2017a; OECD, 2017a). Moreover, inter-state regulatory requirements can still involve detailed documentation such as permits, waybills, tax invoices, and delivery notes which lead to delays and increases in the transaction cost. These not only create barriers to inter-state trade but also inefficiencies in supply chains (IMF, 2015).

India's trade openness, measured as the ratio of traded goods and services to GDP, has increased from 15% in 1990 to 40% in 2016. The latter is close to the ratio in other economies with large domestic markets such as China (37%) or Indonesia (37%). With a share of 37%, services constitute the bulk of exports. In turn, agro-food products represent 13% of exports and 7% of imports. Export growth has been decelerating from 7.8% in 2013 to 4.5% in 2016 as India's dynamic services export sector was also hit by the appreciation in the real effective exchange rate (IMF, 2015; World Bank WDI, 2018).

The country has also experienced a significant acceleration of its integration into global value chains (GVCs) over the last two decades with the foreign content of its exports more than doubling from less than 10% in 1995 to nearly 21% in 2014, which now puts it at the second highest rate among BRIICS economies after China. The increased participation in GVCs was led by services: 59.4% of the total value of India's exports reflects services content in 2014. Middle East and North Africa (MENA) economies constitute the main export market destination of India's products (30%), followed by Asia-Pacific (27%). India's main supplier of intermediate and final goods remains the Asia-Pacific region (38%), followed by MENA (29%) (IMF, 2015; World Bank WDI, 2018; CEPII, 2018; OECD-WTO TiVA, 2017).

Overall, India's competitiveness is ranked 40th out of 137 countries classified by the World Economic Forum in 2017-18, consolidating its position after advancing 16 places in 2016-17. It also compares rather favourably with other countries classified as factor-driven economies[12], but rather poorly when compared with other key emerging Asian economies such as China, Malaysia, and Thailand. While the large market size constitutes an advantage, and important progress has been made in terms of fostering innovation, goods market efficiency, and business sophistication, there are remaining challenges as regards the low labour market efficiency, cumbersome regulatory procedures, low quality of infrastructure, low technological readiness, barriers to FDI, and underperforming higher education and training (Box 2.3) (OECD, 2017a; WEF, 2018).

Box 2.3. Key structural challenges for the Indian economy

Labour market efficiency: Although direct labour costs are relatively low, labour regulations are complex and stringent, for the manufacturing sector in particular. Employment protection legislation (EPL) is particularly restrictive compared to both OECD countries and other emerging economies. There is also uncertainty regarding enforcement since many labour laws are old and responsibilities are often shared across state jurisdictions. Implementation of recent reforms aiming to make labour regulations friendlier to job creation can be heterogeneous at the state level. This partly explains the significant degree of informality and the low formal job creation, as well as the low quality of jobs.

Cumbersome regulatory procedures, including in the services sector: The OECD Product Market Regulation (PMR) indicators show that in 2013 India scored poorly in terms of barriers to entrepreneurship and investment. These scores reflect the complex regulations and burdensome administrative procedures for firms, which impede growth, keep prices high and create opportunities for corruption. There have been initiatives to simplify and improve government administration across various states and UTs, including through ICT tools, to increase transparency. However, such efforts encounter many implementation challenges at local levels. India also tends to have more restrictive regulation than most other countries covered by the OECD Services Trade Restrictiveness Indices (STRI): the general regulatory framework imposes a number of burdensome administrative procedures and time consuming licensing and permit requirements. The particularly restrictive sectors are among the ones potentially supporting the *Make in India initiative*, namely communications services, professional services, financial services and distribution.

Low quality of infrastructure and low technological readiness: This concerns roads, ports and airports, as well as electric power transmission and distribution. India ranks 66st out of 137 economies covered by the WEF Global Competitiveness Report as regards the quality of infrastructure and 100th with respect to the electricity and telephony infrastructure. Land acquisition laws induce significant delays in the implementation of infrastructure projects. In addition, India remains one of the least digitally connected countries in the world (120th out of 148); only one in five Indians access the Internet on a regular basis.

Barriers to FDI: The OECD FDI Regulatory Restrictiveness Index 2016 series – measuring statutory restrictions on FDI in 62 economies – reveals that while India is considerably more open to FDI than China, barriers to FDI are much higher than in most OECD economies. FDI inflows remain low as a share of investment, depriving India of a valuable source of financing and technology transfer.

Underperforming higher education and training: Adult literacy, as well as secondary and tertiary enrolment rates place India behind all major emerging economies. Even people with higher education or vocational training (VET) are often ill-equipped and require significant on-the-job training.

Source: Benz, Khanna and Nordås (2017); IMF (2015); OECD (2014, 2015a, 2015b, 2017a, 2017b); WEF (2018).

While India's economic growth remains strong, the supply-side bottlenecks and structural challenges discussed above will constrain medium to long-term growth, hinder job creation and also weaken the enabling environment for agricultural development (Box 2.4).

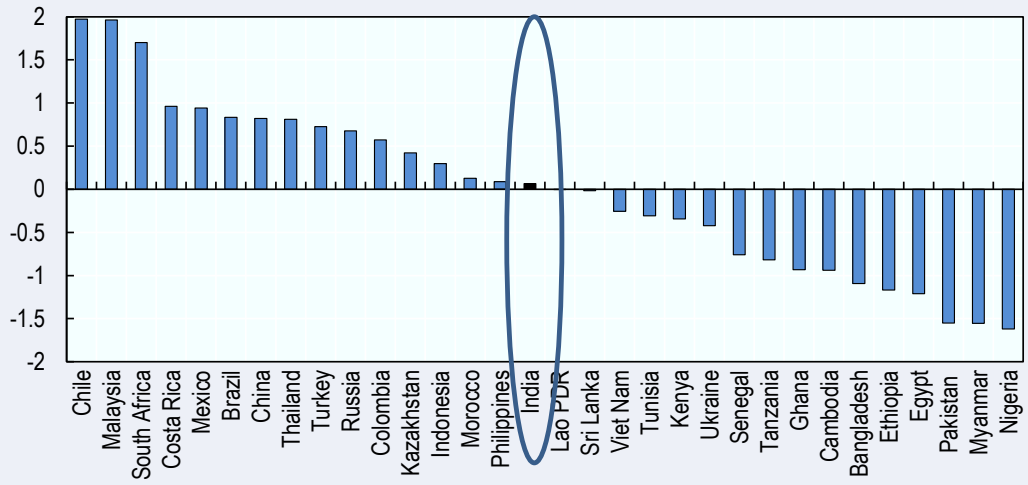
Box 2.4. Agriculture Growth Enabling Index

A country's enabling environment is defined as the multifaceted settings within which the agricultural sector and economy more broadly operates, comprising non-distorting and stable policies, adequate provision of public goods, good governance through laws and regulations that are conducive to private-sector economic activity while addressing market failures, and strong and effective institutions through which government measures and actions are operationalised. Collectively, these factors play an important role in ensuring a favourable environment for innovation at the farm level and by other businesses in agricultural value chains, by shaping incentives for investment and sustainable use of natural resources, and by building economic capacities.

To assess agriculture's enabling environment in a given country and to compare it with other countries, the OECD in co-operation with IFPRI constructed a preliminary Agricultural Growth Enabling Index (AGEI). The Index has been further developed by the OECD Secretariat to include sustainability components and to cover a wider range of countries. The Index assemblies a wide array of information to provide cross-country comparisons or single-country evaluations. The AGEI assembles existing indicators and indices for measuring the determinants of agricultural growth and competitiveness. It has been applied to 32 developing and emerging economies, including India. Relative scores on the AGEI overall are shown in Figure 2.9. The overall AGEI score for India is slightly above average, ranking 16 out of 32 countries covered in 2015.

Further decomposition can be made both across and within the four key blocks of the AGEI (governance quality, investments in and availability of capital, effectiveness of market operations, and agriculture/sustainability). India performs relatively well on governance and markets, but below average on capital and agriculture/sustainability. Within governance, India performs well on political stability, but somewhat poorer on institutions and macro stabilisation. For capital, India performs slightly above average on human capital, as captured by health/education indicators, but much poorer on infrastructure. For markets, India scores above average on financial markets and trade facilitation, but poorly on goods and labour markets. For agriculture/sustainability, India scores particularly low on various sub-components, including: capital intensification, measured by the capital stock per person employed in agriculture, land market rights and access, land availability per person employed in agriculture, pressure on water, as well as on agricultural R&D; on the other hand, it appears to score above average with respect to farm finance.

Figure 2.9. Agricultural Growth Enabling Index, 2015



Note: The index is comprised of four blocks with 40% of the weight on agriculture/sustainability factors and 20% each on broader economy-wide governance, capital and market operation. The indicators selected measure circumstances within each country in the early 2010s. To account for the differences in averages of scores of the 32 countries and the variances of these scores across the index and its blocks, this figure shows the normalised score of each country on the AGEI index and on each component. Specifically, for the AGEI and each of its four blocks the average for the 32 countries has been subtracted from each country value and the resulting country value divided by the standard deviation for the series, to create series with zero mean and unit standard error. For example, a value of 2 means that the observation for a given country is 2 standard deviations above the average (which is zero) for the 32 countries.
Source: OECD estimates.

2.3. Agriculture in the Indian economy

Climatic conditions

India has great geographic diversity and a variety of climate regimes. The agriculture sector spreads over six major climatic subtypes, ranging from arid desert in the west, alpine tundra and glaciers in the north, and humid tropical regions supporting rainforests in the south-west and the island territories. The northern region of the country possesses continental climate with alternating severe summers and cold winters. Peninsular India has a more moderate but arid climate. The coastal regions receive abundant rains and have unvarying warmth. The north-east also receives abundant rainfall but has a more contrasting seasonal temperature (Ministry of Environment, Forest and Climate Change, 2015).

The Indian monsoon with its summer (south-west) and winter (north-east) stages is the dominant climatic influence on the subcontinent. The south-west monsoon is the most important feature of India's climate as nearly 75% of the annual rainfall of the country is received during this season (June-September). The north-east monsoon brings rain mainly to the south-east parts of the country. Variation in the onset, withdrawal and amount of rainfall during the monsoon season affects the water resources, agricultural production, and ecosystems of the country (Ministry of Environment, Forest and Climate Change, 2015).

Trends in agricultural output

The annual average growth in agricultural output[13] has been of approximately 3.6% since 2011 (Figure 2.10). Driven by the technological improvements of the green revolution in the 1960s-70s, the agricultural sector was able to overcome productivity stagnation and the production of cereals increased at a very fast rate until the early 1990s, increasing the net availability of food grains. The green revolution was followed by the white revolution, which completely transformed milk production and marketing in India (Box 2.5) (Gulati, Saini and Jain, 2013; OECD/FAO, 2014; MAFW, 2017a; FAOSTAT, 2018; WB WDI, 2018).

Since 1995, output growth has nevertheless been highly volatile reflecting periods of erratic climatic conditions, particularly as regards monsoons (Figure 2.10). This performance contrasts sharply with that of the agricultural sectors in China or Viet Nam, which has been more dynamic. The sector follows nevertheless similar trends to other countries in the region such as Indonesia, Malaysia and Thailand (Figure 2.11) (Gulati, Saini and Jain, 2013; MAFW, 2017a; FAOSTAT, 2018).

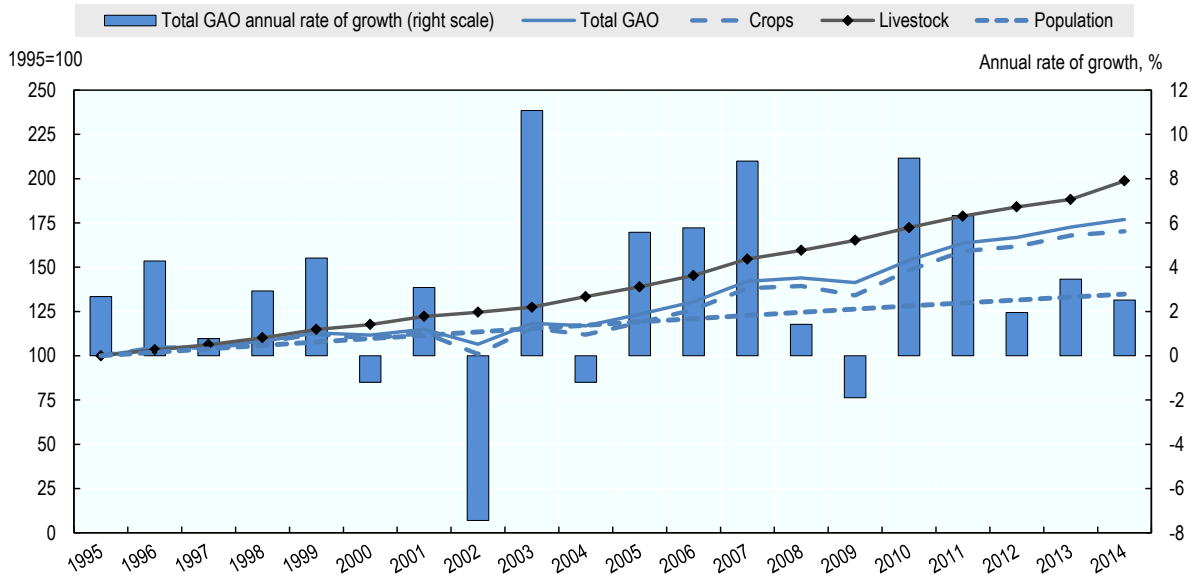
Box 2.5. The green and white revolutions

The 'green revolution' began with the introduction of semi-dwarfed, high-yielding varieties of wheat in 1967 and rice in 1968. Favourable policies in the form of price and procurement support as well as input subsidies encouraged farmers to adopt the new varieties. The Green Revolution spread largely in areas with favourable agro-climatic conditions, i.e. irrigated areas where wheat and paddy were mainly grown. Another notable feature was the adoption of double-cropping. Major irrigation facilities, such as dams, were built while simple irrigation techniques, like the digging of tube wells for extracting groundwater, were also adopted on a massive scale. During the 1990s, there was a shift from investments in capital assets, such as irrigation, power and rural infrastructure, to subsidies on inputs like power, water and fertiliser and to minimum support prices.

In the 1950s and 1960s, India relied heavily on milk imports, while dairy farmers had only a few animals and were struggling to get this highly perishable product to markets in urban centres. Against this background, the Indian government set out to "flood India with milk" and launched Operation Flood in 1970. This aimed to increase milk production, connect milk producers and consumers, and thus raise the income of dairy farmers. Operation Flood addressed three different levels: i) at the farm-level, dairy farmers were organised into co-operatives. Co-operatives were provided with advanced technologies, such as modern animal breeds that produced more milk; ii) at the district level, co-operative unions were formed, which owned and operated milk processing plants as well as storage and transport equipment. The unions also provided animal health services; iii) at the state level, state federations conducted and co-ordinated the nation-wide marketing of milk. Today, India is the largest producer of fresh buffalo and goat milk and the second largest producer after the United States of fresh cow milk.

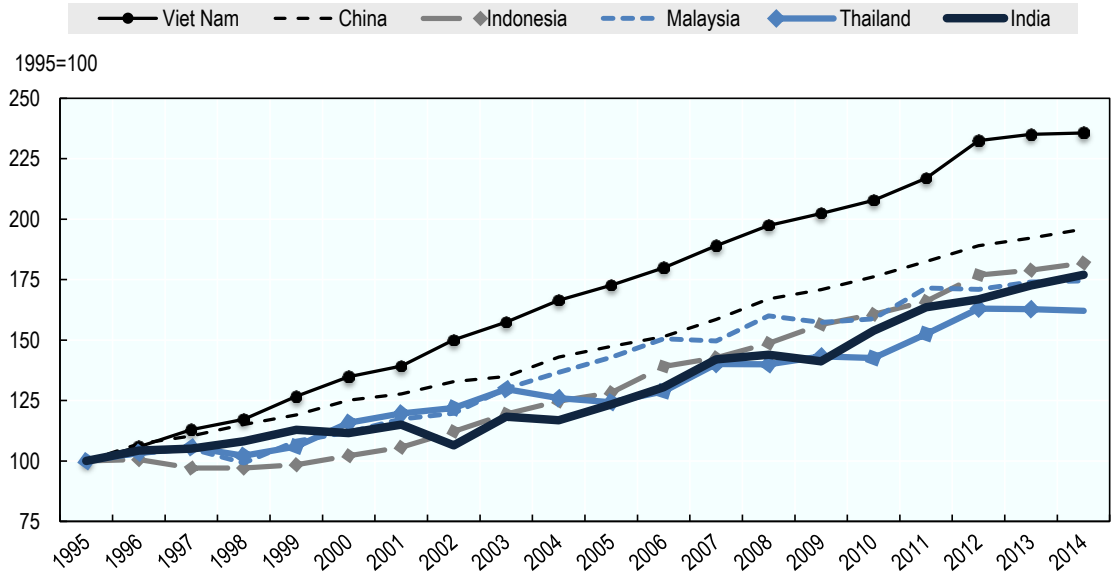
Source: OECD/FAO (2014).

Figure 2.10. Growth in agricultural output in India, 1995-2014



Note: FAO indices based on the 2004-06 period have been recalculated taking 1995 as base year.
Source: MAFW (2017a); FAOSTAT (2018).

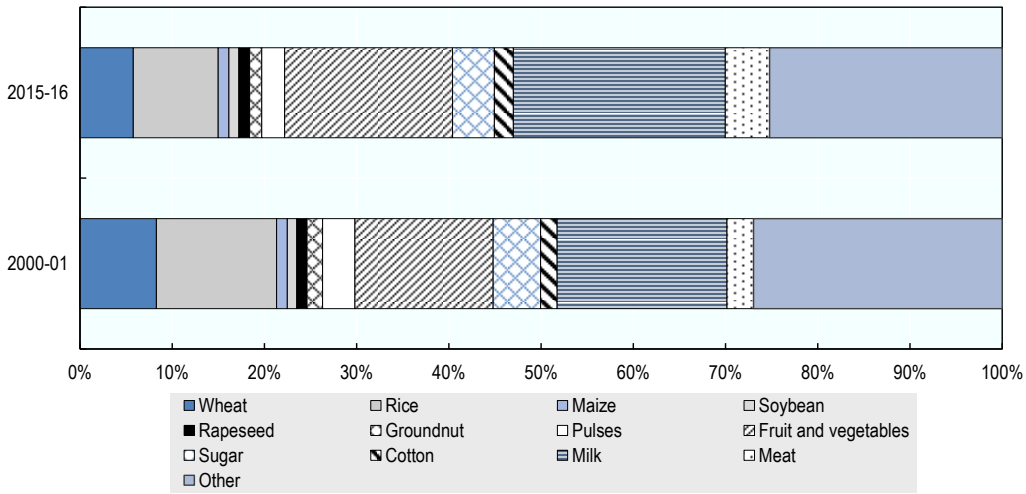
Figure 2.11. Growth in gross agricultural output in selected Asian countries, 1995-2014



Note: The FAO indices of agricultural production show the relative level of the aggregate volume of agricultural production for each year in comparison with the base period 2004-06. They are based on the sum of price-weighted quantities of different agricultural commodities produced after deductions of quantities used as seed and feed weighted in a similar manner. In this figure, indices based on the 2004-06 period have been recalculated taking 1995 as base year.
Source: FAOSTAT (2018).

The differential rates of growth in the two main sub-sectors (Figure 2.10) show that Indian agriculture is continuing to steadily diversify towards livestock and away from grain crops. Livestock output growth has been faster and less volatile compared to the crop sector. While grains and milk remain dominant, there has been a gradual change in the composition of production to other crops – such as sugarcane, cotton, fruit and vegetables – as well as certain meat sub-sectors (Figure 2.12). In contrast to grains, where policy intervention has been extensive on the supply side (Chapter 3), the expansion of high-value crops and livestock was primarily led by growth in consumer demand and changing diet preferences associated with rising incomes, urbanisation, and demographics dynamic (Gulati, 2009; Gulati et al., 2016).

Figure 2.12. Changes in the composition of the value of agricultural production, 2000-16

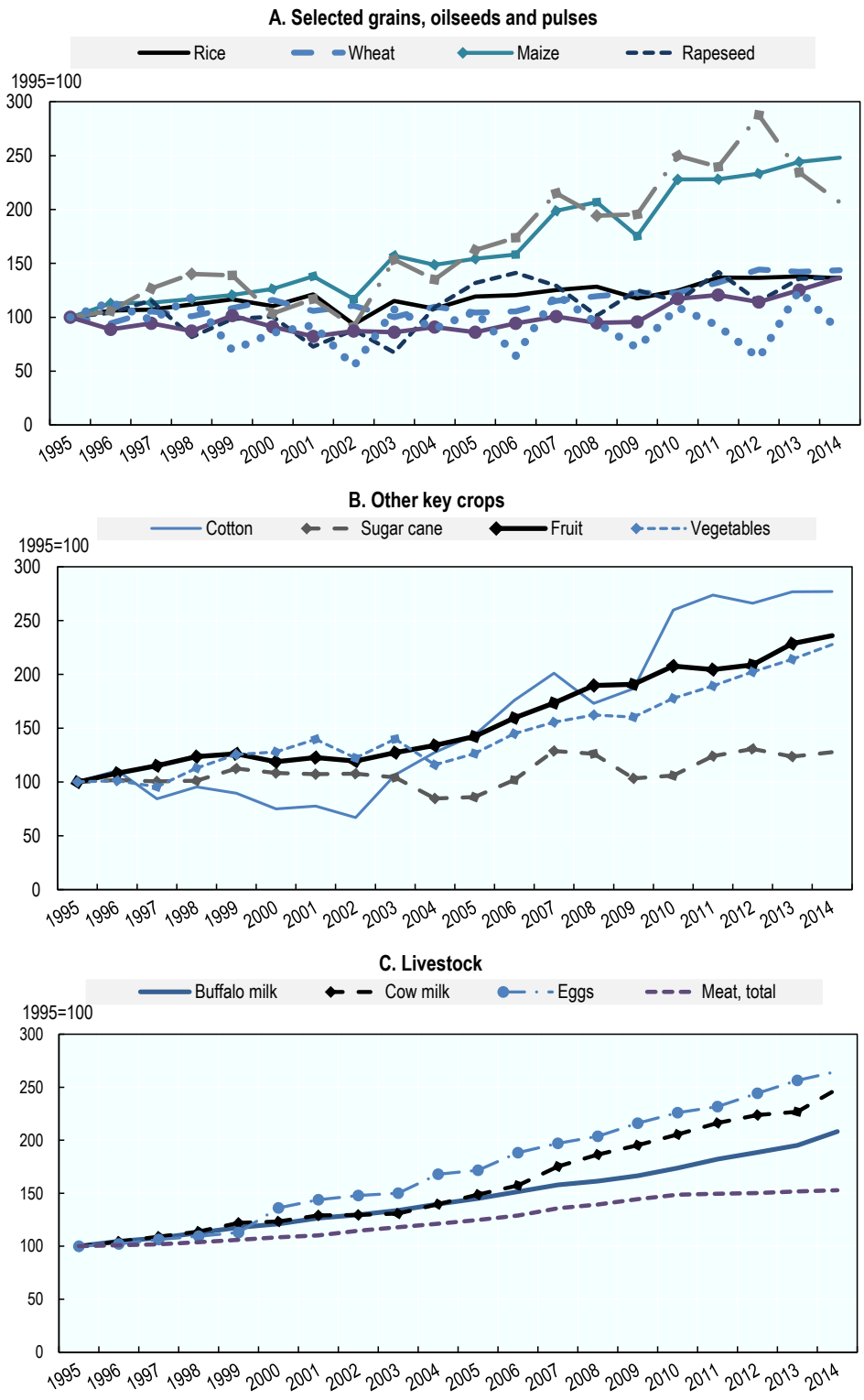


Note: 'Meat' includes here bovine meat, sheep meat, and poultry.
Source: MAFW (2017a); Ministry of Statistics and Programme Implementation (MOSPI) (2016a).

Output trends in cereals and oilseeds

Beyond the green revolution, growth in rice and wheat output slowed, with annual production increasing since 2000 by only 1.9% and 2.5% annually (Figure 2.13). Oilseeds production is dominated by soybeans, accounting in some years for close to half of the total oilseeds produced. Groundnuts and rapeseed make up most of the rest of India's oilseed production. Soybeans production expanded much faster than groundnuts and rapeseed, which experienced significant year-to-year fluctuations. Production of pulses remained stable until mid-2000s, but picked up slowly afterwards, largely in response to focussed efforts in the National Food Security Missions from 2007 and the Accelerated Pulse Production Program launched in 2010-11 (Chapter 3). Chickpeas, a *rabi*[14] crop, constitutes over 40% of the total pulses output. Pulses production remains insufficient to cater to domestic demand, making India a major importer of pulses (MAFW, 2016a, 2017a; MOSPI, 2017; FAOSTAT, 2018).

Figure 2.13. Output trends for key crops and livestock, 1995-2014



Source: FAOSTAT (2018).

Dynamic change in the composition of output: fruit and vegetables…

Among crops, cotton and fruit and vegetables are by far the outstanding performers in terms of output growth over the last two decades. The cotton sector expansion was driven by the 2002 introduction and subsequent rapid adoption of Bt (*Bacillus thuringiensis*) technology, with output almost tripling in 2001-15 (the gene revolution). As a result, India today has the largest area under Bt cotton (greater than that in China).

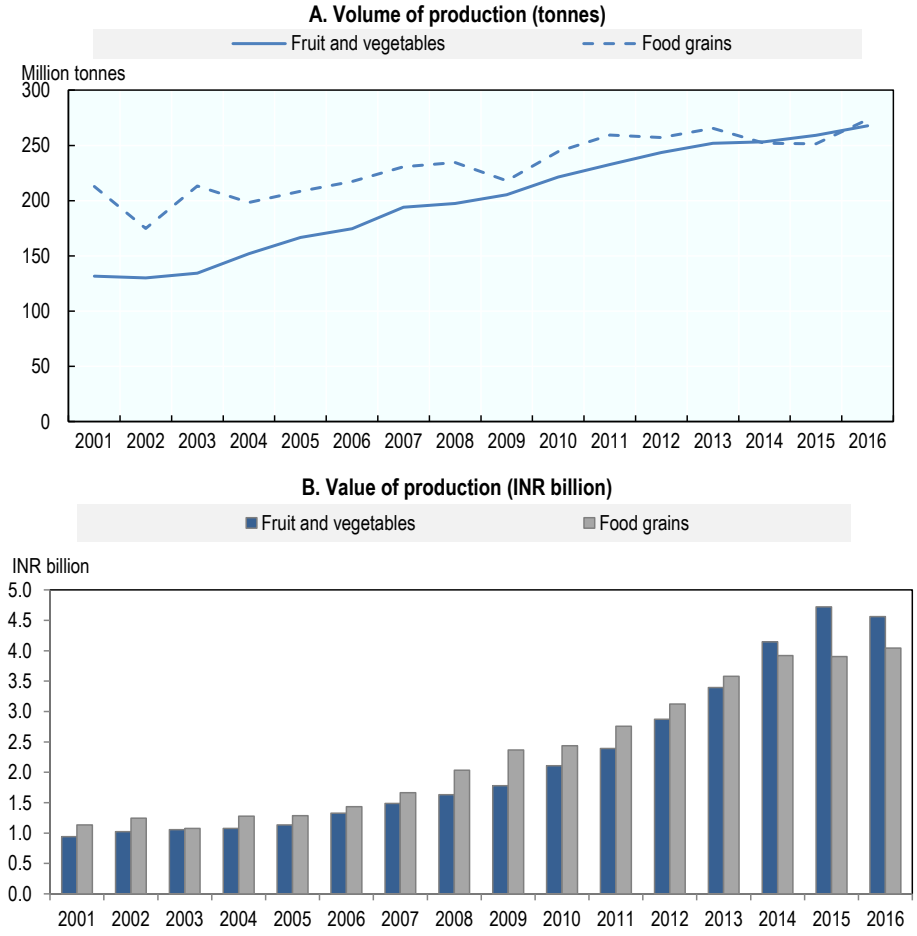
Fruit and vegetables production has also surged, growing at 4.3% per year since 2001 and making India the second largest global producer after China. These are primarily destined for the domestic market and such output growth reflects the evolving pattern in domestic consumer preferences. India is first in the production of fruits such as mango, banana, papaya, or pomegranate. The country is also second to China in the production of many vegetables, including potato, tomato, onion, eggplant, cabbage, or cauliflower. India currently grows 41% of world's mangoes, 23% of bananas, and 10% of onions. With the advantage of diverse agro-climatic zones, some crops can be harvested in shorter durations compared to food grains and have better access to irrigation. Moreover, fruit and vegetables production overtook food grains production in terms of both volume and value in 2014-15 (Figure 2.14) and has been much less volatile than other crops (Figure 2.13) (Gulati, 2009; Gulati et al., 2016; MAFW, 2017a; MOSPI, 2017; FAOSTAT, 2018).

…as well as livestock products

Milk production has almost tripled since 1995, continuing the developments of the white revolution. India is unique among the major milk producers because more than half of its production is from buffalo, rather than cattle. India has one sixth of the world's cattle and about half of the world's buffalo population. The bulk of milk production is destined to domestic consumption. Moreover, about half of the milk produced represents self-consumption, while the rest is marketed through both formal and informal channels (Gulati, 2009; Gulati et al., 2016; MAFW, 2016a; MOSPI, 2016a; FAOSTAT, 2018).

Meat production has been gradually increasing at 2.5% per year since 2000, driven by both bovine meat and poultry sectors expansion. The bovine meat supply is primarily destined for exports (section 2.6) and based on adult male buffalos as well as unproductive and least milk productive female buffalos. Sale of cattle for meat production is frequently used as an income smoothing mechanism, especially among small farmers. Poultry is also one of the fastest growing segments in Indian agriculture, with the production of eggs and broilers rising at a rate of 6% to 10% per year over the last two decades. The poultry sector was spearheaded by developments in high yielding layer and broiler varieties, together with improved practices of disease control. While relatively small-scale producers account for the bulk of production, integrated large-scale producers represent a growing share of the sector in some regions (Chatterjee and Rajukumar, 2015; Landes et al., 2016; MAFW, 2017a; MOSPI, 2017; FAOSTAT, 2018).

Figure 2.14. Fruit and vegetables production overtaking food grains in volume and value



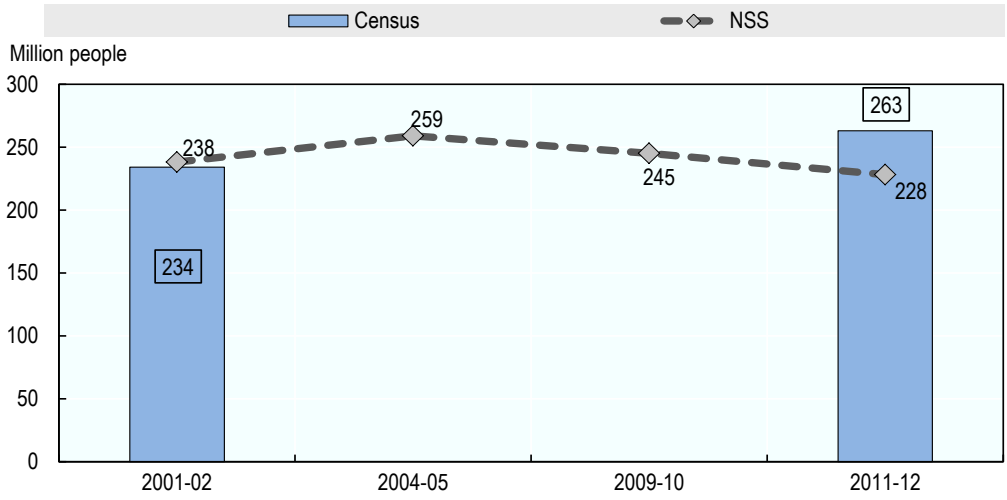
Source: MAFW (2017b), *Horticulture at a Glance Statistics*; MOSPI (2017).

Farm employment and off-farm rural job opportunities

Available official statistics can diverge in terms of the evolution of the absolute number of people employed in the farm sector. While the National Sample Survey (NSS) notes an absolute decline in the size of India's agricultural workforce between in 2004-12 by 33.3 million, evidence from the latest Census of India points that, on the contrary, the sector does not seem to have started shedding labour in absolute terms: the overall number of workers engaged in agriculture – including cultivators[15] and agricultural labourers[16] – would have increased from 234.1 million in 2001 to 263 million in 2011 (Figure 2.15). According to the Census, while the 2001-11 period saw a decline in the number of cultivators (from 127.3 million to 118.7 million) the number of agricultural labourers increased by 35% (from 106.8 million to 144.3 million). According to the NSS results, self-employed workers in agriculture (which roughly correspond to cultivators) represented 147 million in 2011-12, almost 30 million more than the Census estimate for cultivators. In turn, the NSS estimated casual employees in agriculture – corresponding to agricultural labourers – at 76 million, which amounts to 68 million less persons than the Census estimate. Since 2011, the Ministry of Labour through its Labour Bureau has been declaring labour statistics every year and according to that in 2015-16, out of the total

469 million labour force, about 220 million people (47%) are employed in agriculture[17] (Census India, 2011; Ministry of Labour and Employment, 2016; Thomas and Jayesh, 2016).

Figure 2.15. Evolution of absolute farm employment, 2001-02 to 2011-12



Note: Census data are for 2001 and 2011.
Source: National Sample Survey Office (NSSO), Employment and unemployment survey, various rounds (1999-2012); India Census (2001, 2011).

Different factors are behind this significant divergence between the Census and NSSO datasets. These include definitional differences that may have led to a different classification of worker categories, the slow structural transformation of large parts of the rural areas – which meant that many workers divided working days during a year between farm and non-farm jobs – as well as the limited capacity to accurately account for short-term migration. The discrepancy between the two databases is higher in several states across the central, eastern, and northern parts of the country; discrepancies are lower in southern and western states (Thomas and Jayesh, 2016).

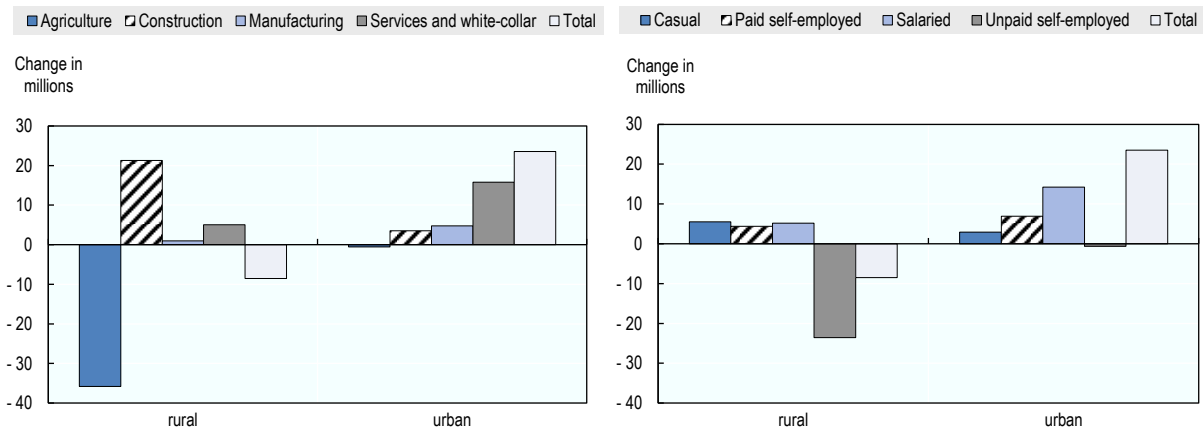
The noteworthy agricultural labour market development for which both NSS and Census estimates concur is that, over the past two decades, there has been a decline in the population of self-employed workers (cultivators) and an increase in the population of casual workers (agricultural labourers). With lower realisation of market prices for several commodities and falling profitability in farming due to increasing farm operating costs, many small and marginal farmers have had to sell their landholdings and became either agricultural labourers or seek alternative employment in the non-farm sector. At the same time, in parallel to the estimated decrease in the number of cultivators, the average size of operational landholdings has been declining over the last decades. This links back to the existing challenges relating to the registration of land records – which often make the official and up-to-date transfer of ownership cumbersome and slow – as well as the restrictive land leasing laws across many states that have forced tenancy to be informal (see section below on land tenure) (Chand and Srivastava, 2014; OECD, 2017a).

Based on the NSS estimates, the share of farm employment in total employment decreased from 61% in 1990 to 47% in 2014 with a contribution of about 17% to the country's GDP. The decline in the sector's share in employment has therefore not kept

pace with the changes in inter-sectoral share in output (section 2.1). This can be partly attributed to the lack of sufficient non-farm employment opportunities in rural areas able to absorb a larger proportion of the workforce from agriculture. Indeed, job creation has taken place largely in urban and peri-urban areas and most of the jobs created in cities are salaried, often offering better conditions than self-employed activities and casual work (Figure 2.16) (Himanshu et al., 2013; Labour Bureau, 2015; OECD, 2017a).

A low level of education and skills continues to hinder the ability to move out of the low-productivity agriculture sector to better-paid non-farm activities. An estimated 40.8% of farmers are illiterate, compared to an illiteracy rate of 15.9% in urban areas (MOSPI, 2013; Chand and Srivastava, 2014; Imbert and Papp, 2014; OECD, 2017a; Sharma and Chandrasekhar, 2014; Srivastava, 2016).

Figure 2.16. Job creation in rural and urban areas by sector and status, 2005-12



Note: A regular salaried/wage employee is a person working in other's farm or non-farm enterprises (both household and non-household) and getting in return salary or wages on a regular basis (and not based on daily or periodic renewal of work contract). The category of salaried/wage employees includes not only salary and wage earners getting time wage but also those getting piece wage or salary and paid apprentices, both full-time and part-time. A person casually engaged in other's farm or non-farm enterprises (both household and non-household) and getting in return wages according to the terms of the daily or periodic work contract is treated as casual wage labour. Unpaid self-employed workers are auxiliary workers ('helpers') who assist the main family workers in an unpaid capacity.
Source: OECD (2017a) based on NSSO, Employment and unemployment survey, rounds No. 61 and 68.

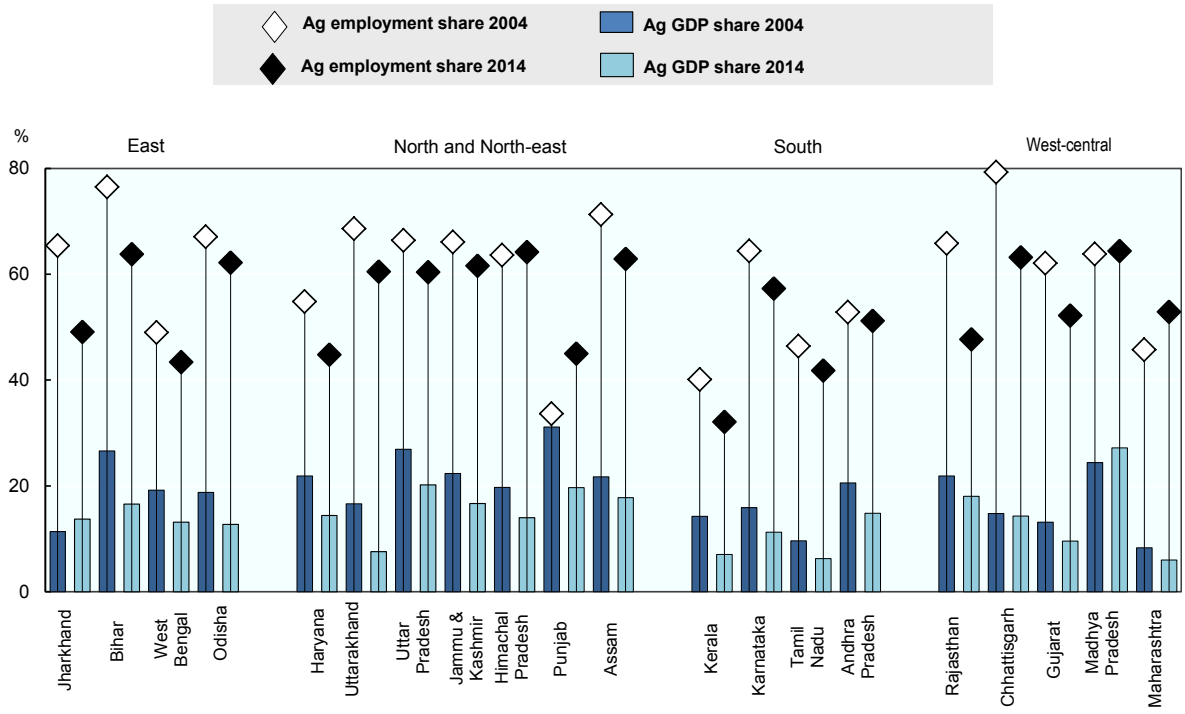
Women represent about 33% of cultivators and 47% of agricultural labourers. However, the participation of women in the sector is generally limited to less skilled jobs when compared to the workforce constituted by men, with many women engaged as unpaid subsistence workers. An estimated 52-75% of Indian women engaged in agriculture are illiterate, an education barrier that prevents them from occupying higher skilled jobs or moving to the non-farm sector (Sanghi et al., 2015).

Spatial heterogeneity: performance at the sub-national level

State-level structural transformation processes are taking place at different paces. While in states such as Uttar Pradesh and Madhya Pradesh agriculture contributes more than 20% to state-level value-added, in other states like Maharashtra, Tamil Nadu, Kerala, Uttarakhand and Gujarat agriculture contributes to less than 10% (Figure 2.17). Very high shares of agriculture in the labour force are recorded not only in the poorer states of

Bihar, Uttar Pradesh, Odisha, Rajasthan and Madhya Pradesh (above 60%), but also in the middle income states of Himachal Pradesh and Andhra Pradesh (above 50%) (OGD Platform India, 2017; NITI Aayog, 2017a).

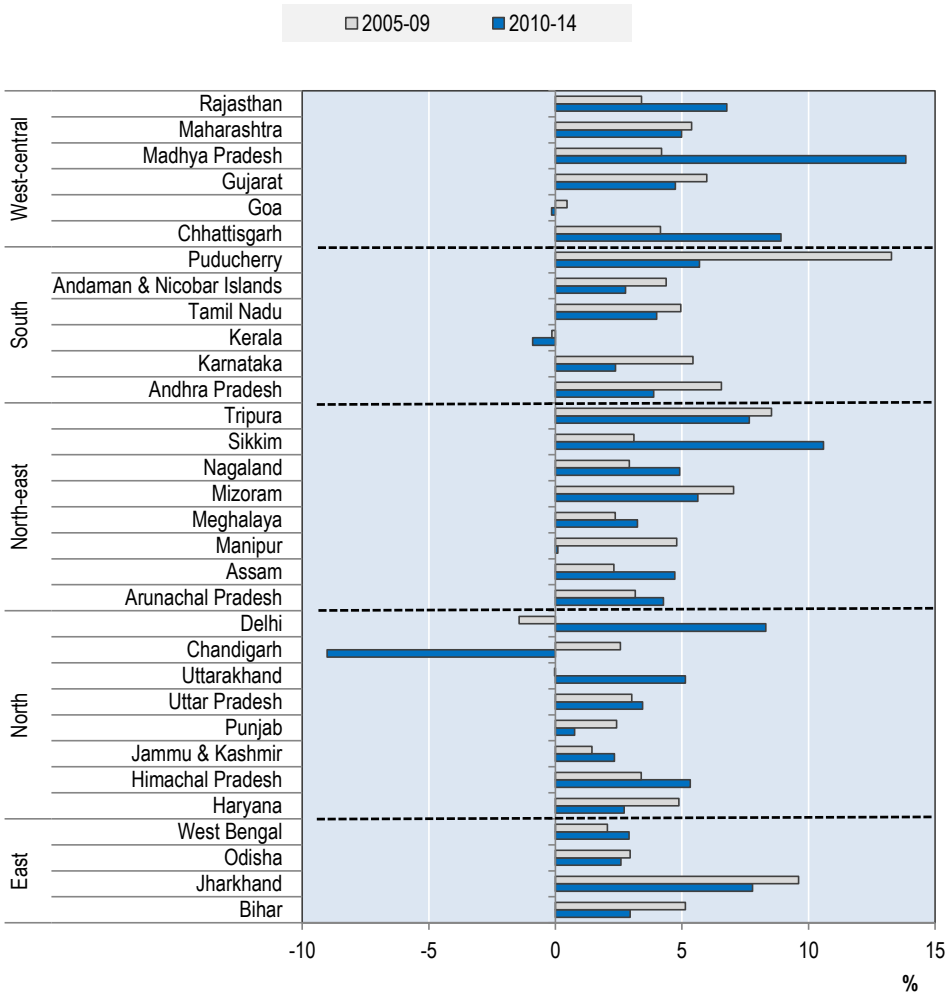
Figure 2.17. Share of agriculture in GDP and employment in selected states, 2004-14



Source: OGD Platform India (2017); NITI Aayog (2017a).

The sector's growth pattern at state level has been highly uneven. At one end of the spectrum, there are states like Rajasthan, Jharkhand or Madhya Pradesh that have been showing strong agricultural growth since 2010, with an average annual growth between 7% and 14%. At the other end there are states like Uttar Pradesh or West Bengal that have been only growing at 1-2.5% per year (Figure 2.18) Diversification of agriculture away from grains to other commodities occurred in all regions, but once again following very different patterns. Cereal shares range from a low of 2.8% in Kerala's value of production to 16% in Madhya Pradesh; livestock shares vary from 20% in Maharashtra to 25% in Kerala, while the share of horticulture varies from 6% in Punjab to 37% in West Bengal (Government of India, 2015a; MAFW, 2016a).

Figure 2.18. Mixed agricultural state performance: Average growth, 2005-14



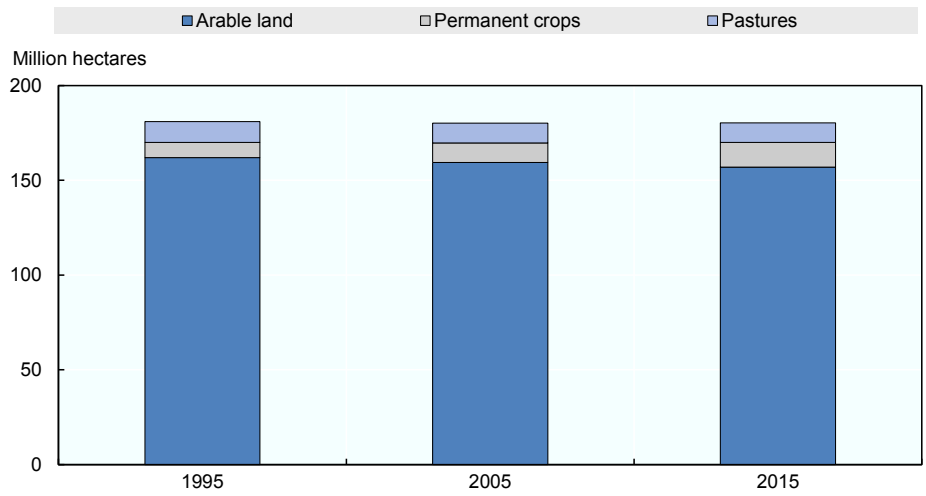
Source: MAFW (2016a).

Input use and sustainability performance

Land

India has the second largest agricultural land area in the world after the United States: this covers 180 million ha, representing about 55% of its total land area. However, at just 0.15 ha per capita agricultural land is very scarce. Agricultural land consists of 157 million ha of arable land, 13 million ha of permanent crops and 10 million ha of pastures and meadows. The arable land area remained relatively stable over the last two decades, highlighting that virtually all of the increase in production resulted from yield gains and multi-cropping rather than expansion of the cultivated area (Figure 2.19). Multi-cropped area currently represents 30% of overall agricultural land (54.5 million ha) (MAFW, 2017c; FAOSTAT, 2018).

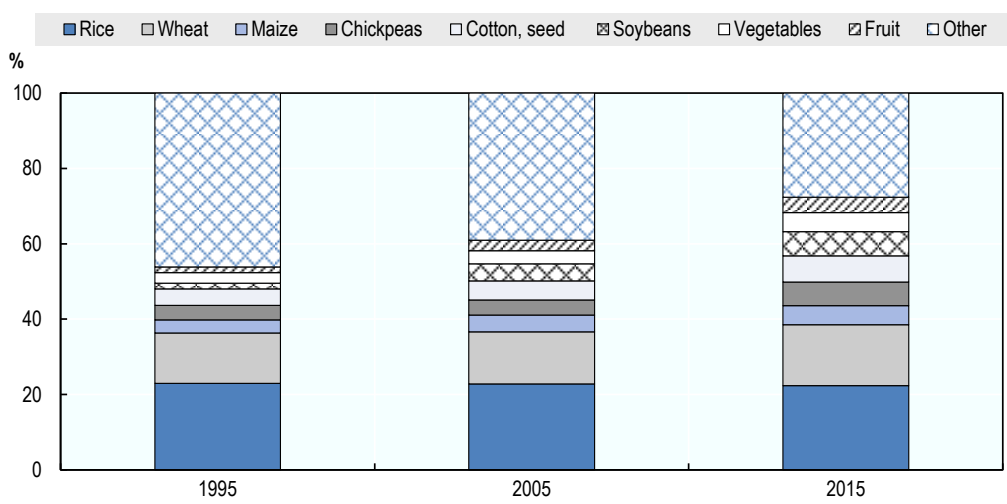
Figure 2.19. Agricultural land, 1995-2015



Source: MAFW (2017c), *Land Use Statistics*; FAOSTAT (2018).

The allocation of harvested area by commodity shows that the largest shares are accounted for by rice (22%), wheat (16%), and cotton (7%). The shares of maize, soybeans, cotton, and chickpeas cultivated areas all increased in 1995-2015. In addition, the shares of fruit and vegetables more than doubled over the same period, but are still relatively small at 4-5% each (Figure 2.20) (MAFW, 2017c; FAOSTAT, 2018). Grazing intensity is very high in India: a cattle population of 467 million grazes on the 10 million ha of pastures, implying an average of almost 47 cattle heads per ha of land (MAFW, 2017c).

Figure 2.20. Composition of the harvested area, by crop, 1995-2015



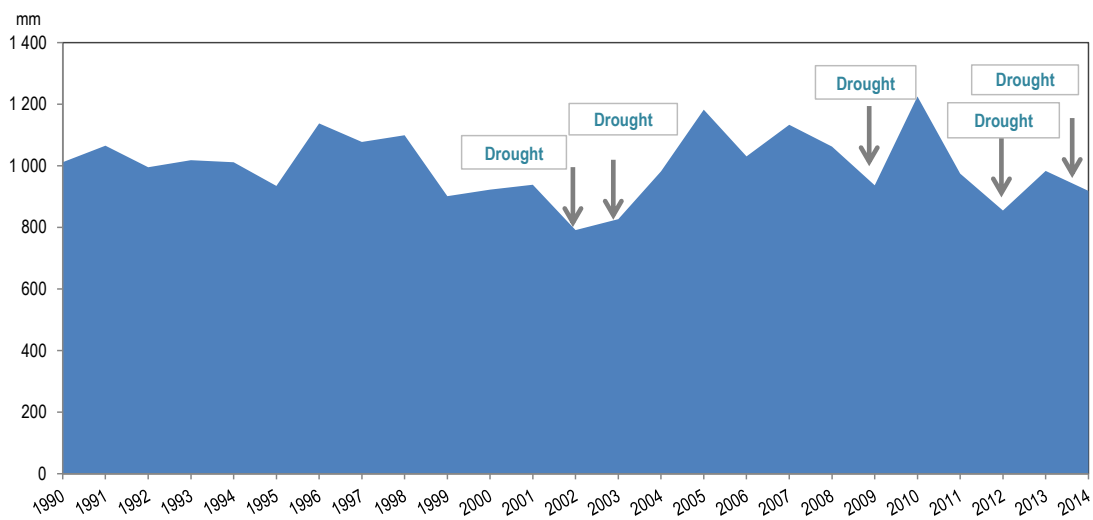
Source: MAFW (2017c), *Land Use Statistics*; FAOSTAT (2018).

Any potential future increase in arable land appears to be limited. On the one hand, India has been implementing one of the largest reforestation and community forestry programmes ever undertaken, which has restricted the conversion of forests to cropland. Deforestation rates in India have thus declined since 1980, largely due to the implementation of the 1980 Forest Conservation Act and the 1988 Joint Forest Management legislation (Ministry of Environment, 2015). Forests currently constitute the second largest land use category in India after agriculture (24.2% of the total area). On the other hand, both agricultural land and forest areas are under pressure from urban and industrial development: the share of the area under non-agricultural use increased from 6.8% of total area in 1995 to 8.2% in 2014 (MAFW, 2017c).

Water use

While India hosts 18% of the world's population, the country has only 4% of the world's renewable water resources. 70% to 80% of precipitation in India is received through the monsoon during the four summer months (June, July, August and September). While the average annual rainfall of the country is about 1 170 mm, there is a huge temporal and spatial variation in rainfall and water availability (Figure 2.21): average rainfall in the North-east region can be as high as 10 000 mm per year, but some parts of Western Rajasthan receive annual rainfall of about only 100 mm. The north-eastern region of the country receives heavy precipitation, in comparison with the north-western, western and southern parts. Whereas the lower rainfall areas (less than 750 mm annual rainfall) account for 33% of the cropped area, the medium rainfall zone (750 mm to 1 125 mm) covers 35%, the high rainfall zone (1 125 mm to 2 000 mm) covers 24%, and the very high rainfall zone (more than 2 000 mm) accounts for the remaining 8% (Government of India, 2015).

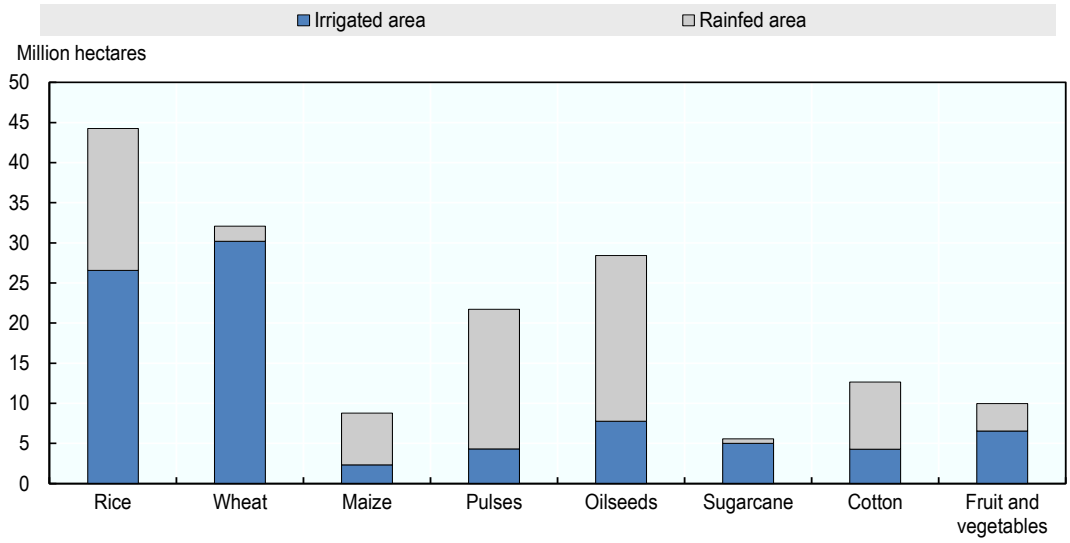
Figure 2.21. Average annual precipitation pattern, 1990-2014



Source: Indian Institute of Tropical Meteorology (2016).

Over half of the total cropped area is rainfed. Rice, maize, pulses, oilseeds and cotton are the most dependent on precipitation (Figure 2.22) and thus among the most vulnerable crops, facing an increasingly erratic pattern of precipitation (MAFW, 2017c). The significant output drops observed in 2002, 2004 and 2009 (Figure 2.10) are directly linked to droughts (Gulati, Saini and Jain, 2013; Government of India, 2015a).

Figure 2.22. Irrigated area under different crops, 2014-15



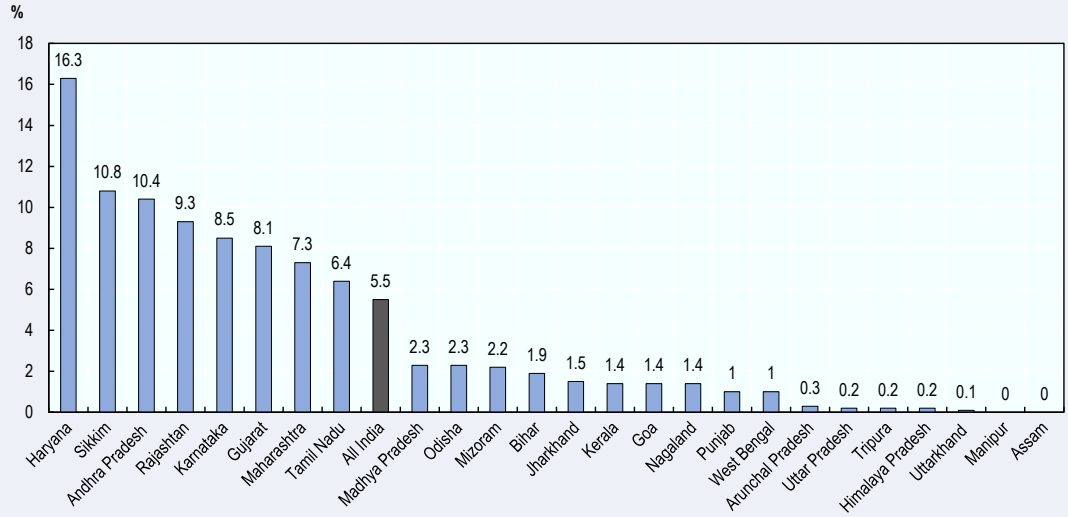
Source: MAFW (2017c), *Land Use Statistics*.

India's agriculture sector accounts for nearly 90% of water use. 66 million ha of total arable land are currently irrigated, while two-thirds of India's vast irrigation system is based on groundwater. 60% of the total irrigated area is dedicated to rice and wheat. Sugarcane and fruit and vegetables are also mainly irrigated, but such systems face high levels of inefficiency: for those relying on surface water sources, efficiency[18] is estimated at only 35-40%, while for those relying on groundwater sources this is estimated at 65-75% (Government of India, 2015). The area under micro-irrigation systems – such as sprinkler or drip irrigation – has been growing, but currently stands at only 7.7 million ha, representing about 5.5% of the cropped area (Box 2.6; Figure 2.23). This is much less than in other countries such as China (10%), Brazil (52%), United States (55%), or Israel (90%) (Irrigation Association of India, 2016).

Box 2.6. Micro irrigation developments in India

The Government of India launched in 2006 the Centrally Sponsored Scheme "Micro irrigation" with the objective of increasing the coverage of area under micro irrigation and encouraging a more efficient use of water resources. These objectives were subsequently upgraded through the National Mission on Micro Irrigation (NMMI) during 2010-14 and the National Mission for Sustainable Agriculture (NMSA) in 2014-15. The area covered under micro irrigation systems has grown since 2006 by 9.7% annually. The states with the largest area under micro irrigation include: Rajasthan (1.68 million ha), Maharashtra (1.27 million ha), Andhra Pradesh (1.16 million ha), Karnataka (0.85 million ha), Gujarat (0.83 million ha) and Haryana (0.57 million ha) (Figure 2.23). The majority of the area covered under micro irrigation systems in 2016-17 comes under sprinkler irrigation (53.9%), followed by drip irrigation (46.1%).

Figure 2.23. Micro irrigation coverage (share of net sown area by state), 2015



Note: The figure provides the combined share for the states of Andhra Pradesh and Telengana. The state of Telengana was separated from Andhra Pradesh in 2014 and became an independent state.
Source: Irrigation Association of India (2016).

The 2014 NMMI impact study conducted a survey of 5 892 beneficiaries of NMMI across 13 states, identifying several key advantages of this technology compared to conventional water use systems:

- Micro irrigation technology ensures water use efficiency as much as 50-90%, achieved through a reduction of use losses, run-off, and evaporation losses. The saved water can be used to increase the area under irrigation or for the recovery of degraded/waste land.
- Due to the smaller power units needed as a result of lower water requirement and thus lower number of hours of irrigation, significant electricity savings were estimated (30.5%, on average).
- The overall irrigation operational cost registered on average a reduction of 32%.
- On average, 30.4% of surveyed farmers were able to introduce new crops due to the use of micro irrigation systems.

As a result of the controlled and targeted application of water, soil moisture could be maintained at optimum levels, improving land productivity. In the case of onions, drip irrigation was associated with 15-25% higher bulb yield, while for sugarcane yields were estimated to go up by 40%.

Source: Planning Commission (2014); Irrigation Association of India (2016); Ganguly, Gulati and von Braun (2017).

Fertiliser use

India is the second largest consumer of fertilisers in the world after China, with about 26.8 million tonnes used by the agriculture sector in 2015-16. At an estimated 131 kg/ha[19] the rate of fertilisers applied per ha in 2015-16 is almost twice that applied in 1990-92 (72 kg/ha). Average intensity of fertiliser use in India remains nevertheless much lower than in other countries in the region[20] such as China (319 kg/ha), Korea (262 kg/ha), Japan (230 kg/ha), Malaysia (208 kg/ha), or Viet Nam (206 kg/ha) (MAFW, 2017c; FAOSTAT, 2018).

Fertiliser use also appears highly skewed across regions, with wide inter-state and inter-district variations. Average intensity of fertiliser use has generally been higher in states such as Punjab, Haryana and Andhra Pradesh with a consumption of over 200 kg/ha, while other states like Odisha, Kerala, Madhya Pradesh, Jharkhand, Chhattisgarh and Rajasthan have had a consumption of less than 100 kg/ha (Sharma and Thaker, 2011; Government of India, 2015, 2017a).

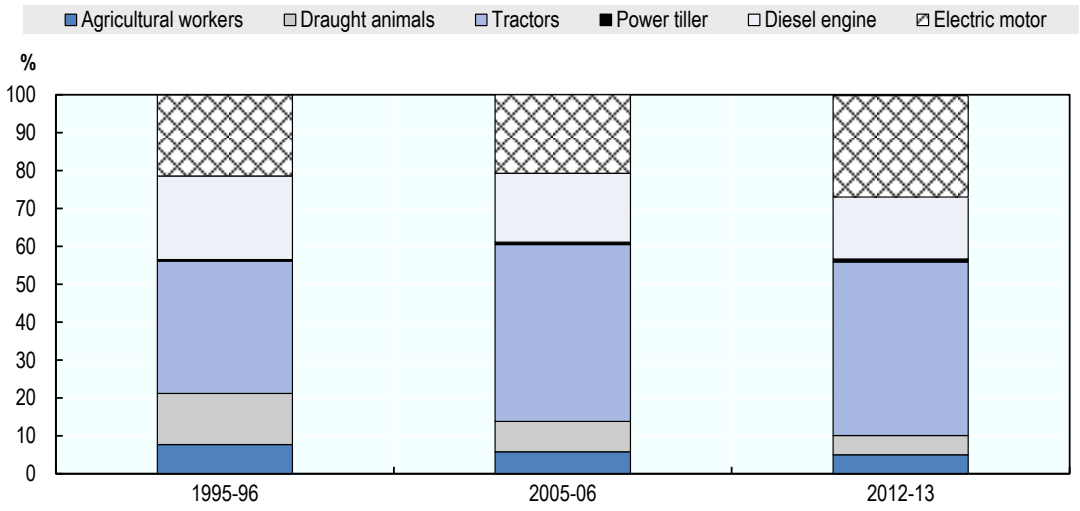
Both the use intensity and patterns have been influenced by fertiliser subsidies, a key component of India's agricultural policy over the last decades (Chapter 3). On the one hand, the allocation of nearly 70% of annual subsidies to urea has led to an unbalanced application pattern of nitrogenous, phosphate and potash (NPK) fertilisers when compared to actual soil and crop nutrient requirements across various regions (Government of India, 2015). On the other hand, in some areas, a comparison between urea subsidy allocations with estimates of the actual use derived from surveys reveals that a large share of urea is likely being diverted for industrial use or smuggled across border to neighbouring Bangladesh and Nepal (Government of India, 2017a).

Farm mechanisation

Two of the major impediments to adoption of mechanisation in India have been land fragmentation, with a majority of marginal and small landholdings hampering the utilisation of agricultural machinery, and an inadequate access to formal sources of finance for long-term credit. To address these challenges, models of farm machinery available on rent made such equipment more effective and affordable for farmers. Estimates suggest that informal farm equipment rental represents roughly 35% of the farm machinery market in India, showing the scope for organising the market as well as expanding services to less mechanised regions. As part of the 2014 Sub-Mission on Agricultural Mechanisation (SMAM) guidelines, the Government of India introduced Custom Hiring Centres (CHCs)[21] at the village level; 711 CHCs were set up in 2014-16. Private players are also entering the market by opening rental hubs in states such as Karnataka, Maharashtra and Gujarat (Ganguly et al., 2017).

Over 90% of farm power is currently from mechanical sources, with tractors and power tillers providing the bulk (47%) (Figure 2.24). The use of tractors and tillers has increased five-fold in the last four decades and the share of agricultural workers and draught animals in overall farm power availability decreased from 21% in 1995-96 to 10% in 2012-13 (Government of India, 2015a).

Figure 2.24. Availability of farm power by resource category, 1995-2013



Source: Government of India (2015a), "State of Indian Agriculture".

The level of mechanisation varies substantially by region. States in the north, such as Punjab, Haryana and Uttar Pradesh, have a greater level of mechanisation due to the highly productive land in the region as well as a declining labour force. The western and southern states have lower levels of mechanisation due to the smaller and more fragmented land holdings prevalent in these regions. In north-eastern states, the level of mechanisation is extremely low. Factors like hilly topography, high transportation costs and financial constraints have hindered the development of a farm equipment sector within these states (Dhiman and Dhiman, 2015).

Agro-environmental impacts: land degradation, water stress and greenhouse gas

Land degradation is prevalent throughout the country: 37% of the total land area (about 120.4 million ha) is affected by various types of degradation[22]; 25% of India's total land is undergoing desertification. Degradation has mainly resulted from deforestation, excessive and unbalanced use of chemical fertilisers, poor irrigation and water management techniques, excessive tillage, over-grazing, improper management of industrial effluents and wastes, poor forest management, surface mining, and urban expansion (Indian Council of Agricultural Research, 2010). In 11 states and UTs, more than 50% of land is affected by some form of degradation. Mizoram, Nagaland, Tripura (East), Himachal Pradesh (North), Madhya Pradesh (West-central), and Kerala (South), are in the top of this list, with 60% of their surface experiencing degradation (Bhattacharyya et al., 2015).

India also faces a severe water crisis due to a widening gap between water supply and demand, as well as poor water resources management, and changing precipitation patterns induced by climate change. Total water demand is expected to increase by 32% by 2050 due to population growth, urbanisation and industrialisation. As 80% of the sewage generated – commonly used for field irrigation and fertilisation – currently goes untreated, the discharge of untreated sewage into water bodies has become a common source of water pollution. Groundwater depletion has also contributed to the deterioration of water quality. India is thus subject to multiple categories of water risk, including risks

associated with shortage, excess, weather variability, and poor quality of water (Annex 2.A) (Amarasighe et al., 2008; Government of India, 2015a; OECD, 2017c).

The existing policy framework lacks a clear incentive structure for efficient and sustainable water use. Low or absent water charging for surface water used in irrigation and energy subsidies for groundwater pumping (Chapter 3) have been driving severe depletion of resources. Issues related to intra- and inter-state water sharing and lack of adequate enforcement and monitoring of existing water policies undermine water governance and policy co-ordination. Moreover, the lack of sustainable financing for water infrastructure results in poor maintenance of existing infrastructure and limits further investment (OECD, 2017c).

The continuous rise of tube well irrigation – particularly suited to the fragmented landholding pattern characterising the sector – has led to an overexploitation of water reserves. Decline in groundwater levels is observed mostly in northern north western and southern of the country in the states of Rajasthan, West Bengal, Andhra Pradesh Karnataka, western Uttar Pradesh, Punjab and Haryana. Groundwater development stress[23] reached an average of 133% in Haryana and 172% in Punjab (Box 2.7). In the states of Andhra Pradesh, Gujarat, Madhya Pradesh and Rajasthan, the water table has been falling every year during 2014-16 (CGWB, 2014; OECD, 2017c).

Box 2.7. Water risk hotspots for agriculture: North-west India

Water hotspots are defined as localised agriculture productive regions subject to acute water risks. Agriculture water risks at hotspot locations can cause three layers of impacts. First, water risks will have a direct negative impact on agriculture production. Second, these production effects may have broader market implications both domestically and potentially internationally. Third, broader food security and associated indirect effects may also occur. In India, agriculture water scarcity issues are forecasted to become most prevalent in the cereal producing regions of the North and North-west (particularly in the states of Punjab and Haryana), while flooding risks are foreseen for the more production diversified South-east region.

Punjab and Haryana are two leading producers of rice and wheat: the two states account for only 3% of the national territory, but produce 15% of its rice and 30% of its wheat. They also represent 38% of the country's rice procurement and 62% of the wheat procurement. The two states belong to the Indo-Gangetic Belt, a fertile region with important groundwater and surface water resources, supplied by the snowmelt water of the Himalaya and annual monsoon rains. However, the climate is characterised by high inter-seasonal and inter-annual variability in precipitation, which makes them particularly exposed to drought. Agriculture in this region depends on groundwater resources. Double cropping, first during the summer monsoon and then during the dry winter season, further intensifies water needs for production. In 2010, the water level fell below a depth of 15 m in 75% of Punjab's surface area, while it was the case for only 14% of the area in 2000. As of 2016, 51% of the local administrative units (blocks) in Haryana and 75% in Punjab are considered as over-exploited with respect to water use.

Due to its semi-arid climate, the Indo-Gangetic plain is also naturally exposed to salinity risks. Intensive groundwater pumping amplifies the phenomena, limiting irrigation sources for farmers. Salinity limits water uptake capacity of plants, and dramatically decreases yields for most of the crops. Almost 0.5 million ha are already affected by salinity in Haryana, and this is expected to rise in the coming decades, following the

patterns of groundwater depletion. By 2023, in some central districts of Punjab, water tables are expected to sink below 50 m. In addition, the mobilisation of deeper and more saline water through tube well irrigation affects the quality of shallow waters. Due to intensive pumping, there is evidence of pollutant breakthrough and water leakage to the deep reservoirs of the multi layered aquifer.

Increased temperatures will affect storage efficiency of surface water reservoirs and open irrigation canals, thus the capacity of these systems to conserve and deliver water without loss. Besides, the Indus basin and the Ganges basin are broadly supplied by snowmelt water. Since melting mountain glaciers are declining in the long term, rivers flows will be affected during the summer as early as 2050. Finally, even if precipitation will increase in total, it will be more variable and concentrated in time during a shorter monsoon. As a result, groundwater recharge could drop if storage capacities are not improved.

Possible increases in the cost to pump deeper groundwater may exacerbate farmers' losses resulting from lower average yields and output levels. Low-cost wells equipped with surface-mounted centrifugal pumps are not powerful enough to lift water below 8 m. Therefore, farmers would have to invest in deep tube wells equipped with electric submersible pumps and cover the associated high costs. Indebtedness and water access restrictions caused by depleting groundwater have had dramatic consequences for rural development: on average, villages where aquifers have fallen below 8 m suffer from a 10% increase in poverty rate.

Source: OECD (2017c).

Accounting for 18% of total greenhouse gas (GHG) emissions in India, agricultural production is the second major emitter of GHGs after the energy sector (71%). Although the share in total GHGs has decreased from 23% in 1990, the amount of agricultural GHGs has increased by 21% over the last two decades. The majority of agricultural GHG emissions occur at the primary production stage, and are generated through livestock rearing (enteric fermentation and manure management) (59% of agricultural GHGs), the use of chemical fertilisers and their associated impacts on soils (21%), paddy rice cultivation (18.3%), as well as residue management practices (1.7%). GHG emissions per kg of product were greater for livestock products than for crops, with the exception of rice (IARI, 2014; Ministry of Environment, Forest and Climate Change, 2015).

Agricultural land tenure system and farm structure

Land tenure key highlights

The Indian system for governing land tenure, both in terms of legislation and institutional framework, is complex. This is due not only to the country's large surface, but also to the various pre-independence political, economic and social influences. At the time of independence, India inherited a feudal agrarian structure in which land rights were concentrated in the hands of a limited number of landlords (*zamindars*), while tenants did not have any right or security of tenure. The government thus enacted in the years following independence a series of land reforms intended to improve both equity in land distribution and efficiency in agricultural production. Land reform legislation introduced as of the 1950s consisted of four main areas for action (USAID, 2011):

- abolition of intermediaries who were rent collectors under the pre-independence land revenue system

- tenancy regulation to improve the contractual terms faced by tenants, including crop shares and security of tenure
- a ceiling on landholdings[24] with a view to redistributing surplus land to the landless
- efforts to consolidate disparate landholdings: pursuant to the Land Acquisition Act of 1894, the government could use compulsory acquisition authority to purchase privately held land if such land was required for a public purpose, including the distribution of land to the landless poor.

The socio-economic impacts of the land reform components appear to be mixed. On the one hand, such reforms did succeed in reallocating land – 8.5 million ha under tenancy and ceiling laws alone post-independence – from large holders to the landless and land poor. However, as the landless were allocated on average very small parcels of agricultural land, many of these holdings became economically unviable. On the other hand, some land reform components – and land ceiling legislation in particular – seem to have had a negative and significant effect on agricultural labour productivity in India (Ghatak and Roy, 2007; Deininger et al., 2017).

Moreover, land acquired under the Land Acquisition Act has often resulted in inadequate compensation to the owners or occupiers of the land. The 1894 Land Acquisition Act was replaced by the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, passed by the *Lok Sabha* and the *Rajya Sabha* in 2013, intending to reduce involuntary displacement, provide greater compensation and an improved legal process to those whose land is taken. The Act introduced the 'consent' clause with land to only be acquired with approval of the 70% of the landowners[25] for private-public partnership projects and 80% for private entities projects. The Act also defines the method by which the market value of the land shall be calculated, as well as the amounts of compensation and subsistence allowance in case of resettlements. Due to identified bottlenecks in implementation, in 2015, the *Lok Sabha* also passed the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Amendment) Bill 2015. The Bill exempts five types of projects from the consent provision: defence; rural infrastructure; affordable housing; industrial corridor; and private-public partnership infrastructure projects where the government owns the land. While the bill was passed in *Lok Sabha*, it still needs approval from the *Rajya Sabha* (Government of India, 2015b).

Rural land markets do not function efficiently as a result of several factors. These include poor land records that make it difficult to officially transfer ownership, tenancy and land ceiling laws leading to concealment of ownership status and impediments to transactions, limited mobility of potential buyers, lack of brokerage services, and limited flow of information about buying and selling opportunities. Given the limited reach of the formal banking sector, particularly in remote rural areas, another factor is the difficulty of financing land purchases. India's property market also lacks transparency, as both sellers and buyers tend to declare lower values than in the actual transaction to avoid steep stamp duties of around 5-12% of transaction values, capital gain taxes, and income tax clearances (OECD, 2009).

The land recordkeeping system lacks a mechanism of proper periodical revision of records due to financial and institutional constraints. India's land recordkeeping system includes national and state laws covering a deeds registration system for any form of land transfer, as well as state-level laws establishing cadastral-based records of land rights for revenue purposes. From state to state, the cadastral systems are managed by agencies with

varying institutional capacities and financial allocations. The records maintained by the deeds and cadastral systems can be in many cases inconsistent as their periodical revisions are not co-ordinated. More significantly, the land records maintained do not constitute land titles, but only 'evidence of title'[26]. This makes the land transfer system costly and slow: to register a land sale transaction in India, the parties must complete six procedures, a process which takes an average of 45 days and costs an average of 7.5% of the value of the property. This often leads to a large number of unrecorded transactions and an overall system of land registration and record keeping providing an inaccurate picture of landholdings on the ground (OECD, 2009).

The Government of India launched in 2008 the Centrally Sponsored Scheme National Land Records Modernisation Programme (NLRMP) with the aim to modernise management of land records by: building an integrated land information management system; minimise scope of land disputes; enhance transparency in the land records maintenance system; and facilitate a subsequent move towards guaranteed conclusive titles to immovable properties in the country. The scheme is currently part of the Digital India initiative (Digital India Land Records Modernization Programme, DILRMP). The central government's Department of Land Resources, in the Ministry of Rural Development, also drafted a National Land Utilization Policy in 2013, which emphasised the need to conduct a detailed and comprehensive survey and documentation of the existing land area. As of mid-2018, 23 states/UTs have completed the computerisation of land records in more than 75% of their respective villages (USAID, 2011; MOA, 2014; Government of India, 2017a; Ministry of Rural Development, 2018).

Restrictive land leasing laws have forced tenancy to be informal, insecure and inefficient. There is significant variation in the adoption and implementation of land and tenancy reforms across states and over time. State tenancy laws were enacted in the 1960s-70s, with most state governments having either legally banned or imposed some type of restrictions on agricultural land leasing. Tenancy is completely prohibited in some states but completely free in others: for instance, Punjab and Haryana have not prohibited tenancy whereas Karnataka has a near-complete ban on tenancy (specific features of tenancy laws across states are provided in Annex Table 2.B.2) (Deshpande, 2005; USAID, 2011).

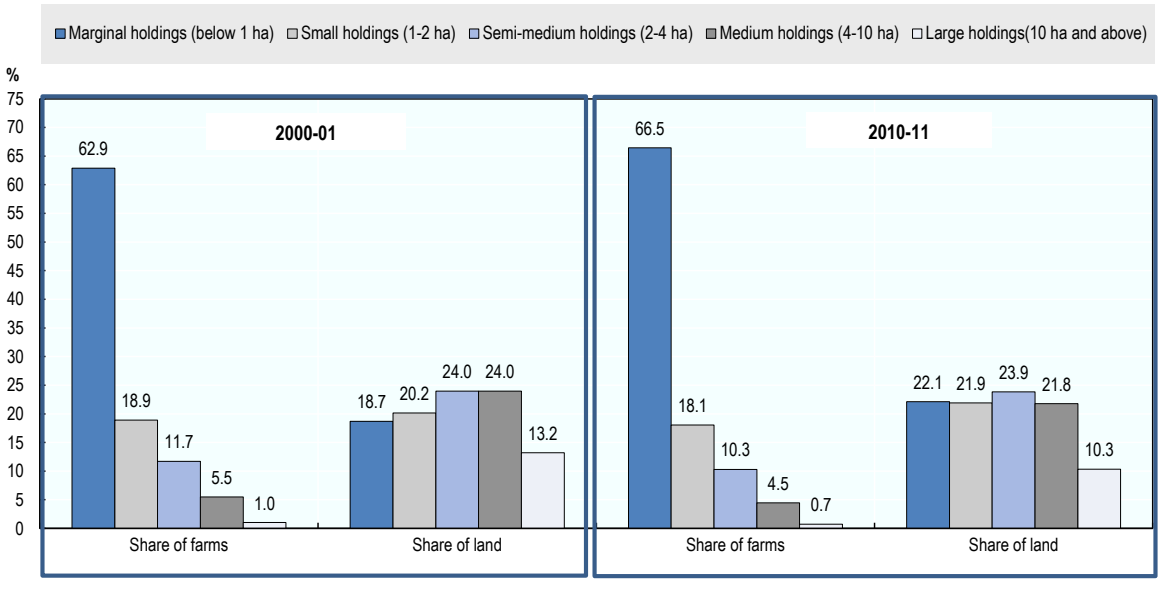
In 2016, the central government rolled out a Model Agricultural Land Leasing Act with the objective to relax the restrictive tenancy laws across states, ensure complete security of land ownership for landowners and security of tenure for tenants for the agreed lease period. State governments would enact the Land Leasing Act as they see appropriate; if and when adopted by a state, it would overrule any other existing act and would be effective from the date of notification by the respective state. It would in general permit and facilitate the leasing of agricultural land while protecting fully the land rights of the owners. As per the Model Act, the land owner could legally enter into a lease contract with the tenant for use of his/her agricultural land for agriculture and allied activities over a specified period, based on an agreement with terms and conditions mutually agreed by the owner and the tenant[27]. The Act would provide for recognition of farmers who cultivate on leased land, which would ultimately facilitate their access to institutional credit (NITI Aaayog, 2016). An additional Model Land Cultivators License Act has been put forward by the Union Budget 2018-19, proposing to provide lessee cultivators with a licence, without compromising on the legal rights of the landholder. The licence would enable these farmers to avail the benefits of farm credit, crop insurance, and compensation in the event of a natural calamity (Ministry of Finance, 2018).

Several states already took the lead in reforming tenancy laws. For instance, in 2016, Rajasthan provided statutory support to land records, effectively guaranteeing land and property ownership. Rajasthan also passed a Land Pooling Bill that eases aggregation of small land holdings and should facilitate the development of adequate infrastructure. Gujarat eliminated the requirement of a social impact assessment and consent clauses for certain types of development projects. Maharashtra allowed the sale of certain publicly owned lands that were previously slated only for leasing and allowed mid-size plots to be divided (OECD, 2017a).

Agricultural land holdings

Agricultural census estimates show that the sector continues to be dominated by a large number of marginal and small-scale operators: 85% of the operational holdings in India are of less than 2 ha and represent 45% of the total cropped area. In turn, only 5% of farmers operate on holdings larger than 4 ha, but they occupy nearly 32% of the overall cropped area (Figure 2.25). This also implies that the national average operational holding size has been showing a steady decline, from 1.33 ha in 2000-01 to an estimated 1.15 ha in 2010-11 (Agricultural Census India, 2016).

Figure 2.25. Distribution of operational holdings and agricultural area, by land size classes, 2000-11



Note: The basic statistical unit for data collection is 'operational holding'. The concept of agricultural operational holdings does not include those holdings which are not operating any agricultural land and are engaged exclusively in livestock activities and fishing etc.
Source: Agricultural Census India (2016).

As in the case of farm employment, there are discrepancies between official data on landholdings available from Agricultural Censuses versus NSS Surveys on Land and Livestock Holdings (LHS). The later reports an average landholding area of 0.91 ha for the same recent period as the census. There are several reasons for this, starting with those stemming from the use of different definitions as well as differences in the data collection process. The census refers exclusively to cropped land and does not cover

operational holdings that are engaged exclusively in livestock activities and fishing, while the LHS includes all agricultural activities (Kumar, 2016).

The agricultural census identifies operational holdings[28] primarily based on land records within states,[29] while LHS data are collected through a sample survey of rural households. The structural issues arising from the land tenure system can complicate the exact identification of plots as well as their characteristics under the different surveys. For instance, many land registrations can be done under a fictitious name, so as to avoid household landholdings from coming under the purview of land ceiling legislation. Consequently, a single holding may often be recorded as distinct units under different landholders. Households, including absentee landowners, may be shown operating agricultural holdings in land records, while they might not be engaged in farming anymore (Kumar, 2016).

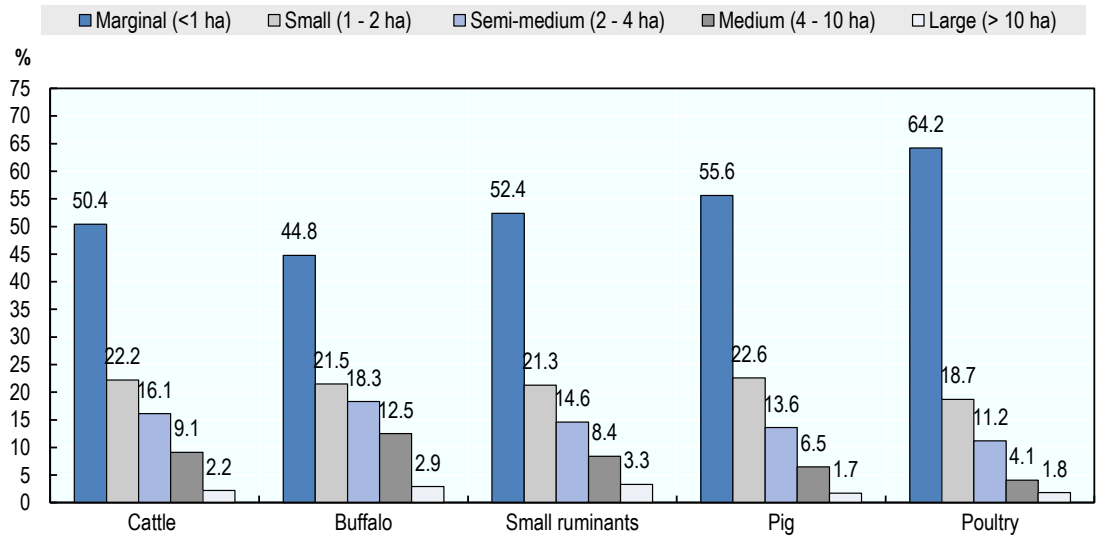
Both the agricultural census and the LHS do coincide in the increase in the area under the marginal and small holding category, as well as the increase in the number of marginal and small farmers. This increase is largely explained by population growth, subdivision upon inheritance,[30] the structural issues in the land legal framework and land markets, as well as the insufficient non-farm alternative employment opportunities. The restrictions on land leasing and related uncertainties have reduced the occupational mobility of many landowners who could take up employment outside agriculture and yet are forced to stay due to the fear of losing the land if they lease out and migrate. Moreover, fragmented parcels enable owners to sell or mortgage discrete portions of their total holdings at any one time. Cumbersome and lengthy procedures in the land transfer market together with the land ceiling regulations also dissuade consolidation (Vyas, 2007; USAID, 2011).

According to the Census, nearly half of the total number of marginal farmers (below 1 ha) are located in three states: Uttar Pradesh (23%), Bihar (16%) and Andhra Pradesh (9%). These three states, together with Tamil Nadu (8%) and Kerala (8%), account for nearly two thirds of the marginal farmers in the country. On the other land, each of the following states – Punjab, Haryana, Himachal Pradesh, Gujarat, and Jammu and Kashmir – have less than 1% of the country's marginal farmers (MOSPI, 2013; Agricultural Census India, 2016).

The proportion of socially disadvantaged groups such as Scheduled Castes (SCs) and Scheduled Tribes (STs) is higher among marginal and small farmers than that of medium and large farmers. Around 22% of marginal and small farmers are from SCs compared to 7.8% among medium and large farmers; 15.6% of small farmers belong to STs compared to 14.9% among medium and large farmers (MOSPI, 2013; Agricultural Census India, 2016).

Marginal and small farmers own most livestock. Marginal farmers (less than 1 ha) own more than 50% of all cattle, small ruminants, pigs, and poultry, and almost 45% of India's buffaloes (Figure 2.26). These characteristics of Indian dairy farming translate into low productivity, with milk production per head of cattle 5 to 7 times lower than in the United States or Japan (MOSPI, 2016b).

Figure 2.26. Livestock ownership by land holding size, 2013

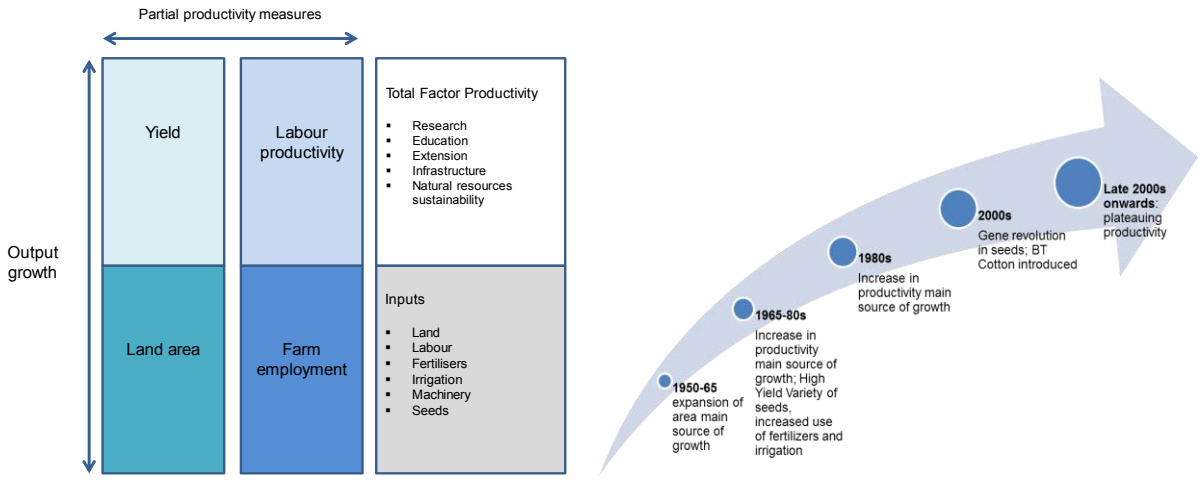


Source: MOSPI (2016b).

2.4. Productivity trends

As discussed in the previous sections, India has experienced considerable changes in the crop mix and production since the onset of the green revolution. In the pre-green revolution period, output growth was mainly driven by the expansion of the agricultural area. The beginning of the green revolution in the mid-1960s raised agricultural land productivity through improved seed varieties and technologies. This was accompanied by an expansion of extension services and an increase in the use of fertilisers, pesticides, and irrigation. In the 1980s-90s, these yield-enhancing technologies were expanded to additional crops and regions (further details on the policy setting in Chapter 3). Over the last decade however, the sector's overall performance in terms of growth on a sustainable basis has been much more modest. The following sub-sections provide an overview of agricultural productivity trends, components and drivers (Figure 2.27).

Figure 2.27. Understanding agricultural productivity drivers

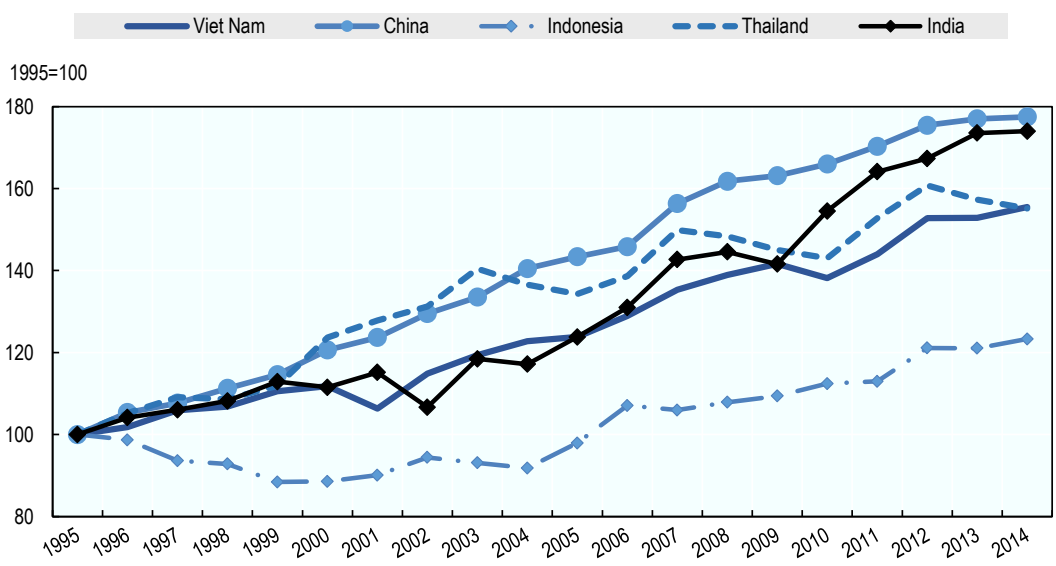


Source: Own tabulation based on literature review.

Land productivity: yields for key crops

In India, overall land productivity increased by 74% in 1995-2014, slightly less than in China but more than in Viet Nam, Thailand, and Indonesia (Figure 2.28). In recent years however, increases in nutrient input use have exceeded land productivity growth, suggesting diminishing marginal contributions of nutrient input to yield growth and reaching the limits of current technology (Fuglie and Rada, 2018; FAOSTAT, 2018).

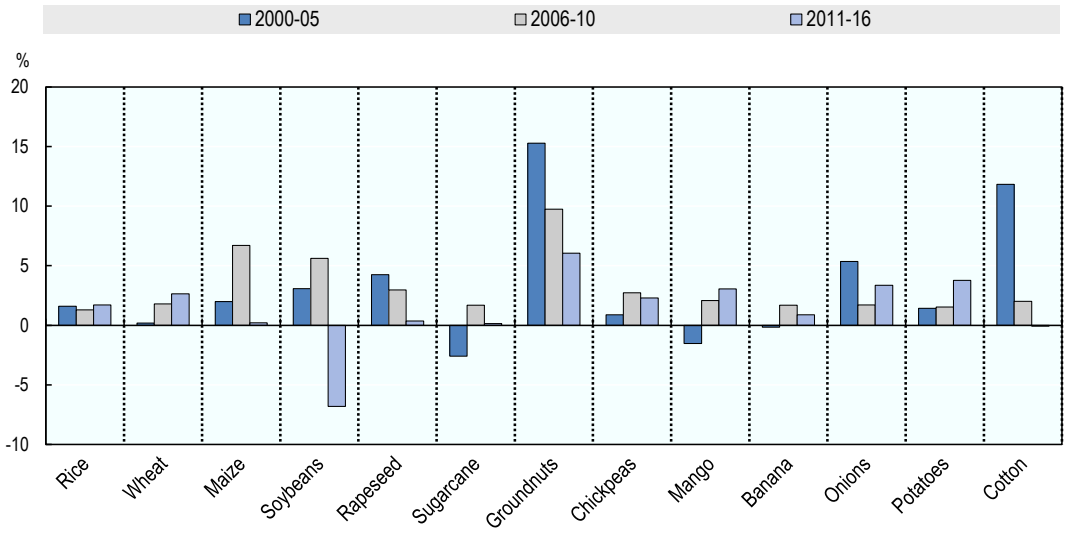
Figure 2.28. Growth in land productivity in selected Asia countries, 1995-2014



Note: Data used for time and cross-country comparison purposes.
Source: Own tabulation based on Fuglie and Rada (2018), *International Agricultural Productivity Dataset*, ERS, USDA.

A mapping of yield trends in India in 2011-16 highlights that land productivity has stagnated for many of the key commodities. Annual yield growth has been under 2% in recent years for key grains (including rice, wheat and maize) as well as for soybeans, rapeseed, sugarcane, chickpeas, and cotton (Figure 2.29). This counters a decade of increasing yields between 2000 and 2010 driven by technological innovation. The development and adoption of hybrid maize varieties, high-yield variety groundnut seeds, and Bt cotton in the early 2000s had a significant impact on their respective yield trends and the expansion of these sub-sectors. Farm-level analysis also highlights the importance of increased input quantity and quality in raising yields until the end of 2000s: in the case of cotton, for instance, the use of fertilisers and pesticides, or increased adoption of hybrid seeds, appear to have contributed significantly to the yield increase in addition to Bt cotton (Gruère and Sun, 2012; FAOSTAT, 2018).

Figure 2.29. Average yearly yield growth for key crops, 2000-16



Source: FAOSTAT (2018).

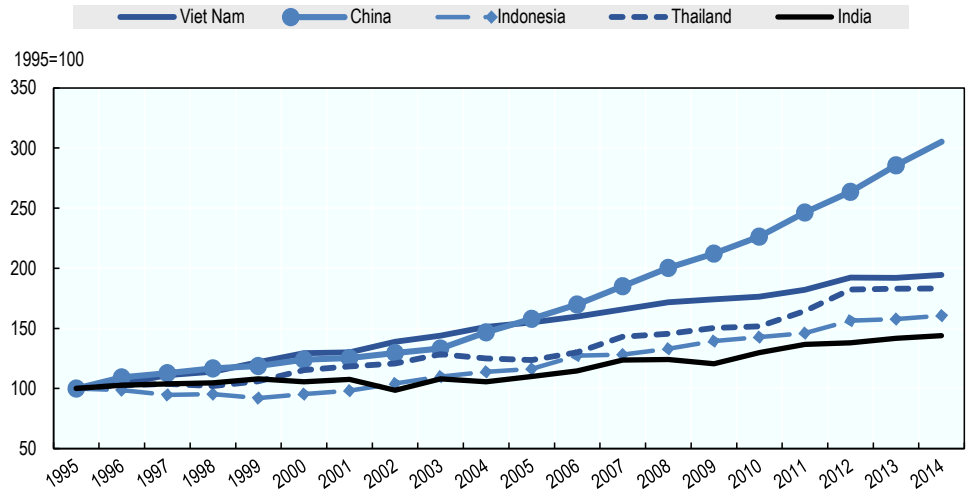
In addition to yield stagnation, significant gaps remain in yield potential. Average yields of most key crops in India are still low compared to the highest yields achieved worldwide and, in some cases, even world averages. For instance, current wheat and rice yields are approximately 3 times lower than the highest global yields, while yields for key fruit and vegetables – including mango, banana, onion or potato – are between 2 to 7 times lower than highest yields achieved worldwide. Therefore, vast untapped potential exists in yields for most crops and states; considering that the frontiers of expansion of cultivated area are practically attained in India, future output growth must come from increase in yield (FAOSTAT, 2018).

Labour productivity

Farm labour productivity growth in India has been lagging over the last decade behind that of other Asian economies such as China, Viet Nam, Indonesia, and Thailand (Figure 2.30) (Fuglie and Rada, 2018). As in the case of land productivity, average annual growth has also been considerably slowing in recent years. These trends are directly linked to the slower growth of agricultural output versus the evolution of farm

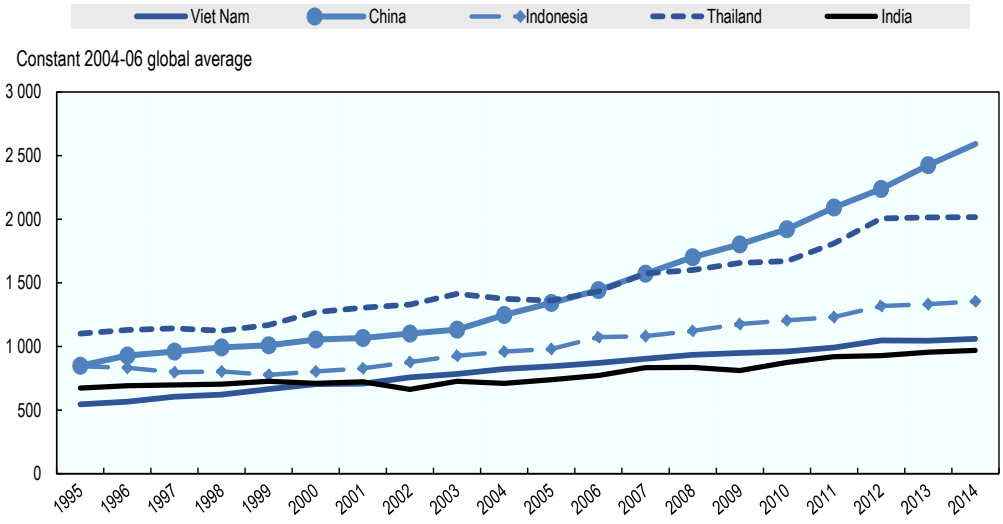
employment, with labour moving out of the sector at a very sluggish pace. Real agricultural value added per worker in India is one third of that in China (Figure 2.31) (Fuglie and Rada, 2015). The low levels of labour productivity in agriculture can be attributed to the continuous fragmentation of landholdings and underemployment in the sector, with many agricultural workers actually dividing their time between farm and non-farm jobs (sections 2.3 and 2.5). Larger farms benefit from scale effects associated with mechanisation and less labour use per hectare (Rada and Schimmelpfennig, 2015).

Figure 2.30. Growth in labour productivity in selected Asian countries, 1995-2014



Note: Labour productivity is measured as total agricultural output (constant 2004-06 global-average prices) divided by the total number of economically active persons in the sector in a given year.
Source: Own tabulation based on Fuglie and Rada (2018), *International Agricultural Productivity Dataset*, ERS, USDA.

Figure 2.31. Agriculture value added per worker in selected Asian countries, 1995-2014



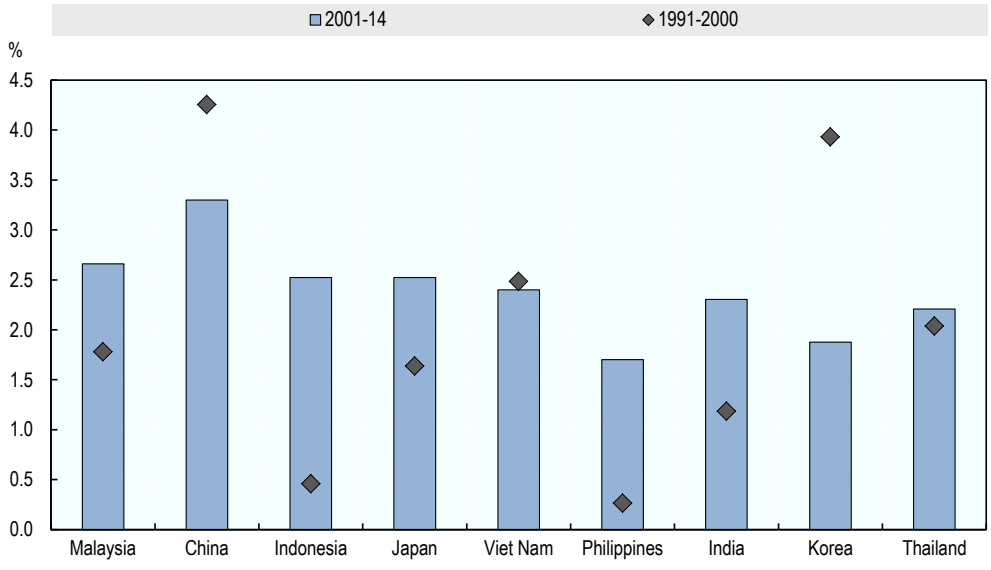
Source: Own tabulation based on Fuglie and Rada (2018), *International Agricultural Productivity Dataset*, ERS, USDA.

Total factor productivity

Improvements in Total Factor Productivity (TFP) have also been an important source of output growth. TFP represents the share of output increase not explained by the amount of inputs used in agricultural production; it accounts for effects in total output growth relative to the growth in total inputs used in production, such as fertilisers, land, or irrigation. TFP thus captures the effects of technological change, skills, or infrastructure, as well as the increase in efficiency with which inputs are utilised in production.

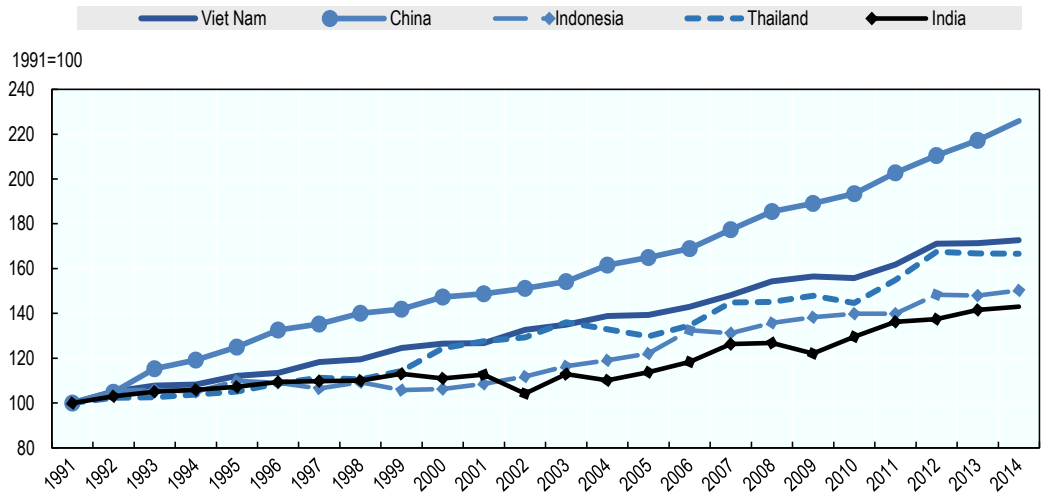
India's TFP growth since 2001 has been robust, reversing the early 1990s slowdown (Figure 2.32). However, TFP growth levels are behind those in China, Viet Nam, Thailand or Indonesia (Figure 2.33) (Fuglie and Rada, 2017). Technological progress has been the main and consistent driver of TFP growth over the past two decades. Main components of technological progress in India included the use of improved seeds, as well as better infrastructure coverage and quality (irrigation, road density, electricity supply). In turn, efficiency[31] stagnated over the long run and shows even a declining trend in recent years, indicating that the gap between realised and potential productivity levels has widened. It also means that farmers have not been efficiently applying existing technologies in production due to suboptimal investment in public extension services (Chapter 3). This has been accompanied by a deterioration of farmland infrastructure, particularly the existing water conservation systems, which constrained the farmers from applying best production techniques (Rada and Schimmelpfennig, 2015).

Figure 2.32. Average annual growth rate in Agricultural Total Factor Productivity, 1991-2014



Source: Fuglie and Rada (2018), *International Agricultural Productivity Dataset*, ERS, USDA.

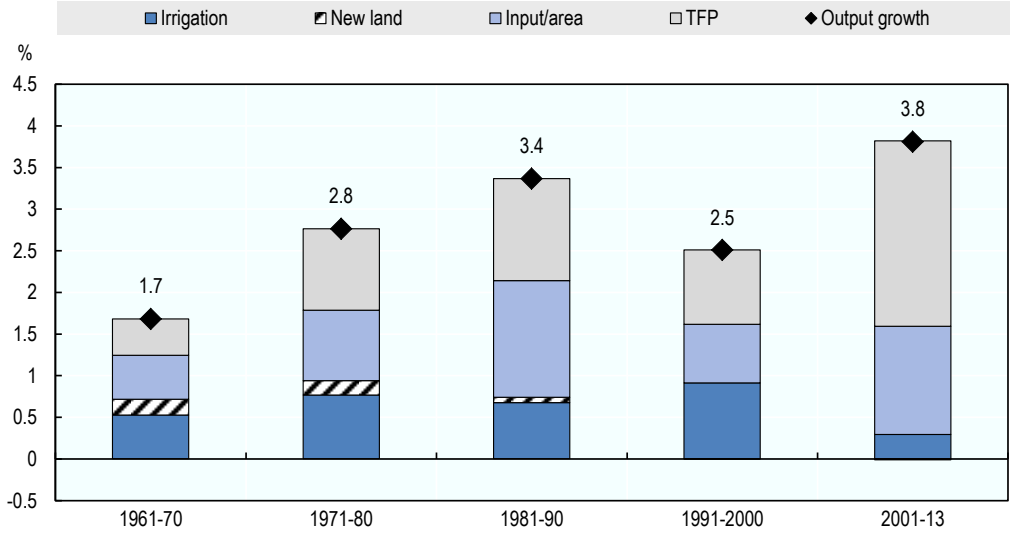
Figure 2.33. Growth in total factor productivity in selected Asian countries, 1991-2014



Note: TFP growth rate is calculated as the difference between output and input growth rates.
Source: Fuglie and Rada (2018), *International Agricultural Productivity Dataset*, ERS, USDA.

Among individual inputs, irrigation was an important driver of growth in the earlier decades, but it expanded much more slowly in the 2000s and so did its contribution to output increase. Growth in inputs other than land and irrigation – such as chemical fertilisers – has also been an important source of output increase throughout the last decades. TFP growth was nevertheless by far the most important driver of output growth in 2001-13 (Figure 2.34) (Fuglie and Rada, 2018). TFP for grains shows little improvement over the most recent period, implying that the overall agricultural TFP has been mainly driven by high-value horticulture and livestock sub-sectors (World Bank, 2014a).

Figure 2.34. Contribution of inputs and TFP to output growth, 1961-2013



Source: Fuglie and Rada (2018), *International Agricultural Productivity Dataset*, ERS, USDA.

India's TFP growth rate has varied not only over time and crops, but also by regions and states. TFP growth was faster in those regions that complemented traditional crops with specialty and horticultural crop production as well as livestock (such as the western, southern, and eastern regions of India). In comparison, TFP has been increasing at a slower pace in regions specialising in grains and animal products (northern India) as well as in the regions unable to benefit from the higher returns from high-value commodity production (central and north-eastern India) (Rada and Schimmelpfennig, 2015).

Agriculture performance in face of climate change

India is already highly exposed to natural catastrophes: 59% of the land is vulnerable to earthquakes, 8.5% to cyclones, and 5% is prone to river basin floods. Droughts also severely impacted agricultural output in early 2000s, mid-2000s and recent years. Further changes in temperatures, precipitation, and carbon dioxide concentration are foreseen in India. Thus by mid-century, impact of climate change would be felt as an increase in the average surface temperature by 2 to 4 degrees C, changes in rainfall (distribution and frequency) during both monsoon and non-monsoon months, as well as an increase in the frequency and intensity of both droughts and floods. A shift towards wetter forest types in the north-eastern region and drier forest types in the north-western region is predicted, which will alter ecosystems (Ranuzzi and Srivastava, 2012).

As described above, the agricultural sector is exposed to existing stresses such as the widening gap between water supply and demand, land degradation, and air pollution; climate change will therefore make already sensitive systems even more vulnerable. Indian agriculture is doubly exposed in face of climate change. First, due to the large share of the agricultural land area which is rainfed, it is highly vulnerable to climate change impacts on the monsoon pattern. Second, due to the large share of small and marginal farmers, which currently have a lower capacity to cope with climate change impacts on agriculture, challenges will arise in adapting to new cultivation cycles, technologies and infrastructure (Ranuzzi and Srivastava, 2012).

Due to higher temperatures, increased rainfall variability and decreasing access to freshwater for irrigation, land productivity of most crops in India is projected to be lowered by 10% to 40% by the end of the century, relative to a scenario with no water or climatic shocks (Shrivastava, 2016). Cereals such as rice, wheat, and maize, as well as cotton, sugarcane and vegetables will be particularly affected. Because of moisture deficit and heat, irrigated rice yields are projected to fall in absolute terms by about 16% in Haryana and Punjab by 2050. The increase of mean temperatures and the intensification of monsoon rains will also favour the development of pests and parasites: the north-west region is projected to suffer from the highest yield deviation in the country for rainfed rice by 2080, with a relative decline ranging from 7% to 22% (Soora et al., 2013). *Kharif* crops grown during monsoon periods are more likely to be exposed to rainfall variability and droughts, while *rabi* crops sown in winter are expected to be more particularly sensitive to low temperature stress (CRIDA, 2013). Under different irrigation stresses and climate change scenarios, with no adaptation or mitigation, the production of sugarcane, cotton and vegetables is projected to fall by 2050 by between 15% and 25% relative to a scenario with no water stress or climatic shocks (OECD, 2017c).

While the livestock sector is a major contributor to GHG emissions in India (section 2.4), it will also be affected by the projected increases in temperature. These may cause distress to dairy animals and thus impact milk production. For instance, a 10% to 25% loss in milk production is forecasted in Haryana by mid-century. High producing

crossbred cows and buffaloes will be impacted more than indigenous cattle. Heat stress due to high ambient temperature accompanied with excess humidity during summer months will also have adverse effects on the reproductive performance of most farm animals (Government of Haryana, 2011).

In the scenario of climate damages – driven by higher temperatures, increased rainfall variability and frequency of extreme weather events – India stands to lose more than other regions and major agricultural producers. Yields losses for wheat and rice could be almost twice as high in India when compared to other economies in South-east Asia, China, or average worldwide estimated impacts. India is also among the economies to suffer the highest impacts on trade, with exports estimated to contract more than imports (-6% and -4%, respectively, relative to worldwide average impacts of about -2%). Production costs are forecasted to increase much more in India than those of its trading partners, affecting its overall competitiveness (Delink et al., 2017).

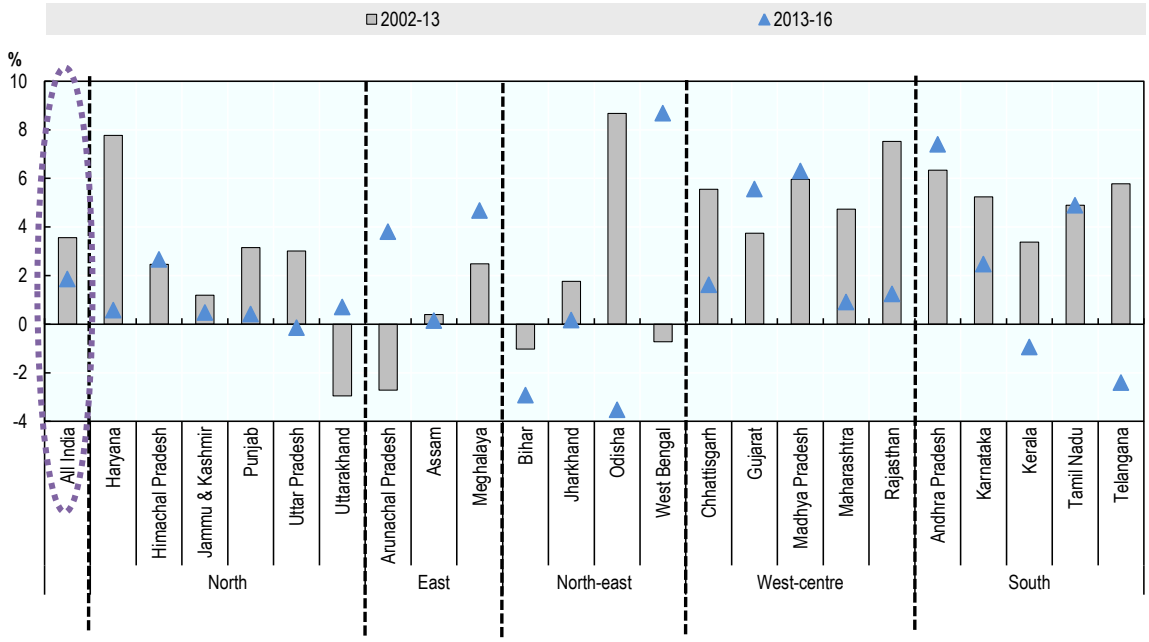
2.5. Rural socio-economic aspects

Farmer incomes and rural poverty

Farm incomes are currently at less than one-third of those of non-agricultural households, highlighting once again the significant productivity differences between sectors[32] (NITI Aayog, 2017b). Farmer incomes[33] grew at 3.7% in the 1990s, but this trend slowed in the early 2000s and the average all-India annual real growth was of 3.5% during 2002-13. Latest all-India available estimates would indicate that between 2013 and 2016, real farmer incomes increased by only 2% per year[34] (Government of India, 2017b) (Figure 2.35). The Government of India recently announced an objective to double farmers' income by 2022 (NITI Aayog, 2017b).

There is a wide variation in farmer income growth magnitudes between regions as well as between individual states. In 2002-13, incomes grew at more than 7% in states such as Odisha, Haryana, Rajasthan, Andhra Pradesh and Madhya Pradesh compared to states like Uttarakhand, Arunachal Pradesh, Bihar or West Bengal where incomes even decreased in real terms (Figure 2.35). However, not all strong performers from 2002-13 continued on this path in 2013-16, highlighting thus the volatility in farmer incomes evolution. In Haryana, Rajasthan and Maharashtra, farmer incomes increased at a lower rate than the all-India average and appear to have even been decreasing in Odisha. While incomes continued their decrease in Bihar in 2013-16, they appear to have increased by over 8% annually in West Bengal. Gujarat, Madhya Pradesh, Andra Pradesh and Tamil Nadu are the most consistent performers, with farmer income growth well above the all-India average in both 2002-13 and 2013-16 (Gulati et al., 2014; Birthal et al., 2014; Government of India, 2017b).

Figure 2.35. Evolution of real farmer incomes in selected states, annual growth, 2002-16



Note: Estimates for 2013-16 are derived by the Government of India Doubling of Farmers' Income (DFI) Committee.
Source: Government of India (2017b) based on NSSO unit level data, 59th and 70th Rounds.

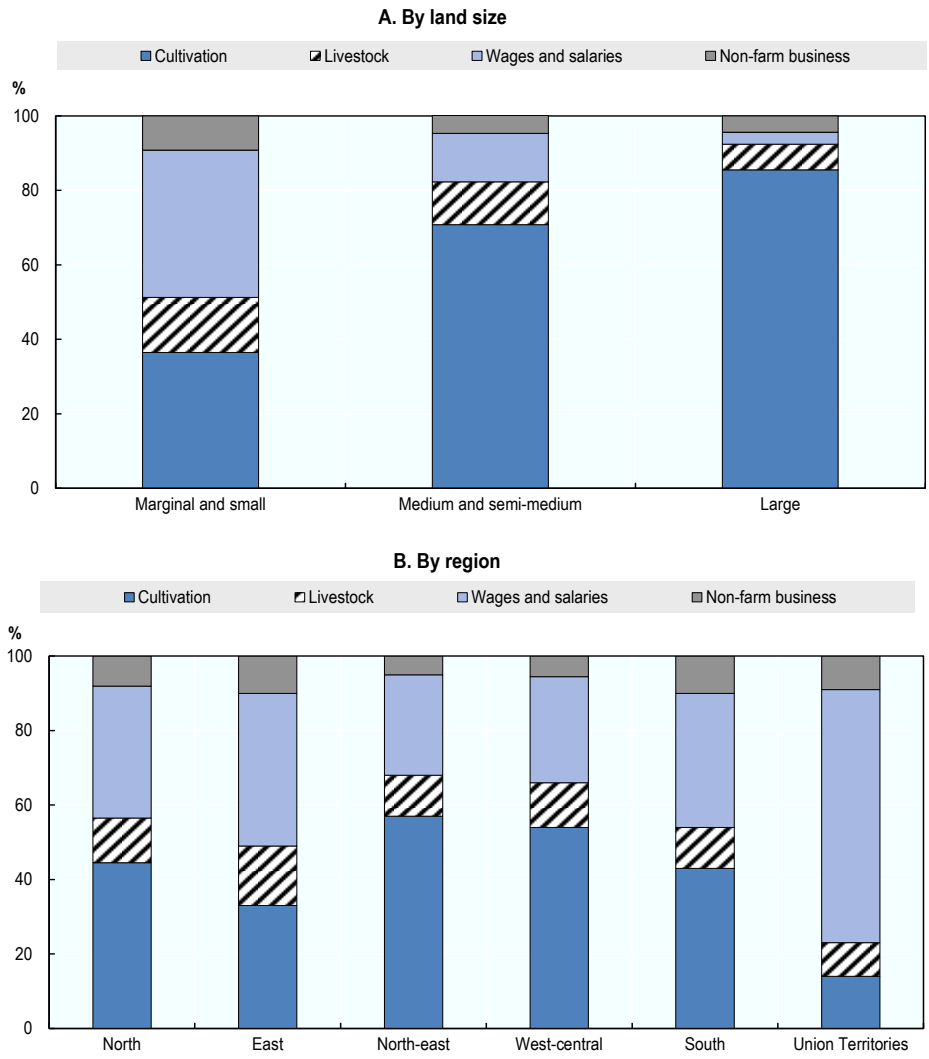
The evolution of farm incomes has been influenced by both "pull" and "push" factors. The implementation of the 2005 rural public employment programme Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) scheme acted as "push factor" by providing at least 100 days of wage employment in a financial year to every household whose adult members volunteered to perform unskilled manual work. This scheme set an upward pressure on farm wages. On the other hand, overall economic growth creating employment opportunities outside the farm and in particular, the development of the construction sector in some rural areas, have been a factor behind labour "pull" out of agriculture and farm incomes increase (Gulati et al., 2014; Birthal et al., 2014).

For persons employed in agriculture, growth of income from animal husbandry and livestock has been higher than the one from cultivation across a wide range of selected states in 2002-12. At an all-India level, income from livestock increased in 2002-12 by 14.7% annually, income from cultivation by 3.8%, wages and salaries by 1.5%, while income from non-farm business sources by 0.5% (Government of India, 2017b).

The relative contribution of the different agricultural household income components is linked to the farm size. The share of income from cultivation increases with the size of the landholdings. At the lower end of the spectrum of land size (marginal and small farmers, owning land size of less than 2 hectares) wages and salaries constitute the principal source of income. In turn, for medium and semi-medium farmers (owning land size in the range of 2 to 10 hectares) and large farmers (owning land size of more than 10 hectares), income derived from cultivation represents the highest share of the overall farmer income. The share of income from livestock declines with farm size (Figure 2.36A) (Government of India, 2017b).

The sources of income differ also across regions and states. The share of cultivation in income ranges on average between 33% and 64%, barring in the UTs for which the average share is approximately 14% (Figure 2.36B) (Government of India, 2017b).

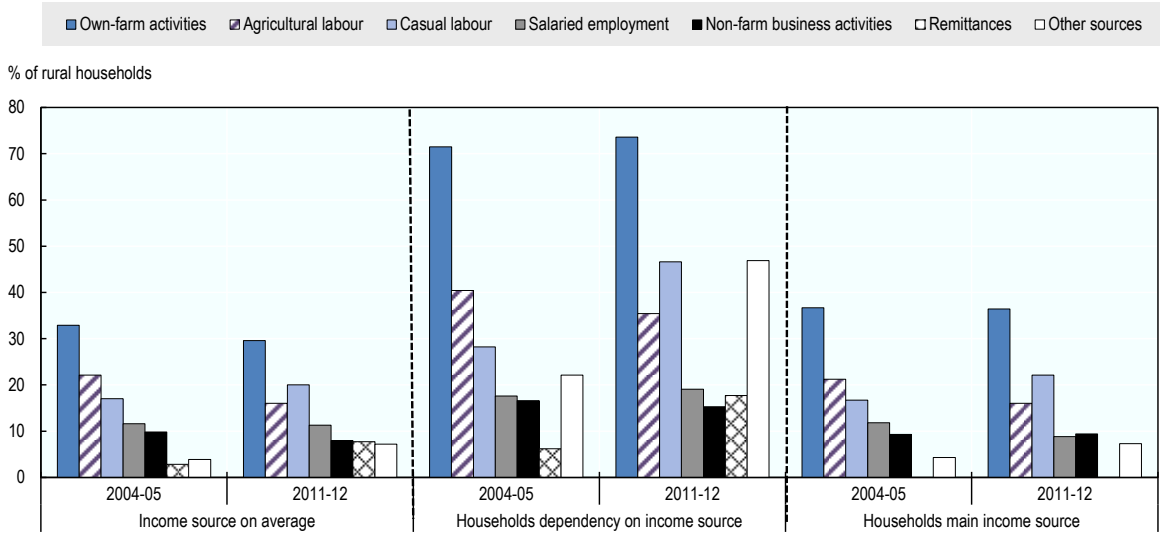
Figure 2.36. Main sources of income, 2012-13



Source: Government of India (2017b) based on NSSO unit level data, 59th and 70th Rounds.

There has been significant change in rural household income sources over the past decade, with a reduction in the share of agriculture in total household revenue. This matches the increasing participation of rural households in the non-farm sector. The share of income an average rural household earned from own farm activities (including cultivation, livestock and lease rent) decreased from 32.9% in 2004-05 to 29.6% in 2011-12 and the share of income earned through paid work on other farms declined from 22.1% to 16% over the same period (Figure 2.37). Only 1.8% of all rural households derived most of their income from self-employment in livestock farming. Milk production remains nevertheless a secondary occupation to crop cultivation for about 69% of India's agricultural households. Non-farm sources (wage, salary, non-farm business activities etc.) contribute about 40% on average to a rural household's income (MOSPI, 2016b; Ranganathan et al., 2016).

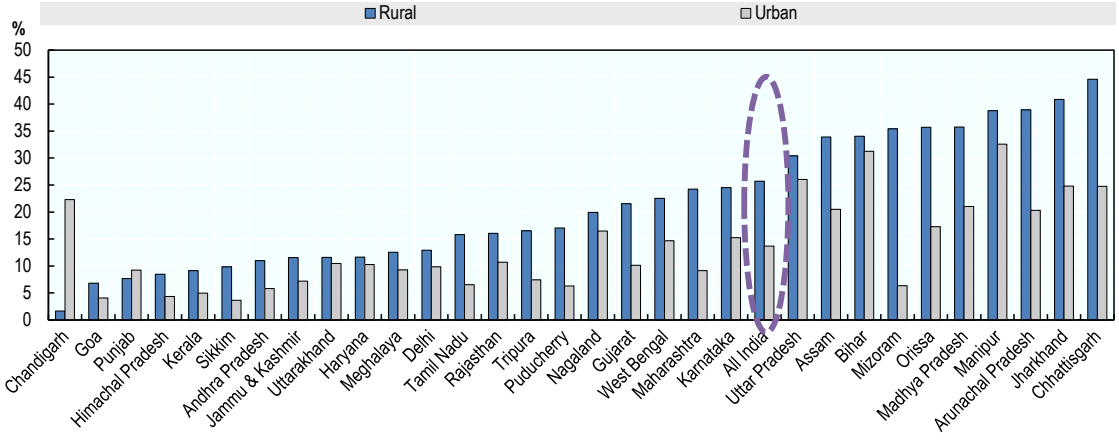
Figure 2.37. Rural income diversification dynamics, 2004-12



Note: Own-farm activities include incomes from cultivation, livestock and lease of agricultural property. Agricultural labour income considers agricultural wages which are obtained from work on other farms. Non-farm business activities include income from manufacturing, hotels and restaurants, construction, mining and quarrying, repairing, and other services.
Source: Ranganathan et al. (2016) based on the *India Human Development Survey* (IDHS).

Low farm incomes lead to high poverty rates among farmers. Rural poverty is both widespread and severe, largely reflecting very low farm labour productivity and insufficient non-farm employment opportunities. According to the national definition of the poverty line, the poverty incidence for rural households is high, 25.7% in 2012, compared to the nationwide average for the urban population of 13.7% (Figure 2.38). There are large differences in rural poverty incidence across states, varying from above 40% (Jharkhand and Chhattisgarh) to under 10% (Kerala, Himachal Pradesh, Punjab, Goa) (OECD, 2017a).

Figure 2.38. Rural and urban poverty rates across selected states, 2011-12



Note: Poverty is calculated by using the Tendulkar methodology, which defines poverty not in terms of annual income, but in terms of consumption or spending per individual over a certain period for a basket of essential goods.
Source: OECD (2017a) based on Reserve Bank of India data.

Food consumption

Consistent with overall economic growth, the share of consumer spending on food has declined in both urban and rural areas: the proportion of expenditure on food items across all income groups has declined by about 10 percentage points in the rural areas and by about 16 percentage points in the urban areas from the end of 1990s to 2010. In 2011-12, food constituted 52.9% of rural households' expenditure and 42.6% for urban households. Income-induced dietary diversification has resulted in consumers moving away first from cereals such as *jowar* and *bajra* to superior grains such as wheat and rice and more recently from cereals to higher value food products such as milk, egg, meat, fruit and vegetables. There is also a rise in consumption of processed food, with 83-85% of food products being consumed at some degree of processing (Minten and Reardon, 2010; MOSPI, 2014).

Despite the changing diet over the years, the overall calorie intake has registered only a modest increase from an average 2 333 kcal per day in 2000-02 to 2 450 kcal per day in 2010-13 (Chapter 4). A decline in calorie intake from cereals has nevertheless been offset by increased intake from animal-based food products and fruit and vegetables. Over the same period, the contribution from cereals and pulses to protein intake declined by 7%, while the contribution of animal products and fruit and vegetables increased by 25% and 29%, respectively. The share of energy intake contributed by cereals is about 57% for rural India and 48% for urban India. The contribution of cereals varies across the major states from 42% (Punjab) to 70% (Odisha) in the rural sector and from 39% (Haryana) to 60% (Odisha and Bihar) in the urban sector (Census India, 2014; MOSPI, 2014).

Food consumption patterns also differ across India's regions and are influenced by religious and cultural factors. Food expenditure shows a more diversified diet across the eastern, southern and western coasts. Rice consumption is higher in the eastern, southern and coastal parts of India whereas wheat consumption is more prevalent in the northern, western and central regions. Vegetable consumption is greater in southern, eastern and north-eastern parts of the country. The states where the majority of the population is vegetarian are Rajasthan (74.9%), followed by Haryana (69.3%), Punjab (66.8%), and Gujarat (61%). In states such as Punjab and Kerala, religious beliefs and cultural movements have played an important role in keeping meat consumption low. Aside cereals, protein rich crops such as pulses meet the needs of a large segment of the population that, to a varying extent, eschew animal-based products, such as meat, eggs or fish. Overall, 37.7% of Indian households are estimated to be vegetarian in 2011-12, down from 43.3% in 1993-94 and 41.8% in 2004-05, showing that non-vegetarian diets are increasing. Meanwhile, India still has more vegetarians than the whole of the rest of the world put together (Gupta and Mishra, 2014; MOSPI, 2014; Gulati, 2016).

As far as meat consumption regions are concerned, meat is mainly consumed in the southern, north-eastern and north-western parts. Seven states in North-east India had the highest share of non-vegetarians in 2011-12 (97%), followed by West Bengal (95%) and Kerala (92%). This has largely been driven by poultry consumption, with the proportion of households consuming poultry increasing from 8% in 1993-94 to 38% in 2011-12. The increase of chicken meat consumption is due to its widespread availability, lower fat content, versatility, and relatively low cost in comparison to other meat products (Gupta and Mishra, 2014; Gulati, 2016).

2.6. Structural change beyond the farm gate

Input markets

Seeds and fertilisers

Farmers have access to seeds through formal and informal systems. Central and state-level public agencies, together with the private sector, currently play a role in the formal industry. Several channels are part of the formal system: traditional input dealers, the Primary Agricultural Credit Societies (PACS)[35], state seed stores (located mainly at the district level), agricultural universities (offering direct retail of breeder and foundation seed to selected farmers), Rural Business/Service Hubs (RBH) outlets, and *mandi* (wholesale market) traders. The major share (over 80%) of the formal seed market is supplied by the private sector (56% through traditional retail and 24% through RBHs). The informal sector consists of seed saved on-farm and that obtained from the trading and exchange sub-systems within the community. The formal system is expanding rapidly, with about 39% of operational holdings using certified seeds and 9.8% hybrid seeds in 2011-12. However, 60% of food crops in India are still sown from seed stocks selected and saved by farmers (World Bank, 2014a; MAFW, 2016b).

The establishment of the National Seeds Corporation (NSC) in 1963 marked the beginning of the formal seed sector. The seed industry had been dominated by the public sector until 1988, when the liberalisation of seed policy through the New Policy on Seed Development (NPSD) opened the door for private domestic and multinational seed companies in the import of seeds and technologies, as well as in research and development investment. The laws and policies thereafter encouraged private participation and seed production increased four-fold in 1991-11. The growth drivers in this period were the rapid development and adoption of innovations (improved varieties, hybrids and proprietary technologies) and more dynamic seed markets (especially for Bt cotton, single-cross maize hybrids, hybrid rice, and vegetables). The private sector currently comprises several multinational corporations, joint venture companies and domestic research-based seed companies, which are all involved in producing, processing and marketing both public and private varieties. However, the main focus of private seed companies has been on the high-value low-volume hybrid seeds such as fruit and vegetables, while the public sector seed corporations still dominate the market for low-value high-volume seeds of cereals, pulses and oilseeds (Majunatha et al., 2013).

The distribution of fertilisers takes place through private channel sale points (77% of the market or approximately 211 750 units) as well as through co-operatives and other institutional agencies (23% of the distribution points). Some quantities are also made available through manufacturers'[36] own outlets. Co-operatives are the main institutional agency in the country handling fertilisers, comprising at present 29 state level marketing federations (called Apex Co-operative Marketing Federations), 171 district level marketing societies, and about 66 200 village level co-operative societies (PACS). The other institutional agencies engaged in the distribution of fertilisers are the State Agro-Industries Development Corporations, Commodity Federations and State Departments of Agriculture. They operate both through their own sale depots as well as through private dealer networks. The co-operative structure differs from state to state and administrative units at different levels (district/sub-district/village) can perform distinct functions across states (Sharma and Thaker, 2011).

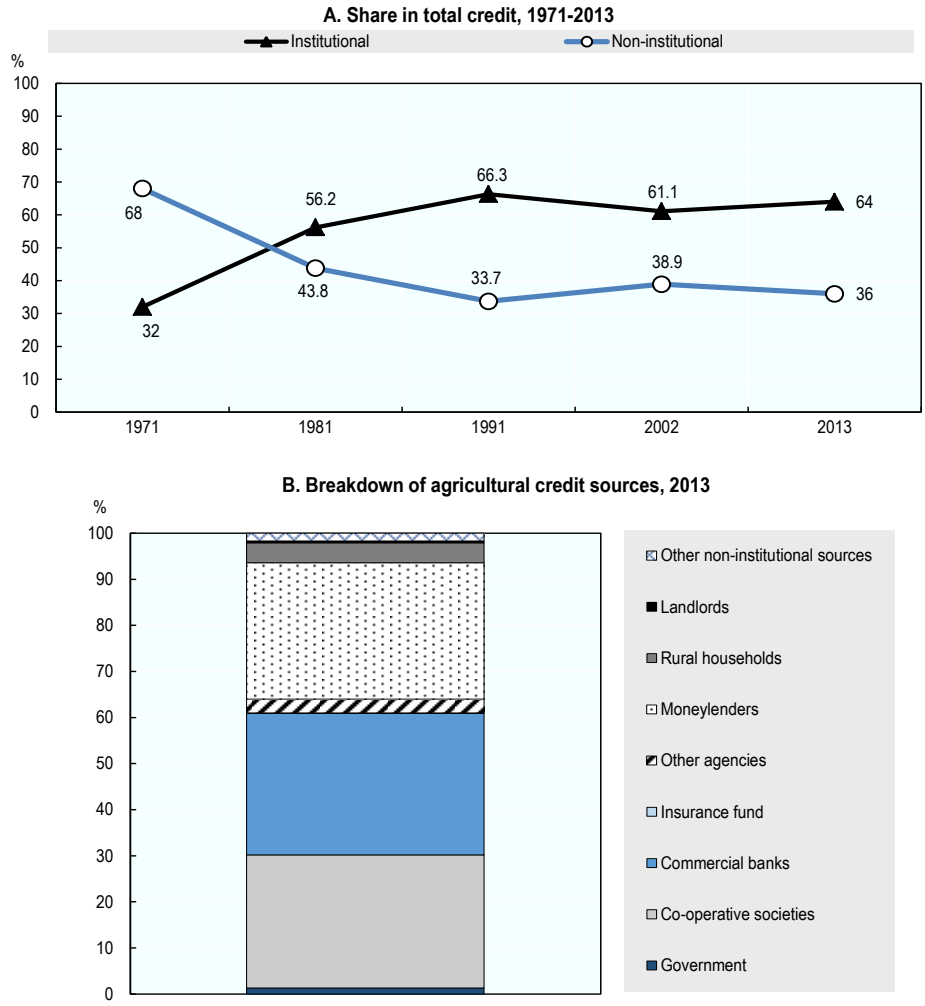
The Government of India's longstanding policies and regulations with respect to fertiliser prices (Chapter 3) have a direct impact on access to and use of fertilisers. While the average use intensity of fertilisers has risen steadily at an all-India level (section 2.2), the domestic production of fertilisers has not increased to meet these growing requirements mainly due to raw materials limitations. India depends entirely on imports for potassic (K) resources and imports 90% of phosphatic (P) inputs used in the production of fertilisers. Urea (N) is the only fertiliser for which the requirement is largely (around 80%) met through domestic resources (Majunatha et al., 2013). 50% of urea is under the Department of Fertilizers' movement control order – that is setting the amount of imports and the point of sale – compared with 20% for fertilisers based on K and P. Only three agencies are allowed to import urea into India, while there are no specific import controls on K and P-derived fertilisers. The entire process – from the time the Department of Fertilizers decides to import to the time urea reaches consumer centres – takes about 60-70 days; such delays can exacerbate shortages, and are particularly costly during peak demand periods (Government of India, 2016).

Access to financial services

While the rural banking system in India made significant achievements in increasing the amount of loans granted to the agricultural sector, several qualitative aspects of the credit delivery system have been neglected. Rural areas currently dispose of a range of financial service providers, including formal sector financial institutions at one end of the spectrum, informal providers (mostly moneylenders) at the other end, and in between a number of semi-formal/microfinance providers. In terms of size and coverage of operations, formal sector financial institutions dominate the rural finance landscape. The Government of India policies supported branch expansion of public sector commercial banks in rural areas, particularly in the 1970s and 1980s. India currently has over 32 000 rural branches of commercial banks (mostly public sector commercial banks) and regional rural banks (RRBs), some 14 000 co-operative bank branches, 98 000 PACS providing financial services, thousands of mutual fund sellers, several non-bank finance companies (NBFCs), and a large post office network with 154 000 outlets that are required to focus on deposit mobilisation and money transfers. Agriculture is also one of the priority sectors for lending[37], with a requirement that at least 18% of adjusted net bank credit (ANBC) is directed to the agricultural sector. More specifically, within the 18%, a sub-target of 8% of ANBC or Credit Equivalent Amount of Off-Balance Sheet Exposure – whichever is higher – is reserved for small and marginal Farmers (Reserve Bank of India, 2015).

This hides nevertheless a notable inter-state variation in access to formal credit: in 2013, Andhra Pradesh had the lowest share from the formal sector at 31%, while Kerala and Maharashtra had the highest at about 83%. There are also big differences across socio-economic groups, with 87% of marginal farmers not having access to credit from a formal source. This is exacerbated by the inability of small borrowers to provide collateral, coupled with volatile incomes and erratic expenditure patterns, as well as difficulties in contract design and enforcement. In addition, the transaction costs of rural lending are high, mainly due to small loan size, the high frequency of transactions, the large geographical spread, the heterogeneity of borrowers, and low education levels. Non-institutional agencies still account for as much as 36% of the total outstanding loans of cultivator households in 2012-13, an increase from 34% in 1990-91 (Figure 2.39) (Hoda and Terway, 2015; Rajeev, 2015).

Figure 2.39. Agricultural credit by source, 1971-2013



Source: Hoda and Terway (2015) based on various issues of *All India Debt & Investment Surveys*, National Sample Survey Office (NSSO).

The range of financial products of rural financial institutions remains limited and inadequate in relation to long-term farm investment needs. Direct lending to farmers by institutional agencies (co-operative banks, commercial banks and regional rural banks) takes the form of either short-term or long-term credit[38]. The banking sector has focused disproportionately on basic financial products, such as short-term credit, also motivated by interest rate subsidies on this type of credit[39] (Chapter 3). Long-term credit for the sector constituted only 57.6% of private capital formation in 2012-13, with significant fluctuations since the 1970s. Small and marginal farmers are particularly dependent on short-term credit (Hoda and Terway, 2015).

To compensate for the relative lack of success of formal banks in reaching the rural poor, new microfinance approaches were developed. These include the "Self-Help Groups (SHGs) - Bank Linkage", initiated by the National Bank for Agriculture and Rural Development (NABARD) to target the poorest segments of the rural population. However, outreach, volume of lending, and average loan size remain limited, with disbursements accounting for only 2% of the formal sector credit in rural areas (Rajeev, 2015).

The level of indebtedness rose sharply in both urban and rural areas in 2002-13: about 31.4% of rural households and 22.4% of urban households were in debt, up from 26.5% and 17.8% respectively in 2002. There is a higher level of indebtedness among cultivators (35%) than non-cultivators (25.6%). Recovery of loans in the agricultural sector is poor. The reasons behind this phenomenon lie mainly in the low level of income generation especially on small-sized farms, diversion of loans to unproductive purposes, inadequacy of the loans leading to their diversion, and wilful default in expectation of a waiver (MOSPI, 2016c). Indeed, the poor debt recovery has led many state governments to announce several waves of agricultural debt write-offs in recent years (Chapter 3). Although India's banks are recapitalised by the government for the full amount of loans written off under such programmes, district-level data suggest that banks shifted credit to observably less risky regions as a result of such programmes (Giné and Kanz, 2014).

Marketing channels for farm output

Marketing infrastructure

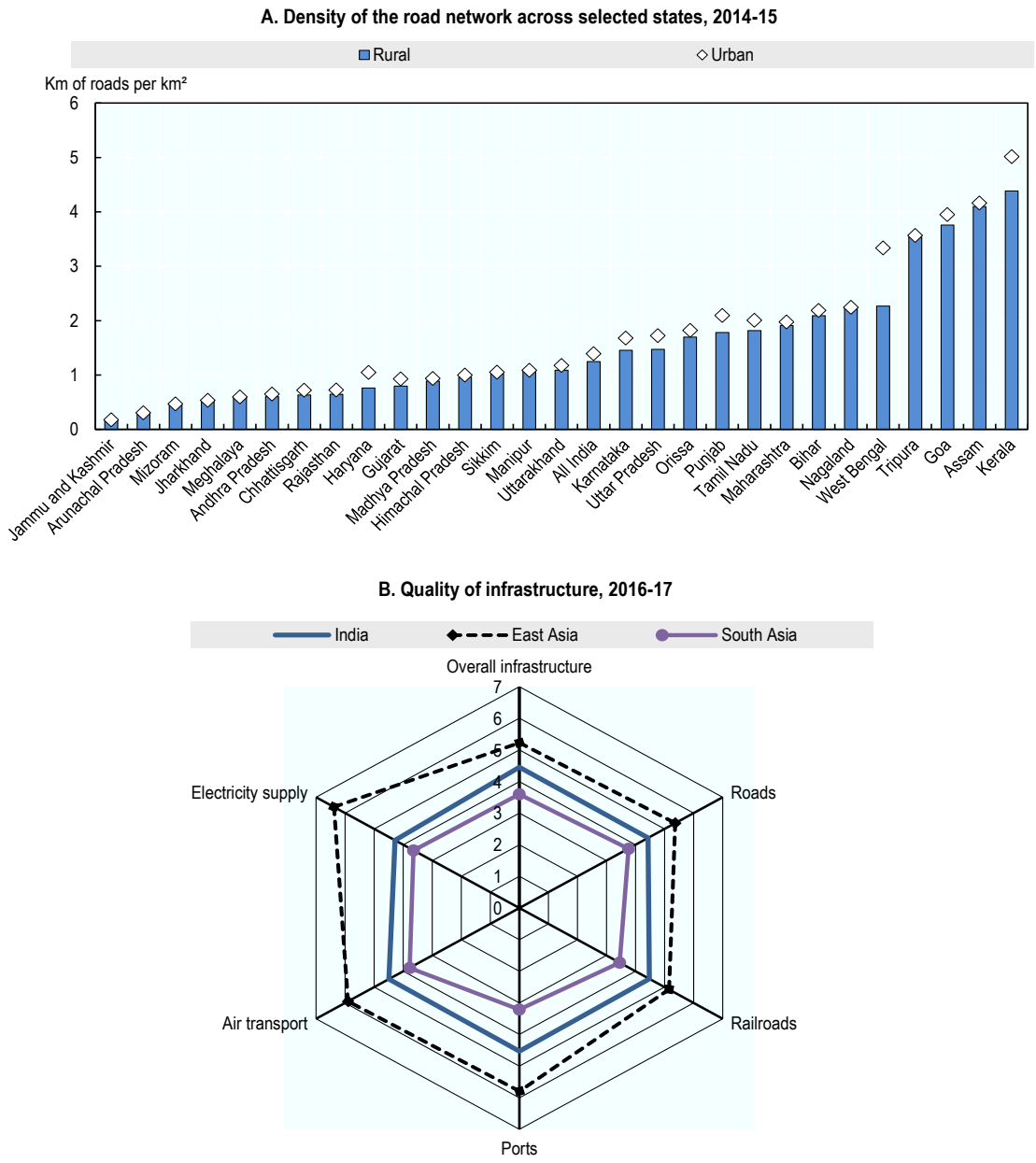
Current infrastructure deficiencies in India – concerning transport connectivity, cold chain and storage infrastructure, logistics, and energy supply – can be disruptive for agricultural supply chains, particularly when connecting small-scale producers to other market actors. These gaps lead to delays and uncertainties in supply chains and drive up transaction costs, resulting in higher prices for inputs and higher wholesale and retail prices for food.

Road transport infrastructure coverage in India has expanded considerably since independence. The average all-India rural road density is of 1.5 km/km^2 in 2014-15, ranging from 0.17 in Jammu and Kashmir to 4.38 km/km^2 in Kerala (Figure 2.40A). The fully centrally-sponsored scheme *Pradhan Mantri Gram Sadak Yojana* (PMGSY), introduced by the Government of India in 2000, made a significant contribution to providing all-weather road connectivity to every rural habitation with a minimum population of 500 in the plains and 250-plus in hill states, tribal districts and desert areas (Government of India, 2016; OECD, 2017a).

Meanwhile, the most acute strains on India's physical infrastructure lie in the quality of roads, railroads, ports, airports, as well as electricity supply. While India's quality of roads, railroads, ports, air transport, and electricity supply is better than South Asia peers, it lags considerably behind the average of East Asian economies (Figure 2.40B). About 40% of the road network is currently not paved and so far, only 14 states have developed policies for maintenance of rural roads (OECD, 2017a; WEF, 2017).

In the absence of appropriate rail and waterway networks, freight is highly concentrated in road transport, which dominates the freight market (over 65% of goods in terms of tonnage are transported by road, while 21% are transported by rail). Moreover, seven long-haul corridors account for about half of the total freight, even though national highways along these corridors are less than 0.5% of the Indian road network. This makes the current infrastructure over-stretched, with most of the national highway network and rail links along the North-South and East-West corridors congested: the average distance travelled by a truck in India is estimated to be around 250-300 km per day, compared to a world average of 400 km per day (World Bank, 2014b).

Figure 2.40. Physical infrastructure in India



Note: Panel B: The index is on a scale of 0 (lowest performance) to 7 (highest performance).
Source: Panel A: OECD (2017a) based on Ministry of Road Transport and Highways; Panel B: WEF (2017), Global Competitiveness Indicators.

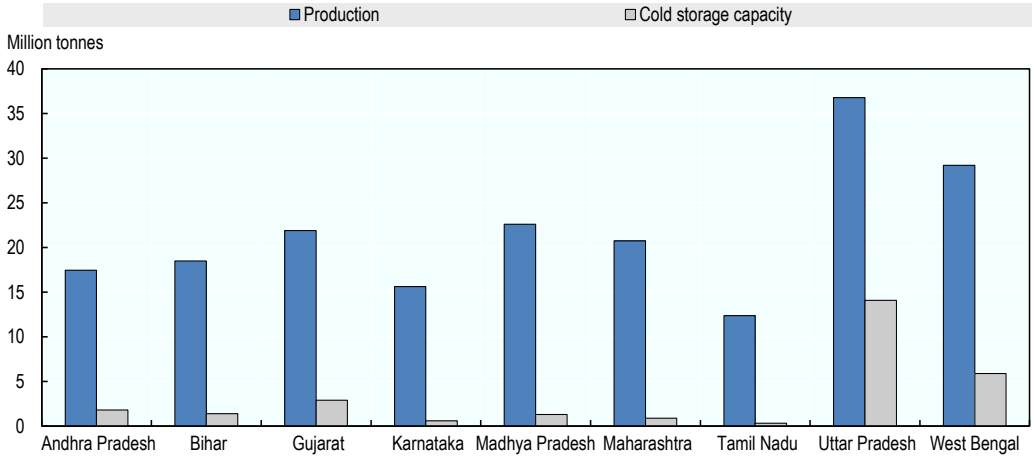
In addition, the trucking industry in India is largely fragmented and in the hands of small truck operators. Estimates suggest that nearly 75% of truck owners in India own between 1 and 5 trucks, while 15% own between 6 and 20 trucks. Trucks overloading is often an outcome of a truck fleet dominated by very small operators. Moreover, the cost of refrigerated transport can be up to three times higher than transport of non-perishable goods (World Bank, 2014b).

Aside road transport and freight services quality, inter-state checkpoints[40] and other checks during transit add to delays and uncertainties in the supply chain and push up total costs. There is also substantial variance in the number of checkpoints across states. Haryana, for example, has managed to eliminate domestic checkpoints, replacing them with widespread mobile squads; in contrast, Uttar Pradesh is reported to maintain over 100 checkpoints. Karnataka and other states have implemented e-permits that have cut the time spent at checkpoints, while Gujarat has moved to a fully electronic inter-state check-post system (World Bank, 2014b).

The private sector currently accounts of only 14.9% of the all-India available storage capacity in warehouses, slightly above co-operatives (11.9%) but well behind the public sector (73.2%). Cold storage units are estimated to exist in only 9% of wholesale markets while grading facilities exist in less than one third of the markets. For instance, in the case of fruit and vegetables, only 12% of output is covered by cold storage capacity at an all-India level, with notable differences between states such as Uttar Pradesh (capacity for 14% of output) and Tamil Nadu (0.32%) (Figure 2.41). Moreover, the functioning of available cold storage units is impacted by problems in electric power transmission and distribution losses, which represent 18.5% of total electric power output and are much higher than in other economies in Asia such as Indonesia (10%) or China (6%) (WB WDI, 2018). There is also a mismatch between storage and transport capacity, as refrigerated transport capacity represents only 12% of the all-India cold storage capacity.

Figure 2.41. Production of fruit and vegetables versus overall cold storage capacity

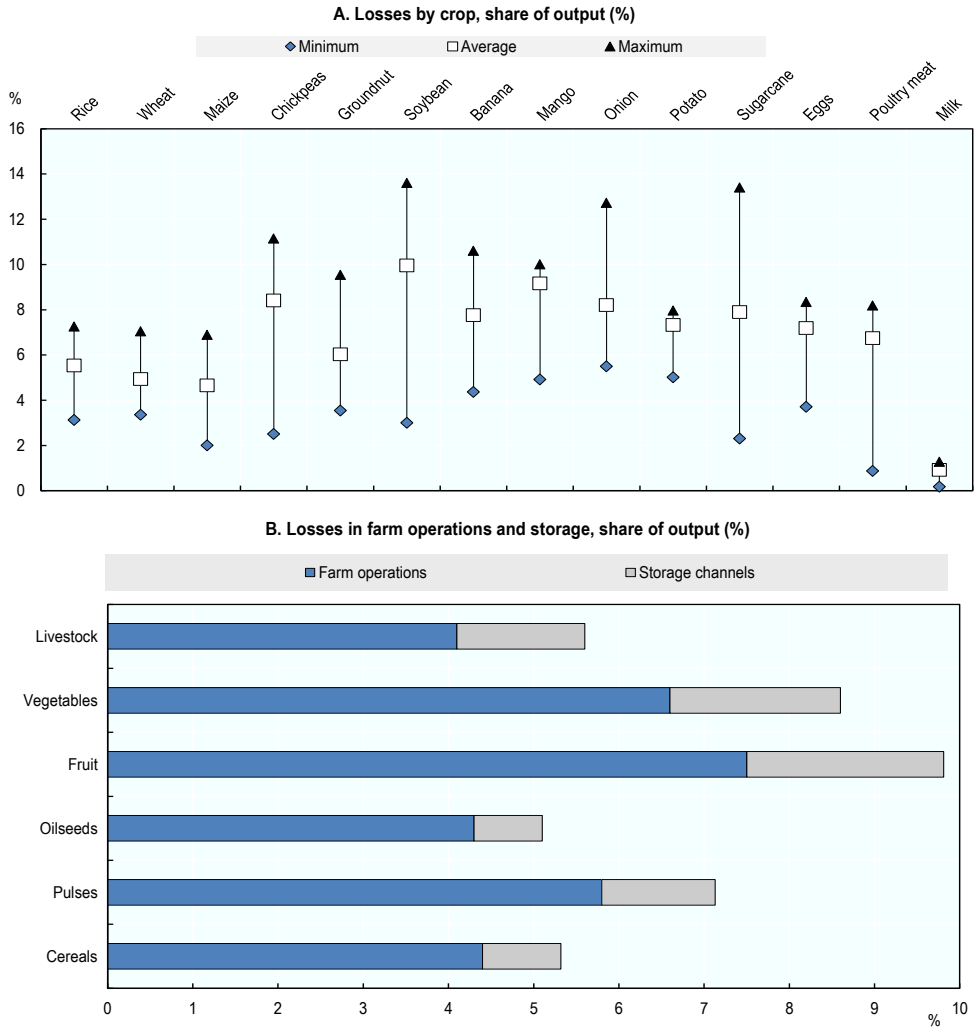
By selected states, million tonnes



Source: MAFW (2017), *Horticulture at a Glance*.

Transport inefficiencies between production and processing areas, together with the limited capacity in storage infrastructure, also increase post-harvest losses and hinder the development of efficient agro-marketing chains. Estimates indicate that while reductions in annual post-harvest losses have been registered for fruit and vegetables, these still remain high (between 4% and 16%, depending on the state). In turn, an increase in annual output losses has been recorded for cereals, pulses, oilseeds, dairy (Figure 2.42) (ICAR, 2012; World Bank, 2014a; MOFPI, 2015; Gulati and Saini, 2016; Government of India, 2017c).

Figure 2.42. Average state-level post-harvest losses and wastage intervals, by product category, 2015



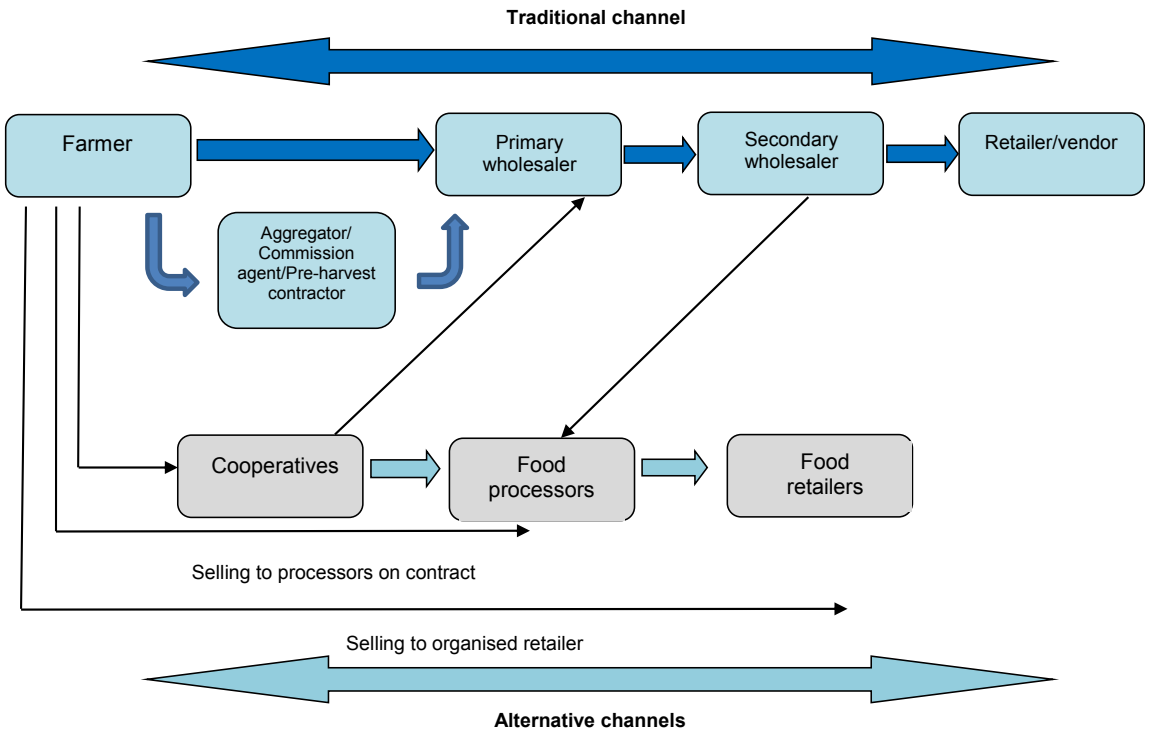
Note: Post-harvest losses are recorded as a share of total output in selected states. The figure accounts for milk marketed through formal channels. Almost half of India's milk production is consumed by the household in which it is produced and is not marketed, while about 33% of milk production is channelled to consumers through the small and informal sector (Chapter 3).
Source: MOFPI (2015).

Multiple challenges still remain with respect to infrastructure development, including funding constraints, land acquisition issues, delays related to identification and award of projects, and policy failures in transport infrastructure maintenance. To improve the situation, the Union Budget 2017-18 foresees ambitious programmes in transportation, telecommunications, and energy supply. Total government spending on physical infrastructure has been increasing from 4.1% of GDP in 2006-07 to 4.5% in 2011-12 and 5.1% in 2016-17[41]. The budget allocation for the transportation sector as a whole constitutes 60% of the overall infrastructure allocation in 2017-18. The infrastructure system – the aggregation, transport, storage and distribution – requires integrating operational capacities so as to serve as a conduit to the market and not function in isolation (Government of India, 2017a, 2017b).

Agricultural output markets

The traditional agro-marketing system stretches from farmers to aggregators, wholesalers, processors and retailers (Figure 2.43). This marketing channel includes both primary and secondary wholesale markets. Primary wholesale markets are located very close to production areas, allowing farmers to participate in transactions, in addition to other agents such as aggregators and contractors. Secondary wholesale markets, where transactions take place between different traders and market intermediaries, are usually located in or near large cities and commercial centres (MOA, 2013; World Bank, 2014a).

Figure 2.43. Agricultural output marketing channels



Source: Adapted from MOA (2013) and Ghesh (2013).

Agricultural output markets function under a large set of regulations, including controls on private storage, processing, distribution, and market infrastructure development (Chapter 3). Inter-state barriers, such as the complex tax system prior to the implementation of the GST reform (Chapter 3) and the existence of state border checkpoints, have led to fragmentation of the national agricultural market. At the level of government-regulated primary and secondary wholesale markets, the complex licensing arrangements – initially set up so as to control the behaviour of market participants – has led to market arrangements characterised by multiple middlemen and multiple commissions, charges and levies: these all contribute to placing downward pressure on farmers' prices (Chapter 3). For instance, in the case of fruit and vegetables, the lengthy supply chain can lead to aggregators, market traders, wholesalers etc. accounting for between 30% to 50% of the retail consumer price (Boston Consulting Group, 2012).

Alternative marketing arrangements for linking farmers to markets

Alternative arrangements for linking farmers to markets have been developing given the inefficient and weak functioning of many output markets. In many cases, this has helped bypass some of the traditional intermediaries and thus reduce sourcing costs and wastage levels. Such initiatives include co-operatives and contract farming (Figure 2.41) (Patnaik, 2011; World Bank, 2014a).

For instance, in the dairy sector, the network of co-operatives has been a key driver of development since the onset of the White Revolution and currently accounts for approximately 60% of processed fluid milk. The first co-operative was established by producers in 1946 in Anand, Gujarat in order to sell directly to consumers. The "Anand Model" continues to function as a three-tiered approach which includes (1) village-level dairy co-operative societies that collect milk with quality-based payments to members; (2) District Co-operative Milk Producers' Unions (DCMPUs) that process, market, and provide technical support for the village-level societies; and (3) State Co-operative Milk Marketing Federations that provide a range of marketing, feed distribution, and administrative functions. The village-level societies collect milk daily from members, with the milk chilled, aggregated, and transported to a co-operative plant owned by a DCMPU. Members receive an immediate payment based on the fat content of their milk, and a later payment based on the overall earnings of the district and state unions. Most district unions also provide a range of inputs and services to village societies, including feed, veterinary care, artificial insemination services, as well as training. The dairy co-operatives network includes 22 State Milk Marketing Federations, 183 district milk producer unions, and nearly 156 000 village-level co-operative societies with a total membership of about 15.1 million dairy farmers (Landes et al., 2017).

Contract farming has been developing as another alternative marketing channel for producers. As an example, within the last decade, many poultry meat processors have vertically integrated their operations[42] with farmers, particularly in southern and western India (which accounts for 70% of total chicken meat production). Integrators own all the hatcheries, feed mills, and slaughter facilities, and enter into a contract with multiple smaller farmers (a large integrator may have as many as 20 000 contracted farms). This has provided farmers with lower transaction costs, guaranteed markets, faster turnaround, more transparent pricing, and better allocation of risks, while contracting firms had the advantage of more secure supplies and reasonable control over quality and other specifications. Some integrators also provide credit and extension services (GAIN FAS, 2016).

Direct procurement from farmers can be done only in states that have amended their Agricultural Produce Marketing Committee (APMC) Act to permit buyers to purchase directly from producers, in line with the Model Act 2003 proposed by the central government (Chapter 3). Moreover, contract farming arrangements are largely dependent on the legal enforceability of contractual provisions – with many being often verbal and informal in nature – as well as the ability of small farmers to form clusters that can create a scale effect and enhance their bargaining position (Gulati, 2009). According to the Doing Business indicators, India is only halfway in reaching worldwide best practice in the ease of enforcing contracts, with the efficiency, cost and time associated to resolving a commercial dispute lagging significantly behind other major Asian agricultural producers such as China, Thailand or Viet Nam. In addition, in many sectors – including fruit and vegetables – organised processing and retail establishments often have strict

requirements regarding the produce, which means they would more often procure from small and medium farmers rather than marginal ones (Minten and Reardon, 2010).

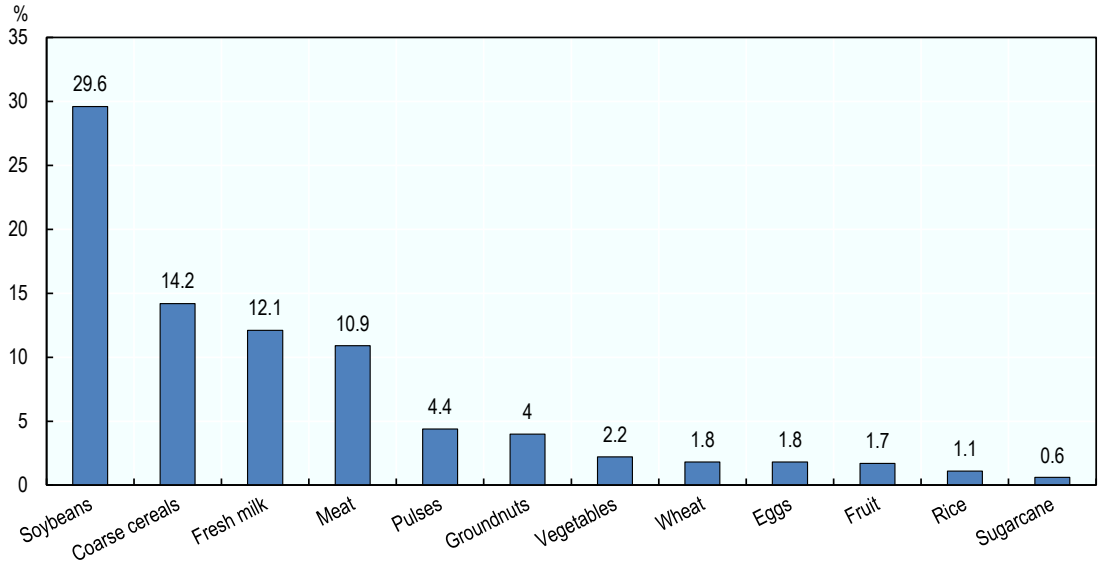
Agro-food industry: food processing and retail

Changing demographics, increased urbanisation, lifestyle changes, evolving preferences for branded items, as well as a modernising retail sector are driving demand for processed food. The food processing sector grew rapidly in the past five years, with investments increasing by 20% annually. The central government has made efforts since the mid-1990s to attract private investment in the food processing industry by giving it 'priority sector status' and providing fiscal incentives[43]. Meanwhile, India's food processing mainly involves primary processing which accounts for 80% of the sector. Six traditional sectors – grains, oils and fats, sugar, dairy, tea and coffee – dominate the food processing industry with 80-85% of total processing output, employment, and factories (World Bank, 2014a).

Despite significant increases over the recent period, the shares of high-value sectors in food processing – such as fruit and vegetables and meat products – remains small (less than 5% and 8% of total value of output) compared to cereal-based products (21%) and oilseeds (18%) (Figure 2.44). A significant challenge for both the organised and unorganised sectors is the amount of agro-food output damaged or lost each year due to insufficient and inadequate cold storage (as highlighted in Figure 2.44), as well as post-harvest and further processing facilities. In the case of milk production, only 22% of cities and towns are catered by organised milk distribution networks and only 15% of milk marketed is packed (World Bank, 2014a).

Figure 2.44. Extent of food processing

Share of domestic output by selected commodity (%)



Source: Institute of Economic Growth (2014).

Major constraints to the growth of the Indian food processing industry include the absence of adequate connectivity infrastructure, inadequacy of information and marketing linkages, lack of electricity supply, and the absence of cold chain systems. The food processing sector currently has a dualistic structure: a relatively small (in number of units) but capital-intensive organised segment coexists with a widespread (in number of small units and workers) labour-intensive and mostly rural unorganised segment. The food-processing operations employed nearly 8 million people in 2008–09, with the organised sector accounting for 21%; the difference in productivity between the organised and unorganised sectors remains significant, as the former alone contributes 81% of the industry gross output. The bulk of employment in the processing sectors is generated by grain mill products, sugar refining, dairy sector, oils and fats, and bakery products. Depending on the scale of the operation, the organised Indian food processing sector can be divided into: large Indian companies, wholly-owned subsidiaries of foreign companies or joint ventures, and medium-sized domestic food processing companies with a local or regional presence (Gulati, 2009; World Bank, 2014a; Gulati et al., 2016).

The Indian retail sector has also undergone marked changes in the past years, largely driven by an improved business environment and FDI liberalisation. As in the case of food processing however, food retail is also characterised by a dualistic structure, with the market being divided between organised and unorganised retailers.[44] India's food retail industry remains largely dominated by unorganised retailers like *kirana* (mom-and-pop stores), grocers and provision stores which accounted for 92% of the sector in 2015. The emergence of larger chains and stores began mid-2000s in large cities and the sector has since grown to over 3 500 modern retail outlets across India – nevertheless, such retailers still accounted for only 8% of the sector in 2015 (Gulati et al., 2016).

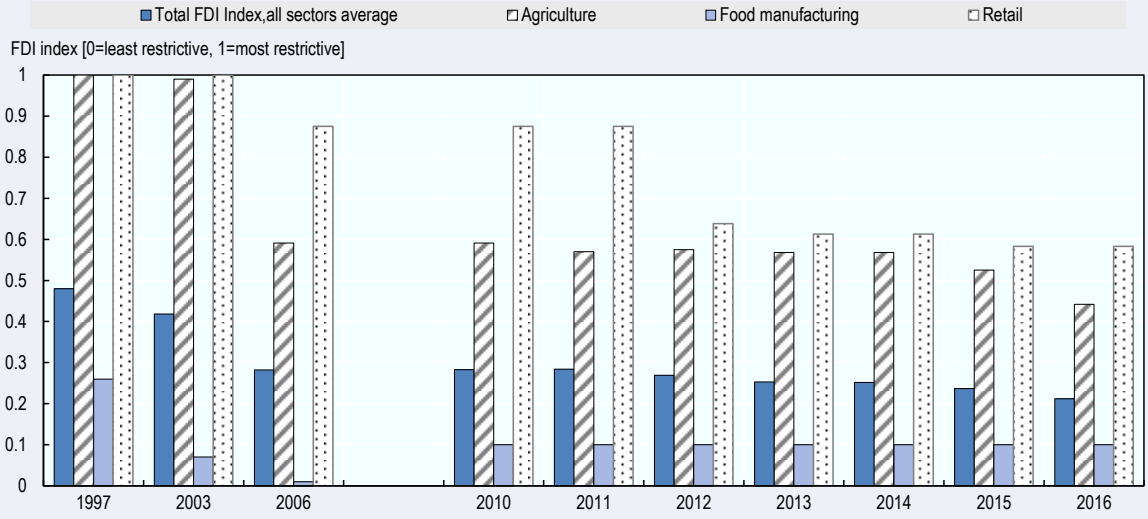
The organisation of the retail sector is also quite different from other Asian countries, such as Thailand (where modern retail represents 45% of the sector versus 55% for traditional retail), Malaysia (43% versus 57%), the Philippines (28% versus 72%), Viet Nam (25% versus 75%), and Indonesia (16% versus 84%). Compared to these other emerging economies, the development of organised private retailers has been driven by domestic capital investment, rather than by FDI-driven retail expansion. Owing to remaining FDI restrictions, particularly in the multi-brand segment,[45] the retail sector is currently biased towards domestic retailers (Box 2.9). It is also only at an early stage in its penetration of small cities and even rural towns and areas. Given the current scale of organised retail establishments and operations, their most important procurement avenue remains from wholesale markets through brokers and other intermediaries. Larger investors in the modern retail sector are more likely to be involved in peri-urban collection centres, where traditional market channels are bypassed, particularly for some fruit and vegetables (Minten and Reardon, 2010; MOFPI, EY and CII, 2017).

Box 2.8. FDI policies in wholesale and retail

The cumulative FDI equity inflows between April 2000 and June 2017 totalled USD 342.4 billion, of which USD 43.5 billion were invested in 2016-17 alone. Services have attracted the highest FDI in India in 2000-17, accounting for almost 18% of the total FDI inflows. Food processing (2.28%), agricultural services (0.6%) and retail trading (0.30%) are also among the important FDI recipients.

During the liberalisation period of the 1990s, the Government of India introduced various reforms relaxing the regulations governing foreign investments. Further on, since 1999, the FDI regime in India continued to be progressively liberalised with many restrictions on foreign investments being removed and procedures being simplified, as reflected by the OECD FDI Restrictiveness Index over the 1997-2016 period (Figure 2.45). For instance, in the case of the approval route, this can now be requested by the investor through the online single window Foreign Investment Facilitation Portal, which replaced in 2017 the Foreign Investment Promotion Board so as to simplify and speed the process.

Figure 2.45. OECD FDI Restrictiveness Index: Agriculture and retail, 1997-2016



Note: The FDI Regulatory Restrictiveness Index (FDI Index) measures statutory restrictions on foreign direct investment across 22 economic sectors and gauges the restrictiveness of a country's FDI rules by looking at the four main types of restrictions on FDI: 1) Foreign equity limitations; 2) Discriminatory screening or approval mechanisms; 3) Restrictions on the employment of foreigners as key personnel; and 4) Other operational restrictions, e.g. restrictions on branching and on capital repatriation or on land ownership by foreign-owned enterprises. The overall restrictiveness index is the average of sectoral scores.
Source: OECD (2017b), *FDI Regulatory Restrictiveness Index database*.

Nonetheless, significant restrictions are still prevalent, particularly in the primary sector and retail:

Agriculture: 100% FDI is permitted under the automatic route only for the following activities: (i) floriculture, horticulture, apiculture and cultivation of vegetables and mushrooms under controlled conditions (i.e. where climatic and related conditions are controlled artificially); (ii) development and production of seeds and planting material;

(iii) services related to agro and allied sectors. 100% FDI is also allowed through the automatic route in the plantation of tea and coffee, rubber, cardamom, palm oil and olive oil.

Food processing: 100% FDI is permitted for the manufacturing sector under the automatic route. A manufacturer is also permitted to sell its products manufactured in India through wholesale, retail or e-commerce activities. Further, notwithstanding the FDI provisions applicable to the retail trading sector, 100% FDI under the approval route is permitted for food products manufactured or produced in India. To increase investment in food processing infrastructure the Ministry of Food Processing Industries (MOFPI) has been implementing a number of central sector schemes, including the *Scheme for Mega Food Parks*, which also provides various fiscal incentives in terms of reduction and exemption of taxes.

Retail: Since January 2018, up to 100% FDI is permitted via automatic route for companies looking to undertake *Single Brand Retail Trading* (SBRT) in India. FDI in SBRT has shown consistent growth in India, with various global conglomerates having set-up operations in the country. Where FDI in SBRT exceeds 51%, mandatory local sourcing norms would be applicable on an annual basis, after the first five years: at least 30% of the value of goods purchased should be from India (preferably from MSMEs, artisans, craftsmen or village/cottage industries).

In 2012, the Government of India also relaxed several conditions with respect to FDI in *Multi-Brand Retail Trading* (MBRT). FDI up to 51% is permitted under the government approval route, with at least 50% of the first tranche of investment required to be invested in 'back-end infrastructure' (quality control, distribution, packaging, warehousing, design improvement, logistics) within 3 years. Entities having FDI, and engaged in MBRT activities, would not be permitted to engage in trading via e-commerce. There are also local sourcing norms for investing in MBRT: at least 30% of the value of procurement should be sourced from Indian MSMEs that have a total investment in plant of machinery not exceeding USD 2 million (sourcing from agricultural and farmers co-operatives would fall in this category). In the first instance, the local sourcing requirement should be met as an average of 5 years and thereafter annually. Additional circumstances include state government discretion, as the FDI policy on MBRT is only enabling in nature, and retail outlets can be set-up exclusively in states or UTs that have agreed to this policy and in cities with a population exceeding 1 million (or other cities agreed by State Governments).

Source: MOFPI, EY and CII (2017); OECD (2017b).

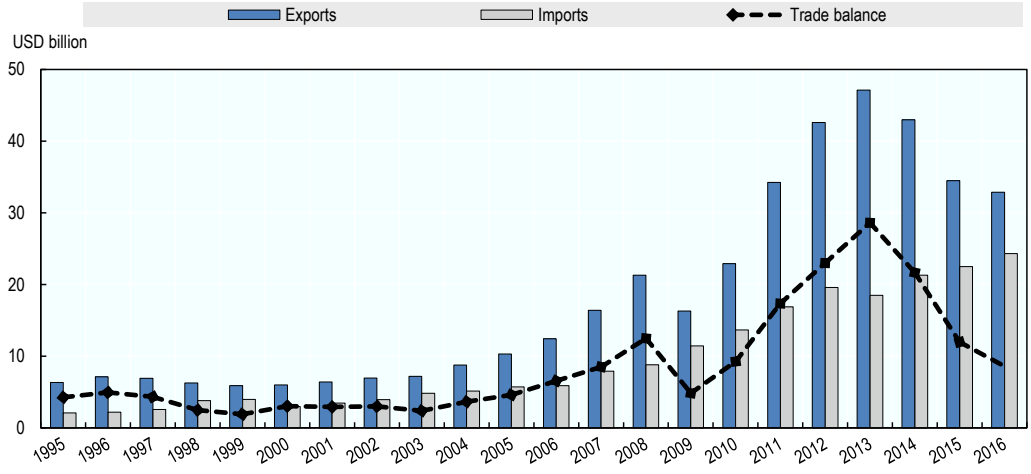
Aside existing FDI restrictions, many structural challenges relating to the establishment of retail businesses affect domestic and foreign players alike. High upfront investments in back-end infrastructure – including warehouses, logistics, and customer services – and access to capital constitute main impediments to the establishment of retail businesses. With a geographically dispersed population, the distribution structure at a pan-India level is fragmented and poor connectivity makes the cost to service stores very high. The wide geographical spread also leads to higher management costs. In addition, competition from low-cost traditional channels sets important pressure on margins, with the organised retail sector not only operating at lower costs but also having lower margin expectations. Scale and profitability thus deter most entrepreneurs from entering the market (MOFPI, EY and CII, 2017).

Existing restrictions in the services sector – another key input to the domestic agro-food processing and retail sectors – set an additional constraint for product development, supply chain management, production process support, distribution and marketing of agro-food products. In services sectors such as distribution or logistics, India tends to have more restrictive regulation than most other countries covered by the OECD Services Trade Restrictiveness Indices (STRI), mainly driven by a general regulatory framework imposing a number of burdensome administrative procedures and time consuming licensing and permit requirements. India is characterised by a distribution services STRI of 0.44,[46] second only to Indonesia among BRIICS, and a logistics storage and warehouse STRI, second after the Russian Federation within BRIICS economies (Benz, Khanna and Nordås, 2017).

Agro-food trade flows and participation in global value chains

India has consistently been a net exporter of agro-food[47] products during the last two decades. Agro-food exports grew at an annual average rate of 11%, from USD 6.3 billion in 1995 to USD 47.1 billion in 2013; exports then decreased to USD 32.9 billion in 2016 due to a mix of lower global commodity prices, sluggish foreign demand, increased domestic consumption, and climate events affecting the domestic production base. Agro-food imports also increased from USD 2.2 billion in 1995 to USD 24.3 billion in 2016, growing at an even higher annual average rate of 14%. With a higher growth rate of agro-food exports in 2009-13, the trade surplus widened considerably until 2013. It then started to narrow, in line with the agro-food exports decrease versus the consistent increase in imports (Figure 2.46) (UN, 2017).

Figure 2.46. Agro-food trade of India, 1995-2016



Note: Agro-food trade data include here fish and fish products.
Source: UN (2017), *UN Comtrade Database*.

Indian agriculture has increasingly been integrated with world markets: agro-food trade as a share of agricultural GDP was just 5% in 1990, when economic reforms started, but reached 16% in 2016 (Table 2.2). It is still low as compared to the share of India's total merchandise exports and imports as a per cent of India's GDP, which increased from 14.7% to 42% over the same period. Agro-food exports constitute 13% of India's total exports, while agro-food imports are 7% of total imports (UN, 2017).

Table 2.2. Agro-food sector's integration with international markets, 1995-2016

		1995	2005	2010	2015	2016
Coverage degree of imports by exports	%	306	181	168	153	135
Share of agro-food trade in total trade						
Exports	%	20	10	10	13	13
Imports	%	6	4	4	6	7
Ratio of agro-food exports to agricultural GDP	%	7	7	8	10	9
Ratio of agro-food imports to agricultural GDP	%	2	4	5	7	7
Ratio of total exports to total GDP	%	9	12	13	13	12
Ratio of total imports to total GDP	%	10	17	21	19	16

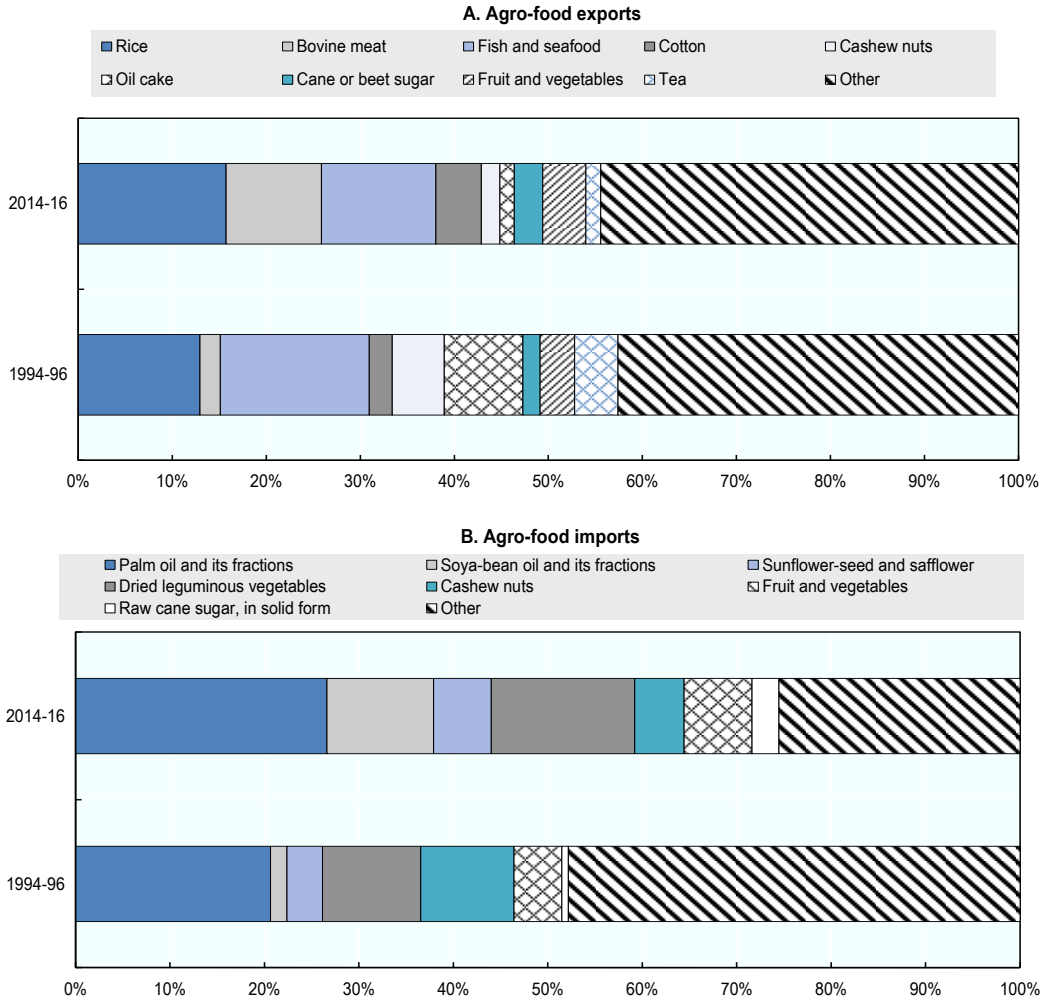
Source: UN (2017), *UN Comtrade Database*.

India's share in total global exports of agro-food products has increased from 0.8% in 1990 to 2% in 2016 and is higher than the share that India has in global merchandise exports (1.7%). The composition of agro-food exports has evolved over the last two decades. The share of rice, bovine meat, cotton, and sugar in total agro-food exports increased over this period (Figure 2.47). In 2012, India emerged as the world's largest exporter of rice and bovine meat, which consists of boneless meat from buffalo[48] only (called *carabeef*). A strong global demand for bovine meat, particularly in low- and middle-income developing countries, and the development of private, export-oriented slaughter and packing facilities in several Indian states have been key drivers of India's emergence as a major bovine meat exporter (Landes et al., 2016). It is also the world's second largest exporter of sugar and cotton, in spite of the national fibre policy allowing only cotton surplus to domestic consumption to be exported. Other dynamic sectors, such as fruit and vegetables, have also been expanding, with the share of this group increasing from 4.2% in 1994-96 to 5.2% in 2014-16, signalling a movement towards high-value exports in line with global demand (Figure 2.47) (Gulati et al., 2016; UN, 2017).

The composition of agro-food imports has remained unchanged over the last two decades, with pulses and edible oils accounting for more than half of the total (Figure 2.47). The share of pulses has increased from 9% in 2001-02 to 13% in 2014-16 while edible oils have increased their share from 46% to 52% in the same period. More than 60% of edible oil imports consist of palm oil, while soybean and sunflower seed oil account for smaller shares. Fruits and nuts (including cashew nuts) accounted for 11% of total agro-food imports in 2014-16 (Gulati et al., 2013; Gulati et al., 2016; UN, 2017).

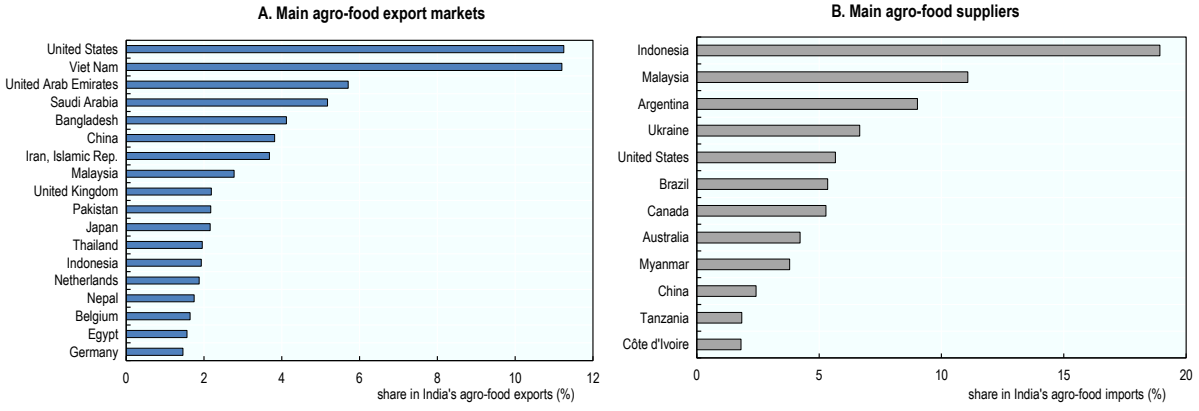
The United States, Viet Nam and United Arab Emirates were the main export markets for India's agro-food products in 2014-16. Other MENA and South Asian economies such as Saudi Arabia or Bangladesh are also important destinations, particularly for cereals. Within Asia, ASEAN's agro-food trade with India increased, with Indonesia and Malaysia becoming India's top suppliers of agro-food products, largely due to vegetable oils imports. Agro-food trade with Europe and Central Asia has been much less dynamic, although Ukraine remains a key source of wheat imports (Figure 2.48) (Gulati et al., 2013; UN, 2017).

Figure 2.47. Composition of agro-food trade, 1994-2016



Source: UN (2017), *UN Comtrade Database*.

Figure 2.48. Main export markets and suppliers of agro-food products, 2014-16

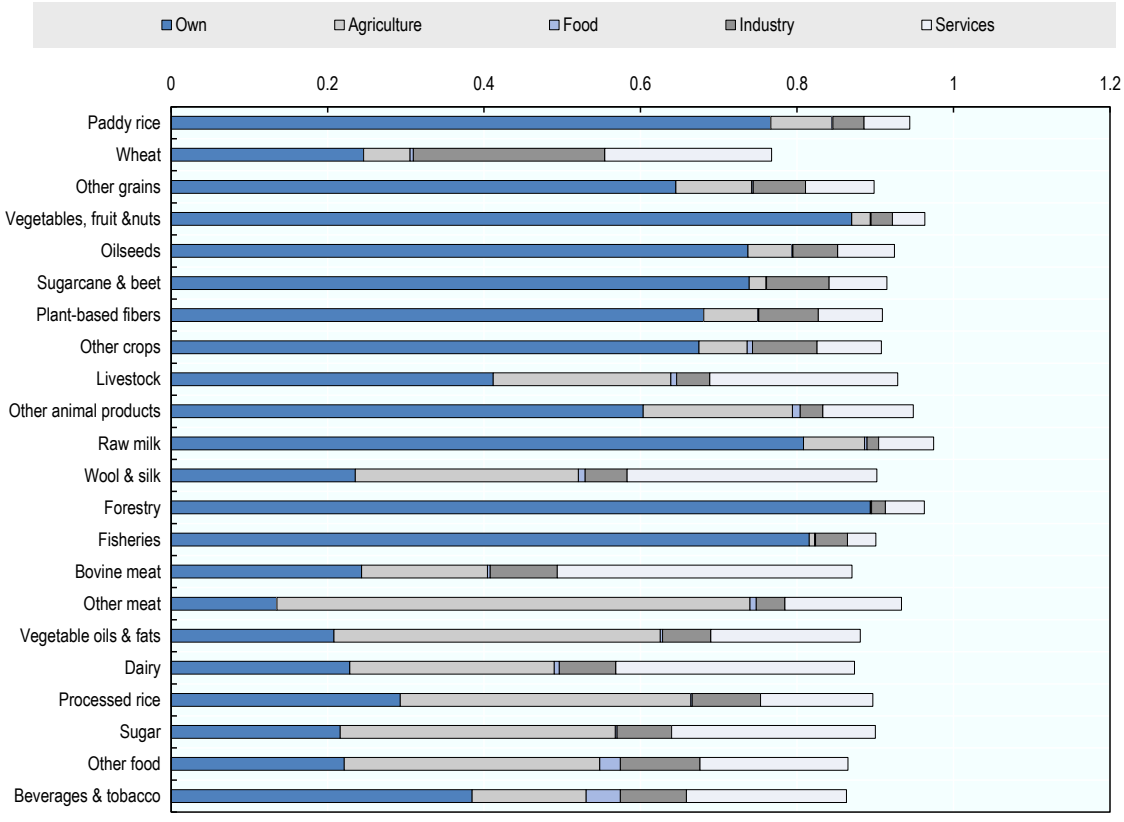


Source: UN (2017), *UN Comtrade Database*.

India's participation in agricultural global value chains (GVCs) is weaker than its engagement in manufacturing or services sectors GVCs. The foreign content in India's exports has increased significantly over the last two decades in sectors such as industrial raw materials, chemicals, machinery or electronics, in the ranges of 28.6% to 56.6% of exports across these sectors in 2011. However, the foreign value added content is only 4.1% in the case of the agriculture sector exports, highlighting a much more limited access to competitively-priced foreign inputs. Similarly, the share of domestic agro-food value added driven by foreign final demand (10%) is lower than most manufacturing sectors (ranging between 20% and 63%) or mining (39.9%) (OECD-WTO TiVA, 2017).

For agriculture, due to the primary nature of production, the majority of domestic value added is generated in the sector itself – that is, from the land, labour and capital employed (Figure 2.49). The high share of value added derived within agriculture itself points to the importance of productivity growth in the agricultural sector as a means to enhance value added in the overall agro-food sector. The high shares of industry and services in the value of agro-food exports highlight as well the importance of accessing competitively-priced inputs – including services such as business, transport, and logistics – for the international competiveness of various sub-sectors. The services sector appears to play a key role for all agro-food exports in India, with services content in total exports ranging between 15 to 38% by agro-food sector (Greenville et al., 2017a, 2017b).

Figure 2.49. Domestic value added in India's agro-food exports by source, 2011

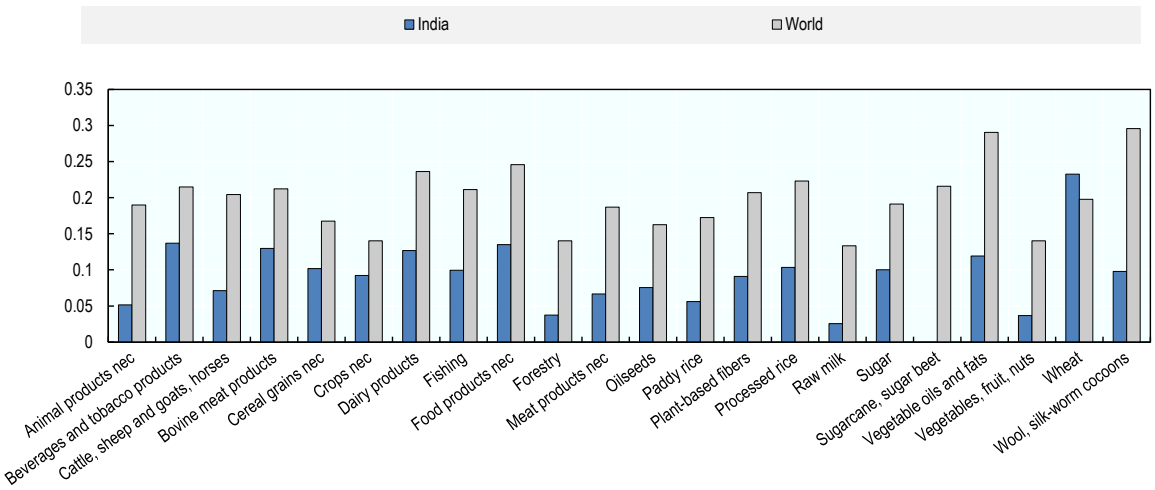


Source: OECD estimates based on the dataset in Greenville et al. (2017a, 2017b).

The specific pattern of India's GVC integration can be analysed through estimates of the engagement in the form of buying from (backward linkages[49]) and selling (forward linkages[50]) to GVCs. In terms of sourcing inputs from value chains (buying from GVCs), India's strongest linkages are in sectors such as wheat, beverages and tobacco products, or dairy products, but overall the sector has low backward integration (Figure 2.50). With the exception of wheat, India's GVC engagement on the demand side is below the world average across all the selected sectors. India's participation in GVCs is much stronger on the supply side of GVCs (forward linkages), with Indian inputs being used in other countries' exports, particularly in live animals, animal products, and wheat, all above world averages (Figure 2.51) (Greenville et al., 2017a, 2017b).

Figure 2.50. Buying inputs within GVCs, 2011

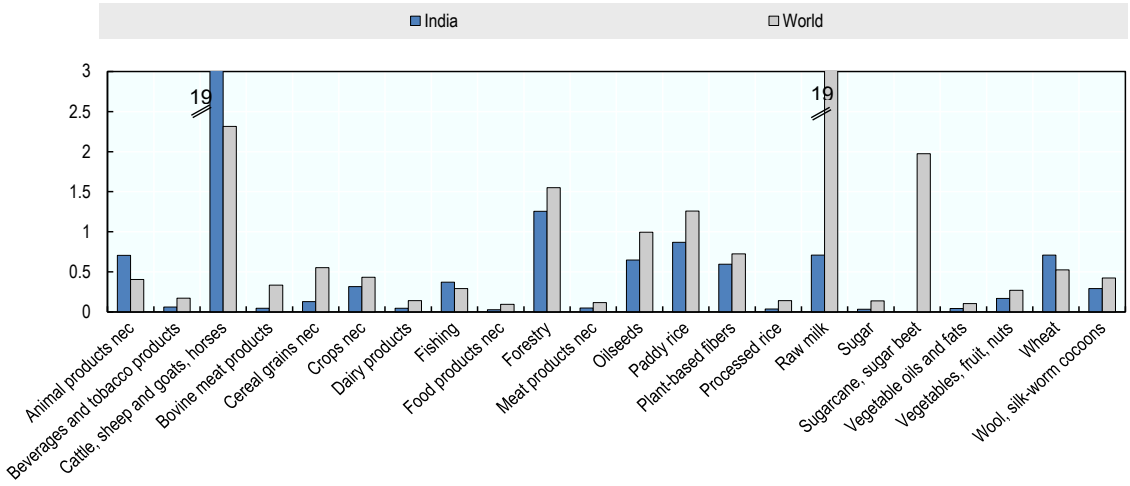
Backward linkages indicator by sector



Source: OECD estimates based on the dataset in Greenville et al. (2017a, 2017b).

Figure 2.51. Selling inputs to GVCs, 2011

Forward linkages indicator by sector



Source: OECD estimates based on the dataset of Greenville et al. (2017a, 2017b).

Overall, the agro-food GVCs integration pattern mirrors the structural challenges and marketing inefficiencies encountered at the level of domestic agro-food supply chains. The low participation in agro-food GVCs – either through direct exporting of intermediates and final products, or through indirect exporting of agricultural value added through other downstream domestic sectors – has also limited the potential labour returns stemming from the sector's participation in agro-food GVCs in India (Greenville et al., 2017a, 2017b).

2.7. Summary: Key highlights

The Indian economy, including its agricultural sector, has undergone significant transformations and realised a number of notable achievements over the last decades. The green revolution (in cereal production, late 1960s-early 1980s) was succeeded by the white revolution (in milk production, starting in the 1970s), the gene revolution (in cotton production, early 2000s) and the more recent diversification of production towards pulses, fruit and vegetables, as well as meat and meat products, largely in response to evolving demand patterns driven by rising incomes and urbanisation. Since the early 1990s, India's agricultural exports have also steadily grown and diversified. India emerged as a major exporter of agriculture and allied products such as rice, meat and meat products, cotton, oilcakes, vegetable extracts, fish and fish products, and several others (including wheat in some years). Given the fact that India is already a significant producer of fruit and vegetables, the next revolution is likely to emerge in the fruit and vegetables sector (both fresh and processed segments). However, this will not occur in a scenario of low storage and processing capacities, significant post-harvest losses, and weak marketing connectivity.

The diversity of natural regions and climatic conditions in India allow for the cultivation of a wide range of crops and undergoing various livestock activities. However, at just 0.15 ha per capita, agricultural land is very scarce. Moreover, land degradation is increasingly prevalent throughout the country: 37% of the total land area (about 120.4 million ha) appears to be affected by various types of degradation. India also faces a severe water crisis due to a widening gap between water supply and demand, as well as poor water resources management and changing precipitation patterns induced by climate change. Total water demand is expected to increase by 32% by 2050 driven by population growth, urbanisation and further industrialisation. Environmental pressures are rapidly intensifying: by mid-century, the impact of climate change would be felt as an increase in the average surface temperature, changes in rainfall during both monsoon and non-monsoon months, as well as an increase in the frequency and intensity of both droughts and floods.

Agriculture accounts for as much as 17% of GDP and 47% of the total national labour force. The slow pace of India's structural transformation is reflected in the large gap in productivity between agricultural and non-agricultural workers. Agricultural labour productivity growth remains a key challenge and lags behind other economies in the region. Farm incomes are currently at less than one-third of those of non-agricultural households and there is a wide variation in farm income growth between regions as well as between individual states. Land productivity has been increasing over the last two decades; however, a mapping of yield trends in India in 2011-14 highlights that land productivity stagnated for several key commodities.

The sector is dominated by a large number of marginal and small-scale operators: 85% of the operational holdings in India are of less than 2 ha and represent 45% of the total

cropped area. In turn, only 5% of farmers operate on holdings larger than 4 ha, but they occupy nearly 32% of all arable land. There is continuing fragmentation of the already very small farms, with the national average operational holding size showing a steady decline, from 1.33 ha in 2000-01 to an estimated 1.15 ha in 2010-11. Mixed crop-livestock farming systems predominate among smallholders.

Land tenure governance in India is very complex, both in terms of legislation and organisational framework. Rural land markets do not function efficiently as a result of several factors, including poor land records, tenancy and land ceiling laws leading to concealment of ownership status and impediments to transactions, limited mobility of potential buyers, lack of brokerage services and limited flow of information about buying and selling opportunities. Restrictive land leasing laws have forced tenancy to be informal, insecure and inefficient.

Gaps in physical infrastructure and logistics disrupt agro-food supply chains and drive up transaction costs, particularly for small and marginal farmers. Limited connectivity and storage infrastructure increase post-harvest losses and impacts farmers' incomes as well as their incentives to produce. This remains a key challenge to address in order to link farmers to markets, encourage private sector participation in the supply chains and tap the potential for the production and export of fruit and vegetables, as well as meat and meat products. Alternative marketing channels are nevertheless emerging (such as contract farming in poultry), in addition to an evolving food processing industry and an improved business environment for the retail sector. The food processing industry has nonetheless a dualistic structure, with a relatively small (in number of units) but capital intensive organised segment coexisting with a pervasive, mostly rural, and more labour-intensive unorganised segment.

Notes

[1] In this chapter, "agriculture" broadly covers crops and livestock. However, where it is not possible to separate the data, "agriculture" will cover cultivation of crops, livestock production as well as forestry, hunting, and fishing.

[2] BRIICS economies include Brazil, the Russian Federation, India, Indonesia, the People's Republic of China (hereafter "China") and South Africa.

[3] The FFC also recommended a change in the formula for distribution of devolved resources to compensate states with higher rates of in-migration and poor fiscal capacity (ability to raise own revenues). Some states thus saw their shares increase (e.g. Chhattisgarh, Madhya Pradesh), while others (e.g. Bihar, Rajasthan) saw their shares reduced.

[4] The unemployment rate measures at both urban and rural levels the number of people actively looking for a job as a percentage of the labour force. The usual employment status considers persons who are self-employed, employed either directly by the establishment on regular/casual basis/contract basis, or through a contractor on contract basis.

[5] The informal sector is defined as unincorporated enterprises with fewer than ten workers; informal employment is defined as workers without any employment security or employer-provided social security. Under-employment concerns persons employed at less than full-time or regular jobs or at jobs inadequate with respect to their training.

[6] For time and cross-country comparison purposes in this study, available data on agriculture value added includes the primary sector, forestry, hunting, and fishing.

[7] National data on employment are available from the National Sample Survey Office (NSSO), the Census, and the Labour Bureau of the Ministry of Labour and Employment. Slight differences can exist between the estimates across these sources due to differences in the definitions used for compiling data. Most recent estimates (2015-16) are available from the Labour Bureau.

[8] This is expressed in terms of monthly per capita consumption expenditure based on a mixed reference period.

[9] The Gini index is a measure of inequality among all regions of a given country. The index takes on values between 0 and 1, with 0 interpreted as no disparity. It assigns an equal weight to each region regardless of its size. Differences in the values of the index among countries may partly reflect differences in the size of regions in each country.

[10] Middle class estimates refer to the number of people living in households earning or spending between USD 10 and 100 per person per day (USD 2005 PPP).

[11] Domestic trade taxes were levied by the central, state, as well as local governments, and had a highly complex structure. The most important categories included: union excise duties (UED) and central sales tax (CST) levied by the centre; general sales tax (GST), entry tax and electricity duty levied by the states; and *octroi* levied by the local governments.

[12] The WEF Global Competitiveness Report separates countries into three specific stages: factor-driven, efficiency-driven, and innovation-driven, each implying a growing degree of complexity in the operation of the economy. In the factor-driven stage countries compete based on their factor endowments, primarily unskilled labour and natural resources. Companies compete on the basis of prices and sell basic products or commodities, with their low productivity reflected in low wages.

[13] "Agricultural output" analysis in this section covers crops and livestock, but does not include forestry or fisheries.

[14] The agricultural crop year in India is from July to June. The *kharif* cropping season is from July–October during the south-west monsoon (summer) and the *rabi* cropping season is from October-March (winter). The *kharif* crops include rice, maize, sorghum, pearl millet/bajra, arhar (pulses), soybean, groundnut, cotton. The *rabi* crops include wheat, barley, oats, chickpea/gram, linseed, mustard.

[15] For purposes of the Census a person is classified as cultivator if he or she is engaged in cultivation of land owned or held from government or held from private persons or institutions for payment in money, kind or share. Cultivation includes effective supervision or direction in cultivation.

[16] A person who works on another person's land for wages in money or kind or share is regarded as an agricultural labourer. She or he has no risk in the cultivation, but merely works on another person's land for wages. An agricultural labourer has no right of lease or contract on land on which he or she works.

[17] While the Census and NSSO account for all workers above the age of 5, the Labour Bureau accounts for workers greater than 15 years of age. Thus, the data between Census, NSSO and Labour Bureau may not be directly comparable.

[18] A scheme's irrigation efficiency (in %) represents the share of the water pumped or diverted through the scheme inlet which is effectively used by the plants.

[19] Use of fertiliser includes nitrogenous, phosphate and potash fertilisers in nutrient terms. Cropland includes arable land and perennial crops.

[20] Latest estimates for selected economies, as available for 2012-14 (national data and FAOSTAT, 2018).

[21] The Government of India provides a subsidy to rural entrepreneurs willing to set up a CHC (40% of the CHC initial investment).

[22] These include water and wind erosion (94.9 million ha), water logging (0.9 million ha), soil alkalinity/sodicity (3.7 million ha), soil acidity (17.9 million ha), soil salinity (2.7 million ha), and degradation from mining and industrial waste (0.3 million ha).

[23] Groundwater development stress is defined as the current annual rate of groundwater abstraction divided by the mean annual natural groundwater recharge: groundwater abstraction is the volume of groundwater removed from the aquifer by wells and other abstraction devices; groundwater recharge is the inflow of water into an aquifer, which may include 'natural' components (natural recharge) and anthropogenic ones (artificial recharge, induced recharge).

[24] Currently, the land holding limit differs across states. For instance, for irrigated land with two crops, this can range from 12 acres (4.9 ha) in West Bengal or Tamil Nadu to 18 acres (7.3 ha) in Gujarat or Rajasthan (more details in Annex Table 2.B.1). In July 2013, the Ministry of Rural Development put forth a draft of a new National Land Reform Policy (NLRP). This draft encouraged state governments to effect a downward revision of land ceiling limits if the existing ceiling is higher than 5-10 acres (2-4.1 ha) in the case of irrigated land and 10-15 acres (4.1-6.1 ha) for non-irrigated land. It does not seem to have been enacted (GoI, 2017a).

[25] These include agricultural workers, families dependent on water or forests on the land, tenants or artisans who work nearby the land to be purchased.

[26] The transfer of land or property between a buyer and a seller is recorded through a sale deed, which needs to be registered according to the current legal framework, which refers to the registration of the transaction and not the land title. The two laws that provide the basis for registration of land are the Transfer of Property Act and the Land Registration Act, which are both central legislations although in the latter the state legislatures can make an amendment. The responsibility of checking the validity of the title (or the rightful ownership of the property) is on the buyer. Any prospective buyer who wants to verify the title has to undertake a tedious process of consulting various sources such as past transactions, mortgage deeds, revenue records and encumbrance certificate as there is no centralised property title registry. Rajasthan was the first state to introduce a Guaranteed Land Title Act in 2008 which allows freehold landed property ownership.

[27] In addition, the law provides for removing the clause of adverse possession of land in the land laws of various states and allows automatic resumption of land after the agreed lease period, without requiring any minimum area of land to be left with the tenant even after termination of tenancy. Further, it allows the terms and conditions of lease to be determined mutually by the land owner and the tenant and facilitate all tenants, including share croppers, to access credit as well as to entitle them to recuperate any unused value of investment at the time of tenancy termination.

[28] The Agricultural Census defines an operational holding as "all land, which is used wholly or partly for agricultural production and is operated as one technical unit by one person alone or with others without regard to title, legal form, size or location". The LHS defines a household operational holding as "land that was used wholly or partly for agricultural production and was operated (directed/managed) by one household member alone or with assistance of others, without regard to title, size or location."

[29] With the exception of West Bengal, Odisha, and Kerala (constituting about 9% of the total operated area in the country), where these are not available, and thus a household survey is carried out.

[30] Different laws governing inheritance apply to different religious groups. Inheritance rights in India for Hindus, Sikhs, Buddhists and Jains were governed by the Hindu Succession Law since 1956. The Law originally entitled daughters equal rights to their father's individual property, once a male died without a will, but no rights to the joint family property (e.g. land) in contrast to sons. The Hindu Succession (Amendment) Act 2005 gives women equal entitlement to the family joint property. However, social norms and customs tend overwhelmingly to prevail, and in practice women's legal rights in their parental land tend to pass to their male siblings.

[31] Efficiency change is a joint outcome of several factors, including knowledge about available technology, the proper use of inputs, the incentives that influence farmers' choice of technology and inputs, access to markets (for inputs and outputs), and other policies and institutions affecting input-use decisions.

[32] NITI Aayog estimate for 2011-12 based on data from the NSSO for farm income per cultivator and non-farm income (NITI Aayog, 2017b).

[33] A 'farmer' corresponds to an agricultural household as defined in the Situation Assessment Survey of Agricultural Households, NSSO 70th Round. There are four components of farmers' incomes: (a) income from crop cultivation; (b) income from farming animals; (c) wages and salaries; and (d) income from non-farm business.

[34] Farmer income data subsequent to 2012-13 are extrapolations carried out by NITI (2017b) based on NSS estimates for 2012-13.

[35] PACS are co-operative credit institutions working at the village or small village (*panchayat*) level.

[36] Currently there are more than 57 large-sized and 64 medium- and small-sized chemical fertiliser production units in India.

[37] Other sectors of priority lending include include Micro, Small and Medium Enterprises; export credit; education; housing; social infrastructure; renewable energy.

[38] Short-term agricultural credit or crop loans enable cultivators to procure inputs such as fertiliser and seeds needed for seasonal agricultural operations, while long-term credit is for investment in fixed assets, such as irrigation pumps, tractors, agricultural machinery, plantations and those related to dairying, fishing and poultry. Short-term credit is also meant to cover the cost of hired labour as well as a part of the consumption needs of poorer farmers.

[39] Farmers' access to credit for inputs such as fertilisers and seeds has been facilitated by the *Kisan Credit Card* (KCC) scheme, which documents a bank customer's personal and financial details.

[40] Checkpoints have been set up to check whether permits are in order, as well as to collect taxes or control the movement of specific types of goods.

[41] This includes electricity supply infrastructure, roads and bridges, railways, telecommunications, irrigation, water supply sanitation, ports, airports, oil and gas pipelines, and storage infrastructure.

[42] They are also called "integrators".

[43] Some of these include a five-year tax exemption and 35% tax deduction for the same period for setting up new agro-processing industries; reduced import duty on processing machinery; no corporate taxes on profits from export sales; and automatic approval for 100% FDI in most items. Exemptions from excise duty have been given to encourage capital investment in large projects and processing firms.

[44] Organised retail refers to trading activities undertaken by licensed retailers, that is, those who are registered for sales tax, income tax, etc. These include the corporate-backed hypermarkets and retail chains, and also the privately-owned large retail businesses. Unorganised retailing, on the other hand, refers to the traditional formats of low-cost retailing, for example, the local kirana shops, owner manned general stores, paan/beedi shops, convenience stores, hand cart and pavement vendors, etc.

[45] Multi-Brand Retail Trading (MBRT) includes super-markets, hyper-markets, malls etc., while Single Brand Retail Trading (SBRT) refers to the trading of products that have been branded (during manufacture) under a single brand.

[46] 0 is the minimum score (least restrictive) and 1 is the maximum score (most restrictive). The STRI database covers 35 OECD Members (as of December 2017), Brazil, China, Colombia, Costa Rica, India, Indonesia, Lithuania, Russia, and South Africa.

[47] "Agro-food" trade includes chapters 1-24 of the Harmonised System together with a number of headings in chapters 33, 35, 38, 41, 43 and 51-53.

[48] Exports of beef as well as buffalo fresh, chilled or frozen, as carcasses, half carcasses or other cuts with bone-in, are prohibited. Exports of boneless meat of buffalo fresh, chilled, or frozen, are allowed.

[49] Backward participation rates explore the extent to which exports from a sector in a given country rely on imports from other countries.

[50] Forward participation rates explore the extent to which domestic value added from an industry in a given country (both direct and indirect through the exports of other domestic industries) form part of the value of another country's exports.

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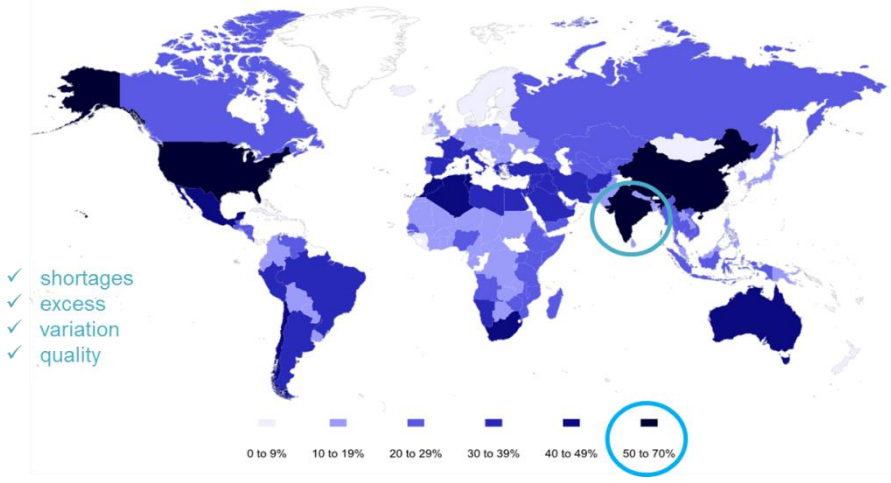
Annex 2.A. Water risk hotspots for agriculture

Annex Figure 2.A.1. China, India and the United States expected to face the highest water risks by 2050

Frequency of observations, listing countries as subjects to high or very high future water risks



Note: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.
Source: OECD (2017c) based on a review of 64 publications, accounting for 142 countries.

Annex 2.B. Agricultural land tenure system

Annex Table 2.B.1. Ceilings on land holdings in selected states and UTs (acres and hectares)

States and UTs	Irrigated land with two crops		Irrigated land with one crop		Non-irrigated land	
	acres	ha	acres	ha	acres	ha
Andhra Pradesh	10 to 18	4.1 to 7.3	15 to 27	6.1 to 10.9	35 to 54	14.2 to 21.9
Assam	17	6.9	17	6.9	17	6.9
Bihar	15 to 18	6.1 to 7.3	25	10.1	30 to 45	12.1 to 18.2
Gujarat	10 to 18	4.1 to 7.3	15 to 27	6.1 to 10.9	20 to 54	8.1 to 21.9
Haryana	18	7.3	27	10.9	54	21.9
Himachal Pradesh	10	4.1	15	6.1	30 to 70	12.1 to 28.3
Jammu & Kashmir	9 to 12.5	3.6 to 5.1	9 to 12.5	3.6 to 5.1	15 to 23	6.1 to 9.3
Karnataka	10 to 20	4.1 to 8.1	25 to 30	10.1 to 12.1	54	21.9
Kerala	12 to 15	4.9 to 6.1	12 to 15	4.9 to 6.1	12 to 15	4.9 to 6.1
Madhya Pradesh	18	7.3	27	10.9	54	21.9
Maharashtra	18	7.3	27	10.9	54	21.9
Manipur	12	4.9	12	4.9	15	6.1
Odisha	10	4.1	15	6,1	30 to 45	12.1 to 18.2
Punjab	17	6.9	27	10.9	51	20.6
Rajasthan	18	7.3	27	10.9	54 to 175	21.9 to 70.8
Tamil Nadu	12	4.9	30	12.1	60	24.3
Sikkim	12.5	5.1	12.5	5.1	50	20.2
Tripura	10	4.1	10	4.1	30	12.1
Uttarakhand	18	7.3	27	10.9	45	18.2
Uttar Pradesh	18	7.3	27	10.9	45	19.2
West Bengal	12	4.9	12	4.9	17	6.9

Source: MAFW (2017b), *Agricultural Statistics at a Glance 2016*.

Annex Table 2.B.2. Highlights of tenancy laws in selected states

Category	States	Specific features of tenancy legislation
1	Kerala, Jammu and Kashmir, Manipur	Leasing out agricultural land is prohibited without any exception.
2	Bihar, Karnataka, Madhya Pradesh, Chattisgarh, Uttar Pradesh, Uttarakhand, Himachal Pradesh, Tripura, Telengana, Odisha	Allow leasing out only by certain categories of land owners, such as those suffering from physical or mental disability, widows, unmarried, separated or divorced women, and members of armed forces.
3	Punjab, Haryana, Gujarat, Maharashtra, Assam	Do not explicitly prohibit leasing, but the tenant (excepting in Haryana) acquires the right to purchase the leased land from the owner after a specified period of creation of tenancy. In Gujarat and Maharashtra, tenancy of a tenant belonging to SC/STs cannot be terminated. In Punjab, law does not ban leasing out, but provides that a tenant of a big land owner above ceiling is entitled to purchase his tenanted land on continuous possession for six years. Similarly, in Assam, tenants who have held land for at least three years consecutively can acquire ownership right on payment of 50 times the rate of revenue.
4	Andhra Pradesh, Tamil Nadu, Rajasthan, West Bengal	No legal ban on leasing, but there are several restrictive clauses differing by state. In West Bengal, only sharecropping is allowed and not leasing on fixed rent or fixed produce basis. In Andhra Pradesh, leasing has to be for a minimum period of six years and tenancy can be terminated only by an application to the special judicial officer on any of the specified grounds.

Source: USAID (2011).

Chapter 3. Trends and evaluation of agricultural policy in India

The chapter describes the evolution of agricultural policies in India since 2000, focusing on current policy settings and institutional structures established to implement such policies. It also presents a quantitative evaluation of support provided through India's domestic and trade policies, based on the support indicators developed by the OECD (including, among others, the Producer Support Estimate, the Consumer Support Estimate, and Total Support Estimate).

3.1. Introduction

Although India's Constitution specifies that only the individual states have legislative power in agriculture, the union retains residual powers (Chapter 2). The Government of India, also called the union government, the central government or the centre, provides most of the government expenditure on agricultural and food policy and has scope for much regulatory intervention in the sector. The actions of the central government therefore dominate the picture of agricultural and food policy in India, but the role of state governments is crucial.[1]

3.2. Agricultural policy framework

Agricultural policy objectives and basic stages of agricultural policy reform

From India's early years, seeking to achieve food security has been an important part of the objectives of both its agricultural and trade policy. The phrase food security has been given different conceptual and practical interpretations over time, whether emphasising national self-sufficiency in food production, economic access to food for certain groups, or other dimensions. The consequent policy approaches have therefore also evolved over time. Before the year 2000 no explicit agricultural policy objectives were published at the central government level, other than the priorities outlined in the five-year plans. An implicit objective, to a large extent driven by the experience of food shortages in the early 1960s, was to pursue self-sufficiency in food production. By the 1990s India had not only become self-sufficient in food grains but produced a surplus of food grains. Although the early five-year plans thus focussed to a very large extent on agriculture, the last one was seeking faster, more inclusive and sustainable growth more broadly by bringing macroeconomic imbalances under control and reversing the economic slowdown while also pushing for structural reform in many areas.

1950s-1980s

In the first few years after India's independence in 1947 growth of agricultural output was achieved mainly by expanding the area under cultivation. Food shortages in the early 1960s made it essential to increase crop productivity and farm output so as to raise national food production. While India in the 1950s met domestic demand for food grains to some extent by imports financed by other countries, uncertainties linked to international political developments brought about a change in such import flows. Although the scope for further expanding the area under cultivation was limited, the advent of the green revolution in the mid-1960s raised crop productivity through improved crop technologies and seed varieties. The government imported and distributed high-yielding varieties of wheat and rice for use in irrigated areas, which was accompanied by an expansion of the extension service and an increase in the use of fertilisers, pesticides, and irrigation. The yields and production of especially wheat and rice increased rapidly. Two institutions with key roles in affecting the prices and distribution mainly of wheat and rice were set up already in 1965, namely the Food Corporation of India (FCI) and the Agricultural Prices Commission, later renamed the Commission for Agricultural Costs and Prices (CACP).

The increasing use of farm inputs other than land underpinned subsequent rapid growth in the industries producing fertiliser, seed and machinery. Government initiatives encouraged increased production and processing of milk. Government funding for agricultural research and extension increased, and many State Agricultural

Universities (SAU) were set up. Institutional lending to farmers was expanded by directing the commercial banks, nationalised from 1969, to provide credit to agriculture. New financial institutions were established, such as the National Bank for Agriculture and Rural Development (NABARD) in 1982 and regional rural banks. In order to allow domestic agricultural production to increase, import competition was highly restricted.

1980s-1990s

In the 1980s and 1990s the yield-enhancing green revolution technologies were expanded to additional crops and regions, and new technologies were also adopted in the production of pulses, oilseeds and coarse grain in drier areas. Farm production diversified into higher value commodities, such as fish, poultry, vegetables and fruit. Policy reforms were carried out in the rest of the economy, such as delicensing and deregulation in the manufacturing sector, but they largely bypassed agriculture, partly because of the prevalence of state level regulations in agriculture. Following the 1991 crisis-driven devaluation of the Indian rupee, India's gradual liberalisation of foreign trade basically left the rural sector untouched, including agriculture. From 1980 to 1999 India's GDP in agriculture at constant prices increased by 80%. Over the same time span, gross fixed capital formation by the public sector in agriculture dropped by about one third whereas subsidies in agriculture increased more than tenfold. Table 3.1 summarises the evolution of agriculture and policy in India from the1950s.

Table 3.1. Evolution of agriculture and policy in India

Approximate years	Key sector features	Major policy initiatives
1950-65	Expansion of area main source of growth	• Agrarian reforms (abolition of intermediary landlordship, imposition of land ceiling acts) • Strengthening of co-operative credit institutions
1965-80	Increase in productivity main source of growth	• Develop pathways for the adoption of technological breakthroughs in rice and wheat production • Policy support for marketing, research and credit; introduction and formalisation of lending to priority sectors, including agriculture • New institutions, e.g. State Agricultural Universities, Food Corporation of India, Agricultural Prices Commission
1980s	Widespread use of technology in major crop areas	• Some delicensing and deregulation • Increase in subsidies and support to agriculture
1990s	Economic liberalisation in agriculture lags behind general economic reforms	• Cautious relaxation of trade protection in some products, e.g. sugar, cotton, edible oils, wheat, rice • Increases in input subsidies • Targeting of beneficiaries of public distribution system of food grains
2000s	Demand-driven shift towards producing fruit, vegetables and livestock	• Alternate tightening and loosening of market and trade regulations • Large increases in input subsidies, including credit • Gene revolution in seeds, including cotton
2010s	Major participant in world markets for some commodities	• More structured interaction between central and state level authorities • Expansion of food subsidies

Source: Own tabulation based on literature review.

2000 to present

The National Agricultural Policy (NAP), formulated in 2000, aimed at a yearly growth rate of more than 4% in agriculture based on efficient use of resources and conservation of soil, water and biodiversity (Government of India, 2003a).[2] The tenth five-year plan of the Planning Commission covered the years 2002-07 (Government of India, 2002). While recognising the growth orientation of the 2000 NAP, the plan articulated a need for strategies to be differentiated based on the agri-climatic conditions and the land and water resources of different regions, with particular emphasis on developing the eastern and north-eastern regions. It put a priority on raising the cropping intensity on existing agricultural land, developing rural infrastructure that supports not only agriculture but all rural activities, developing and disseminating agricultural technologies, and reconsidering the rules and regulations that govern agricultural trade. The policies relating to public distribution of food would also be considered for change. The National Policy for Farmers (NPF), approved by the Government of India in 2007, identified a need to focus more on the economic well-being of farmers rather than just on production (Government of India, 2007). It listed the accompanying policy actions under headings such as farmers' assets and empowerment, farmers' support services, and special categories of farmers and farming.

The eleventh five-year plan, covering the period 2007-12, saw a need for several actions to accelerate yearly agricultural growth to 4% (Government of India, 2008). These actions would bring technology to farmers, improve the efficiency of investments, increase systems support, rationalise subsidies, diversify production while also protecting food security concerns, and improve the access of the poor to land, credit and skills. In specifically addressing water management and irrigation, the plan saw a need to reduce time delays in constructing irrigation projects, increase irrigation efficiency in both surface water and groundwater systems, adopt an integrated approach to water resources development and conservation, and limit the use of groundwater.

For agriculture in broad terms the twelfth five-year plan for 2012-17 would accelerate the annual growth of agricultural GDP to 4% and allow for a shift of employment out of agriculture, helped by a policy restructuring aimed at supporting the diversification of agriculture and a greater involvement of the private sector in marketing agricultural produce. More specifically, the 2012-17 plan articulated the key drivers of growth in agriculture as comprising (1) the viability of the farm enterprise and returns to investment that depend on scale, market access, prices and risk, (2) the availability and dissemination of appropriate technologies that depend on quality of research and extent of skill development, (3) expenditure on agriculture and in infrastructure along with a policy aim to improve the functioning of markets and more efficient use of natural resources, and (4) governance in terms of institutions that make it possible to better deliver services like credit and animal health and quality inputs like seeds, fertilisers, pesticides and farm machinery. The plan also held that certain regional imbalances must be addressed: a national priority in terms of both food security and sustainability would be to fully extend the green revolution to areas of low productivity in India's eastern region, where there is ample ground water, and thereby help to reduce water stress elsewhere.

While such topics as farm output, farmers, resources, and regional balance have figured large in the aims of agricultural policy in India since long ago, concerns about various dimensions of food security, such as availability and affordability of food for consumers, are also important in formulating India's agricultural policy objectives. India's Constitution identifies raising the level of nutrition as a primary duty of government. The

tenth five-year plan (2002-07) recognised that, although the country had attained self-sufficiency in food production a decade earlier, this had not resulted in nutritional security of individuals, especially those of vulnerable groups from the poorer segments of the population. The plan saw the 1997 transition from the Public Distribution System (PDS) to the Targeted Public Distribution System (TPDS) as important in ensuring food at the household level at affordable prices for the poor. Shifting from household food security and freedom from hunger to nutrition security for the family and the individual would involve improving food grain production, increasing production of coarse grains and pulses, and improving the availability of vegetables at an affordable cost. The eleventh plan (2007-12) underlined the need for the TPDS to reduce the leakages (grain not reaching the intended beneficiaries). It also suggested redirecting some subsidies to other welfare schemes in order to achieve better targeting towards the poor, moving towards policies that are specific to individual states or areas, and redefining "poor" for the purpose of the TPDS. The call for action in the twelfth plan (2012-17) recognised similar needs, which would be addressed in the then forthcoming National Food Security Act (NFSA) of 2013.

Framework for policy implementation

Constitutional responsibilities and policy planning

While India's Constitution lists agriculture only as a state subject, the central government, on grounds of agriculture being a subject of national significance, is an important actor in agricultural policy. It acts both in developing and implementing national policy and in co-operating with and funding much of the policy effort implemented by the states. The Constitution also allows the states to devolve their authority in some subjects, including agriculture, to a lower level of government (*panchayat*, sometimes called village-level government). The administration of agricultural and food policy in India is therefore complex and involves many ministries, agencies and other institutions at both the central, state and other levels, such as districts within a state.

From 1950 until 2014 India's Planning Commission, a senior body chaired by the prime minister, outlined national plans and policy priorities. From 1951 it launched a series of five-year plans, the last one for 2012-17. In 2015 the government replaced the Planning Commission with the newly formed National Institution for Transforming India (NITI) Aayog. It is designed to foster greater involvement of the state governments in the economic policy process.

India's Constitution gives the centre's Finance Commission certain responsibilities with regard to recommending how to redress imbalances between the taxation powers and expenditure responsibilities among the central and state governments. The recommendations of the fourteenth Finance Commission cover a five-year period from 2015. The central government has accepted the Commission's recommendation about increasing the share of the states in the pool of central taxes that can be divided between the centre and the states, the so-called devolution of taxes (Government of India, 2016k). This would give the states greater autonomy in designing and financing schemes according to local priorities.

For 2016-17 the central government's budget foresaw allocating 44% of total plan expenditure as central assistance to the plans of states and union territories (Government of India, various years). This percentage can fluctuate considerably – both in 2012-13 and 2013-14 the share of central plan expenditure that was allocated as central assistance was

25% but in 2014-15 it was 58%. Plan expenditure is essentially what in some countries is called programme expenditure, but it does not include some major subsidy items, such as fertiliser subsidies and food subsidies. The revenues that state governments receive from the central government contribute significantly to how much they are able to spend. On average for all states, the own revenue of the states accounted for 63%, 59% and 55% of their expenditure in 2012-13, 2013-14 and 2014-15, respectively (Government of India, 2017u).

Central government roles in administering policy

The central government's Ministry of Agriculture, which in 2015 became the Ministry of Agriculture and Farmers' Welfare (MAFW), provides broad guidelines for agricultural policies. The implementation and administration of many policies remain the responsibility of the state governments. Agencies of the central government directly administer central schemes (CS) and state government agencies administer state sector schemes (schemes are also called programmes). Centrally sponsored schemes (CSS) operate in subjects that are constitutionally the domain of the states. The central government provides resources to the state governments for these schemes while the schemes themselves are implemented by the state government and its agencies. Funds can be transferred from the central to the state level through CS and CSS and also through additional central assistance (ACA) (Chaturvedi, 2011). The priorities, approaches and funding possibilities for agricultural policies differ among India's states. The extent and nature of the state governments' co-operation with the centre in CSS and other schemes thus vary greatly among the states.[3]

The MAFW's Department of Agriculture, Cooperation and Farmers' Welfare (DACFW) has 27 divisions, five attached offices, and twenty-one subordinate offices across the country for co-ordinating with state level agencies and implementing central schemes. One public sector undertaking, nine autonomous bodies, ten national level co-operative organisations, and two authorities also function under the DACFW's administrative control. The MAFW's two other departments are the Department of Animal Husbandry, Dairying and Fisheries and the Department of Agriculture Research and Education.

While the MAFW is responsible at the central level for agricultural policy as such, other ministries have responsibilities in areas that are closely linked to agriculture. At least twelve of the about 40 ministries at the central level have some responsibility for the formulation, implementation or monitoring of agricultural and food policy. Table 3.2 summarises the areas with which the twelve ministries and some of their agencies and institutions are involved.

Many kinds of variable inputs are provided to agricultural producers at artificially low prices, i.e. the inputs are subsidised. This applies mainly to fertilisers, electricity, irrigation water, seeds, machinery, and operating credit. The Ministry of Chemicals and Fertilizer administers the large fertiliser subsidies through its Department of Fertilizers. Many other ministries have responsibilities that concern agriculture and food, including subsidies for electricity and irrigation. The Ministry of Consumer Affairs, Food and Public Distribution administers most food subsidies through its Department of Food and Public Distribution (DFPD). The Ministry of Commerce and Industry administers India's trade policy through its Department of Commerce.

Depending on the subject matter, the processes for developing and implementing policies in agriculture and food require co-ordination among various ministries, departments, and institutions. Cabinet level decisions on many subjects in agriculture and food are taken by

the Cabinet Committee on Economic Affairs, a standing committee chaired by the Prime Minister. Co-ordination among ministries for Committee decisions is ensured by the Cabinet Secretariat. The implementation of policies is guided by a variety of committees or groups of officials at various working levels, established in formal or less formal ways. Such committees can include officials from several ministries and, depending on the subject matter and the committee's responsibility, representatives from interest groups. Some committees can have decision making responsibilities and others are advisory. Occasionally a temporary high level committee is established with some independence from government to examine a particular issue and provide recommendations. While there are thus many opportunities for sharing information, views and evidence in the processes for policy formulation and implementation, the large number of ministries, departments, regions, and other centres of interest obviously poses a challenge for timely and effective co-ordination. This challenge is amplified by the fact that, in agriculture, the central government's identification of policy priorities and implementation of policies in large measure depends on the co-operation of state governments.

State government roles in administering policy

Many state governments have ministries or departments of agriculture, animal husbandry, irrigation or the like. While they implement central and centrally sponsored schemes in co-operation with, e.g. the centre's DACFW and DFPD, many state ministries and departments also implement state-specific agricultural policies in line with their own priorities and availability of own funds. The effectiveness of shared or delegated implementation of many policies relies in many instances on how effective is the work of a committee comprising officials from both the central and state governments. Co-operation with officials of lower levels of government, such as districts where the policy benefits are actually delivered, is also essential for effective administration. The nature of the co-operation between central and state government officials can help to inform the positions taken by a state in interacting with the central government at the political level, whether in a formal or an informal setting. Such interactions appear normally to occur more in pursuit of particular needs than as an institutionalised ongoing process to articulate shared policy priorities. For example, in 2010 a committee of state ministers, chaired by the central government's minister of agriculture, was constituted with a view to persuade the various state governments to implement certain reforms in agricultural marketing and to suggest further reforms in that field (Government of India, 2013b).

There are large differences among states and regions in India in terms of natural resource endowments, level of economic development, and potential for growth in production and income in agriculture (Chapter 2). The central government has over time sought to address such disparities in its policy development by monitoring regional and state-to-state differences, identifying problems and opportunities in specific states, and paying special attention to states characterised by relatively lower levels of economic development. The central government's budget planning allocates resources by taking into account the situation of specific states and regions and providing expenditures and investment incentives accordingly. For example, schemes in agriculture where expenditure is shared by the central and the state government often provide for a larger share of central government expenditure in certain states than in other states or a lower threshold for a farmer's eligibility as a beneficiary of a scheme. The eight north-eastern states are given priority in this respect (Arunachal Pradesh, Assam, Manipur, Meghalaya,

Mizoram, Nagaland, Tripura and Sikkim) sometimes along with three Himalayan states (Himachal Pradesh, Jammu and Kashmir, and Uttarakhand).

Table 3.2. Ministries and public institutions involved with agricultural policy in India (summary)

Subject	Central Ministries, with responsibility for implementing Departments	Selected other implementing institutions
Prices	• Min. of Agriculture and Farmers' Welfare • Min. of Commerce and Industry	• Commission for Agricultural Costs and Prices (CACP) • State level counterparts to centre's Departments
Inputs and production	• Min. of Agriculture and Farmers' Welfare • Min. of Water Resources, River Development and Ganga Rejuvenation • Min. of Food Processing Industries • Min. of Power • Min. Chemicals and Fertilizers • Min. of New and Renewable Energy • Min. of Environment, Forest and Climate Change	• Central Water Commission • State level counterparts to centre's Departments
Credit	• Min. of Finance Reserve Bank of India	• National Bank for Agricultural and Rural Development (NABARD)
Marketing, procurement	• Min. of Agriculture and Farmers' Welfare • Min. of Food Processing Industries • Min. of Consumer Affairs, Food and Public Distribution • Min. of Textiles, Agricultural and Processed Food Products	• Food Corporation of India (FCI) • Cotton Corporation of India (CCI) • Jute Corporation of India (JCI) • NAFED • APEDA • Central Warehousing Corporation (CWC) • National Dairy Development Board (NDDB) • Small Farmers' Agri-Business Consortium (SFAC) • Commodity boards for various plantation crops • Special marketing and processing corporations • Agricultural Cooperative Marketing Federations • Tribal Cooperative Marketing Development Federation • State level counterparts to centre's institutions
Public distribution	• Min. of Agriculture and Farmers' Welfare • Min. of Consumer Affairs, Food and Public Distribution • Min. of Human Resource Development • Min. of Women and Child Development	• Food Corporation of India (FCI) • NAFED • Central Warehousing Corporation (CWC) • State level counterparts to centre's Departments and Institutions
Trade	• Min. of Commerce and Industry	• Agricultural and Processed Food Products Export Development Authority (APEDA) • National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED) • Commodity boards • Agri-export zones (AEZ) • Food Safety and Standards Authority of India (FSSAI)
Research, education, extension	• Min. of Agriculture and Farmers' Welfare	• Indian Council of Agricultural Research (ICAR) • Veterinary Council of India • Indian Council of Forest Research • Central and deemed agricultural universities • Indian Institute of Management (IIM) • Agribusiness management institutes • State level counterparts, e.g. State Agricultural Universities (SAU), *Krishi Vigyan Kendras* (KVK, agricultural science centres), *Krishi Gyan Kendra* (KGK, agricultural knowledge centres)

Source: Elaborated from Arora (2013).

Major components of agriculture and food policy in India

The set of policies directly relating to agriculture and food in India has for a long time consisted of five major categories. They include managing the prices and marketing channels for many farm products, making variable farm inputs available at government-subsidised prices, providing general services for the agriculture sector as a whole (such as research and extension), regulating border transactions through trade policy, and making certain food staples available to selected groups of the population at government-subsidised prices. More recently, environmental measures concerning agriculture have gained prominence.

In line with an evolving set of priorities, the central government has launched particular funding initiatives for important schemes, often called missions, which can include both financial assistance to agricultural producers and processors and the provision of services to agriculture generally to promote and support productivity improvements. Missions often involve co-operation, co-ordination and shared funding between the central government and the state governments in given proportions. Over time the number of missions has changed as missions have come to an end or have been merged with other initiatives under a new name. Missions operating in recent years under the DACFW concern, for example, food security, agricultural development, sustainable agriculture, integrated development of horticulture, oilseeds, oil palms, pulses and maize, micro-irrigation, sustainable agriculture, agricultural mechanisation, and agricultural extension and technology (Annex Table 3.A.1). There is also a Livestock Mission, operating under the DAHD since 2014-15.

In recent years the central government has put a priority on streamlining the provision of benefits to the intended beneficiaries by means of using up to date electronic technology. This applies particularly to the distribution of food subsidies and fertiliser subsidies (Box 3.1).

Box 3.1. Direct Benefit Transfer and Aadhaar

Direct Benefit Transfer

The Direct Benefit Transfer (DBT) system for government transfers was launched in 2013. The transfers include direct cash transfer for food grains and in-kind public distribution of food, many schemes in agriculture, including crop insurance and interest subsidies, as well as fertiliser subsidies. The in-kind schemes under DBT include the Targeted Public Distribution System (TPDS) for food grains, Mid-Day Meals, and, e.g. the Sub-Mission on Agriculture Mechanization – Central Sector. DBT is planned to be applied to 462 schemes from 57 ministries ("DBT Applicable Schemes", Government of India, 2017g). As of mid-October 2017, 380 schemes from 55 ministries had been brought on the DBT platform, including food and fertiliser subsides ("DBT Onboarded Schemes", Government of India, 2017g).

DBT is an effort to reduce the number of levels involved in the flow of transfers, reduce delays in payments, target beneficiaries more accurately, and curb pilferage and duplication. Many schemes have struggled to achieve their goals because of bad targeting, leakages and ineffective service delivery. Part of the motivation for DBT is the observation that benefit transfers and subsidies from

central and state government in India correspond to 4% of Gross Domestic product (GDP), while leakages correspond to 2% of GDP (Government of India, 2016t). DBT is described as a means to speed up payments, remove leakages and enhance financial inclusion. A key element of DBT is the use of modern information and communications technology.

Regarding fertiliser subsidies, DBT is planned to be implemented slightly differently from other schemes (Government of India, 2017h). The subsidy will be released to the fertiliser company instead of the farmer, after the sale is made by the retailer to the farmer. The reasons include the number of products involved, unclear definitions of farmers and their entitlements, and difficulties faced if farmers were to pay an unsubsidised price and only later be reimbursed the amount of subsidy through DBT.

Regarding food grains in the TPDS, there are rules for the cash transfer of the food subsidy, as distinct from beneficiaries buying food grains at the subsidised price (Government of India, 2017b). The amount of food subsidy payable to beneficiaries is calculated by multiplying their entitled quantity of food grains by the difference between 1.25 times the Minimum Support Price and the Central Issue Price. Saini et al. (2017) consider a number of issues in the implementation of DBT, particularly for food subsidies. The Department of Food and Public Distribution has started using DBT for in-kind distribution of food grains to beneficiaries after biometric identification at Fair Price Shops through Aadhaar-enabled devices.

Aadhaar

Since 2010 a process is underway to issue a unique identification number to all residents of India. Named Aadhaar (rough translation from Hindi: base), the system is designed to be robust enough to eliminate duplicate and fake identities and allow cost-effective on-line verification and authentication of a person's identity. Enrolment in the Aadhaar system, which is voluntary and cost-free, captures name, date of birth, gender, address, mobile number (optional), email address (optional) and biometric information consisting of ten fingerprints, two iris scans and a facial photograph. The Aadhaar number itself is random and devoid of any information. By mid-June 2017 about 1.155 billion Aadhaar numbers had been registered.

Most schemes that use DBT digitally seek a person's Aadhaar number to identify the beneficiaries so as to remove fakes and duplicates from the scheme's database. An Aadhaar-enabled Fertiliser Distribution System is being implemented in some localities (Government of India, 2016b). Media reports in 2017 suggest that identification through Aadhaar is or will be required when buying fertiliser (Times of India, 2017; Deccan Chronicle, 2017). As part of the end-to-end computerisation of distributing TPDS food grains, Aadhaar numbers are being linked to the ration cards used for distribution (Government of India, 2017i).

Source: Government of India (2016t); Government of India (2017ac); Government of India (2017g, 2017i).

3.3. Domestic policies

Marketing policies

This section reviews the major policies and regulations affecting agricultural markets - the Essential Commodities Act and the Agricultural Produce Marketing (Regulation) Acts - and introduces the policies involving public procurement, storage and distribution. The procurement of food grains is examined in some detail here, given the important role of this policy area not only for agricultural markets but also for the provision of food subsidies, reviewed in the "Consumer measures" section below. Policies and sector highlights for other crops and for livestock commodities are presented in Annex 3.B.

Essential Commodities Act

An early amendment to India's Constitution gave the central government a statutory provision for regulating the production, prices and distribution of so-called essential commodities with the objective of improving the efficiency of markets and ensuring remunerative prices for producers and affordable prices for consumers. The most fundamental policy instrument is the Essential Commodities Act, 1955 (ECA), which originally applied to foodstuffs, certain cotton yarn, raw jute and jute textiles, many kinds of seeds, fertiliser, petroleum and drugs. The ECA provides for the control of production, supply, distribution, and pricing of essential commodities. It also provides for maintaining or increasing supplies and securing their equitable distribution and availability at fair prices. The motivation is to restrict certain activities of some agents in the context of hoarding and black marketing (i.e. a concern about the prices consumers pay). The movement and storage of many farm products and some inputs have thus been regulated for a long time.

The ECA authorises the central government to make orders of several kinds regarding essential commodities, which are implemented and enforced by the state governments. Many of the wide-ranging powers under the ECA are delegated to the state governments. In respect of food items, the powers have generally been delegated to the state governments except for sugar where the central government exercises some controls. "Control" orders, issued by various ministries and departments at the centre and in the states, regulate the production, storage, transport, distribution, disposal, acquisition, use or consumption of a commodity. Such orders can increase the cultivation of food grains, control prices, prohibit the withholding of a commodity from sale, or require a stockholder to sell a commodity to the government. Some states impose stocking limits on a commodity, and some impose requirements for licensing or for declaring stocks. Although there are no restrictions on movement within a state, some state governments have at different times imposed restrictions on movement of food grains between states.

The commodities declared as 'essential' under the ECA are reviewed from time to time in the light of changes in the economic situation and particularly with regard to their production and supply. The number of essential commodities, which stood at 70 in 1989, had by 2006 been reduced to 7 through such periodic reviews. However, these commodities are in fact commodity groups, one of which is as broad as "foodstuffs": (i) drugs; (ii) foodstuffs including edible oilseeds and oils; (iii) fertiliser, whether inorganic, organic or mixed, (iv) petroleum and petroleum products; (v) hank yarn made wholly from cotton; (vi) raw jute and jute textile; and (vii) seeds of food-crops and seeds of fruits and vegetables, seeds of cattle fodder, and jute seeds. The foodstuffs category applies in practice to, for example, rice, paddy, wheat, pulses, edible oils, and edible

oilseeds. Some specific commodities have at various times been brought explicitly into or out of the ambit of the ECA, such as cotton seeds, sugar, tea, onions and potatoes. The Department of Consumer Affairs (DCA) regularly monitors prices of 22 essential commodities on a daily basis.[4]

The restrictions authorised under the ECA have gone through numerous changes over time by means of government orders or control orders. The licensing requirements, stocking limits, and restrictions on movement were eliminated in 2002 for wheat, paddy and rice, coarse grains, edible oilseeds, and edible oils, but the changes were not immediately or fully implemented (restrictions on investment in new dairy processing were eliminated at about the same time). In 2016, an order superseded the 2002 order, extending and making more precise the set of commodities no longer subject to the constraints of the ECA. Although the ECA is becoming a less pervasive factor in India's markets for agricultural commodities, the longstanding presence of the rules of the ECA is part of the foundation for today's structure of agricultural production and marketing.

APMC Acts

Many states had their own regulations for agricultural marketing since before India's independence, and marketing remains under the administration of the states. In the traditional system of agricultural marketing, the producers selling their products often incurred a high marketing cost and faced various malpractices. A regulated market aims to eliminate such conditions and enable the producer to face several buyers through open and competitive bidding. From the early 2000s the central government promoted organised marketing in agriculture through a network of regulated markets.

While the ECA regulates transactions in the whole value chain from producer to consumer, the Agricultural Produce Marketing (Regulation) Acts (APMR Acts) in many individual states regulate only the point of first sale from the producer. The acts are often called APMC Acts since they regulate agricultural markets through Agricultural Produce Market Committees (APMCs). A state's APMC Act empowers the state to establish regulated wholesale markets for agricultural produce, known as *mandis* or "APMC" markets. It confers wide powers on the APMC to construct and manage agricultural markets and regulate all aspects of marketing, including the levy of a user fee for transactions taking place both on and off the wholesale market yards. The Act extends to the whole of the state and makes the markets the mandatory conduit for trading agricultural produce, which prevents private players from setting up markets and investing in market infrastructure (Government of India, 2017w).

The ECA and APMC Acts affect market development, efficiency, and costs in many ways. For example, the "monopoly of government-regulated wholesale markets has prevented the development of a competitive marketing system" (Government of India, 2014c). The major constraints on the agricultural marketing system have been identified as follows: markets highly fragmented, insufficient number of markets, inadequate physical marketing infrastructure, high incidence of marketing fees and charges, high post-harvest waste, restrictions in licensing, less remuneration to farmers and high intermediation costs, market information asymmetry, and inadequate credit facilities (Government of India, 2015c).

In the context of such concerns, the central government's Ministry of Agriculture circulated a model State Agricultural Produce Marketing (Development and Regulation) Act to the states in 2003. This was followed by model APMC rules in 2007. The Ministry suggested amendments to the respective state APMC Acts to provide for improved

regulation in marketing of agricultural produce, development of efficient marketing systems, promotion of agri-processing and agricultural exports and the establishment and proper administration of markets for agricultural produce (Government of India, 2003b). The Ministry requested the states to complete the process of modifying their APMC Acts by 2007-08. Most states adopted all or some provisions of the model Act but some did not. Bihar repealed its Act in 2006. Kerala, Manipur and four Union territories do not have APMCs. Progress of other states in modifying their APMC Acts has continued but at a varied pace (Table 3.3). The reforms as adopted by the state governments are considered to have been largely ineffective (Government of India, 2017w). The situation with regard to the status of each state's APMC Act and its implementation is thus highly differentiated across India's states.

Table 3.3. Progress of reforms of agricultural markets as of February 2016

Marketing reform	Adopted by number of states and union territories
Establishment of private market yards or private markets managed by a person other than a market committee	21
Direct sale in retail by farmer to consumer (establishment of farmer and consumer market by a person other than the market committee)	22
Direct wholesale purchase of agricultural produce at the farm gate by processor, exporters, or bulk buyer	22
Provision for contract farming	21
Single license or registration for transaction in more than one market	14
Provisions for e-trading	15
Single point levy of market fee across the state	17

Source: Adapted from Government of India (2016c).

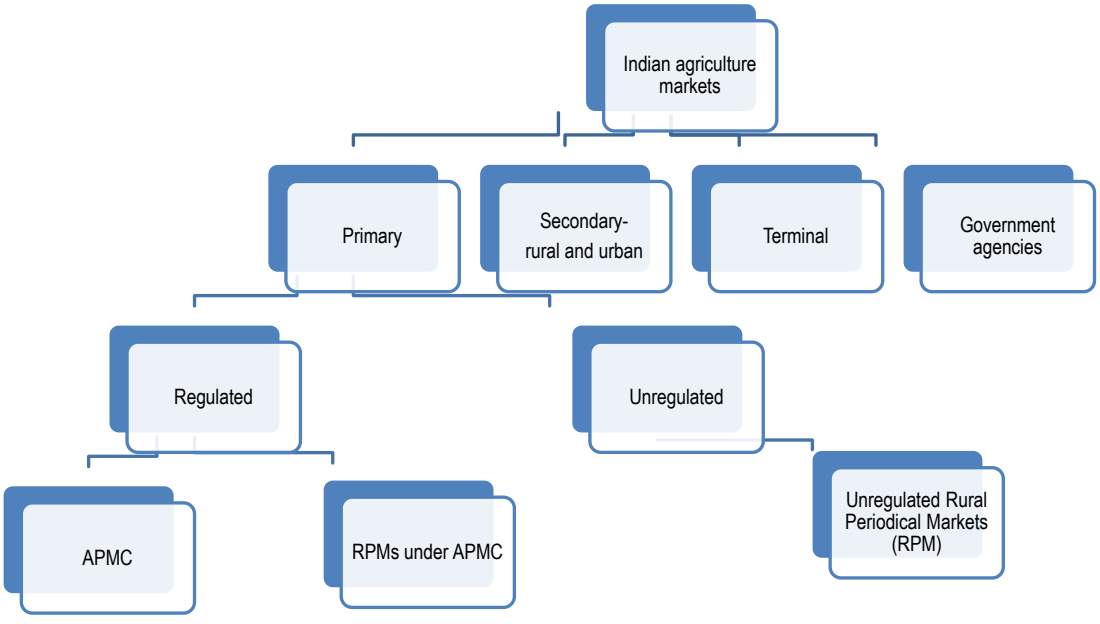
A state is divided into several market areas, and each market area is administered by a separate APMC, which imposes its own marketing regulations, including fees. The markets regulated by the APMC limit the scope of trading in agricultural commodities at the first point of sale, where farmers offer produce after the harvest. These local markets are typically at the level of a *taluka* or *tahsil*, i.e. one administrative level higher than the village itself (Chapter 2). Even one state is not a unified agricultural market, and there are transaction costs when moving produce from one market area to another within the state. Multiple licences are necessary to trade in different market areas in the same state.

Rural periodical markets (RPM) operate on a weekly or daily basis in the hinterland of the country under the control of local bodies, panchayats, councils, APMCs, etc. (Government of India, 2017w). In 2017 there were about 22 932 rural periodical markets and 6 615 regulated markets, comprising 2 339 principal markets and 4 276 sub-market yards (Government of India, 2017w).[5] About 15% of the 22 221 RPMs operating in 2012 were regulated under a state's APMC Act (Government of India, 2011c). The RPMs that are not regulated by an APMC Act operate with traditional informal procedures and link farmers with local consumers. Because of poor infrastructure, the RPMs are generally not able to offer scalable marketing opportunities to farmers (Government of India, 2017w).

The agricultural marketing chain in India is described in different ways in different contexts. Figure 3.1 gives one picture, emphasising the co-existence of regulated and non-regulated markets both at the rural primary and rural secondary levels. It recognises the presence of government agencies, such as the Food Corporation of India, as important

purchasers of some commodities. There are also primary and secondary markets that are not labelled as rural.

Figure 3.1. Major agricultural market types in India



Source: Authors' interpretation.

Three stylised kinds of wholesale markets can be identified in India, although in practice there is a diversity of parallel and overlapping marketing channels (Government of India, 2010). They are:

- Assembling wholesale market, where by and large the producer-sellers or their agents assemble their products and offer them for sale in bulk or large quantities. Some large farmers may also bring their produce to these markets. In this so-called primary wholesale market the wholesalers are predominantly the buyers.
- Secondary or distributing wholesale market, where wholesalers from the assembling markets bring products for sale. The buyers in the secondary wholesale markets are wholesalers from smaller nearby places, retailers, exporters and bulk consumers. However, there are cities like Lucknow where there are no primary markets and farmers bring the produce directly to the secondary market. Enterprising and large farmers can also bring their produce for sale in large secondary wholesale markets.
- Terminal wholesale market, from where generally the product is exported.

In this terminology, the assembling wholesale market is where much of farmers' produce is priced. The notion that some wholesale markets – in this case primary wholesale markets – are the first point of sale for much agricultural produce in India is reinforced by other descriptions, such as those underlying the summary in Table 3.4. However, not all wholesale markets are primary markets, i.e. some wholesale markets are secondary markets, where transactions take place between different traders and market intermediaries, but these are located in large cities and commercial centres. There is no clear distinction between markets in India as there is overlap between the types of markets and the actors in each type.

Table 3.4. Structure and features of the agricultural market system in India

Rural primary markets • Include mainly the periodical markets known as *haats*, *shandies*, *painths*, and fairs • Predominantly used by small and marginal farmers, including landless labourers; village traders may be independent or work for specific brokers in primary wholesale markets • Smallest villages (population less than 500) hold the fewest *haats* (only 1.6%); majority of *haats* (47.9%) are in big villages, with a population of over 5 000 • Nearly two thirds of *haats* are at a distance of 16 km, 23% are at a distance of 6 to 15 km and 9% within a distance of 1 to 5 km
Primary wholesale markets • Located in important towns near centres of production, they are the first points of sale for farmers or aggregators or assemblers • Farmers with larger surpluses or smaller traders generally purchase surpluses from other small farmers and carry along with their produce to the assembling markets • Fees are paid for participating in these markets • Private exporters and bulk processors can meet their requirements from these markets
Secondary wholesale markets • Known as *mandis*, generally located in district headquarters or important production centres, attracting potential buyers and traders who assemble the produce and consolidate a truck load for sale in terminal wholesale market or arrange transportation to a consumption centre for sale there • Conducted according to traditional market practices or as per regulations of APMC, where regulated • Many commodities are traded; a few specialised single commodity markets trade cotton, jute, oilseeds, fruits and vegetables • Buyers and sellers pay a fee to the manager of the market; in addition to the *mandi* tax (usually 2.5% of price but varying among states), several other charges apply to products entering regulated market yard (e.g. rural development cess 2%; infrastructure cess 2%; education cess 0.5%) • Procurement by various government agencies can take place through these markets • In major cities, these markets are transit market for supplies to the hinterland and distant markets and also terminal market for supplies to retailers for local consumption • Six states account for 53% of all regulated markets (Andhra Pradesh, Bihar, Maharashtra, Madhya Pradesh, Uttar Pradesh, and West Bengal) • On average a regulated market serves an area of 435 km^2; area served by each regulated market varies greatly among states, from 115 km^2 in Punjab to 11 215 km^2 in Meghalaya • Cold storage exists in 9% of markets and grading facilities in less than one third of markets
Terminal wholesale markets • Produce is finally sold to consumers or processors or is assembled for dispatch to distant markets or exports • Sellers are usually traders, not producers, unlike in primary and secondary markets

Source: Government of India (2011c); Government of India (2013f); World Bank Group (2014).

The size of the area served or allowed to be served by any particular market is an issue attracting much local political interest. In major producing states, such as Andhra Pradesh, Bihar, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Tamil Nadu, Uttar Pradesh, and West Bengal, the area served ranged between 115 (Punjab) and 615 km^2 (Madhya Pradesh) in 2008 (Government of India, 2010). These two areas correspond to circles with a radius of 6 km and 14 km, respectively. While totally schematic, such radii nevertheless suggest the order of magnitude of the distance between the farm gate and a regulated market: it is usually not a matter of hundreds of kilometres but much shorter.

The fragmentation of markets, even within a state, is considered to hinder the free flow of agricultural commodities from one market area to another (Government of India 2017r). Concern had earlier been expressed regarding the role of APMCs in sales of agricultural produce across states, farmers' returns and incomes, and agricultural productivity growth (Government of India, 2014c). Moreover, multiple handling of the commodity and

charges imposed at multiple levels in the marketing chain has increased the gap between farmers' and consumers' prices (Patnaik, 2011). Inter-state differences in the rates of taxes, levies and commissions have added to the price differences across states, even for a commodity of a given grade (Government of India, 2016n). The fees encountered by farmers and others in agricultural marketing have been very diverse, such as sales taxes, market fees, entry fees, and surcharges (Annex Table 3.A.2). Only some states have imposed a sales tax, and there has been wide variation among the states which did so in terms of which commodities were subject to sales tax and the applicable rates. Likewise, the rates of market taxes varied widely among the states which applied taxes as a percentage of the minimum support price set by the central government. However, from 1 July 2017 sales taxes and entry fees have been absorbed into the Goods and Services Tax, or GST (see below). There is a uniform rate of GST in the entire country for the supply of each product.

Producers in many states are required by the state's APMC Act to sell only to specified middlemen in authorised markets *(mandis)* (Government of India, 2017j). Supply-demand imbalances in this rigid system can generate price increases, which are sometimes amplified by the actions of middlemen. Price increases have been countered for some essential commodities by invoking the ECA to impose stock limits and controls on domestic trade that are typically pro-cyclical (Government of India, 2017j).

A roadmap was initiated in 2014 in the context of moving towards a national market (Government of India, 2015a). In one step towards the creation of a national agriculture market (NAM), the central government in 2016 approved the creation of a pan-India electronic trade portal, integrating 585 APMC markets across the country. The central government in April 2017 shared with all the state governments a reformulated marketing act as a recommendation for adoption and to initiate greater marketing changes in agriculture and to encourage a single national agriculture market (Government of India, 2017w). It is referred to as the model Agricultural Produce and Livestock Marketing (Promotion and Facilitation) Act, 2017 (APLM Act).

The model APLM Act includes provisions that aid in increasing the density of different types of wholesale agriculture markets, i.e. primary, secondary and terminal markets (Government of India, 2017w). There is also provision to expand physical markets through licensing of existing warehouses and cold storages, and to expand the market network through virtual online market networks. The model APLM Act, if adopted by states, would end the monopoly of APMCs by allowing more players to set up markets and create greater competition at the markets. It would allow the establishment of private markets, direct marketing from farmers, the levying of the market fee only at the first wholesale purchase from the farmer (single point levy of market fee), and the exclusion of fruits and vegetables from the APMC Act. The market fee caps under the model act are proposed to be no more than 1% for fruit and vegetables and 2% for food grains. It would cap commission agents' fee at no more than 2% for non-perishables and 4% for perishables. The NAM and the model APLM Act, 2017 are seen by governments as precursors to further reforms in the agricultural marketing system. The inclusion of livestock in the title of the model act is motivated by a desire to help certain states introduce better marketing practices for livestock and livestock products (Government of India, 2017w).

Minimum support prices

Within the marketing structure defined by the ECA and the APMC Acts, the central government's price policy for major agricultural crop commodities seeks to ensure remunerative prices to producers with a view to encouraging higher investment and production and to safeguard the interest of consumers by making available supplies at reasonable prices. The Ministry of Consumer Affairs, Food and Public Distribution (MCAFPD) administers the ECA as it applies to foodstuffs, such as food grains. The Ministry also administers the Prevention of Black-marketing and Maintenance of Supplies of Essential Commodities Act.

The government organises purchase operations through public and co-operative agencies, which intervene in the market through procurement operations with the objective that market prices do not fall below the Minimum Support Prices (MSPs) fixed by the government. The Food Corporation of India (FCI), under the authority of the Department of Food and Public Distribution (DFPD) of the MCAFPD, is the main agency for executing the food grain policies of the central government. The FCI, set up in 1965 under the Food Corporations Act, 1964, is mandated to (a) procure food grains from farmers at remunerative prices, (b) distribute food grains to consumers through public distribution, particularly to vulnerable sections of society at affordable prices; and (c) to maintain buffer stock of food grains for food security and price stability. The functions of the FCI mainly relate to purchasing, storing, moving, distributing and selling food grains on behalf of the central government. The FCI undertakes some of these functions along with other central and state agencies.

A MSP was first announced for rice in 1965. The central government now announces MSPs for the major crop commodities in each marketing season for *kharif* crops, grown mainly in July-October, and *rabi* crops, grown mainly in October-March. The Commission for Agricultural Costs and Prices (CACP), which is attached to the Ministry of Agriculture and Farmers' Welfare (MAFW), provides its recommendations on MSPs to the Department of Agriculture, Cooperation and Farmers' Welfare (DACFW) of the MAFW. In recommending MSPs, the CACP must take into account the cost of production, overall demand-supply, domestic and international prices, inter-crop price parity, terms of trade between agricultural and non-agricultural sectors, the likely impact of the price policy on the rest of the economy, while ensuring rational utilisation of production resources like land and water. No specific weights attach to any of these factors and the Commission's recommendations involve its judgement on some of these issues.

The 23 crops for which CACP recommended MSP for the 2016-17 season included fourteen *kharif* crops: paddy (two types), jowar (sorghum, two types), bajra (pearl millet), ragi (finger millet), maize, arhar (tur, pigeon pea, *Cajanus cajan*), moong (green gram, *Vigna radiata*), urad (black gram, *Vigna mungo*), groundnut, sunflower seed, soybean (yellow), sesamum, nigerseed, and cotton (two types). They also included six *rabi* crops: wheat, barley, gram (chickpea, *Cicer arietinum)*, lentil, rapeseed and mustard (treated as one), and safflower. CACP recommends prices for three other crops: sugarcane, copra, and jute. In some earlier years the CACP recommended a MSP for tobacco. For sugarcane the price is called a Fair and Remunerative Price (FRP) and setting it is the government's statutory responsibility according to a control order issued under the ECA.

The Cabinet Committee on Economic Affairs (CCEA), chaired by the prime minister, takes into consideration the recommendation of CACP as well as the views of other ministries. The MSP recommended by CACP are mostly approved, sometimes with some

minor modifications. The CCEA raised the actual MSP from the recommended MSP or added a bonus to the MSP in 12 out of the 16 years between 2000-01 and 2015-16 (Annex Table 3.A.3). In some years this was done for two MSPs but never for more than five MSPs. In addition, the CCEA decides on the MSP for toria (oilseed related to mustard) on the basis of the normal market price differentials between toria and rapeseed/mustard, which brings to 24 the number of commodities for which the government sets MSPs. In 2015-16 and 2016-17, the CCEA decided to add a bonus in the MSP for pulses above the recommendation of the CACP. Table 3.5 shows the MSPs for a selection of crops.

Table 3.5. Minimum Support Prices (MSPs) for selected crops (INR per tonne)

Crop year	Wheat	Maize	Rice[1] (non-basmati)	Soybean (yellow)	Rapeseed and mustard	Groundnut (in shell)	Chickpeas	Sugarcane[2]	Cotton (H-4 or Long staple)
2000-01	6 100	4 450	7 612	8 650	12 000	12 200	11 000	595	18 250
2001-02	6 200	4 850	7 910	8 850	13 000	13 400	12 000	621	18 750
2002-03	6 200	4 850	7 910	8 850	13 300	13 550	12 200	695	18 750
2003-04	6 300	5 050	8 209	9 300	16 000	14 000	14 000	730	19 250
2004-05	6 400	5 250	8 358	10 000	17 000	15 000	14 250	745	19 600
2005-06	6 500	5 400	8 507	10 100	17 150	15 200	14 350	795	19 800
2006-07	7 500	5 400	8 657	10 200	17 150	15 200	14 450	803	19 900
2007-08	10 000	6 200	9 627	10 500	18 000	15 500	16 000	812	20 300
2008-09	10 800	8 400	12 687	13 900	18 300	21 000	17 300	812	30 000
2009-10	11 000	8 400	14 179	13 900	18 300	21 000	17 600	1 298	30 000
2010-11	11 200	8 800	14 925	14 400	18 500	23 000	21 000	1 391	30 000
2011-12	12 850	9 800	16 119	16 900	25 000	27 000	28 000	1 450	33 000
2012-13	13 500	11 750	18 657	22 400	30 000	37 000	30 000	1 700	39 000
2013-14	14 000	13 100	19 552	25 600	30 500	40 000	31 000	2 100	40 000
2014-15	14 500	13 100	20 299	25 600	31 000	40 000	31 750	2 200	40 500
2015-16	15 250	13 250	21 045	26 000	33 500	40 300	35 000	2 300	41 000
2016-17	16 250	13 650	21 940	27 750	37 000	42 200	40 000	2 300	41 600

Note: MSP does not include the bonus added to the MSP for some crops in some years.
1. MSP for paddy, divided by 0.67.
2. Statutory Minimum Price or Fair and Remunerative Price.
Source: 2000-01 to 2001-02: Directorate of Economics and Statistics, "Minimum Support Prices" at http://eands.dacnet.nic.in/MSP/msp-11-08-2004.htm; 2002-03 to 2007-08: *Agricultural Statistics at a Glance 2007*; 2008-09 to 2011-12: *Agricultural Statistics at a Glance 2012*; 2012-13 to 2016-17: *Agricultural Statistics at a Glance 2016*.

Some states for several years paid a bonus over and above the MSP of wheat and paddy. Annex Table 3.A.4 shows the amounts and extent of such bonuses and one calculation of the amounts involved in 2009-10 to 2013-14. The bonus could correspond to 5-10% of the MSP but could exceed 35% in some cases. The centre started curtailing state level bonus payments in 2014, but the centre itself declared bonuses above the MSP for some crops like pulses.

The MSP for many crops has often been set at a level below the international price. While MSPs and international prices are not strictly comparable without adjusting for such factors as margins and transportation costs, the following examples draw on Government

of India (2016o; 2017ad). For wheat, the MSP was set below the international price throughout 2011, 2012, and 2013 and started to exceed the international price only in 2014. For maize, the MSP switched from below to above the international price in late 2013. For paddy, on the other hand, the MSP was set below the international price of paddy in all years in the 2012 to 2016 period. For pulses, such as arhar and urad, the MSPs and the international prices were very close in 2012 to 2014, but the MSPs did not match the subsequent much higher international prices. The MSP for gram remained below the international price in all of 2011 to 2015 (and part of 2016). For soybeans, 2012 and 2014 saw MSPs below the international prices, followed by MSPs higher than international prices in much of 2015 and 2016. For most of these and other crops the domestic wholesale price has tended to exceed the MSP, but there are episodes, usually less than year long, when the domestic wholesale price has stayed below even the MSP.

Procurement and disposal of food grains

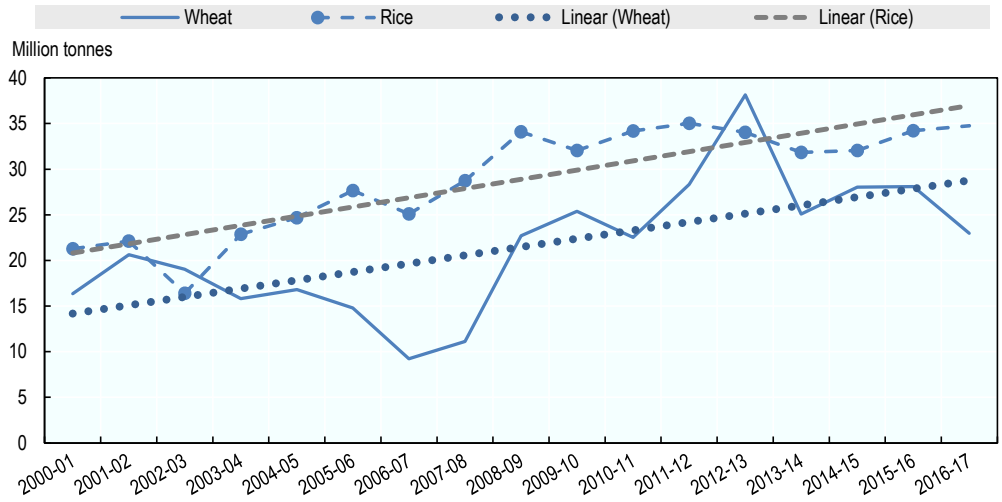
India's agricultural policy effort and related institutions are to a large extent concerned with wheat and rice, including the interface between their supply and demand. This section therefore concentrates on the procurement and disposal of food grains, with particular references to the later section on "Consumer measures". Policies specific to other commodity sectors are reviewed in more detail in Annex 3.B: pulses and oilseeds, sugarcane and sugar, cotton, jute, fruit and vegetables, milk and dairy, and bovine meat.

Implemented as part of India's Price Support Scheme (PSS), the procurement by FCI and state agencies at the MSP is open-ended, i.e. they procure whatever food grains (wheat, paddy and coarse grains) are offered by farmers at specified centres at the MSP plus any applicable bonus. Procurement takes place within a stipulated procurement period specified for each state. Procured grains must conform to prescribed quality specifications. The stock so procured is called central pool stock. In 2015-16 more than 20 000 and more than 44 000 procurement centres operated for wheat and rice, respectively. Most farmers in India sell to other buyers at other prices than the MSP (see below).

In certain states, the state agencies procure wheat and paddy directly from producers and hold the stock on behalf of FCI. These stocks are handed over to FCI when needed for distribution within or outside the state. In other states, the procurement is made under the Decentralized Procurement (DCP) scheme for distribution within the state under TPDS. In 2017 DCP operated for both wheat and rice in 5 states and for either wheat or rice in 11 states. Until 2015 rice was procured through two routes. In certain states the FCI and state agencies procured custom milled rice, which was generated by milling the paddy which the FCI and state agencies procured from producers. In other states, the state and central governments set a state-specific percentage (up to 50%), which determined the share of their production the rice millers had to deliver to the state agency at a "levy" price set by the central government. In 2015, the central government reduced the compulsory levy rice percentage to zero for all of India, effectively ending the levy rice instrument as a procurement channel. This was seen as one way to reduce the procured quantity and thus the level of central pool stocks.

The quantity of wheat procured in 2016-17 amounted to 23.0 million tonnes and the quantity of rice to 34.7 million tonnes (Figure 3.2). The procured quantities show an increasing trend from 2000-01 to 2016-17 for both wheat and rice. The yearly procured quantity of wheat fluctuates more than that of rice.

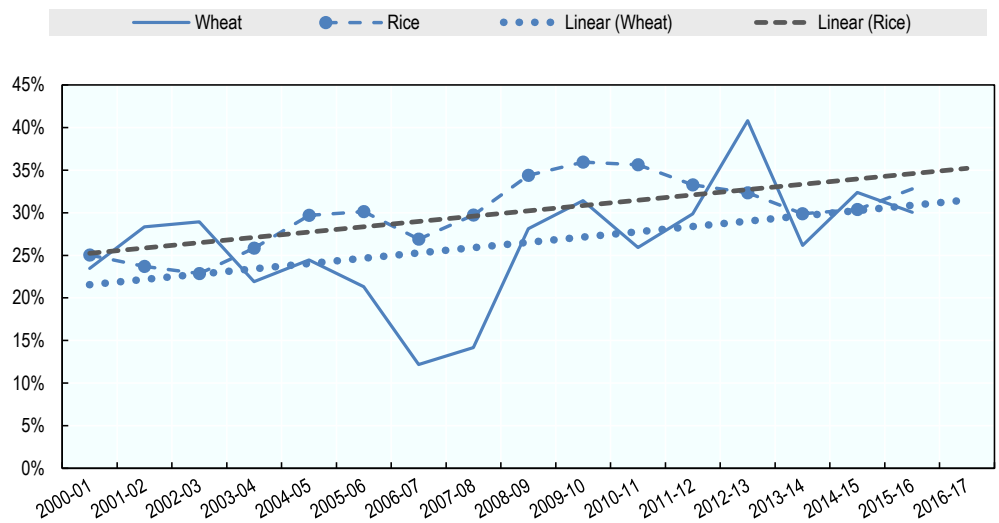
Figure 3.2. Procurement of wheat and rice, 2000-01 to 2016-17



Source: 2002-17: "Procurement Figures July 2017", available at http://dfpd.nic.in/procurement-figures.htm (file: "webupdationjuly"); 2000-01: *Agricultural Statistics at a Glance 2007* (Table 9.1).

Price support procurement effectively operates mainly for wheat, rice and cotton and only in a few states. The states of Punjab, Haryana, Madhya Pradesh, Uttar Pradesh and Rajasthan accounted for 100% of total procurement of wheat in 2016-17. Five states, including Punjab and Uttar Pradesh, accounted for 69% of total procurement of rice in 2015-16. Moreover, only a minor share of total production of wheat and rice is procured. On average between 2000-01 and 2015-16 the procured share of production was 26% for wheat (ranging between 12% and 41%) and 30% for rice (ranging between 23% and 36%) (Figure 3.3). Interestingly, for each of wheat and rice, the time pattern of the procured quantity, which is determined by policy, is almost identical to the pattern of procurement as a share of production. In other words, the policy-determined procurement quantity is more variable than the weather-dependent production quantity.

Figure 3.3. Procurement of wheat and rice as percentage of production, 2000-01 to 2016-17



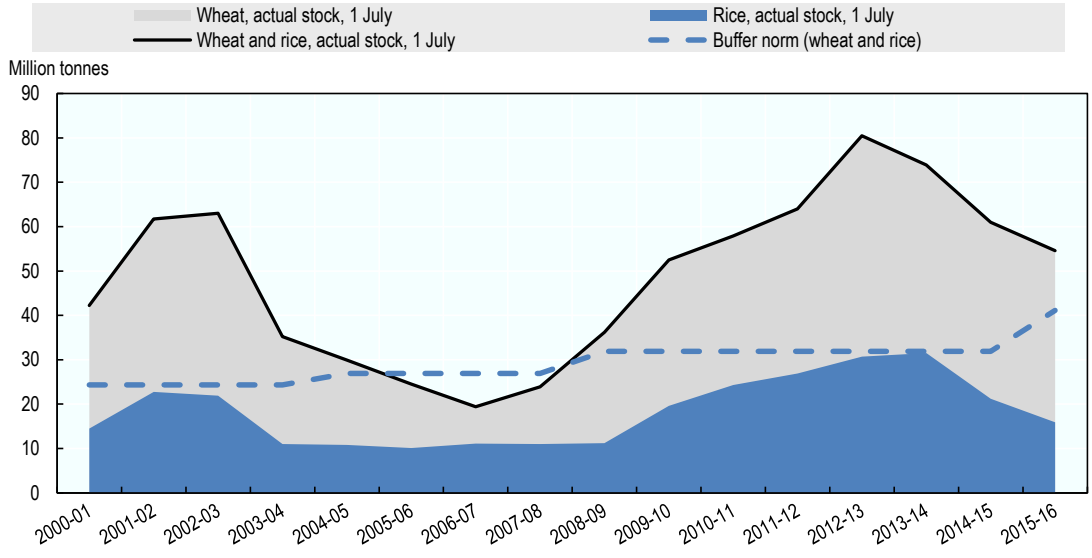
Source: Calculated from procurement data in Figure 2.2 and production data in *Agricultural Statistics at a Glance 2016*, Tables 4.6(a) and 4.7(a).

Procurement at MSP involves only a small share of producers. Out of 90.2 million agricultural households in India, 18.7 million reported sales of paddy in July-December 2012 (Government of India, 2015j; Government of India, 2016q). Of those who reported sales of paddy, only 32.2% were aware of any MSP, 25.1% were aware of any procurement agency, and 13.5% actually sold anything to a procurement agency. Among those households which sold paddy to a procurement agency, only 27% of their sales were at the MSP. Against this background it has been recommended to give wide publicity about MSP and procurement agencies in media before procurement starts and to seek ways to increase farmers' confidence about procurement being carried out (Government of India, 2016n). The central government has accepted a recommendation to focus more of its procurement on states in eastern India, where farmers often have no alternative to selling at prices below the MSP (Government of India 2015j; Government of India, 2017b).

The procurement of wheat and rice by the FCI and state agencies in support of the MSP enables them to meet their responsibilities to maintain buffer stocks. The central government determines the minimum quantities of wheat and rice that must be maintained in each quarter. These stocking norms comprise "food security reserves" for meeting shortfalls in procurement and "operational stocks" for meeting the monthly requirements for targeted public distribution and other welfare schemes. Earlier terminology referred to the stocking norms as buffer norms and strategic reserve.

From 2000-01 to 2015-16 the stocking norms were slowly raised with a few years' interval. The stocks have fluctuated between 20 million tonnes and 80 million tonnes for the total of wheat and rice in that period. Stocks were much above the norms in the early years and then fell below the norms. Later in the period the stocks again rose to a peak much above the norms, from which a decline has been observed in recent years. The actual stocks of wheat and rice vary in a regular pattern through each year, partly a result of most procurement taking place in the harvest season of each crop. The peak total stocks of wheat and rice tend to be seen in June and the lowest has in recent years been in the February-March period for wheat and August-October period for rice.

Figure 3.4. Actual stocks of wheat and rice and buffer norms, 2000-01 to 2015-16



Source: 2000-01 and 2001-02: Government of India (2005); 2002-03 onwards Government of India (2015i).

The quantities of wheat, rice and coarse grains procured by the FCI and state agencies are issued to the relevant agencies for distribution under the Targeted Public Distribution System or other welfare schemes or disposed of through sales, including sales for exports. The FCI issues food grains at Central Issue Prices (CIP) for public distribution under the National Food Security Act, 2013, and other welfare schemes (section "Consumer measures", below). The CIP are set by the government and are lower than the MSP. The operational loss of the FCI is reimbursed by the central government as the food subsidy. The operational loss is the difference between (1) the "economic cost" (sum of MSP, procurement incidentals, and distribution cost) and (2) the CIP, multiplied by the relevant quantities. The government's food subsidy also includes the FCI's cost of carrying stocks.

Sales, mainly of limited quantities of wheat and small quantities of rice (only recently), take place through auction or at a pre-determined price under the Open Market Sales Scheme (Domestic) (OMSS-D). Historically, OMSS-D provides for the sales of mainly wheat through several routes. In 2013-14 the government approved sales of 8.5 million tonnes of wheat to bulk traders or consumers through tenders, direct sales to small traders from depots of FCI in different parts of the country, and retail sales to consumers through state government agencies or national co-operative bodies. Rice was also made available for sale to retail consumers through state governments. The FCI reports exports of wheat under the heading "Exports of food grains from Central Pool from 2012-13" amounting to 2.9 and 2.7 million tonnes in 2012-13 and 2013-14, respectively (Government of India, 2017l). In other years such exports have been nil or very small.

Coarse grains have been procured by state governments and their agencies in earlier years. The central government has no buffer stock commitments for coarse grains, unlike for wheat and rice. The government does not allow the use of food grains, including coarse cereals, to produce biofuels. However, grains certified not fit for human consumption can be sold in open market to be used for producing ethanol for industrial use, including use for blending for potable liquor. India has not approved any genetically engineered coarse grain crops. Seed companies and public sector research institutions are developing genetically engineered crops, including corn and sorghum, but their approval by government and commercialisation may be several years away.

Price and market institutions for other crops

The DACFW implements procurement of oilseeds, pulses and cotton at the MSP as part of India's Price Support Scheme (PSS). It also implements the Market Intervention Scheme (MIS) for the procurement of perishable agricultural and horticultural commodities that are not covered under the PSS. (Annex 3.B reviews policies in these and other commodity sectors in detail).

The PSS is implemented at the request of a state government which agrees to exempt the procured commodities from the levy of *mandi* tax and to assist the central agencies with logistical and financial arrangements. The National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED) is a central agency for procuring oilseeds, pulses and cotton under the PSS and is the sole central agency for procuring coconut products under the PSS. NAFED is a federation of almost 800 producing and processing societies, state level marketing federations from most states, and several other entities. It promotes the marketing and trading activities of its affiliated co-operative institutions, such as internal and international trade, storage, consumer marketing, production of seeds and planting material, fertiliser sales, and implementation of organic farming programmes.

The major policy instrument applying in the production and marketing of pulses and oilseeds are the MSP and the associated procurement under the PSS. In the past, NAFED has procured groundnuts, soybeans, rapeseed and mustard seed in small scale and occasional operations. In 2015–16 and early 2016-17 NAFED and the Small Farmers' Agri-Business Consortium (SFAC) procured small quantities of sunflower seed, milling copra, moong beans, groundnuts and soybeans in seven different states. In November 2015 the Cabinet, in order to strengthen the procurement mechanism of pulses and oilseeds, made the FCI the central agency for procuring pulses and oilseeds when their market prices fall below MSPs. Its efforts are supplemented by NAFED, SFAC, the National Cooperative Consumers' Federation of India Limited (NCCF), and the Central Warehousing Corporation (CWC). The FCI procured a small quantity of pulses in 2015-16 and 2016-17. In order to increase the procurement of oilseeds and pulses from farmers, the Government has recently increased the maximum limit of its quantity to be procured under the PSS from 25% to 40% of the total estimated production of the commodity in a particular state.

NAFED has procured cotton directly from farmers through its co-operative network at state and primary levels. NAFED initiated buffer stocking of pulses under the Price Stabilization Fund (PSF) and procured and stored a small quantity of onion in 2015.

Under the PSS, losses incurred by the central agencies are reimbursed by the government and profits are credited to the government. The DACFW provides working capital to the central agencies in the form of bank guarantees for procurement under the PSS. A standing government guarantee of INR 25 000 million is available with the NAFED and INR 15 000 million to the SFAC. The DACFW also provides letters of comfort to financial institutions for providing short-term loans to the central agencies.

MIS procurement can be undertaken when there is at least a 10% increase in production or a 10% decrease in market prices over the previous year. The MIS is implemented at the request of a state government, which is ready to bear 50% of the loss, if any, within a limit. A pre-determined quantity at the fixed Market Intervention Price (MIP) is procured by agencies designated by the state government for a fixed period or until the prices are stabilised above the MIP. In 2015-16 and early 2016-17 MIP procurement had been carried out for potatoes, oil palm (fresh fruit bunches), grapes, and palm oil in six different states.

Price comparisons

Producer prices have for many years and for many crops remained below comparable reference prices in international markets. This is explained partly by inefficiencies in the marketing chain from producers onwards, associated with the ECA and the APMC Acts and other factors, and partly by MSPs having been set below the international reference prices for several commodities at different periods in 2000-16. This has resulted in significant negative price gaps. However, in recent years the producer price has risen above the MSP for non-basmati rice, soybeans, and groundnuts (section 3.5). Moreover, for wheat and maize, the MSPs themselves have been raised above the international reference prices and the producer prices have been high enough to exceed these higher MSPs. The gaps between the producer price and the reference price have thus turned positive. Lately the producer prices of refined sugar and milk have also exceeded or been very close to the international reference prices.

Reduction of input costs

This section reviews the major policies through which agricultural producers obtain farm inputs at low prices. The largest input subsidies are provided through policies governing the supply of fertilisers, electricity, and water, which have operated for many years (Gulati and Narayanan, 2003). Other inputs are now also supplied at subsidised prices, as is the case for seeds, machinery, credit, and crop insurance. The section outlines some of the mechanisms the central government uses for transfers to producers and to the agriculture sector.

Fertilisers

Fertiliser is an essential commodity under the ECA and a fertiliser control order applies. The central government controls the prices at which some fertilisers are sold to farmers. Within India's Ministry of Chemicals and Fertilizers, the Department of Fertilizers has the main objective of ensuring adequate and timely availability of fertilisers at affordable prices for maximising agriculture production in the country (Government of India, 2017k). The Department of Fertilizers ensures that fertilisers are available at the state level. Distribution within a state is the responsibility of the state government through co-operatives, the private sector or marketing federations. The Department of Fertilizers administers ten fertiliser manufacturing enterprises, nine in the form of "public sector undertakings" and one multi-state co-operative society. The central government subsidises some railway and road transportation of fertilisers. Having gone through several changes over the last few decades, India's fertiliser policy now operates differently for urea and for phosphate and potash fertilisers, such as di-ammonia phosphate (DAP) and muriate of potash (MOP).

Virtually all of India's consumption of nitrogenous fertiliser is in the form of urea, and most of the urea consumed in India is manufactured domestically. In 2014-15 imports accounted for 28% of the total consumption of nitrogenous fertiliser, a share that has increased significantly from 2004-05. Under the New Pricing Scheme (NPS), introduced in stages from 2003, a government-fixed selling price applies to urea (sometimes called a maximum retail price). It has been raised slowly over the 2000-17 period from INR 4 600 per tonne to INR 5 360 per tonne, an increase of 17%. From 2015, fertiliser manufacturers in India have been required to produce only neem-coated urea in order to make it more difficult for black marketers to divert urea to industrial consumers (Government of India, 2016f).[6] Farmers pay an extra 5% of the MRP for neem-coated urea (Government of India, 2017d).

The government provides domestic urea manufacturers with a subsidy to settle the difference between their production cost and their revenue from sales at the fixed selling price. The subsidy is calculated for each individual manufacturing plant, taking into account a plant-specific fixed cost and a variable cost which largely represents the plant's cost of natural gas, which is the feedstock for urea production. Natural gas has been supplied to urea manufacturing plants at a government-determined price that is much lower than the international price, i.e. the government subsidises the difference.

Imports of urea are permitted through three state trading enterprises for direct agricultural use (Metals and Minerals Trading Corporation of India Ltd., Indian Potash Ltd., and State Trading Corporation of India Ltd.). The Department of Fertilizers appoints certain entities as responsible for the handling, bagging and marketing of imported urea. In addition, the central government imports urea from Oman through two co-operative fertiliser enterprises. For most of the time from 2000 a basic duty of 5% has applied, along with a

minor countervailing duty or a cess. When urea is imported, usually at a price higher than the selling price to farmers, the government subsidises the difference. As international prices of natural gas and urea increased in the 2005 to 2008 period, the subsidy on urea in India also increased. From 2015 a pooling mechanism is in place for averaging the price of domestic natural gas and imported natural gas supplied to urea plants.

The government's expenditure on urea subsidies is thus a function of several subsidy calculations, which vary over time as a result of changes in international prices of urea and natural gas. The expenditure is also affected by the quantity of nitrogenous fertiliser consumed, which rose by 55% from 10.9 million to 16.9 million tonnes (nutrient) between 2000-01 and 2014-15 (Government of India, 2011b; 2014d; 2016h).

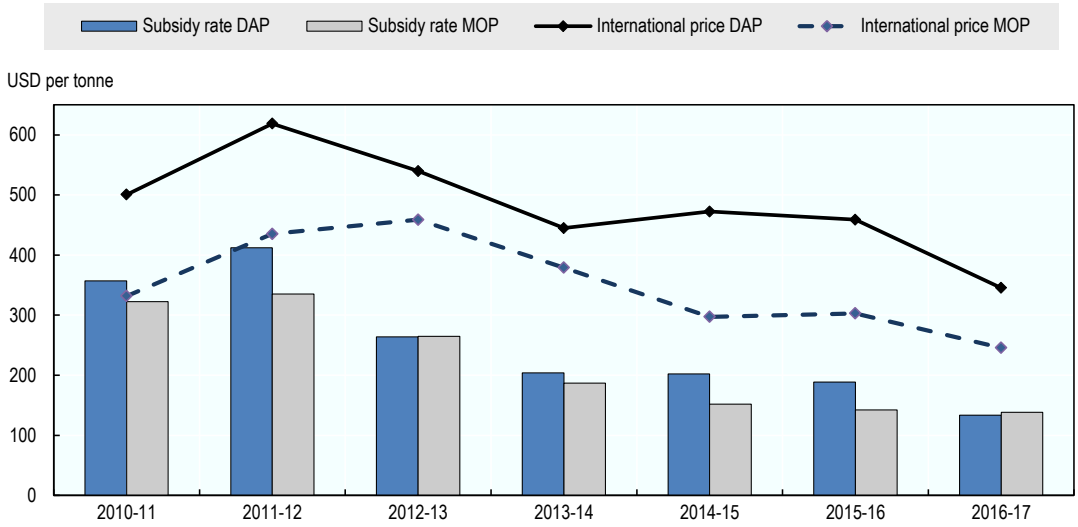
Imports account for the bulk of the consumption of phosphatic fertilisers and for the entire consumption of potassic fertilisers. Virtually the same duties as for urea apply to these imports, which are open to many commercial companies. Until 2010 subsidy payments by the government for about 22 types of phosphatic and potassic fertilisers corresponded to the difference between the respective import parity prices and the Maximum Retail Price (MRP) fixed by the government. From 2010 the Nutrient-Based Subsidy (NBS) policy applies to these so-called decontrolled fertilisers, and the government no longer fixes the MRP. The government sets NBS rates in INR per kilogram of nutrient (nitrogen, phosphate, potash, sulphur), which translate into subsidy rates per tonne of fertiliser, such as di-ammonium phosphate (DAP) and muriate of potash (MOP, potassium chloride) (Fertilizer Association of India, 2017). The fertiliser companies themselves set maximum retail prices at a "reasonable rate". Fertiliser companies are required to clearly print retail price along with the applicable subsidy rate on the fertiliser bags. Any sale above the printed retail price is punishable under the ECA. Farmers effectively pay the market price less the NBS subsidy rate for the nutrients in the fertiliser they buy. As international prices for DAP and MOP declined markedly between 2010-11 and 2016-17, the respective NBS subsidy rates in INR per tonne were reduced even more, and the subsidy rate reduction was still larger in terms of USD per tonne. In 2016-17 the NBS subsidy rate on DAP and MOP was INR 8 945 and 9 282 per tonne, respectively, which was 45% and 37% less than in 2010-11. The subsidy rates for DAP and MOP are shown in USD per tonne in Figure 3.5, along with their respective international prices. In the first couple of years after the 2010 decontrolling of phosphatic and potassic fertilisers, the maximum retail price of DAP more than doubled and for MOP it more than tripled (Gulati and Banerjee, 2015).

Similar to the situation for urea, the consumption of phosphatic and potassic fertiliser has a direct effect on the amount of subsidy. The consumption of phosphatic fertiliser increased from 4.2 million tonnes to 6.1 million tonnes (nutrient) between 2000-01 and 2014-15, while the consumption of potassic fertiliser increased from 1.6 million tonnes to 2.5 million tonnes (nutrient) in the same period (Government of India, 2011b; 2016h). This corresponds to increases by 45% and 62%, respectively.

The time path of fertiliser subsidisation in India is shown in Figure 3.6, based on government expenditures. In two years part of the subsidies was provided to manufacturers in the form of government bonds, which they sold in the market or sold back to the government in later years. Both cash and total subsidies peaked in 2008-09, when world fertiliser prices were extremely high. After falling back, fertiliser subsidies have continued to increase in most of the recent years, but the rise is slower than it was ten years earlier. In most years, except between 2008-09 and 2011-12, urea subsidies (sum of indigenous and imported) were larger than the subsidies on phosphatic and

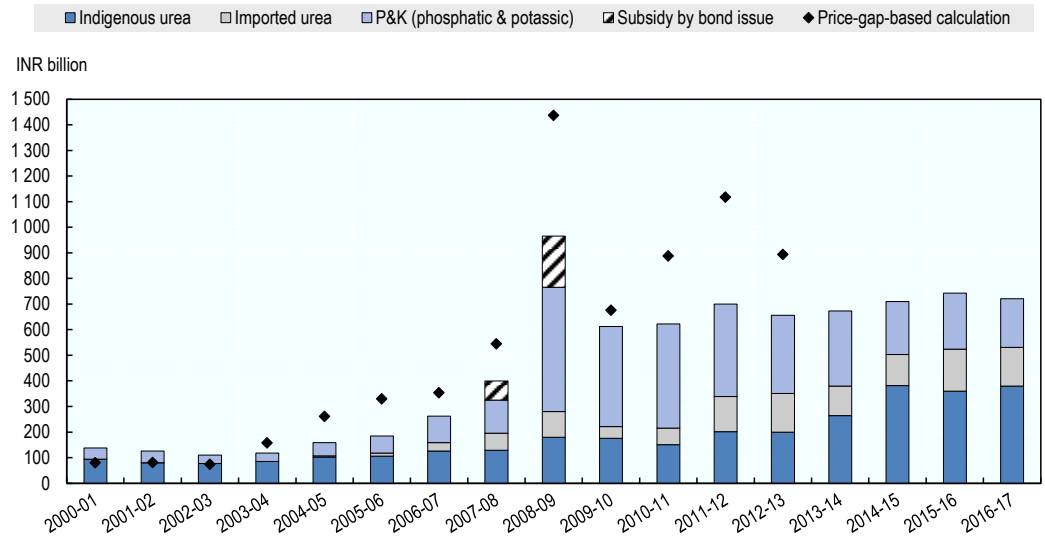
potassic fertiliser. More than half of the fertiliser expenditure in the most recent years is accounted for by subsidies on indigenous urea. The expenditure on phosphatic and potassic fertiliser has been declining since these fertilisers were decontrolled in 2010.

Figure 3.5. Subsidy rates for DAP and MOP, 2010-11 to 2016-17



Source: NBS rates 2010-10 to 2013-14: Government of India, 2014d; 2014-15 to 2016-17: Fertilizer Association of India (2017). NBS rates for 2010-11 refer to April-December 2010; rates were slightly lower in January-March 2011. NBS rates converted to USD/tonne with Reserve Bank of India exchange rates: International prices: World Bank (The Pink Sheet).

Figure 3.6. Evolution of fertiliser subsidies, 2000-01 to 2016-17



Source: 2000-01 to 2014-15: Gulati and Banerjee (2015); 2015-16 and 2016-17 (revised budget): Government of India's Expenditure Budget, Ministry of Chemicals and Fertilisers, Demand No. 7.

Electricity

Electricity is a major input in agricultural production in India, primarily for powering pumps for irrigation water. Much water pumping is for bringing ground water in tube wells to the surface. Numerous entities operate under the central Ministry of Power. They include statutory bodies, such as the Central Electricity Authority, regulatory commissions and transmission utilities, autonomous bodies, such as research and training institutes, and public sector undertakings, such as the power generation entities and the Rural Electrification Corporation, which provides financial assistance in the form of loans for rural electrification. Over the last 25 years, reforms in electricity governance, such as the Electricity Act 2003, have resulted in some unbundling of these functions into separate entities for generation, transmission and distribution. The central government's regulatory reach extends only to the transmission of electricity by state electricity boards between states, not within a state. The public sector, primarily state electricity boards (SEBs), is responsible for generating, transmitting and distributing electrical power. Regulatory bodies have been established both in the states and at the centre. The state regulatory bodies are empowered to set the electricity rates the SEBs charge to different categories of customers, such as agriculture, industry, domestic and commercial.

The rates the SEBs charge to agricultural customers is very low relative to the rates charged to other customers. In 2013-14 the rate for agriculture was zero not only in several states in the Northeast but also in the important agricultural producing states of Punjab and Tamil Nadu (Government of India, 2014b). The share of SEB revenue from agricultural consumers in total SEB revenue is much lower than the share of energy sold (in kWh) to agricultural consumers in India: in 2009-10 and 2013-14 the revenue shares were 6% and 8% and the sales shares were 23% and 22%, respectively (Power Finance Corporation Ltd., 2015). In other words, industrial and commercial electricity consumers cross-subsidise both agricultural consumers and domestic consumers (essentially households). Moreover, to the extent that the SEBs on an ongoing basis operate at a loss, covered by some policy intervention, a further subsidy element may be identified, although not specific to agriculture. On the other hand, it could be argued that the costs of SEBs are unnecessarily high, due to such factors as inefficient capacity utilisation and theft. The evolution of electricity subsidisation, along with irrigation subsidies and other variable input use subsidies is shown in Figure 3.14.

While the price agriculture pays for electricity is low, it is also recognised that the supply is erratic and the quality is low. Lengthy power interruptions are common and erratic, making it difficult to rely only on electrical power for pumping water. Voltage fluctuations harm the pump motors or reduce their efficiency. Farmers' electricity consumption is often not metered and they pay a flat charge related to the capacity of the pump motor. The cost per kWh of the electricity they do consume can therefore be high. Some of these problems may be remedied through the DDUGJY initiative announced in 2014 by the central government's Ministry of Power.[7] The initiative, ongoing until 2022, aims to separate the feeder lines for agriculture and non-agriculture, strengthen the transmission and distribution infrastructure in rural areas, including the metering of electricity consumption, and carry out rural electrification. Many states had already separated feeders for electricity supply for agricultural use from supply for rural non-agricultural use, allowing stricter scheduling to be imposed on supply for agricultural use while maintaining its lower price (Government of India, 2013e).

Water

Surface water for irrigation is supplied to agricultural producers in India at prices lower than the costs incurred by the government agencies at central and state level that manage the supply. While groundwater as a source for irrigation has become relatively more important than surface water, the pricing of surface water remains a crucial instrument in reducing the cost of inputs for agricultural producers. The Central Water Commission, operating under the Ministry of Water Resources, River Development and Ganga Rejuvenation, is concerned with schemes for irrigation, among other things. In policy making it consults with state governments.

Government-funded projects involve building physical infrastructure, such as canals and dams, and operating and maintaining these facilities. The yearly costs the agencies incur thus include operations, maintenance, depreciation and interest on the capital employed. Recovering the full cost from the users of water would require making assumptions about the interest on capital, among other things. In the event, out of the expenses on operations and maintenance, i.e. excluding any interest on capital, only a small portion is recovered from the users of water in the form of an irrigation service fee. In 2001 the irrigation service fee that was collected corresponded to 8% of the expenses on operations and maintenance and the proportion is reported to have since declined further.

Water rates fixed in the past are not revised to account for inflation and there are shortfalls in the collection even of the resulting low rates. A lack of metering of water use in irrigation contributes to the difficulty of matching what a user pays with what it costs to supply the water, the value of the water used in irrigation, or some other indicator. Several initiatives have over the years been devised or integrated so as to increase the irrigated area more rapidly, increase water efficiency, and make irrigation management more effective (Chapter 2).

The National Mission on Micro-Irrigation (NMMI) operates since 2005-06 to financially support farmers setting up drip irrigation, sprinkler systems, and irrigation systems. Government assistance in general has paid for 50% of the cost of a micro-irrigation system, up to a maximum of 5 ha per beneficiary. The subsidy rate is more recently set at 35%, varying by category of farmer. Funding has been shared 80 (centre):20 (states), and from 2016 it is 60:40. State governments also subsidise micro-irrigation systems. While governments seek to expand water-saving micro-irrigation by means of financial support, the availability of free or low-cost electricity is an incentive for farmers to pump and use more water rather than less. It has been recommended that both the price of water and the price of energy for pumping water be regulated as part of the management of this natural resource (Government of India, 2016r),

Seeds, machinery and other inputs

Many kinds of seed are essential commodities under India's ECA. From the time of the green revolution in the 1960s policies governing the development, production and distribution of seeds have been put in place, whether as acts, control orders, plans or missions. Seed policies concern such issues as balancing the incentives for plant breeding between the private and public sectors and encouraging farmers to use certified seeds and replace seed more often so as to increase yields. The central government's Indian Council of Agricultural Research plays a central role, along with universities, research centres and sponsored breeders, in producing breeder seeds. The National Seeds Corporation (NSC) (amalgamated with the former State Farms Corporation of India), state seeds

corporations, state departments of agriculture, and private seed producers are involved in bringing breeder seeds to the foundation seeds stage.

State seeds corporations and other state institutions, along with the NSC, arrange for the production of certified seeds. A variety of initiatives at the central and state levels are in place to develop the institutional infrastructure for distribution of certified seeds and provide financial assistance for the use of certified seeds.[8] The centre's major scheme in this area is the Development and Strengthening of Infrastructure Facilities for the Production and Distribution of Quality Seeds, operating since 2005-06. Several of the central government's missions in agriculture include components that subsidise farmers' use of certain seeds and improved planting material.

The government's several missions also promote and support farm mechanisation. The centre's DACFW co-operates with state government departments in training farmers and technicians, testing machinery and equipment, encouraging the establishment of machinery banks for custom hiring, and subsidising the acquisition of machinery by farmers individually or in groups. The ICAR and state agricultural universities contribute to the development of suitable machinery. Larger pieces of machinery are increasingly employed as a result of custom hiring becoming more widespread. The policy efforts extend to post-harvest technology, such as storage, transport and primary processing.

The purchase or use of farm inputs of many other kinds is often encouraged by some form of government expenditure, often as part of the missions. This can apply to the purchase of diesel fuel, pesticides, machinery and irrigation equipment, such as diesel-powered and solar-powered pumps.

Credit

About 64% of agricultural credit outstanding is held by institutional sources, almost all of it by commercial banks, co-operative societies and banks, and regional rural banks (Chapter 2). The National Bank for Agriculture and Rural Development (NABARD), established in 1982, supervises co-operative banks and regional rural banks and promotes sustainable and equitable agriculture and rural prosperity through credit support, related services, and institutional development. NABARD's financial operations include loans to rural infrastructure institutions, marketing federations, producer organisations, and food processing industry, as well as refinancing of co-operative banks and regional rural banks. NABARD is under the responsibility of the Department of Financial Services of the Ministry of Finance, which holds almost all of its capital (the Reserve Bank of India holds a very small share).

Some three-quarters of all agricultural credit outstanding consist of short-term credit and the share has been growing (Chapter 2). The policy instruments in the credit sector, such as interest subsidies, almost exclusively relate to short-term credit over six to twelve months, i.e. operating credit during the crop season. Subsidisation of fixed inputs is on a much smaller scale in the form of requirements that institutional lenders provide credit to agricultural producers at interest rates below the market rate.

Since 2006 the central government has operated the Interest Subvention Scheme (ISS) for farmers. The subsidy takes the form of transfers to lending institutions to enable them to deliver credit to farmers at the subsidised rate. Initially the interest rate subsidy amounted to two percentage points on short term credit up to INR 300 000 (Hoda and Terway, 2015; Government of India, 2017f). Subsidy increases followed, such that by 2013-14 an additional interest subsidy of three percentage points was available if the interest was paid

on time. This brought the total interest subsidy to five percentage points, reducing the effective rate of interest on some short-term credit to 4%. From 2016-17 the DACFW instead of the Department of Financial Services provides the interest subvention. The scheme continues in 2017-18. The scheme also assists small and marginal farmers with a two percentage point interest subsidy on loans for post-harvest storage. The interest subsidy for short term credit to farmers was budgeted at INR 150 billion in 2017-18.

Since 2004 the centre has encouraged the restructuring and issue of fresh loans to farmers affected by natural calamities, one time settlement for small and marginal farmers, fresh finance to farmers whose earlier debts had been settled, and relief measures for farmers indebted to private money lenders (Hoda and Terway, 2015). The Reserve Bank of India has issued standing guidelines to banks for relief measures in times of natural calamities, including the conversion of the principal outstanding on crop loans and agriculture term loans and the accrued interest into term loans for periods ranging from 3 to 10 years (Government of India, 2013a). In 2006 the central government undertook to mitigate the distress of the farmers in suicide-prone districts (Hoda and Terway, 2015). This included interest waivers and restructuring of loans, investments in irrigation, seed replacement, watershed development and horticulture development. A lending scheme for priority sectors requires commercial banks to direct 18% and 4.5% of their lending to, respectively, agriculture and suppliers of a variety of agricultural inputs (Hoda and Terway, 2015). Farmers' access to banking and credit is facilitated by the Kisan Credit Card (KCC) scheme, which documents a bank customer's personal and financial details.

Debt relief in agriculture has applied through partial or full debt waivers, in which the government reimburses the lending institutions their cost of implementing the debt waivers. In 2008 the central government introduced the Agricultural Debt Waiver and Debt Relief Scheme (ADWDRS) on overdue short-term production loans and investment loans (Hoda and Terway, 2015). Farmers with landholdings of up to two hectares (small and marginal farmers) were provided a complete waiver. For other farmers, 25% of the eligible amount (including principal and interest) was waived, provided they paid 75% of that amount. About half of the central government's expenditure on this scheme was incurred in 2008-09, with the remainder being accounted for in declining amounts in the subsequent three years, for a total of INR 522 billion (Government of India, 2013a).

At the state level, Andhra Pradesh and Telangana decided on a debt redemption scheme for farmers in 2014 (Ramakrishnudu, 2015). While media reports in 2017 have indicated several initiatives where a state government intended to provide funds for lending institutions to waive farmers' loans, it has not been possible to substantiate the status and the amounts of these initiatives. One report lists eight such announcements ranging between INR 77 billion (USD 1.2 billion) and INR 560 billion (USD 8.5 billion), depending on the state, in Uttar Pradesh, Maharashtra, Punjab, Madhya Pradesh, Gujarat, Haryana, Tamil Nadu, and Karnataka (IndiaSpend, 2017). Out of these, Uttar Pradesh, Maharashtra and Punjab have implemented their debt waivers. Rajasthan is reported also to have announced a debt waiver in 2017.

Crop insurance

Several crop insurance schemes have been and are being implemented under the responsibility of the central government through the National Agricultural Insurance Scheme (NAIS).[9] Participation in crop insurance schemes is optional for state governments. The NAIS was introduced in 1999, replacing the Comprehensive Crop Insurance Scheme. The Weather Based Crop Insurance Scheme (WBCIS) was introduced

in 2007 and a Modified NAIS in 2010. In 2013 the National Crop Insurance Program (NCIP) merged the WBCIS, the Modified NAIS, and the Coconut Palm Insurance Scheme. The implementation and administration of crop insurance have been handled by the Agriculture Insurance Company of India Ltd. (AIC) since 2003, involving also private sector and public sector insurance companies (AIC, 2017). The central and state governments pay the AIC to reimburse claim payments and subsidise premiums. The AIC and other insurance companies offer additional insurance products, such as rainfall insurance, coffee rainfall insurance, and rubber plantation insurance (AIC, 2016).

The NAIS, which began to be phased out in 2016, covered all food crops, oilseeds, and annual commercial and horticultural crops. Participation was compulsory for indebted farmers and voluntary for others. The premium rates ranged between 1.5% and 3.5% of the insured value of food and oilseed crops, while actuarial rates applied for commercial and horticultural crops. Small and marginal farmers were provided a 10% subsidy on their premium, shared by the central and state governments.

From 2016 the PMFBY (*Pradhan Mantri Fasal Bima Yojana*, Prime Minister Crop Insurance Scheme) is being implemented in association with the state governments. Buying crop insurance remains compulsory for indebted farmers and voluntary for others, which effectively involves agricultural lending institutions, such as banks, in farmers' crop insurance decisions. In contrast to other insurance schemes there is no limit on the government's premium subsidy (Government of India, 2016d). Producers pay a premium of 2% and 1.5% of the "sum insured" of the *kharif* and *rabi* crops, respectively, and 5% for annual commercial and horticultural crops. The actuarial premium may be several times larger, with the central and state governments sharing the cost of paying the difference in premium. A crop loss is determined on the basis of the yield shortfall in the producer's local administrative area, such as a village, i.e. not specifically on the producer's own land. Electronic technology is expected to be used for estimating yield losses and for depositing payments in producers' bank accounts.

The PMFBY is implemented along with a Restructured Weather Based Crop Insurance Scheme (RWBCIS). About 30% of India's cropped area was covered by crop insurance schemes in 2016-17. The premium rates paid by farmers in the most recent scheme, the PMFBY, are generally lower than in earlier schemes, especially the Modified NAIS (Table 3.6). Although the PMFPY premiums are calculated on an actuarial basis, farmers pay 1.5% of the sum insured for *rabi* crops, 2% for *kharif* crops and 5% for horticulture and commercial crops. The remaining amount of premiums is paid by the central and state governments in a 50:50 ratio.

Table 3.6. Premium charged to farmers for crop insurance

Season	Crops (selected)	Premium charged to farmers as % of sum insured			
		NAIS	mNAIS	WBCIS	PMFBY
Rabi crops (October-March)	Wheat	1.5%	10-11%	10-11%	1.5%
	Pulses and oilseeds	2.0%	10-11%	10-11%	1.5%
Kharif crops (July-October)	Paddy and pulses	2.5%	10-11%	10-11%	2.0%
	Oilseeds and bajra	3.5%	10-11%	10-11%	2.0%
Annual crops	Commercial and horticultural crops	Actuarial	10-11%	10-11%	5.0%

Note: NAIS: National Agricultural Insurance Scheme; mNAIS: modified National Agricultural Insurance Scheme; WBCIS: Weather-based Crops Insurance Scheme; PMFBY: *Pradhan Mantri Fasal Bima Yojana*. While the premiums are calculated on an actuarial basis, the insured farmers are required to pay only the premium rates shown. The residual premiums are paid by the central government and the state governments concerned.
Source: Government of India (2011a; 2014f; 2015a; 2016d; 2016o).

Missions

The National Food Security Mission (NFSM) operates since 2007-08 to increase the production of wheat, rice and pulses as well as the promotion of commercial crops like cotton, jute and sugarcane. The strategy is to provide financial assistance promote and extend improved technologies regarding, e.g. seed, micronutrients, soil improvement, pest management, machinery, and irrigation, as well farmer capacity building. Until 2014-15 the central government provided all the funding, and more recently the funding has been shared between the central and state governments in a 60:40 ratio. From 2016-17 several new such initiatives were undertaken to increase the production of pulses.

The National Agricultural Development Plan (known by its Hindi name: *Rashtriya Krishi Vikas Yojana*, RKVY) operates since 2007-08 to encourage the formulation of state and district level plans and to induce the states to increase own spending on a highly diverse set of activities. They relate to, e.g. crop development, horticulture, mechanisation, natural resource management, marketing, animal husbandry, dairy development, and extension. In 2014-15 the three largest elements of RKVY in terms of expenditure were crop development, horticulture and micro/minor irrigation, together accounting for 44% of total expenditure on RKVY. Until 2015-16 the central government provided all the funding for the mission, and more recently funding is shared 60 (centre):40 (state) in most states. The states have full flexibility in their use of the mission funds. A number of sub-schemes have been introduced from 2010-11 or later, focussed on bringing the green revolution to eastern India, crop diversification, reclamation of problem soils, shifting rice fallow area in eastern India to pulses and oilseeds, and controlling foot and mouth disease.

The centrally sponsored National Mission on Oilseeds and Oil Palm (NMOOP) restructures since 2014 the earlier Integrated Scheme of Oilseeds, Pulses, Oil Palm, and Maize (ISOPOM), along with the centrally sponsored schemes for tree borne oilseeds and oil palm area expansion (Government of India, 2014a). Operating through three mini-missions (oilseeds, oil palm, tree borne oilseeds), NMOOP seeks to increase the production of vegetable oil through support for many kinds of improvements in inputs and practices, such as seeds, nutrient management and sprinkler irrigation. Funding of the mission is mostly shared 50:50 between the central and state governments. Launched in

2004, ISOPOM is a centrally sponsored scheme aiming to promote crop diversification, with funding shared 75 (centre):25 (state). ISOPOM had resulted from the 2004 merger of programmes for the development of oilseeds production, pulses, maize, and oil palm.

The Mission for Integrated Development of Horticulture (MIDH) brings together since 2014-15 the earlier National Horticulture Mission (the major element of MIDH), the Horticulture Mission for North East and Himalayan States, National Bamboo Mission, National Horticulture Board, Coconut Development Board, and Central Institute for Horticulture, Nagaland. The central government's 50% share and the state governments' 25% share of the premium for coconut palm insurance is funded under MIDH, and 25% is paid by farmers.

The National Mission for Sustainable Agriculture (NMSA) operates since 2014-15 to make agriculture more productive, sustainable, remunerative, and climate resilient. The mission restructures other missions and programmes in the DACFW and has two major components: rainfed area development and soil health management. Since 2015-16 an additional scheme is in place to mitigate the effects of drought and increase the area under irrigation: the *Pradhan Mantri Krishi Sinchayee Yojana* (PMKSY; Prime Minister's Agricultural Irrigation Plan). The scheme aims at providing end-to-end solutions in irrigation supply chains, with respect to water sources, distribution network and farm-level applications. Under PMKSY, ongoing canal and water surface schemes will be looked at in conjunction with watershed development, rain water harvesting, micro irrigation etc. One prominent element of the NMSA is the introduction of a scheme to provide information to farmers on soil analysis and related nutrient recommendations. The scheme is designed to provide this information in the form of a "soil health card" once every two years.

In livestock, the National Livestock Mission (NLM) in 2014-15 subsumed many earlier central and centrally sponsored schemes under a common heading. They include schemes focused on the development of production of particular species, such as sheep, pigs and poultry, as well as schemes concerned with developing livestock feed and with particular issues in livestock production, such as utilisation of fallen animals (Annex Table 3.A.5 illustrates the diversity of subjects subsumed under the NLM). A livestock insurance scheme offers a 50% subsidy of the premium for insurance for loss of high-yielding cattle or buffalo by death. Five animals per beneficiary are eligible for coverage. Insurance is offered by private insurance companies. Similar to the various crops missions, the NLM also has an extension component.

State-level agricultural policies

In addition to implementing policies funded fully or partially by the centre, many states operate their own agricultural policies. The Constitution allows the states to devolve their authority in some subjects, including agriculture, to a lower level of government (*panchayat*, sometimes called village-level government). Some state policies complement or add to the policy effort undertaken by the centre (e.g. some states have in the past declared a state bonus on wheat and paddy over and above the MSP set by the central government). Policies in many states include making financial contributions to cover part of the cost of a farmer's investment or input purchases. For example, the Madhya Pradesh government used a two-pronged strategy to increase the use of farm machinery: a village scheme and a scheme to give incentives to rural youth to establish custom hiring centres. Both were found to have contributed significantly to increased mechanisation in

agriculture (Gulati et al., 2017). For an illustrative example of the roles of state departments of agriculture see Box 3.2.

Assessments of state-specific agricultural issues and policies emphasise the importance for agricultural development of improvements in irrigation, electricity supply (including solar), roads, rice varieties, crop and livestock diversification, drought proofing, marketing and procurement, land leasing, and downstream cold storage and food processing facilities (Verma et al., 2017; Hoda et al., 2017a; Hoda et al., 2017b; Gulati et al., 2017). The priority put on any single one of these subjects depends on the decision of the state government.

Box 3.2. Illustrative example of state agricultural policy: Odisha

The Department of Agriculture in Odisha, an eastern state, is responsible for agriculture, horticulture, soil conservation and a watershed mission. Several autonomous bodies work under the department, such as the Odisha State Seeds Corporation, Odisha Agro Industries Corporation, Agriculture Promotion and Investment Corporation of Odisha Limited, Odisha State Seed and Organic Products Certification Agency, Institute on Management of Agricultural Extension, and Odisha Cashew Development Corporation.

Odisha has an explicit State Agriculture Policy, which specifies many instruments for state financial assistance to the agriculture sector, such as paying a specified share, up to a limit, of the cost of farmers' investment and input purchases. Odisha's agricultural policy lists more than 80 instruments for financial assistance under the following headings.

Agriculture: capital investment subsidy for commercial agri-enterprises; private lift irrigation projects; soil management; organic farming; pesticides and bio-pesticides.

Horticulture: nursery; vegetable seed production; seed infrastructure; vegetable cultivation in open condition; establishment of new garden (area expansion); floriculture; spices (ginger and turmeric); mushroom cultivation; plantation crops; post-harvest management; establishment of marketing infrastructure for horticulture produce; protected cultivation; promotion of integrated nutrient management and integrated pest management; organic farming; vermi compost unit; micro irrigation.

Animal resources development: milking machine; manual and power operated chaff cutter; cream separator; mini cattle/ poultry/ fish feed mill; paneer making machine; khoa making vat; deep freezer; bulk cooler and chillers.

Source: State Agriculture Policy 2013, Agriculture Department, Odisha http://agriodisha.nic.in/Content/pdf/State_Agriculture_Policy_2013_e.pdf and http://agriodisha.nic.in/Home/HomeAboutUs.

Rural public services infrastructure (research and development, education and training, quality and sanitary control, agricultural infrastructure, marketing and promotion)

Research

The publicly funded National Agricultural Research System (NARS) consists of the Indian Council of Agricultural Research (ICAR) and a network of research institutions and State Agricultural Universities (SAUs). ICAR has a vast mandate concerning research, technological development, extension and education. ICAR co-ordinates, guides and manages research in areas including crop science, natural resource management, horticultural science, fisheries science, and animal science in all of India. ICAR's network includes 62 State Agricultural Universities, four deemed universities, three central agricultural universities, and four central universities with agricultural faculty. The SAUs, originally modelled after land grant universities in the United States, are usually established through state legislation and rely on funding mainly from state governments. To provide a legal base for the establishment, functioning and uniformity of agricultural universities, ICAR developed a model act for agricultural universities in India, last revised in 2009.

Although an autonomous body, ICAR links to and is mainly funded by the central government through the Department of Agricultural Research and Education (DARE) in the MAFW. In 2011 DARE established Agrinnovate India Limited to promote and spread the research and development outcomes of ICAR. A major activity of the company is the commercialisation of technology. Agro-economic research is under the administration of DAFW, not DARE.

Extension

The central government provides support to the state governments to reform their extension services, including the establishment of several hundred Agriculture Technology Management Agencies (ATMAs) across the country. This is in addition to the network of 662 centres called *Krishi Vigyan Kendra* (KVK) or agricultural science centres. The KVKs, which assess, refine and demonstrate location specific technology in agriculture, are financed by the central government. DAC and ICAR guidelines for state governments and SAUs encourage the linking of the research and extension systems, such as the ATMAs working together with KVKs at the district level, keeping district priorities in view. Some SAUs operate *Krishi Gyan Kendra* (KGK) or agricultural knowledge centres.

In recent years the National Mission on Agricultural Extension and Technology (NMAET) has supported a vast array of extension activities, both through central schemes and centrally sponsored schemes. The NMAET supports such activities as extension education, training, and agricultural mechanisation. The mission provides financial assistance for individual ownership of farm machinery. Some components under the mission support the production and distribution of certified and quality seeds, and others address plant protection, plant quarantine, pesticide management and food safety. From 2014-15 the Sub-Mission on Agricultural Mechanization (SMAM) promotes the use of farm machinery and provide financial assistance to acquire and hire farm machinery.

Product safety and inspection

The Food Safety and Standards Authority of India (FSSAI) is established by the Food Safety and Standards Act 2006 (FSSA). Operating under the Ministry of Health and Family Welfare (MHFW), the FSSAI administers the Food Safety and Standards Regulations (FSSR) of 2011. The FSSR applies equally to domestic and imported foods and requires all food processors, manufacturers, exporters, and importers to have their products certified according to FSSAI regulations. The FSSAI establishes standards for food and regulates the manufacture, storage, distribution, sale and import of food, with a view to ensuring availability of safe and wholesome food for human consumption, and contributing to the development of international technical standards for food and sanitary and phytosanitary standards. The MAFW is involved with sanitary and phytosanitary measures through its Department of Animal Husbandry, Dairying, and Fisheries (DAHDF) and Directorate of Plant Protection, Quarantine and Storage (DPPQS). Standards, including those in agriculture and food, are administered by the Bureau of Indian Standards (BIS). Technical regulations are formulated by sector-specific agencies.

The Ministry of Food Processing Industries (MOFPI) provides assistance for the setting up and upgrading of food testing laboratories by organisations in the central and state governments, including universities. MOFPI also operates schemes to motivate the food processing industries to adopt food safety and quality assurance mechanisms, such as ISO 9000 and HACCP, to prepare food processing industries to face global competition, to enable adherence to stringent quality and hygiene norms, to enhance product acceptance by overseas buyers, and to keep Indian industry technologically abreast of international best practices.

The Agricultural Produce (Grading and Marking) Act, 1937 provides for grading and marking of agricultural, horticulture and livestock products with the objectives of making available quality agricultural products to consumers. The central government makes rules for grade designations to indicate the quality of the product and specifies grade designation marks. Manufacturers who comply with standards laid down by the Directorate of Marketing and Inspection of the MAFW are allowed to put 'AGMARK' labels on their products.

The Fruit Products Order, administered by the Ministry of Food Processing Industries, was a mandatory certification mark on processed fruit products under the Food Safety and Standards Act, 2006.

Producer organisations

The National Cooperative Development Corporation (NCDC) promotes and develops co-operatives in agriculture and rural activities, such as farmers' co-operatives for production, marketing, processing, storage, and exports and imports of agricultural produce and foodstuffs. It supplements the efforts of state governments. In addition to internal accruals and borrowings, it is funded by the central government's MAFW.

The central government promotes the creation of Farmer Producer Organizations (FPOs) through the SFAC (Government of India, 2016r). An FPO is an association of farmers offering the advantages of both a co-operative and a private company. State governments and their agencies can also be involved in promoting FPOs. The SFAC helps to create state-level farmer producer companies (FPC) with smaller FPOs as shareholders of the state-level FPC.

An FPO can offer a variety of services to its members, including financial services (loans for crops, purchase of tractors, pump sets, and construction of wells), input supply (fertilisers, pesticides, seeds, and others), purchasing produce (also storing, processing and packaging), marketing, insurance (e.g. crop insurance), and technical services (promoting best practices, providing marketing information). SFAC supports FPCs with credit guarantees and with equity grants up to INR 1 million. Both instruments help FPCs obtain credit from mainstream financial credit institutions. In March 2017 there were 586 registered FPOs and 152 were in the process of registration.

Taxes in agriculture

The central government's income tax act specifically excludes "agricultural income" from central government taxation. It defines agricultural income essentially in terms of rent or revenue derived from land and income from land by agricultural operations, including processing to make agricultural produce fit for sale. In keeping with India's constitutional distinction between agriculture and animal husbandry, agricultural income does not include here income from selling livestock products, such as animals, poultry and milk, which is therefore subject to taxation. The exclusion of rent, revenue or income associated with land is explained by the long-established imposition by state governments of a land based levy called "land revenue". The states, but not the centre, have the constitutional right to collect land revenue. The land revenue can be collected at different rates depending on the classification of the land, such as wet or dry. While the states can also tax agricultural income, the implementation of such taxes varies: most states impose no such tax and some impose tax only on income from plantations, such as tea, coffee, rubber or spices. Some states have intermittently introduced and then abandoned agricultural income tax.

Following protracted centre-state negotiations and a constitutional amendment in 2016, the central and state governments started applying a new value-added tax from 1 July 2017 (Chapter 2). This Goods and Services Tax (GST) replaces a large number of taxes, levies and other fees collected by the central and state governments at different rates at different points in the value chains of different products. The initial GST structure is designed such that massive changes in the tax rates for any sector are avoided (Government of India, 2017b). Six different rate levels apply to goods and services: nil, 3% (goods only), 5%, 12%, 18%, and 28% (also a 0.25% rate for three minor goods items). As in similar systems in other countries, it is the "supply", such as the sale, of a product that is subject to tax, not its production. The supply of primary agricultural commodities, including food grains, is taxed at the nil rate and the supply of most other food items are taxed at the lower percentages (Government of India, 2017m). Moreover, a person who cultivates land ("agriculturist") does not need to register for GST as a supplier. A dairy, poultry or livestock farmer needs to register as a supplier if the farm's sales figure exceeds INR 2 million (about USD 30 000) (Government of India 2017q).

The collection of GST is destination based, with central GST and state GST applying to transactions within a state. An integrated GST applies to transactions between states, for which the central government has a particular responsibility in enabling the integration. The integrated GST is collected on imports from other countries but not on exports. The integrated GST on imports is levied and collected under the Customs Tariff Act 1975, as amended, and applies in addition to the basic customs duty. The implementation of GST is seen by some as facilitating India's move towards a National Agricultural Market (Government of India 2015e). By subsuming many kinds of taxes on the marketing of

agricultural produce, the GST may ease the inter-state movement of agricultural commodities.

Consumer measures

Supply of food grains to state governments

A series of public food distribution systems has evolved in India from 1942. The Targeted Public Distribution System (TPDS) was introduced in 1997. It targeted the distribution of food grains and other essential supplies to various categories of the population defined in relation to the government-determined poverty line. The public distribution of food grains, such as the TPDS, operates under the joint responsibility of the central and state governments.

The central government, through the FCI and state agencies, is responsible for the procurement and storage of food grains. The central government allocates food grains to the state governments. The FCI on behalf of central government transports food grains from surplus states to deficit states. The operational responsibility for distribution to beneficiaries rests with the state governments.

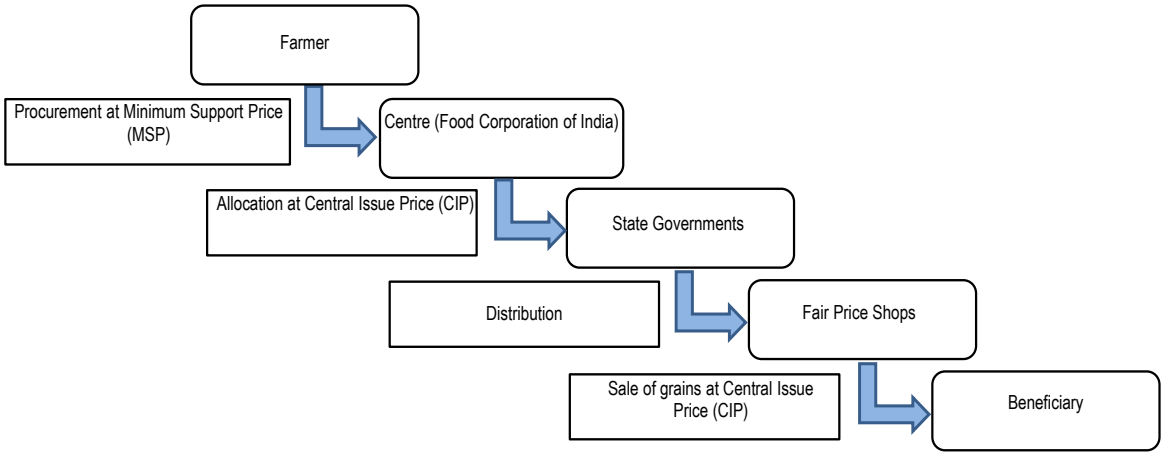
Distribution of food grains to beneficiaries

In September 2013, the National Food Security Act (NFSA) was enacted by the Parliament, extending to all of India and absorbing the TPDS and several other food programmes. The NFSA established a statutory right for the targeted sections of the population to obtain certain quantities of food grains at subsidised prices under the TPDS. The Act envisaged this right extending to about two-thirds of India's population, i.e. to more than 800 million people. The incorporation of TPDS into the NFSA proceeded at different speeds in different states, but by 1 November 2016 the NFSA had been implemented in all 36 states and Union Territories, which thus receive their monthly allocation of food grains as per their entitlement under the NFSA. Several other welfare schemes, mainly operating under the NFSA, also provide food grains to particular categories of recipients (discussed below).

The state governments are responsible for distributing the food grain entitlements, i.e. allocating the supplies within the state, identifying eligible families, issuing ration cards, distributing food grains mainly through Fair Price Shops (FPSs) and licensing and supervising the functioning of the FPSs. FPSs, which numbered 528 000 in 2016, can be owned privately, by co-operative societies or by the government. Some state governments also distribute such items as sugar, pulses, edible oil, iodised salt, and spices through the same outlets as where they distribute NFSA food grains. The central government provides assistance to the state governments to meet the cost of transporting food grains within a state and for the margins of the Fair Price Shop (FPS) dealers.

The functions and actors in the food grain distribution system are summarised in Figure 3.7. The activities of governments in procuring food grains at MSP and acquiring and managing public stocks are deeply intertwined with government activities in making food grains available for public distribution (allocating at Central Issue Price), distributing food grains, and enabling their sale to beneficiaries (Saini and Gulati, 2015).

Figure 3.7. Schematic of procurement and public distribution of food grains in India



Source: Balani (2013).

State governments use their own criteria to identify families or households eligible for TPDS and NFSA entitlements, using estimates by the central government of the numbers of recipients. The TPDS distinguishes among three categories of recipients: families Above the Poverty Line (APL), Below the Poverty Line (BPL), families and AAY households (AAY stands for Antyodaya Anna Yojana, a category established in 2000, comprising the poorest of the poor and numbering up to 25 million people).[10] The Central Issue Price at which TPDS beneficiaries could buy food grains was held constant since 2002 at INR 8.30 per kg for rice and INR 6.10 per kg for wheat for APL families; INR 5.65 and INR 4.15 per kg, respectively, for BPL families; and INR 3.00 and INR 2.00 per kg, respectively, for AAY households (Government of India, 2017y).

Under the NFSA the state agencies identify the eligible recipients as belonging to one of only two categories: priority households and AAY households. The size of the food grains entitlements in the priority category are defined in terms of a person, an innovation possibly related to raising the likelihood of reaching the intended group of NFSA recipients, while the entitlements in the AAY category continue to be defined in terms of a household as under TPDS. Priority households are entitled to buy 5 kg of food grains per person per month at subsidised prices. AAY households are entitled to buy 35 kg of food grains per household per month at the same subsidised prices. These prices are INR 3, INR 2, and INR 1 per kg, respectively, for rice, wheat, and coarse grains (corresponding to about USD 45, USD 30 and USD 15 per tonne in 2016; calculated at average daily exchange rates of the Reserve Bank of India). For AAY households these prices and entitlements remain the same under NFSA as under TPDS.

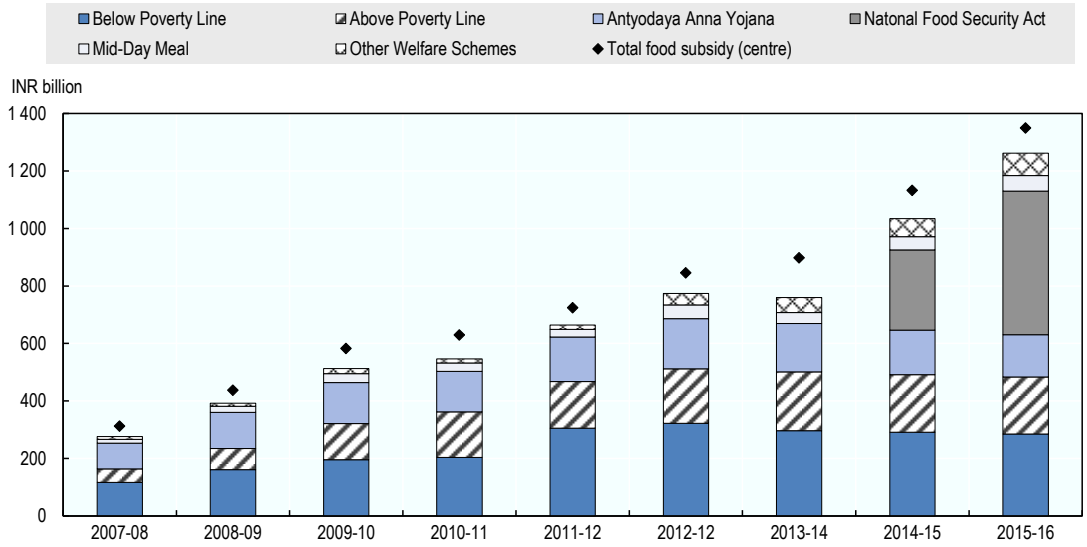
In addition to the TPDS, a set of Other Welfare Schemes (OWS) operates under the NFSA. The National Program of Mid-Day Meal in Schools (Mid-Day Meal Scheme) is the responsibility of the central government's Ministry of Human Resource Development. Local depots of the FCI supply food grains for free to the relevant state agencies (the FCI is paid the food subsidy by the Ministry at the NFSA prices). The state agencies are responsible for the distribution and meal preparation functions in schools according to central government rules. More than 100 million children benefit from this scheme.

The Wheat Based Nutrition Program (WBNP) is implemented by the Ministry of Women and Child Development under its Integrated Child Development Scheme. The Ministry pays the food subsidy to FCI at NFSA prices for food grains allocated to state-run child development projects to provide food to children below the age of six and to pregnant or lactating women. Despite the programme name, rice accounts for more than 30% of the allocated grains. Other schemes under which the central government allocates food grains at subsidised prices include the scheme for Supply of Food Grains to Welfare Institutions, the scheme for Supply of Food Grains for SC/ST/OBC Hostels (SC/ST/OBC refers to certain defined segments of the population), the Annapurna Scheme (concerns senior citizens in certain circumstances), the Emergency Feeding Programme, and the Rajiv Gandhi Scheme for Empowerment of Adolescent Girls. Moreover, states that participate in the Decentralized Procurement Scheme are responsible not only for procuring food grains within the state but also for distributing it to the segments targeted under TPDS and other welfare schemes.

Food subsidies

The centre determines the difference between the economic cost and the central issue price, which is passed on to the FCI or the state government as food subsidy. The amounts of food subsidies released for the three recipient categories under the TPDS (BPL and APL families and AAY households) increased significantly from 2007-08 onwards (Figure 3.8). The increases in these components ceased or reversed in conjunction with the introduction of the NFSA in 2013-14. From 2014-15 the share of the NFSA component in the food subsidy is seen as growing along with the progressive implementation of the NFSA by state governments. The total food subsidy is somewhat larger than the sum of the components accounted for explicitly in Figure 3.8. This may be related to the fact that the total food subsidy reported by the DFPD includes not only subsidies released under various welfare schemes but also reimbursement of the FCI's carrying charges for buffer stocks, such as freight, storage, and interest charges. In addition to the food subsidy of the central government, state governments have provided food subsidies of varying size, ranging between 6% and 17% of the centre's food subsidy expenditure.

Figure 3.8. Major components of the centre's food subsidy, 2007-08 to 2015-16



Source: Government of India (2017z).

A shift away from the physical grain transfer to deposits of cash into the beneficiaries' bank accounts is envisaged as part of the government's direct benefit transfer initiative (Box 3.1 above and Chapter 4). A pilot initiative of this kind is ongoing in three Union Territories. The recent application of India's Direct Benefit Transfer and its Aadhaar identification to the distribution of fertiliser subsidies is outlined in Box 3.1 above.

Environmental measures

While few measures are explicitly labelled as environmental measures in the context of agricultural policy in India, the nexus of agriculture and the environment is gaining recognition. The need for attention to environmental sustainability in agriculture is identified in policy documents such as the twelfth five-year plan 2012-17 (Government of India, 2013e). This relates to such issues as the use of water and fertiliser in Indian agriculture, among others. The National Mission on Sustainable Agriculture (NMSA), which derives from India's national action plan on climate change, involves co-operation with state level agencies. The mission merges many activities of the DACFW related to sustainable agriculture, with special emphasis on soil and water conservation, water use efficiency, soil health management, and rainfed area development. Adaptation measures are also covered under other ongoing schemes such as the National Initiative on Climate Resilient Agriculture (NICRA), the *Pradhan Mantri Krishi Sinchayee Yojana* (PMKSY; Prime Minister's Agricultural Irrigation Plan), and the District Agricultural Contingency Plans (DACP).

The authority to regulate the quality of genetically modified crops is provided under the Environment (Protection) Act, 1986. The Ministry of Environment, Forest and Climate Change is responsible for approving the release of genetically modified seeds, such as Bt cotton hybrids. It is reported that genetically modified eggplant (brinjal) has been developed but not approved for release, while approval for release of genetically engineered mustard is under consideration (Deshpande, 2017). India participates in the Global Environmental Facility Formulation, concerning such issues as climate change mitigation and adaptation, biodiversity and land degradation. The central government's Ministry of New and Renewable Energy (MNRE) implements the National Biogas and Manure Management Programme (NBMMP), which supports the installation of household size plants to generate gas from biomass, including what is generated in farming. The programme was launched already in 1981 under the name National Programme on Biogas Development (NPBD). The Solar Pumping Program for Irrigation and Drinking Water, operating under the responsibility of the MNRE since 1992, offers financial support through state governments, NABARD and regional rural banks for the installation of such pumps, in some cases replacing diesel pumps. A National Policy on Biofuels has been in place for many years, with steps having been taken in 2017 towards new biofuels initiatives.

Overall budgetary outlays on agro-food policies

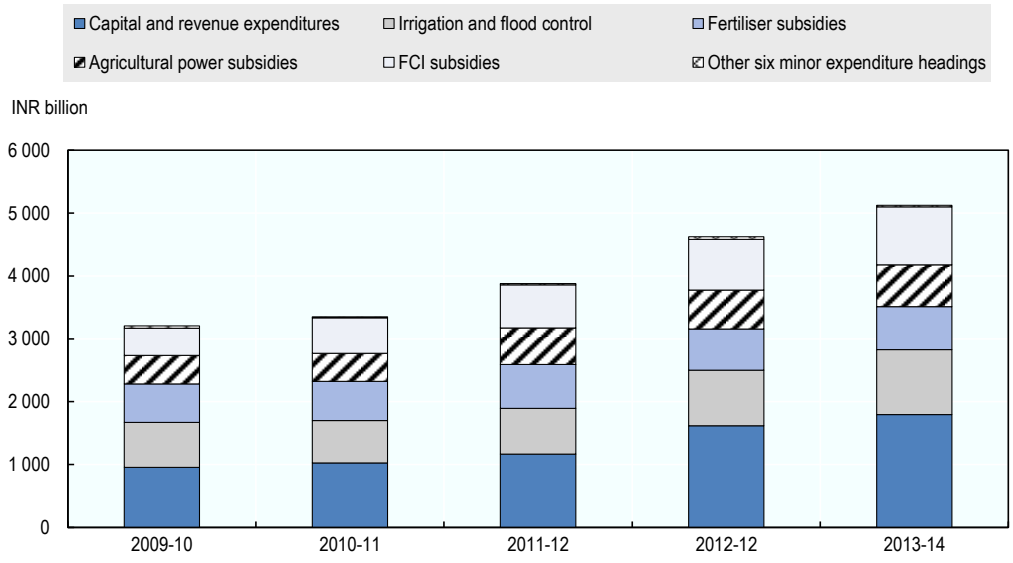
Overall the ministry in the central government with the largest expenditure on agriculture and food is the Ministry of Agriculture and Farmers' Welfare (MAFW).[11] The Ministry of Chemicals and Fertilizers and the Ministry of Consumer Affairs, Food and Public Distribution also account for large shares of the central government's expenditures on agriculture and food. The major subsidy schemes provide subsidies to agricultural producers and others under the headings of fertiliser subsidies, power (electricity) subsidies, and irrigation subsidies, while consumers are the beneficiaries of the

government's food subsidy. However, the central and state governments operate many more subsidy schemes and also fund or provide general services for agriculture.

Accounting for expenditures of both the central and state governments, one analysis reported yearly total amounts averaging about INR 4 000 billion, including expenditure on capital account, in the 2009-10 to 2013-14 period (U.S. Department of Agriculture, 2014).[12] Based on the data reported by this source, about two-thirds of all expenditure on agriculture and food took the form of the four major items of fertiliser subsidies, agricultural power subsidies, expenditure on irrigation and flood control, and Food Corporation of India subsidies (not clear whether this includes subsidies released directly to states undertaking decentralised procurement), and a sub-total of six much smaller items. This latter sub-total consisted of five items that are primarily central government expenditures (commodity boards and export development, Cotton Corporation of India subsidies, NAFED subsidies, jute subsidies, and sugar subsidies) and one state government item, which is the dominant component of this sub-total (state bonuses on the minimum support prices for procurement). The remaining one-third of all state and central government expenditure on agriculture and food falls under a very wide variety of headings. It does not appear possible to gauge the relative shares of the central and state governments in this one-third of expenditure, which, in line with the source, could be labelled capital and revenue expenditures on agriculture and allied services, rural development, and special area programmes.

The evolution in nominal terms of the major categories of expenditure in agriculture and food in the 2009-10 to 2013-14 period is highlighted in Figure 3.9. The single largest and fastest-growing expenditure category was capital and revenue expenditure on agriculture and allied services, rural development and special area programmes (expenditure on irrigation and flood control has been excluded from this category for purposes of Figure 3.9). All the other expenditure categories also increased over the period, except fertiliser subsidies, which had reached a peak in 2008. The sum of the six minor expenditure headings, at INR 24 billion in 2013-14, is too small to be visible in the context of the larger expenditure items shown in Figure 3.9.

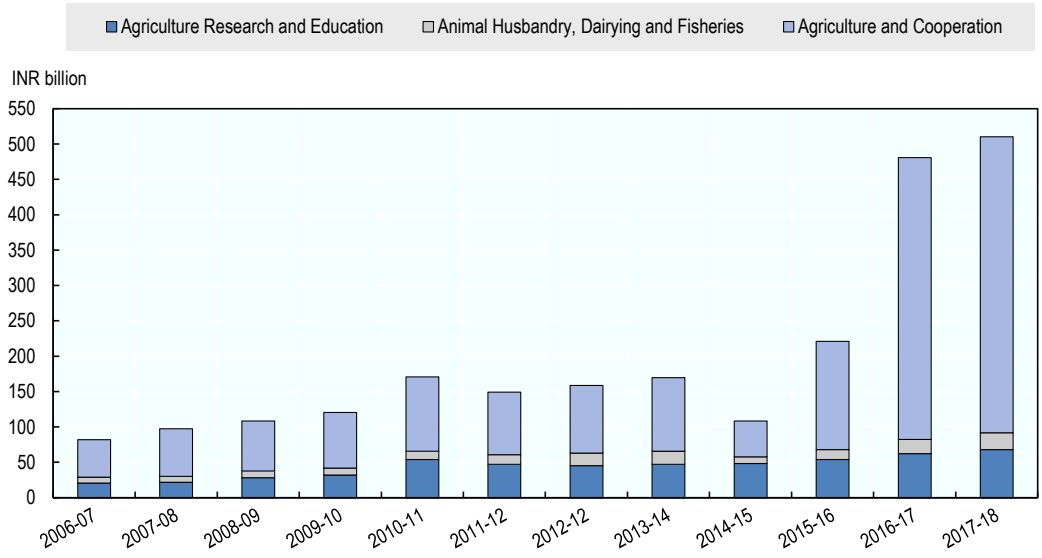
Figure 3.9. Agriculture and food expenditures by states and centre, 2009-10 to 2013-14



Source: Calculated based on U.S. Department of Agriculture (2014).

Within the MAFW the Department of Agricultural Cooperation and Farmers' Welfare (DACFW) is responsible for many of the programmes that involve transfers to state governments. The expenditures of the DACFW are many times larger than those of the Department of Animal Husbandry, Fisheries and Dairying and a few times larger than those of the Department of Agriculture Research and Education (Figure 3.10). This corresponds to the relatively few support programmes directed to India's livestock sector, compared to the crop sector. The expenditures of all three departments have been on a slowly increasing path in nominal terms since the mid-2000s and possibly before. The steep increase in anticipated DACFW expenditure in 2016-17 is explained by expenditures on two schemes: the PMFBY crop insurance scheme and the Interest Subsidy for Short Term Credit to Farmers. Of these PMFBY is a new scheme while the interest subsidy scheme was earlier in the budget of the Ministry of Finance (Department of Financial Services) and transferred to the budget of DACFW from 2016-17.

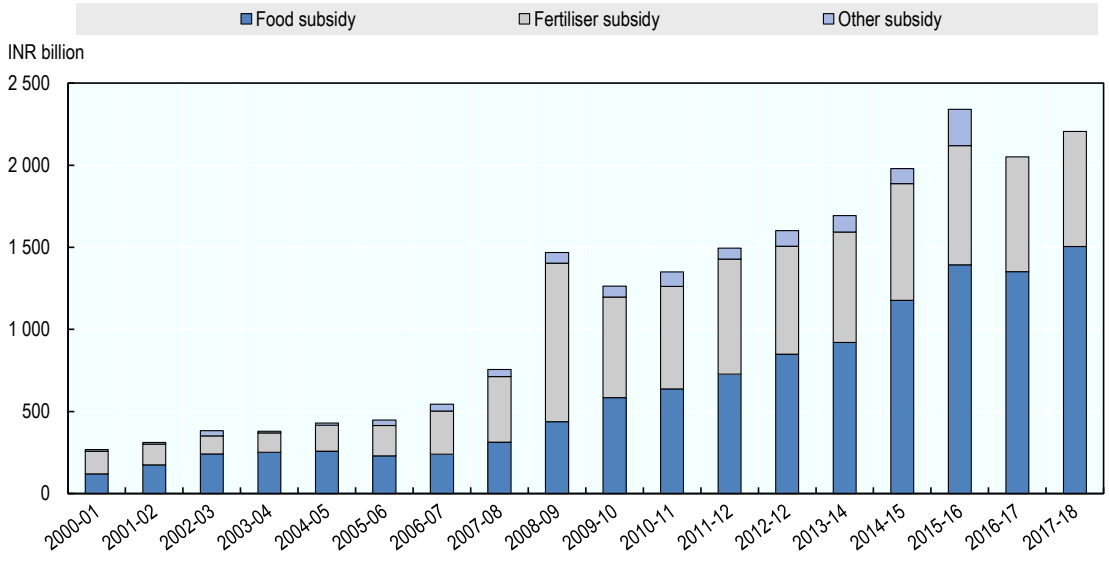
Figure 3.10. Expenditures of departments of the Ministry of Agriculture and Farmers' Welfare, 2006-07 to 2017-18



Note: 2016-17 and 2017-18 are revised estimate and budget estimate.
Source: Expenditure Budget, Volume I (various years), Statement No. 2 or Demand No. 1.

The two large subsidies for food and fertiliser are accounted for more explicitly in government accounting than the large subsidies for electricity in agriculture and irrigation, the measurement of which can involve some estimation of price gaps or revenue forgone. The food subsidy has increased significantly from 2007-08, with the somewhat larger increases in 2014-15 and 2015-16 being associated with the implementation of the NFSA (Figure 3.11). The fertiliser subsidy has increased more slowly, except for the peak in 2008-09. The yearly fertiliser subsidy has been quite stable at roughly INR 700 billion since 2011-12. The category 'other subsidy' includes many relatively small expenditure, of which the major one has usually been the interest subvention for providing short term credit to farmers (this programme has somewhat different names, depending on the data source).

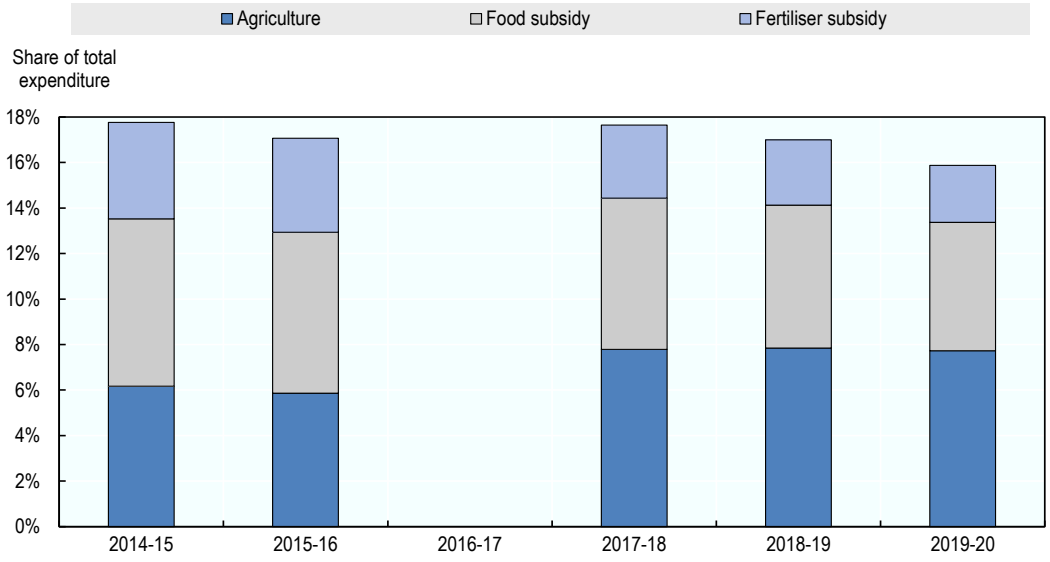
Figure 3.11. Expenditures on selected subsidies, 2000-01 to 2017-18



Note: 'Other subsidy' includes interest subsidies and other subsidies. No data for 'Other subsidy' available for 2016-17 and 2017-18.
Source: Gulati and Banerjee (2015) (2000-01 to 2013-14); Government of India, various budget statements, revised estimates and budget estimates (2014-15 to 2017-18).

NITI Aayog, the policy "think tank" of the central government, provided in April 2017 an analysis of recent and projected expenditures. It suggested that expenditure on agriculture (including livestock, forestry, fishery, and rural development) could more than double from 2015-16 to 2019-20 in nominal terms. The food subsidy might increase by about 25%, while the fertiliser subsidy might decline slightly, in both cases taking into account better targeting of the expenditure. Since total expenditure by the central government (revenue and capital) might increase by about 58% between 2015-16 and 2019-20, the share of the food subsidy and particularly the share of the fertiliser subsidy in total expenditure might decline over that period (Figure 3.12).

Figure 3.12. Past and projected shares of major subsidies in total central government expenditure, 2014-15 to 2019-20



Note: 'Agriculture' refers to agriculture and allied sectors (livestock, forestry and fishery) and rural development. The 'agriculture' heading does not include food or fertiliser. No consistent data for 2016-17.
Source: Calculated from data in Government of India (2017ab).

3.4. Trade policies

Institutional responsibilities

The Ministry of Commerce and Industry is responsible for international trade and trade policy. Several of the entities under the Ministry's Department of Commerce have a role in trade in agriculture and food. The Directorate General of Foreign Trade (DGFT) formulates and implements India's Foreign Trade Policy. The Agricultural and Processed Food Products Export Development Authority (APEDA) has particular responsibilities in developing and promoting exports of many agricultural products.

India's Foreign Trade Policy (FTP) is announced every five years and reviewed and adjusted annually. The current FTP applies from 2015 to 2020. India's trade policy is largely driven by domestic supply considerations and also intended to attain short-term objectives, such as containing fluctuations in commodity prices. This requires constant fine-tuning of policies, for example, through decisions by the DGFT and the Central Board of Excise and Customs, which reduces the predictability of the policy regime applicable to imports and exports. A Trade Infrastructure for Export Scheme was launched in 2017 in connection with the midterm review of the FTP. Many other parts of government play important parts in advising on and implementing agricultural trade policy (Table 3.7).

Table 3.7. Main institutions involved in agricultural trade policy

Institutions	Trade-related functions
Ministry of Commerce and Industry	
Department of Commerce	Regulates, develops, and promotes India's international trade and commerce; responsible for multilateral and bilateral commercial relations and negotiations
Directorate General of Foreign Trade	Advises the Government in formulating and issuing the Foreign Trade Policy, the Handbook of Procedures, and their amendments; issues import and export licences
Tariff Commission	Makes recommendations on tariff-related issues taking into account the interests of manufacturers, traders, consumers, and India's international commitments
Ministry of Agriculture	
Department of Agriculture and Cooperation	
Trade Division	Co-ordinates export and import of agricultural commodities
Plant Protection Division	Plant protection and quarantine, and pest management
Department of Animal Husbandry, Dairying, and Fisheries	Develops sanitary requirements for imports of animals and animal products, including dairy, poultry, meat, and fishery products; protects livestock health
Ministry of Finance	
Department of Economic Affairs	Prepares and presents the Central Budget and the budgets for the state governments to the Parliament
Department of Revenue	In charge of matters relating to the levy and collection of direct and indirect taxes and levies; enforces certain acts; levies taxes on sales in the course of inter-state trade or commerce
Central Board of Excise and Customs	Formulates policy concerning the levy and collection of customs duty, central excise duty, and service tax; the prevention of smuggling; and the administration of matters relating to customs, central excise, service tax, and narcotics
Ministry of Consumer Affairs, Food, and Public Distribution	
Department of Consumer Affairs	Monitors prices, availability of essential commodities, and consumer movement in India; controls some statutory bodies
Bureau of Indian Standards	Develops and formulates Indian standards and provides certification of products, processes, and management system
Department of Food and Public Distribution	Formulates and implements national policies on procurement, movement, storage, and distribution of food grains; formulates policies concerning the sugar subsector, and imports and exports of rice, wheat, and edible oil

Source: Table II.3, WTO (2011b).

Trade relations

As a contracting party of the General Agreement on Tariffs and Trade 1947, India is an original member of the World Trade Organization (WTO) (WTO, 2015b). It provides most-favoured-nation treatment to all WTO members and to other trading partners. India is a partner in 16 regional trade agreements notified to the WTO, mainly with its neighbours and other Asian countries and also Chile and MERCOSUR. India has made "early announcements" of negotiations with the European Union, the European Free Trade Area, the Southern African Customs Union and the Bay of Bengal Initiative on Multi-Sectoral Technical and Economic Cooperation with Bangladesh, Bhutan, Myanmar, Nepal, Sri Lanka and Thailand. Negotiations are ongoing with Australia, Canada, the Gulf Cooperation Council, Indonesia, Israel and New Zealand and are being considered with Egypt and Mauritius. India is a party to the negotiations on a Regional Comprehensive Economic Partnership (RCEP) Agreement between the 10 members of the Association of South East Asian Nations (ASEAN) and six of their trade partners (Australia, China, India, Japan, Korea and New Zealand).

India is a recipient of preferences under the Generalized System of Preferences from Australia, the European Union, Japan, New Zealand, Norway, Switzerland, Turkey, the United States, and the Eurasian Economic Union. India provides duty free and quota free treatment to least developed countries under the Duty Free Tariff Preference Scheme, which is open to all least developed countries.

As of June 2017 India was not involved as the complainant in any recent WTO disputes on agricultural products. India was involved as the respondent in compliance proceedings brought by the United States concerning the importation of certain agricultural products, such as poultry meat and eggs, and relating to sanitary and phytosanitary measures.

In the WTO Committee on Agriculture India has faced numerous questions (268 by June 2017) by other members both on its notifications and on matters relevant to the implementation of its commitments. By February 2018 India's annual notifications of domestic support in agriculture extended up through 2013-14. India has provided no notifications of new or modified domestic support measures exempt from reduction.

In the negotiations on agriculture under the WTO Doha Development Agenda, India is an active participant, often aligned with groups of other developing countries.

Tariff and non-tariff import policy measures

In the decades preceding the economic reforms of 1991-92, India's import regime for merchandise was comprehensively controlled through quantitative restrictions and high import duties. After the 1991-92 economic reforms a process of phasing out the restrictions was initiated, along with progressive reductions of tariffs. The reductions in agricultural tariffs were more modest than for other imports. Agriculture continued to be shielded from foreign competition also by non-tariff barriers, including quantitative restrictions, import licensing requirements, price controls on inputs and final goods, and marketing restrictions.

Tariffs apply to imports of most agriculture and food items. Tariff rate quotas (TRQs) are scheduled on a few products. Import prohibitions or import restrictions apply to several products. Sanitary or phytosanitary import permits are required for imports of animal products, plants, and plant material.

Tariffs

A 1999 WTO dispute ruling found that India's quantitative restrictions on many imports, including agriculture, were no longer justified on balance-of-payments (BOP) grounds (WTO, 1999).[13] Leading up to India's subsequent lifting of its BOP quantitative restrictions on agricultural imports, India renegotiated its WTO tariff bindings on many agricultural products. This involved raising the tariffs of several products, including skim milk powder, maize, rice, certain other cereals, and rapeseed, colza and mustard oils. The increases were combined with the introduction of tariff rate quotas (TRQs) for some of these products. At the same time, India reduced the tariffs on numerous products, including butter, other cheeses, and certain processed foods. While many quantitative restrictions through state trading monopolies were also given up at that time, imports of some commodities, such as cereals and coconut oil, continued to be the monopoly privilege of state trading enterprises. From the early 2000s India continued to manage import protection in agriculture through tariffs, TRQs, state trading requirements, monitoring or prohibition of imports of certain sensitive products.

India's bound tariffs in agriculture are inscribed in its WTO Schedule of Concessions and Commitments. India's Basic Customs Duty (BCD), known as its Scheduled Rate of Customs Tariff or statutory rate, is approved by Parliament at the time of approving the annual budget. These rates are notified, i.e. made public, by the Department of Revenue of the Ministry of Finance. They are in many cases lower than the WTO scheduled bound rate. For many products the government applies tariff rates that are still lower than the annually approved statutory rates (which themselves for many products are lower than the WTO bound rates). Table 3.8 outlines the diversity of the three tariff rates (WTO bound, statutory[14], and applied) associated with each of a selection of crop products. The government may through executive decisions allow imports to be exempt from duty, i.e. an applied rate of zero (Hoda and Gulati, 2013).[15] In addition to the BCD (statutory rate), imports can be subject to cesses and an additional duty in lieu of the excise duty levied on domestic products.[16]

In 2015 the simple average applied customs duty for agricultural products was 32.7%, significantly higher than the corresponding average of 10.2% for non-agricultural products. The 32.7% leaves a relatively large gap below the simple average final bound rate in agriculture of 113.5% (WTO, ITC and UNCTAD, 2017).[17] The average of the bound rate results from India's WTO tariff bindings of 100% for agricultural commodities, 150% for processed products, and 300% for some edible oils. The decision to maintain applied rates considerably below the bound rates creates a wide spread between bound and applied tariff rates for many tariff lines. This is conducive to larger imports than if applied tariffs were at the bound level, which may be associated with the size of India's imports of, for example, pulses, vegetable oils and sugar. It also allows India to raise its tariffs substantially while complying with its WTO commitments.

While the simple average applied tariff in agriculture in 2016 was 32.7%, the trade-weighted average was likely higher: in 2015 the trade-weighted average was 47.2% (WTO, ICT and UNCTAD 2017). No tariff lines have a bound tariff below 5%, but the Most Favoured Nation (MFN) applied duty was zero on 5.2% of the tariff lines in 2016. Non-*ad-valorem* tariffs accounted for 0.3% of the tariff lines in agriculture in 2016 for both bound and MFN applied tariffs.

The average final bound tariff for the standard WTO products groups ranged between 65.0% for dairy products and 169.7% for oilseeds, fats and oils in 2016 (Table 3.9). In terms of the MFN applied duties, cotton was the lowest at 6.0% and beverages and tobacco the highest at 68.6%. Within some standard groups, several individual products were imported duty free. The applied tariffs for some products have often been changed considerably as market pressures have fluctuated.[18] Annex Tables 3.A.6 and 3.A.7 show the evolution over time of ad valorem duties on selected cereals, pulses, and oilseeds and on fruit, vegetables, and livestock, respectively.

Table 3.8. Trade policy status and import tariffs, selected crops, 2017

HS	Item	Export policy[1]	Import policy	WTO bound rate (%)	Statutory duty (%)	Applied rate (%)
	Cereals					
10.01	Wheat and meslin	Free	STE[3]	100/80	100	10
1006.10	Rice in the husk	Free	STE[3]	80	80	80
1006.20	Brown rice	Free	STE[3]	80	80	80
1006.30	Semi-milled or wholly milled rice	Free	STE[3]	70	80	70
1006.40	Broken rice	Free	STE[3]	80	80	80
	Pulses					
713.10	Peas[4]	Prohibited[2]	Free	50	50	0
713.20	Chickpeas[4]	Allowed	Free	100	30	0
713.31	Moong and urad	Prohibited[2]	Free	100	30	0
713.40	Lentils[4]	Prohibited[2]	Free	100	30	0
713.50	Broad beans	Prohibited[2]	Free	100	30	0
713.60	Pigeon pea	Prohibited[2]		100	30	10
	Oilseeds					
12.01	Soya beans	Free	Free	100	30	30
12.02	Groundnuts, shelled	Free	Free	100	30	30
12.03	Copra	Free	STE[3]	100	70	70
12.05	Rapeseed and mustard seed	Free	Free	100	30	30
1207.10	Sunflower seeds	Free	Free	100	30	30
1207.20	Palm nuts and kernels	Free	Free	100	30	30
1207.40	Cotton seeds	Free	Free	100	30	30
1207.50	Mustard seeds	Free	Free	100	30	30
1207.60	Safflower seeds	Free	Free	100	30	30
1207.99	Other (niger seeds)	Free	Free	100	30	30
	Vegetable oils					
15.07	Soyabean oil	Prohibited	Free	45	45	12.5-20
15.08	Groundnut oil	Prohibited	Free	300	100	12.5-20
1511.10	Crude oil (palm oil)	Prohibited	Free	300	100	7.5
1511.90	Other (palm oil)	Prohibited	Free	300	100	15
1512.00	Sunflower seed, safflower or cottonseed oil	Prohibited	Free	300	100	12.5-20
1513.11	Crude oil (coconut oil)	Free	STE3	300	100	12.5
1513.19	Other (coconut oil)	Free	STE3	300	100	20
1513.21	Crude oil (palm kernel or babassu oil)	Prohibited	Free	300	100	12.5
1513.29	Palm kernel or babassu oil	Prohibited	Free	300	100	20
1514.11	Crude oil (rapeseed/mustard oil)	Prohibited	Free	75	75	12.5

1. The binary categorisation free-prohibited may in some cases involve less discrete interpretations.
2. Import for value addition and subsequent export under Advance Authorisation Scheme allowed since 14 November 2013. Subsequent to the date of the source document for this table, the prohibition on exports of all varieties of pulses was removed on 22 November 2017.
3. Import allowed through state trading enterprise.
4. The applied duty for chickpeas is 40% as of February 2018, for lentils 30% as of December 2017, and for peas 50% as of November 2017 (Commodity Profile for Pulses, February 2018, Department of Agriculture & Cooperation, Ministry of Agriculture and Farmers Welfare, Government of India).
Source: Government of India (2017p) (import tariffs as of 28 June 2017).

Table 3.9. Final bound and applied MFN rates on agricultural products in 2005 and 2016

	Final bound rate (%)		MFN applied 2005 (%)		MFN applied 2016 (%)	
	Average	Maximum	Average	Maximum	Average	Maximum
Animal products	106.1	150	33.0	100	31.1	100
Dairy products	65.0	150	35.0	60	33.5	60
Fruit, vegetables, plants	100.1	150	31.5	105	29.4	100
Coffee, tea	133.1	150	56.3	100	56.3	100
Cereals and preparations	115.3	150	37.3	160	31.3	150
Oilseeds, fats and oils	169.7	300	52.5	100	35.1	100
Sugars and confectionery	124.7	150	48.4	100	35.9	60
Beverages and tobacco	120.5	150	68.9	182	68.6	150
Cotton	110.0	150	17.0	30	6.0	30
Other agricultural products	104.8	150	27.1	70	22.3	70

Source: WTO, ITC and UNCTAD (2006, 2017).

Tariff rate quotas

India has scheduled TRQs on five lines at the HS six-digit level, corresponding to twelve lines at the HS eight-digit level (skimmed milk powder and certain related dairy products, maize, sunflower or safflower seed oil, and rape, colza and mustard oil and fractions of the oilseeds) and applies TRQs to imports of these products (WTO, 2015b). Eligible importers are state-trading companies, including NDDB, NAFED, The State Trading Corporation of India Ltd (STC), and others, including State Cooperative Marketing Federations. Imports must be cleared by customs before 31 March of each financial year.

Import prohibitions and licensing requirements

From well before the early 2000s prohibitions have applied to imports of a range of agricultural products, including meat and offal and animal fats. India has continued to ban imports of milk and milk products from China. Some products which had earlier been subject to quantitative import restrictions are designated as sensitive products, the imports of which are monitored with a view to raising the applied tariff rates in case of a surge in imports. The list of such products had by 2011 expanded to include bamboos, cocoa, copra, cotton, milk and milk products, edible oils, food grains, fruits and vegetables, pulses, poultry, tea and coffee, spices, and sugar. APEDA monitors the imports of sugar. Imports of some products are subject to a licensing requirement, in some cases conditional also on, e.g. a sanitary or phytosanitary permit also being obtained. Import licensing without such conditions applied in 2014-15 to less than 4% of the tariff lines for live animals and products and vegetables products. Counting also the need for other permits, the number climbs to 17% of tariff lines for live animals and products and 8% for vegetable products. The imported material must be used by the importer and cannot be sold. Imports of some products, such as cashew and betel nuts, are subject to minimum import prices.

State trading

Goods subject to state trading for imports in 2002 comprised mainly edible oils, including coconut oil and other oils and copra. State trading also applied to many cereals traded by the Food Corporation of India (FCI): rice, wheat, maize, oats, rye, grain sorghum, buckwheat, millet, canary seed, jawar, bajra, and ragi. In later years imports of these

products continued to be subject to state trading, and a few products were added to the list, such as milk or cream, and sunflower seed or safflower oil. On 29 September 2014 the exclusive rights of the FCI to import 11 agricultural products, other than wheat and rice, were removed and the FCI is no longer a state trading enterprise for these products. Imports of wheat, rice and coconut products remained subject to state trading in 2017 (Table 3.8). The State Trading Corporation of India Ltd (STC), a government enterprise, handles exports and imports of bulk agricultural commodities predominantly on behalf of the government. It imports pulses and maize for popcorn. The importing state trading enterprises identified by India in its 2014 notification to the WTO included the FCI, NDDB, STC, NAFED, Project and Equipment Corporation of India Ltd. (PEC Limited, a government enterprise under the Ministry of Commerce and Industry), and Spices Trading Corporation Ltd. (all business activities of the latter have ceased). Several of these are importing STEs for milk powder.

Sanitary and phytosanitary measures

Imports of animal products into India require sanitary import permits (SIPs) issued by the DAHDF. Permits must be obtained prior to shipping from the country of origin. The DAHDF issues SIPs for livestock products based on an import risk analysis. Imports of live animals and animal products that are restricted items under India's trade policy require an import licence issued by the DGFT following an import risk analysis by the DAHDF. Imports of animal products are only allowed through designated ports where animal quarantine and certification services are available (Amritsar, Bangalore, Chennai, Delhi, Hyderabad, Kolkata, and Mumbai). Imports of plants and plant materials are regulated under the Destructive Insects and Pests Act 1914, the Plant Quarantine (PQ) (Regulation of Import into India) Order 2003, and international conventions. The Directorate of Plant Protection, Quarantine and Storage of the MAFW implements the Plant Quarantine Regulations. Inspection of agricultural commodities for exportation is carried out to meet the requirements of importing countries under the International Plant Protection Convention (IPPC). Imports of any food, feed, and food materials that contain genetically modified material require the approval of the Genetic Engineering Appraisal Committee (GEAC), a body established under the Ministry of Environment, Forest and Climate Change.

India participates in the Codex Alimentarius. India's national enquiry points under the WTO SPS Agreement are: the DAHDF for animal health and related issues; the MHFW for food safety related issues; and the DACFW for plant health or phytosanitary issues. Between 1996 and May 2015, India had made more than 200 notifications to the WTO Committee on SPS Measures. The Ministry of Commerce and Industry is responsible for implementing the WTO Agreement on Technical Barriers to Trade.

Export policy measures

Some agricultural products have been subject to export prohibitions, export quotas, and minimum export prices. State trading is required for some products, and export subsidies are provided. Government of India (2012) provides some details.

The Agricultural and Processed Food Products Export Development Authority (APEDA), under the responsibility of the Ministry of Commerce and Industry, provides financial assistance to exporters in the areas of market development, infrastructure development, quality development and transport assistance. The products involved are cereals, processed food and vegetables, fresh fruits and vegetables, animal products, floriculture

and seeds, and organic products. The DGFT administers export measures, such as minimum export prices, export prohibitions, and export licensing and quotas, and state trading requirements.

Export subsidisation and export promotion

Regarding export subsidisation in agriculture, India has in recent years provided assistance for exports by sea in non-reefer containers or by air at the rate equal to the lesser of 10% of the FOB value or 25% of the freight cost. Transport by sea in reefer containers is assisted at a higher rate. A subsidy of INR 3 300 per tonne for the marketing and promotion of raw sugar was approved in 2014. India has reported to the WTO Committee on Agriculture that it provided certain export subsidies from 1995-96 onwards (reports available only up through 2009-10) (WTO, 2011a, 2012b). These subsidies took two forms: international air freight assistance and internal transport subsidies. The former has applied to an evolving set of products, such as fresh fruit, fresh and processed vegetables, plants and flowers, cotton, tea and animal products. The latter has applied primarily to sugar. India's understanding is that it is entitled to provide certain export subsidies under the WTO Agreement on Agriculture. A WTO decision in 2015 requires the subsidisation of agricultural exports to end, which for India would occur at the end of 2023 (WTO, 2015a).

India has increasingly promoted exports of agricultural products since the mid-2000s. In its 2002-07 foreign trade policy, India took specific steps to boost agricultural exports. They included the establishment of agri-export zones, which receive assistance from the central and state governments to improve efficiencies in the supply chain of specified products through such measures as the provision of services and inputs by ministries of agriculture, research and development support from agricultural universities, and the setting up of cold storage facilities with assistance from the National Horticulture Board. The agricultural export zones are monitored by APEDA. The Indian Oilseed and Produce Export Promotion Council (IOPEPC) is concerned with the promotion of various oilseeds and oils. The Cashew Export Promotion Council of India carries out similar functions and provides export assistance in the form of grants.

A special agricultural products scheme (*Vishesh Krishi Upaj Yojana*) was introduced in 2004 to promote the exports of fruit, vegetables, flowers, dairy, poultry and their value-added products. The scheme provided an incentive in the form of an import duty credit, which was equivalent to a certain percentage of the value of exports in the previous year. The scheme was renamed as *Vishesh Krishi Gram Udyog Yojana* (VKGUY or Special Agricultural and Village Industry Scheme) in 2006, following modifications of the scheme. The 2015-20 Foreign Trade Policy merged several earlier schemes, including VKGUY and an Agri-Infrastructure Incentive Scrip into the new Merchandise Exports from India Scheme (MEIS) (Government of India, 2015g). Agricultural and village industry products previously supported under VKGUY receive higher support than other products. Exports of most agricultural products are supported regardless of their destination. Rewards under MEIS are payable as a percentage (2%, 3% or 5%) of realised FOB value of exports as a MEIS duty credit scrip. The scrip can be transferred or used for payment of a number of duties or taxes. Scrips and inputs imported under the scrips are transferable, which provides more flexibility to exporters than did earlier schemes (Government of India, 2016i). The export incentives under MEIS were increased by 2% for labour intensive products of the micro, small and medium enterprise sectors in December 2017.

Export regulations

In contrast to export promotion, India has for several decades managed its agricultural exports through a combination of such tools as export prohibitions, export licensing requirements, export quotas, export duties, minimum export prices, and state trading requirements. The application or elimination of such restrictions could be changed several times per year, with a view to maximising agricultural exports earnings while also taking into account concerns about domestic supplies and prices. Export controls were gradually being relaxed by the early 2000s. Export cesses, a form of export taxes, which had applied to several products, such as coffee, spices, tobacco, and other agricultural commodities, were removed in 2006. An export tax was imposed on cotton for six months in 2010. In 2015 an export cess applied to tobacco. An export duty applied from June 2016 on certain exports of sugar.

Table 3.10 summarises the kind of export measures applied for selected products in the 2000-01 to 2015-16 period. The years 2006-07 to 2012-13 saw the most intensive use of export measures for these products. Many other products were not subject to export measures in any of the years observed, and there were years when no export measures applied to the selected products either. Table 3.8 indicates the export policy applicable to selected crops in 2017.

Minimum export prices were sometimes imposed both before and in the early 2000s, e.g. for onions, which were also subject to state-trading and export quotas. In 2015 minimum export prices were applied to certain edible oils, onions, Bangalore roses, Krishnapuram onions and, until 27 December 2016, potatoes.

Export prohibitions and export quotas are imposed on an annual basis. They are usually in place for a specific period, during which they may be subject to change. Goods subject to export restrictions and quotas must be accompanied by licences from the DGFT and sometimes by other permits. Export licensing requirements apply to live animals and certain animal products. Milk powder, wheat, edible oil, pulses, and non-basmati rice and wheat products have been subject to export quotas, as has sugar exported by state-trading enterprises within the preferential import regimes of the European Union and the United States.

Exports of many livestock products were prohibited in the early 2000s. In 2006 exports of wheat, pulses, sugar (to certain destinations), and bone-in sheep meat and goat meat were prohibited. Agricultural products subject to export prohibitions for some time in the subsequent years have included non-basmati rice, wheat, pulses, edible oils, milk powder, casein and casein derivatives, and onions. In 2014, export prohibitions, with some exemptions, applied to pulses (not chickpeas) and to all edible oil. The export prohibition on pulses was removed in November 2017.

Exporters of boneless meat of buffalo (the only bovine meat exports allowed) require a certificate from the veterinary authority of the state where the meat originates to show that the meat is from buffaloes not used for breeding and milch purposes. Quality control and inspection is also required. The prohibition on exports of beef and bone-in buffalo meat is established under the authority of the Export (Quality Control and Inspection) Act, 1963.

Table 3.10. Mention of various export measures in selected sources, 2000-15

	2000-01	2001-02	2002-03 to 2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Wheat	EB	EI			EB	EB, M4	EB, M4	EB, ER, M3, M4	EB, ER, M4	EB	ER	ER	ER
Maize							M4						
Rice						EB, MEP, M3, M4	EB, MEP, M3, M4	EB, M3, M4	EB, M3, M4	ER	ER	ER	ER
Chickpeas[1]					ER, EB	M4	M4	M4	M4				
Potatoes													MEP
Onion	MEP, ER, STE			STE	M14	STE, MEP	STE, MEP	EB, STE, MEP	STE, EB	STE	STE, MEP	STE, MEP	STE, MEP
Mango												EI	EI
Sugar			EI		EB	STE, ER	STE, ER	STE, ER	STE, ER	STE	STE	STE, EI	STE
Cotton	ER	ER							ED	ED, EB	ED, EB		
Milk					M4	M3, M4	M4	M4	EB, M4	EB	ER	ER	ER

Note: Entries represent only mentions in the indicated sources without assessing their validity. The mentions drawn from WTO Trade Policy Reviews and Saini and Gulati (2017) are interpreted broadly, while those drawn from the OECD database (in grey shaded cells) are more specific. The abbreviations read as follows: EB= export ban; ED= export duty; EI= export incentive, ER= export restriction; MEP= minimum export price; STE= state trading enterprise for exports. The codes drawn from the OECD database, shaded in grey, read as follows: M3= export quota; M4= export prohibition; M14= other export measure. The products shown are a subset of the products in the PSE estimation for India. No export measures were mentioned in the listed sources for the other products in the PSE estimation (Soybeans, Rapeseed, Beef, Sheepmeat, Poultry, Eggs, Bananas, Eggplant, Groundnut, Tomatoes). Any mention is recorded if it can be assigned to a particular year. Even a short application of measure, such as one week or part of a year, is recorded in the year applied. Years are financial years: April-March.

1. While chickpeas are generally exempt from export measures, other pulses (peas, lentils, beans, etc.) are often subject to export bans. This matters for the interpretation of market price differentials for pulses in the PSE estimation for India.

Sources: Saini and Gulati (2017); *WTO Trade Policy Reviews* 2002, 2007, 2011, 2015; OECD database "Export restrictions on Primary Agriculture Products" http://qdd.oecd.org/subject.aspx?subject=8F4CFFA0-3A25-43F2-A778-E8FEE81D89E2 and http://www.oecd.org/tad/benefitlib/inventory-export-restrictions-agr.pdf.

India has identified several exporting state trading enterprises in agriculture in its reporting to the WTO. The 2014 notification covers 14 such enterprises (WTO, 2012a; 2013). Exports of onions have been carried out by state trading enterprises except when exports were prohibited in 2010 and 2011. The onion state trading enterprises are mainly state level enterprises, in addition to the National Cooperative Consumers' Federation of India Ltd. (NCCF) and the National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED). In its reporting to the WTO, India has explained that export prices are determined on commercial considerations and by the demand and supply forces in the international market. State trading by the Indian Sugar Exim Corporation Limited has been used for exports of sugar under preferential import quotas. The Tribal Cooperative Marketing Development Federation of India Ltd. (TRIFED) has operated as a state trading enterprise for gum karaya. The State Trading Corporation of India Ltd exports wheat and rice, maize, oilseed extraction (such as soybean meal and rapeseed meal), and tea. Despite its name this government enterprise has not been identified by India as an exporting state trading enterprise to the WTO.

3.5. Evaluation of support to agriculture

This section presents a quantitative evaluation of support provided to agriculture through India's domestic and trade policies for the period 2000 to 2016. The evaluation is based on the indicators of agricultural support developed by the OECD, including the Producer Support Estimate (PSE), the Producer Nominal Assistance Coefficient (producer NAC), the Producer Nominal Production Coefficient (producer NPC), the Consumer Support Estimate (CSE), the General Services Support Estimate (GSSE), Total Support Estimate (TSE) and others (Box 3.3). A detailed description of the OECD methodology to estimate agricultural support (the "PSE Manual", OECD, 2016) and a comprehensive database for OECD and selected non-OECD countries including India are available from http://oe.cd/pse. The methodology applied in this study is fully consistent with that used for other countries as presented in OECD reports that monitor and evaluate agricultural policies (OECD, 2017).

Box 3.4 provides basic information on how this methodology has been applied in the case of India.

Box 3.3. OECD indicators of support to agriculture

INDICATORS OF SUPPORT FOR PRODUCERS

Producer Support Estimate (PSE): The annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impacts on farm production or income.

Percentage PSE (%PSE): PSE transfers as a share of gross farm receipts (including support).

Producer Nominal Assistance Coefficient (producer NAC): The ratio between the value of gross farm receipts (including support) and gross farm receipts valued at border prices (measured at farm gate).

Producer Nominal Protection Coefficient (producer NPC): The ratio between the average price received by producers at farm gate (including payments per

tonne of current output), and the border price (measured at farm gate). The producer NPC is also available by commodity.

Producer Single Commodity Transfers (producer SCT): The annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level, arising from policy measures directly linked to the production of a single commodity such that the producer must produce the designated commodity in order to receive the transfer.

Producer Percentage Single Commodity Transfers (producer %SCT): The commodity SCT expressed as a share of gross farm receipts for the specific commodity (including support).

INDICATORS OF SUPPORT TO CONSUMERS

Consumer Support Estimate (CSE): The annual monetary value of gross transfers from (to) consumers of agricultural commodities, measured at the farm gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impacts on consumption of farm products. If negative, the CSE measures the burden (implicit tax) on consumers through market price support (higher prices), that more than offsets consumer subsidies that lower prices to consumers.

Percentage CSE (%CSE): CSE transfers as a share of consumption expenditure on agricultural commodities (measured at farm gate), net of taxpayer transfers to consumers.

Consumer Nominal Assistance Coefficient (consumer NAC): The ratio between the value of consumption expenditure on agricultural commodities (at farm gate) and that valued at border prices (measured at farm gate).

Consumer Nominal Protection Coefficient (consumer NPC): The ratio between the average price paid by consumers (at farm gate) and the border price (measured at farm gate).

Consumer Single Commodity Transfers (consumer SCT): The annual monetary value of gross transfers from (to) consumers of agricultural commodities, measured at the farm gate level, arising from policy measures directly linked to the production of a single commodity.

INDICATORS OF SUPPORT TO GENERAL SERVICES FOR AGRICULTURE

General Services Support Estimate (GSSE): The annual monetary value of gross transfers to general services provided to agricultural producers collectively (such as research, development, training, inspection, marketing and promotion), arising from policy measures that support agriculture regardless of their nature, objectives and impacts on farm production, income, or consumption. The GSSE does not include any transfers to individual producers.

Percentage GSSE (%GSSE): GSSE transfers as a share of Total Support Estimate (TSE).

INDICATORS OF TOTAL SUPPORT TO AGRICULTURE

Total Support Estimate (TSE): The annual monetary value of all gross transfers from taxpayers and consumers arising from policy measures that support

agriculture, net of associated budgetary receipts, regardless of their objectives and impacts on farm production and income, or consumption of farm products.

Percentage TSE (%TSE): TSE transfers as a percentage of GDP.

Box 3.4. India's PSEs: What and how?

Period covered: 2000-16

Products covered: Wheat, maize, rice (basmati and non-basmati weighted together), soybeans, rapeseed and mustard, groundnuts, chickpeas, other pulses, potatoes, onion, tomatoes, mango, bananas, sugar, cotton, milk, bovine meat (includes buffalo meat), sheep meat, poultry, eggs. These 20 commodities account for 66% on average of the total value of agricultural output in India in 2014-16. The fifteen crop products account for 56% of the value of total crop production in 2014-16, while the five animal products represent on average 85% of total livestock production.

Market Price Support

Producer prices: For wheat, maize, non-basmati rice, basmati rice, soybean, rapeseed and mustard, groundnuts, potatoes, onion, tomatoes, mango and sugar a nationally representative yearly price is obtained from monthly state average prices in Agmarknet in the states that together produced at least half of national production of the crop (2000 and 2001 prices were estimated differently, as Agmarknet data were not available). Agmarknet reports prices from a large number of markets, many of which are very close to the producer level. Prices of cotton, milk, and eggs are from the Cotton Association of India, the National Dairy Development Board, and the Directorate of Economics and Statistics, respectively. Prices of chickpeas, bananas, buffalo meat, sheep meat, and poultry meat are obtained by dividing value of output by quantity of output.

External reference prices: Export unit values are used for basmati rice, soybeans, rapeseed and mustard, groundnuts, potatoes, onion, tomatoes, mango, bovine meat, sheep meat, and eggs. Wheat uses export prices from U.S. Gulf (FAO-GIEWS), maize uses export prices from U.S. Gulf (World Bank Pink Sheet), non-basmati rice uses export prices from Thailand, refined sugar uses export FOB prices from European Union ports, cotton uses Cotlook U.S. Memphis CFR Far Eastern, and bananas uses export prices from Ecuador. Chickpeas uses import unit values. Milk uses Oceanian FOB export prices of skim milk powder and butter from the OECD's Aglink data base. Poultry meat uses FOB export prices from Brazil (FAO-GIEWS). Prices other than import and export unit values are adjusted for international transportation costs.

Price gap estimates: For the purposes of calculating market price differentials, chickpeas and other pulses are treated as imported. All other commodities are considered exported. The subtraction of the external reference prices from the domestic producer price resulted in negative price gaps for most commodities examined in most or all years. The weaknesses in the physical infrastructure in the producer-to-consumer value chain especially for perishable commodities ("market development gap") are confounded with policy-induced practices on the part of

the many intermediaries in the value chains for all commodities. These factors combined contribute to making the price gaps negative. Because of the existence of restrictive regulations and the pervasive presence of governmental institutions in the marketing of agricultural commodities these negative price gaps are retained in the estimation of the PSE for India, in line with established methodology. As there are no specific policies targeting sheep meat, the price gap has been set to zero in line with the PSE methodology.

Marketing margins: The number of markets in which producers or aggregators sell to wholesalers as first buyers is very large and the distance between many producers and their market is relatively small. Marketing margins beyond the point where the producer price is observed, processing costs, and transportation costs are expressed as percentages of the producer price, whether that price is the price observed in Agmarknet (most crops) or the unit value of output (chickpeas, bananas, and livestock products). These percentages are different for different commodities. Port handling charges are expressed as percentages of the border price, also different for different commodities.

Quality adjustments: A quality adjustment of the reference price was made for mango, tomatoes, potatoes and onions intended to capture the quality difference between exports and domestic use.

***Budgetary support*:** Budgetary expenditure information for the period 2000-16 originates from the central government's Union Budget. It includes expenditures under several other ministries in addition to the Ministry of Agriculture and Farmers' Welfare, such as the Ministry of Chemicals and Fertilizers and the Ministry of Consumer Affairs, Food and Public Distribution. This includes expenditures on central schemes and centrally sponsored schemes. Expenditures by state governments of their own resources are not at this stage incorporated.

Support to agricultural producers

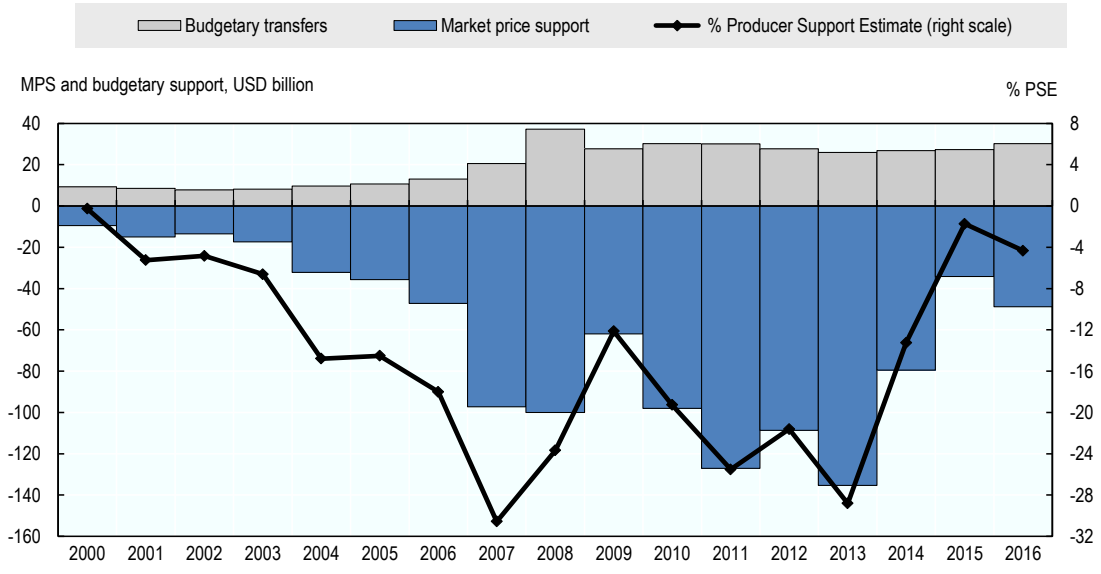
Level of producer support

The percentage Producer Support Estimate (%PSE) is the OECD's key indicator to measure the level of support provided to agriculture. It expresses the monetary value of support transfers to agricultural producers as a share of gross farm receipts. Because it is not affected by inflation or differences in the size of the sector, it allows comparisons of the level of producer support over time and between countries. The level of producer support is important because it provides insights into the burden that agricultural policies place on consumers (positive Market Price Support, MPS), producers (negative MPS) and taxpayers (budgetary transfers). In most of the countries studied by the OECD any MPS is positive, often because the support price for a commodity is set higher than the international reference price. The opposite situation, where support prices have been set below international reference prices, is observed in India for many commodities and years. Examples include wheat (not 2016) and maize (not in 2014-16) and non-basmati rice. Producer prices of many commodities have thus also been below their reference prices in all or many years in the 2000-16 period, which generates a negative MPS for each such commodity and year. The sum of MPS amounts across all the 19 individually studied commodities is negative in all years (not counting "other pulses"). This complicates the interpretation of agriculture-wide indicators, such as the %PSE, TSE and %TSE.

The support to agricultural producers in India, expressed as a share of gross farm receipts (%PSE) averaged -3.5% in 2000-02 and -6.2% in 2014-16 (Tables 3.11 and 3.12). These negative percentage PSEs are made up of negative and positive components which to some extent offset each other arithmetically and they therefore need to be interpreted carefully. For example, the average figure of -6.2% (INR -1 643 billion) for the period 2014-16 results from two main components. One is budgetary payments, almost exclusively composed of input subsidies, which are equivalent to a positive figure of 6.9% of gross farm receipts (INR 1 814 billion plus some very minor miscellaneous payments). The other component is market price support, which is equivalent to a negative figure of -13.1% of gross farm receipts (INR -3 458 billion).

India's %PSE fluctuated markedly in the 2000 to 2016 period, registering a high of zero in 2000, a low of -31% in 2007, followed by large swings and then registering levels much closer to zero in 2015 and 2016 (Figure 3.13). These variations were driven primarily by changes in the relative levels of the domestic and international prices underlying MPS, while input subsidies followed a more steadily increasing trend. The particularly large absolute size of negative MPS in 2011-13 (and to some extent also in 2007 and 2008) coincides with periods of high international commodity prices, which were not or only partially transmitted to the domestic market, due at least in part to India's use of export-impeding measures. For example, export restrictions or export bans applied in several of those years to wheat, non-basmati rice, certain chickpeas, sugar and milk. While the absolute amounts of negative MPS generally increased from 2000 to 2013 (i.e. MPS became more negative), the absolute amounts of negative MPS then declined very rapidly in 2014 and 2015, particularly as a result of a declining reference price for milk. Combined with slowly increasing budgetary transfers this made the post-2000 %PSE attain its smallest absolute negative value in 2015, before it again became somewhat more negative in 2016.

Figure 3.13. Level and composition of Producer Support Estimate in India, 2000-16



Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

Table 3.11. India: Estimates of support to agriculture, INR million

	2000-02	2014-16	2014	2015	2016
Total value of production (at farm gate)	**5 305 693**	**24 610 640**	**22 691 460**	**24 343 410**	**26 797 050**
of which: share of MPS commodities (%)	64.8	66.1	66.6	66.2	65.5
Total value of consumption (at farm gate)	**5 012 789**	**21 830 062**	**20 534 748**	**22 111 841**	**22 843 596**
Producer Support Estimate (PSE)	**- 199 839**	**-1 642 688**	**-3 223 974**	**- 452 842**	**-1 251 247**
Support based on commodity output	- 602 122	-3 458 446	-4 862 898	-2 238 803	-3 273 639
Market Price Support [1]	- 602 122	-3 458 446	-4 862 898	-2 238 803	-3 273 639
Payments based on output	0	0	0	0	0
Payments based on input use	401 566	1 813 560	1 638 924	1 781 763	2 019 992
Based on variable input use	401 566	1 778 066	1 611 612	1 746 265	1 976 321
with input constraints	0	0	0	0	0
Based on fixed capital formation	0	35 493	27 312	35 497	43 671
with input constraints	0	0	0	0	0
Based on on-farm services	0	0	0	0	0
with input constraints	0	0	0	0	0
Payments based on current A/An/R/I, production required	0	0	0	0	0
Based on Receipts / Income	0	0	0	0	0
Based on Area planted / Animal numbers	0	0	0	0	0
with input constraints	0	0	0	0	0
Payments based on non-current A/An/R/I, production required	0	0	0	0	0
Payments based on non-current A/An/R/I, production not required	0	0	0	0	0
With variable payment rates	0	0	0	0	0
with commodity exceptions	0	0	0	0	0
With fixed payment rates	0	0	0	0	0
with commodity exceptions	0	0	0	0	0
Payments based on non-commodity criteria	0	0	0	0	0
Based on long-term resource retirement	0	0	0	0	0
Based on a specific non-commodity output	0	0	0	0	0
Based on other non-commodity criteria	0	0	0	0	0
Miscellaneous payments	718	2 199	0	4 198	2 400
Percentage PSE (%)	**-3.5**	**-6.2**	**-13.3**	**-1.7**	**-4.3**
Producer NPC (coeff.)	**0.9**	**0.88**	**0.82**	**0.91**	**0.89**
Producer NAC (coeff.)	**0.97**	**0.94**	**0.88**	**0.98**	**0.96**
General Services Support Estimate (GSSE)	**166 942**	**787 407**	**718 578**	**802 495**	**841 147**
Agricultural knowledge and innovation system	19 006	68 918	68 197	65 447	73 109
Inspection and control	1 187	32 286	30 667	31 204	34 988
Development and maintenance of infrastructure	95 727	595 030	525 807	625 417	633 867
Marketing and promotion	642	9 572	9 798	6 917	12 000
Cost of public stockholding	49 392	74 017	80 571	61 024	80 457
Miscellaneous	987	7 583	3 538	12 487	6 725
Percentage GSSE (% of TSE)	**99.6**	**135**	**-60.1**	**42.9**	**78.2**
Consumer Support Estimate (CSE)	**776 664**	**5 006 394**	**6 221 559**	**3 893 277**	**4 904 346**
Transfers to producers from consumers	587 747	3 307 608	4 691 541	2 089 511	3 141 772
Other transfers from consumers	- 10 949	278 638	250 702	287 011	298 200
Transfers to consumers from taxpayers	200 554	1 438 407	1 309 935	1 519 911	1 485 377
Excess feed cost	-688	- 18 259	- 30 619	- 3 156	- 21 003
Percentage CSE (%)	**16.3**	**24.7**	**32.4**	**18.9**	**23**
Consumer NPC (coeff.)	**0.9**	**0.86**	**0.81**	**0.9**	**0.87**
Consumer NAC (coeff.)	**0.86**	**0.8**	**0.76**	**0.84**	**0.81**
Total Support Estimate (TSE)	**167 657**	**583 126**	**-1 195 461**	**1 869 564**	**1 075 276**
Transfers from consumers	- 576 798	-3 586 246	-4 942 243	-2 376 522	-3 439 972
Transfers from taxpayers	755 404	3 890 734	3 496 080	3 959 075	4 217 048
Budget revenues	- 10 949	278 638	250 702	287 011	298 200
Percentage TSE (% of GDP)	**0.7**	**0.4**	**-1**	**1.4**	**0.7**
GDP deflator 2000-02 = 100	**100**	**220**	**215**	**219**	**226**

Note: NPC: Nominal Protection Coefficient. NAC: Nominal Assistance Coefficient. A (area planted), An (animal numbers), R (receipts), I (income). [1]MPS commodities for India are: wheat, maize, rice, soybean, rapeseed, groundnuts, chickpeas, other pulses, potatoes, onion, tomatoes, mango, bananas, sugarcane, cotton, milk, bovine meat, sheep meat, poultry, and eggs. Market Price Support is net of producer levies and Excess Feed Cost. n.a.: not applicable.

Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

Table 3.12. India: Estimates of support to agriculture, USD million

	2000-02	2014-16	2014	2015	2016
Total value of production (at farm gate)	**112 279**	**380 817**	**371 118**	**371 834**	**399 501**
of which: share of MPS commodities (%)	*64.8*	*66.1*	*66.6*	*66.2*	*65.5*
Total value of consumption (at farm gate)	**106 234**	**338 051**	**335 845**	**337 748**	**340 561**
Producer Support Estimate (PSE)	**-4 166**	**-26 100**	**-52 728**	**-6 917**	**-18 654**
Support based on commodity output	-12 692	-54 178	-79 532	-34 197	-48 805
Market Price Support [1]	*-12 692*	*-54 178*	*-79 532*	*-34 197*	*-48 805*
Payments based on output	*0*	*0*	*0*	*0*	*0*
Payments based on input use	8 511	28 045	26 805	27 216	30 115
Based on variable input use	8 511	27 498	26 358	26 673	29 464
with input constraints	0	0	0	0	0
Based on fixed capital formation	0	547	447	542	651
with input constraints	0	0	0	0	0
Based on on-farm services	0	0	0	0	0
with input constraints	0	0	0	0	0
Payments based on current A/An/R/I, production required	0	0	0	0	0
Based on Receipts / Income	0	0	0	0	0
Based on Area planted / Animal numbers	0	0	0	0	0
with input constraints	0	0	0	0	0
Payments based on non-current A/An/R/I, production required	0	0	0	0	0
Payments based on non-current A/An/R/I, production not required	0	0	0	0	0
With variable payment rates	0	0	0	0	0
with commodity exceptions	0	0	0	0	0
With fixed payment rates	0	0	0	0	0
with commodity exceptions	0	0	0	0	0
Payments based on non-commodity criteria	0	0	0	0	0
Based on long-term resource retirement	0	0	0	0	0
Based on a specific non-commodity output	0	0	0	0	0
Based on other non-commodity criteria	0	0	0	0	0
Miscellaneous payments	15	33	0	64	36
Percentage PSE (%)	**-3.5**	**-6.2**	**-13.3**	**-1.7**	**-4.3**
Producer NPC (coeff.)	**0.9**	**0.88**	**0.82**	**0.91**	**0.89**
Producer NAC (coeff.)	**0.97**	**0.94**	**0.88**	**0.98**	**0.96**
General Services Support Estimate (GSSE)	**3 526**	**12 183**	**11 752**	**12 258**	**12 540**
Agricultural knowledge and innovation system	402	1 068	1 115	1 000	1 090
Inspection and control	25	500	502	477	522
Development and maintenance of infrastructure	2 021	9 201	8 600	9 553	9 450
Marketing and promotion	14	148	160	106	179
Cost of public stockholding	1 044	1 150	1 318	932	1 199
Miscellaneous	21	116	58	191	100
Percentage GSSE (% of TSE)	**99.6**	**135**	**-60.1**	**42.9**	**78.2**
Consumer Support Estimate (CSE)	**16 370**	**78 112**	**101 753**	**59 468**	**73 116**
Transfers to producers from consumers	12 399	51 828	76 730	31 916	46 839
Other transfers from consumers	-236	4 310	4 100	4 384	4 446
Transfers to consumers from taxpayers	4 222	22 261	21 424	23 216	22 145
Excess feed cost	-15	-287	-501	-48	-313
Percentage CSE (%)	**16.3**	**24.7**	**32.4**	**18.9**	**23**
Consumer NPC (coeff.)	**0.9**	**0.86**	**0.81**	**0.9**	**0.87**
Consumer NAC (coeff.)	**0.86**	**0.8**	**0.76**	**0.84**	**0.81**
Total Support Estimate (TSE)	**3 581**	**8 345**	**-19 552**	**28 557**	**16 031**
Transfers from consumers	-12 163	-56 138	-80 830	-36 300	-51 284
Transfers from taxpayers	15 981	60 174	57 178	60 473	62 869
Budget revenues	-236	4 310	4 100	4 384	4 446
Percentage TSE (% of GDP)	**0.7**	**0.4**	**-1**	**1.4**	**0.7**
GDP deflator 2000-02 = 100	**100**	**220**	**215**	**219**	**226**

Note: NPC: Nominal Protection Coefficient. NAC: Nominal Assistance Coefficient. A (area planted), An (animal numbers), R (receipts), I (income). [1]MPS commodities for India are: wheat, maize, rice, soybean, rapeseed, groundnuts, chickpeas, other pulses, potatoes, onion, tomatoes, mango, bananas, sugarcane, cotton, milk, bovine meat, sheep meat, poultry, and eggs. Market Price Support is net of producer levies and Excess Feed Cost. n.a.: not applicable.

Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

Composition of producer support by policy category

Beyond measuring the level of support, whether positive or negative, it is more important to analyse the way in which support is delivered. The composition of support shows how positive producer support is provided and negative producer support is imposed, with different impact on the agricultural sector and on the distribution of benefits across society. This is particularly relevant in the case of India, where in essence two separate policy regimes operate at the same time: output market policies that seem to depress domestic producer prices, particularly in years past, and positive budgetary transfers to producers by means of input policies.

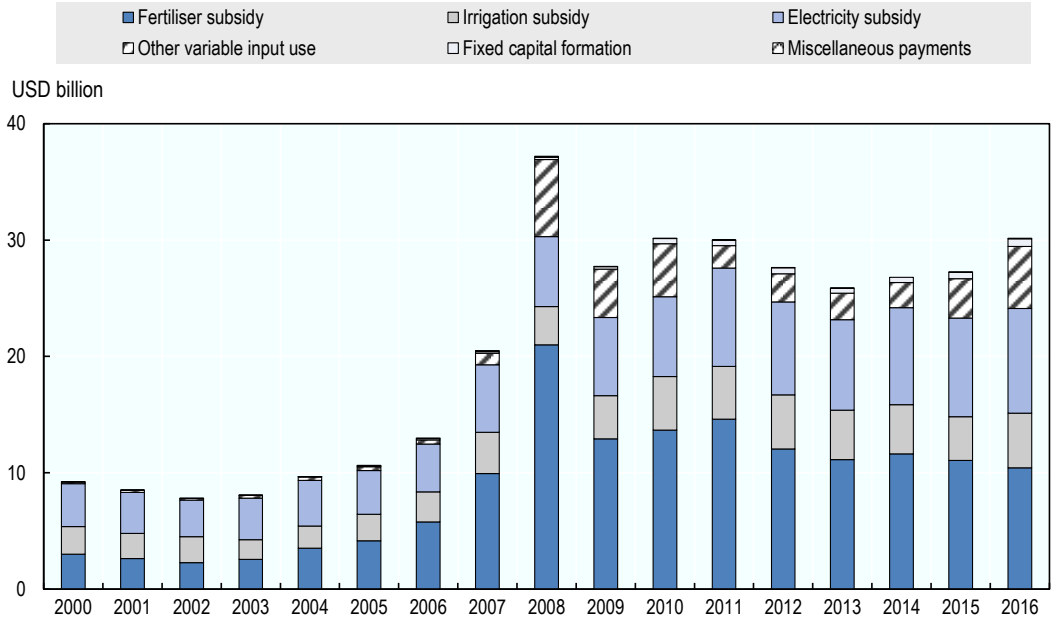
Positive market price support can have a large effect on production and trade, imposes additional, regressive costs on domestic consumers, is not effective in improving farm income, and can have negative effects on the environment. Negative market price support taxes producers and is a disincentive to producing in line with effective demand. Negative market price support, by itself, provides a positive transfer to those consumers who buy at market prices. Both positive and negative market price support, either of which by definition applies on a commodity-by-commodity basis, distort relative production incentives across individual commodities. More direct forms of income support are much more effective at improving farm income with fewer spill-over effects than are input subsidies and output subsidies. Policies that directly target the achievement of specific policy objectives are likely to be more effective than those that are provided to all producers through production or input subsidies. At the same time, targeted policies may involve higher costs associated with designing, implementing, monitoring and evaluating specific policy measures, which can make the move towards targeted policies more challenging (van Tongeren, 2008; Martini, 2011).

Budgetary transfers account for practically all of the positive producer support for agriculture as a whole in India. Virtually all of this support is classified as payments based on variable input use, the OECD classification that includes the provision of inputs such as fertiliser, irrigation, water, electricity, pesticides, seeds, and fuel at subsidised prices, and the share of crop insurance premiums paid by government. Paying less than market interest rate for short-term or operating credit and policy-driven write-offs by lenders of such debts are also components of this support category. Agricultural producers may not be receiving explicit payments under policies in this category but are able to buy inputs at prices that are lower than a reference price, such as the price they would face in the absence of the policy or the price paid by other users of the input. Input subsidies not only allow producers to respond to output market and policy signals but also give incentives to produce more of those commodities where producers are most able to respond to the distortions in relative input prices resulting from subsidies. Their potential to distort producer decisions is thus at least as large as that of market price support. Although the large input subsidies, such as for fertilisers, electricity, irrigation water, credit and many other kinds of inputs, are part of India's PSE, they are not allocated to individual commodities and do not enter the Single Commodity Transfers (SCT; see below).

Budgetary support to agricultural producers increased from an average of INR 402 billion (USD 9 billion) in 2000-02 to INR 1 816 billion (USD 28 billion) in 2014-16 (Figure 3.14). An intermediate peak of INR 1 711 billion (USD 37 billion) was observed in 2008, when fertiliser subsidies were particularly large, as was the write-off of debts incurred mainly as operating credit (part of "other variable input use"). The input subsides have throughout the 2000-16 period been overwhelmingly dominated by

subsidised fertilisers, electricity and irrigation water. While fertiliser subsidies are on a slow decline, electricity subsidies are slowly rising (while seen in USD terms in Figure 3.14, fertiliser subsidies have levelled off in INR terms and electricity subsidies have risen more quickly). Subsidies for irrigation water declined only slightly over several years, followed by an increase in 2016 to the earlier level. Interest subsidies on operating credit have increased and in some years farmers' credit balances have been fully or partially written off, translating into considerable amounts of producer support. Payments supporting fixed capital formation, primarily for agricultural mechanisation, were not made to any significant degree before 2007 but have since followed a slowly growing trend while remaining very small in relation to subsidies on operating credit (Figure 3.14).

Figure 3.14. Level and composition of budgetary transfers in India, 2000-16



Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database.*

Fertiliser subsidies remain the single largest component of India's input subsidies. The large yearly increases of the mid-2000s have not been continued, and the yearly amount of fertiliser subsidies has largely stabilised in 2014-16 in INR terms. This may have been a consequence of the 2010 policy change, which differentiated the subsidy regime for phosphatic and potassic fertilisers (that are largely imported) from the regime for urea (that is both imported and manufactured in India). Fertiliser subsidies in government expenditure accounting can include subsidies accruing to both fertiliser manufacturers and importers and to fertiliser users, i.e. farmers. Fertiliser subsidies could alternatively have been measured by multiplying price gaps at the farm level by fertiliser consumption, with the price gaps being the difference between the hypothetical unsubsidised farm gate price and the subsidised price. Such estimates for urea, di-ammonium phosphate (DAP) and muriate of potash (MOP) would show fertiliser subsidies at the farm level even larger than the expenditure-based measurement in some years but generally with the same pattern over time. The expenditure-based measurements were retained in the PSE calculations.

State governments operate many programmes providing budgetary transfers to agricultural producers or the sector. The amounts involved are small in relation to the transfers funded by the central government (Box 3.5).

Box 3.5. Estimating budgetary transfers by state governments in relation to PSE

In addition to the central government expenditures and state level expenditures on major input subsidy programmes, which are included in the estimated PSEs, states finance a myriad of small programmes. In order to make an assessment of the significance of these programmes, expenditures in six states were studied in 2013-14 and extrapolated to all states as follows.

The budgetary transfers on agricultural programmes of the ministries of agriculture (or similar) were obtained from the budget documents for 2013-14 of the governments of Punjab, Madhya Pradesh, Gujarat, Uttar Pradesh, Bihar and Odisha. Each transfer was classified as a PSE or a GSSE transfer based on the implementation criteria of the programme. Most of the PSE transfers were classified as payments based on variable input use or payments based on fixed capital formation. The sum of the budgetary transfers on PSE programmes in the six states was divided by the total agricultural budget of the six states, and the ratio was applied to the total agricultural budget of all states in India. This generated an estimate of the magnitude of PSE transfers fully financed by the state governments themselves. The extrapolation assumes that the share calculated for the six states represents the share in all states, on average, of PSE transfers in their agricultural budgets.

The data on budgetary transfers by the states was obtained from the document "State Finances: A Study of Budgets", issued by the Reserve Bank of India. The data includes both capital expenditure and revenue expenditure under the heading agricultural and allied activities. Some state government budgetary expenditures are accounted for separately under certain headings in the PSE and GSSE categories and did not enter this extrapolation. This includes capital expenditure on irrigation and under the *Rashtriya Krishi Vikas Yojana* (RKVY) scheme.

The estimated budgetary PSE transfers of all states from their own resources in 2013-14 amounted to INR 105 billion (USD 1.7 billion). This would correspond to 0.5% of the gross farm receipts in agriculture used to calculate %PSE if incorporated. As the data are available for only one year and for a relatively small number of states, they are not included in the estimates of the PSE.

Negative market price support strongly dominated the market price support picture in 2000 to 2016 for agriculture as a whole in India. In years when a commodity's market price support (MPS) has been positive, its level was modest. For several commodities the calculated MPS was negative in all years of the period (groundnuts, onion, tomatoes, and bananas). For some other commodities the calculated MPS was negative in all years except one (wheat, milk, and bovine meat). The negative MPS occurs when the domestic producer price is less than the reference price calculated for the same level of transformation in the marketing chain.

Many countries maintain the domestic producer price higher than the reference price with the help of policy measures at the border or a combination of border measures and

domestic policy measures. The domestic producer price can also be kept lower than the reference price with the help of domestic regulations and policy impediments on exports, such as prohibitions, restrictions, or duties on exports, as well as administrative barriers to exports. Weak institutional infrastructure concerning, e.g., marketing channels, and poor physical infrastructure, such as roads or facilities for handling perishable commodities, contribute to the wedge between the higher reference price and the lower producer price. Such a wedge can be attributed to policy-based distortions in the commodity value chain (Pursell et al., 2009; Government of India, 2013e; Saini and Gulati, 2017) and have been interpreted as such in the PSE calculations reported here.

Producer prices of agricultural commodities in India are affected by policies on pricing, procuring, stocking, moving, and trading the commodity. Policies that govern the flow of commodities from the producer level to downstream levels in the marketing chain include the Essential Commodities Act and the APMC Acts. Differences among the states in the status of their respective APMC Acts and how these acts are implemented make it difficult to generalise about the effects on the prices of a set of commodities. A variety of policies impeding the export of a commodity throughout the period examined, such as export prohibitions, export quotas, export duties, and minimum export prices tend to have negative effects on producer prices. In India's fruit and vegetable sector, poor transportation infrastructure has been more explicitly identified as an important element of the difference between the farm gate and international prices (Mattoo et al., 2007). That study also mentions policy distortions that restrict competition and result in uneven utilisation of existing infrastructure, and high domestic storage and marketing costs. NCAP (2010) and Deodhar et al. (2006) drew similar conclusions. Such conditions may apply not only to perishable commodities, including fruit, vegetables, milk, meat, and eggs, but also to grains, oilseeds and other crops more generally.

The Market Price Differential (MPD) for a commodity is the domestic price less the reference price, calculated at the same level in the value chain. In the OECD's measurement of policy support to agricultural producers in many countries, the standard approach is to set a negative MPD to zero unless the negative differential can be explained as a result of the application of agricultural policies. For an imported commodity to which policies, such as tariffs, are in place to increase the domestic price but the domestic price is nevertheless below the reference price, the MPD is set to zero. This attributes the observed negative price gap to factors not related to agricultural policies. While a negative MPD is observed for India for most commodities in many, most or all of the years of the 2000-16 period, negative MPDs were set to zero only for chickpeas (and thus also for other pulses) in 2001-14 and for sheep meat in all years.

While the calculation of producer support in India is carried out separately for 19 individual commodities, some additional commodity coverage is achieved by extrapolating support from chickpeas to all pulses. Moreover, a group called "other commodities" comprises all commodities for which an MPD is not obtained individually nor by the extrapolation for pulses. "Other commodities" includes all fruits and vegetables, other than potatoes, onion, tomatoes, mangoes, and bananas, as well as all other crops and livestock produced in India. It accounted for 34% of the value of production in India's agriculture in 2014-16, a slight decline from 35% in the early years of the period. An MPS is attributed to "other commodities" as a group, based on the assumption that the ratio between the MPS for those commodities where an MPD is calculated or extrapolated and their total value of production is the same as the corresponding ratio for "other commodities" as a group.

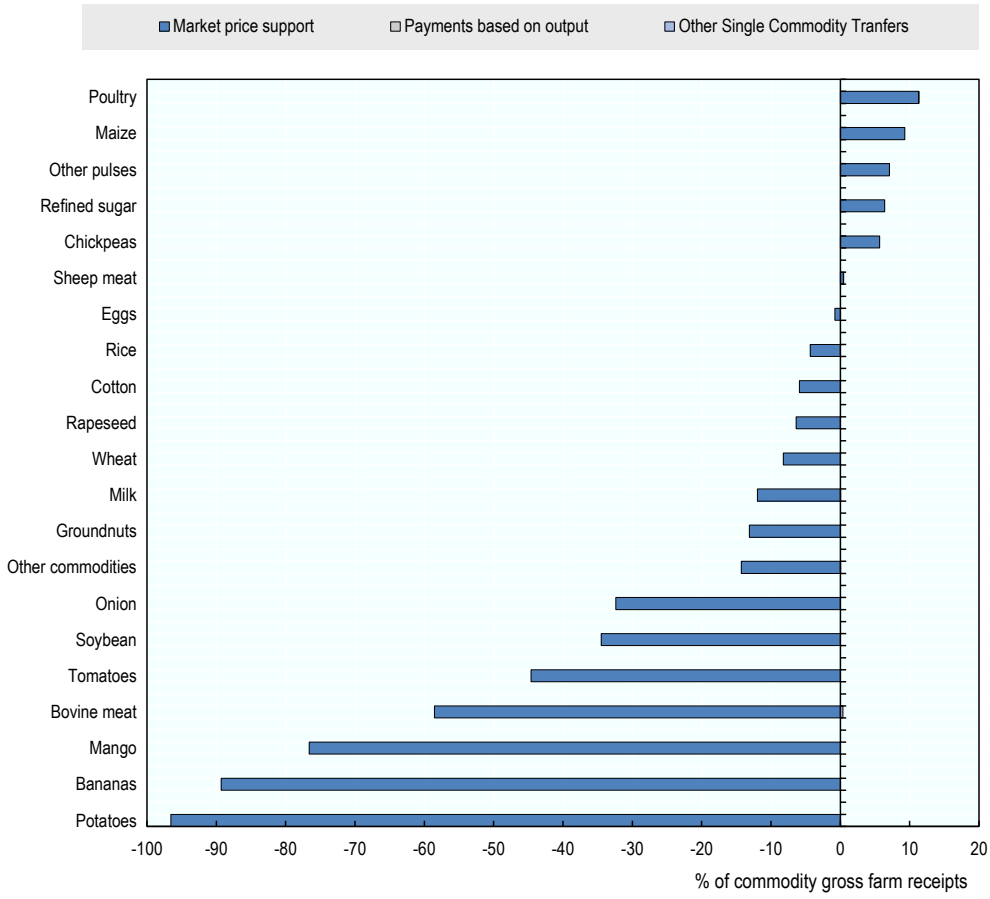
Commodity profile of producer support

Producer Single Commodity Transfers (SCT) is an indicator of the extent to which agricultural policies are commodity-specific, or the flexibility that policies allow producers in their choices of product mixes. For example, some countries (not India) provide output payments designated for a specific commodity and require recipient farmers to produce that commodity. This provides a production incentive similar to that of market price support. The prevalent negative market price support in India gives a disincentive to the production of the commodity. Alternatively, payments may be provided to producers of any commodity in a designated group (for example, any crop within a cereal group), or simply to producers of any commodity without distinction. The latter payments give freedom to those who receive support to define their production mix, and producers become more responsive to market signals.

The SCT measures the sum of MPS, whether positive or negative, and payments provided for the production of only a specified individual commodity. While there are no output-based payments for individual specified commodities or groups of commodities in India, the SCTs nevertheless include some small such input-based payments, for example for seeds and dairy development. The SCT can be expressed in relative terms as a percentage of gross receipts for a given commodity, i.e. %SCT. A figure of 10%, for example, would indicate that the value of transfers that are specific to that commodity is equivalent to 10% of gross receipts for that commodity. Similarly, a %SCT of -15% for a commodity would reveal that the value of commodity-specific transfers from producers of the commodity corresponds to 15% of the commodity's gross receipts. In the case of India, a commodity's gross receipts are the same as or very close to the commodity's value of production. This occurs because there are no commodity-specific output payments, commodity-specific input subsidies are relatively small, and the value of the transfers through other input subsidies are not allocated to individual commodities.

On average, in 2014-16, only poultry meat, maize, sugar, chickpeas (and other pulses) and sheep meat exhibit positive %SCT (Figure 3.15). For chickpeas, the positive %SCT in 2014-16 results from averaging positive MPS values in 2015 and 2016 with the zero MPS in 2014, one of the many years in which the producer price was below the reference price (in spite of MFN tariffs in place) and the negative price gap was set to zero. The small positive %SCT for sheep meat derives from setting sheep meat's negative price gap to zero, leaving its Excess Feed Cost as positive support because feed commodities in India exhibit negative price gaps. Negative %SCT are observed for the important crops of rice, cotton, and wheat, but these %SCT levels are moderately negative compared to the much more negative %SCT for mango, bananas, and potatoes. Positive commodity-specific transfers other than MPS have accounted for a negligible share of positive producer support in India in 2000-16.

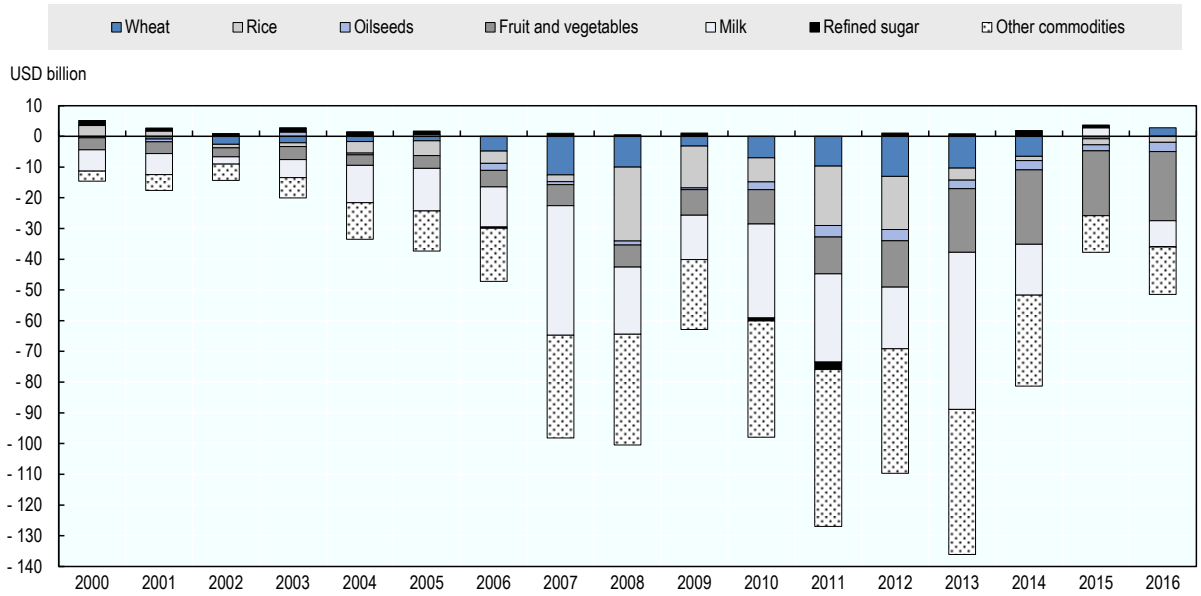
Figure 3.15. Producer Single Commodity Transfers (SCTs) by commodity in India, 2014-16



Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

The individual commodity with the largest amount of negative MPS in most years of the 2000-16 period was milk (Figure 3.16). However, milk MPS turned slightly positive in 2015 when the reference price continued dropping from its 2013 high. Rice saw small positive MPS amounts in the first couple of years, large negative MPS in the middle of the period and then small negative MPS amounts in recent years. Wheat registered large negative MPS amounts in most years of the period but its MPS turned positive in 2016. The size of the negative MPS for oilseeds was more consistent over time, as were the negative MPS amounts for cotton and bovine meat. The MPS for refined sugar was positive all except three years in the 2000-16 period, often coinciding with the availability of some form of export incentives (the negative MPS in 2016 is accounted for in the positive average MPS in 2014-16). While the MPS for pulses was set to zero instead of being counted as negative in 2001-14, it became positive in 2015 and 2016 (not shown). The set of fruit and vegetable commodities in the figure (onion, potatoes, mango, bananas, and tomatoes) showed a significant and rapidly growing amount of negative MPS. It is thus possible to discern a clear pattern of MPS for an increasing number of commodities having turned positive in 2015 (maize, chickpeas, milk) and 2016 (wheat, eggs), in contrast to the more numerous and larger negative MPS amounts in the years before.

Figure 3.16. Level and composition of market price support in India by commodity, 2000-16



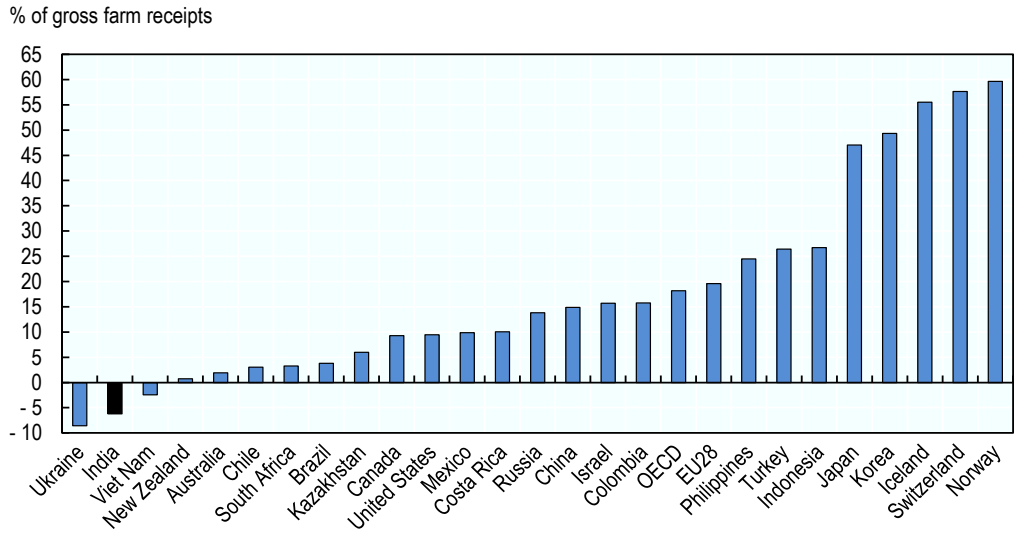
Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

A commodity's support indicated by %SCT, whether positive or negative, results from policy interventions which affect farmers' production choices, compared to a situation of no intervention. Policies in India, whether impeding exports or suppressing producer prices through the structure and conduct of the marketing chain, have for many years generated predominantly negative levels of %SCT for most commodities. This pattern has been attenuated in the most recent years, with more commodities, including wheat and maize, registering positive %SCT. Apart from the positive or negative effect of a positive or negative %SCT on the production of a given commodity, the relative levels of support among commodities also translate as incentives for the production of more or less of any single commodity. These effects are confounded with the effects of support for different kinds of inputs and the responsiveness of production of different commodities to such support. Producers' marketing options also play a role in their decisions on what to produce. In some parts of India the government's procurement activities are an important part of the marketing environment that producers face especially for wheat and rice, but less so in other parts of the country.

Therefore, as already indicated great care needs to be taken in interpreting a country's %PSE, or any other aggregate country indicator, when the value reported is the result of large positive and negative components numerically offsetting each other. In this situation, the aggregate indicator is likely to be a poor indicator of policy performance. The policies behind both the negative and the positive components alter the relative prices and therefore the incentives in the sector in different but not offsetting ways. While the numerical indicators for negative price support and positive input subsidies may arithmetically offset each other, the distortions the policies generate are multi-faceted and cumulative. Similarly, in comparing across countries, caution needs to be exercised in interpreting the indicators, since it is less misleading to concentrate on the composition of the indicator than on its single numerical value.

The average level of support in India at -6% was lower than the OECD average of 18% in 2014-16. India along with Ukraine and Viet Nam were the only three countries covered by OECD calculations to show a negative average %PSE in 2014-16 (Figure 3.17). Compared to the East and Southeast Asian countries in the sample, the level of support to producers in India was much lower than in Japan (47%) and Korea (49%), and lower than in Indonesia (27%), the Philippines (24%) and China (15%) (OECD, 2017).

Figure 3.17. Producer Support Estimates in India and selected countries, 2014-16



Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

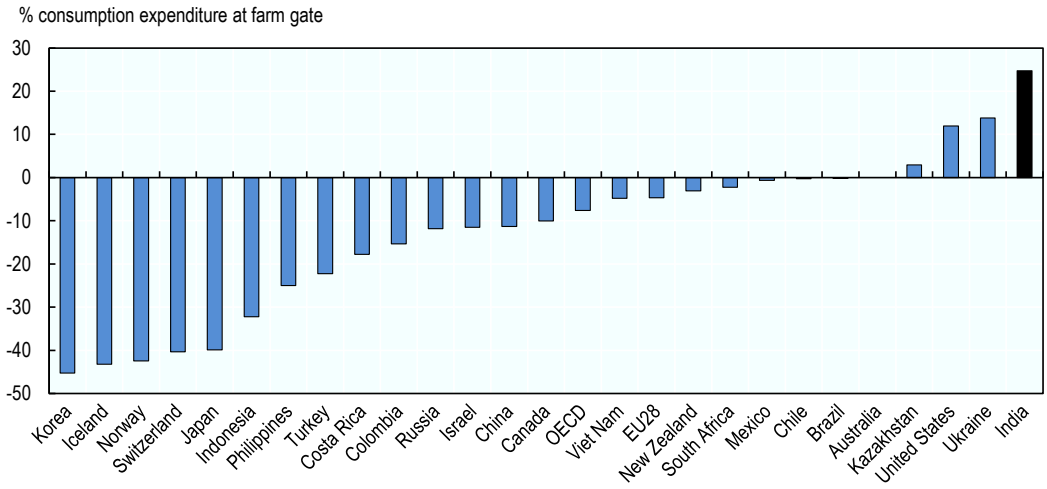
Support to consumers of agricultural products

The Consumer Support Estimate (CSE) is a related indicator measuring (1) the cost to consumers arising from policies that support agricultural producers by raising domestic producer prices, as many countries do, and (2) the support (negative cost) to consumers from policies that suppress domestic prices. The CSE also includes budgetary food subsidies for consumers. In the OECD methodology, the consumer is understood as the first buyer of the commodity. A negative CSE indicates that consumers are paying more than they would in comparison to border prices (an implicit tax). In the majority of countries monitored by the OECD, consumers are taxed in this way but may in some countries be partly compensated, e.g. through direct budgetary subsidies to processors or various forms of food assistance. When CSE is positive, consumers are able to purchase the product more cheaply on the domestic market (an implicit subsidy). An additional large component of CSE in India is the food subsidy, which allows large segments of the population to purchase food grains at prices that are even much lower than their already low domestic market prices.

Similar to the PSE, the CSE can be expressed in relative terms as a percentage of consumption expenditures (%CSE). In 2014-16, consumers in India benefitted from agricultural and food policies that generated a %CSE of 25% (Figure 3.18). This positive %CSE indicates that policies that depressed farm prices, along with food subsidies, reduced consumption expenditure by (positive) 25% on average across all commodities, compared to what consumptions expenditure would have been in the absence of these

policies and subsidies (this static comparison does not account for changes in production and consumption if policies and subsidies were removed). This contrasts sharply against the negative %CSE of -8% observed in OECD countries on average in 2014-16, acting as a tax on consumers. It is a rate of consumer support that is considerably higher than that observed in the few other countries where net support to consumers is positive, whether through policies that keep domestic prices below international prices (Ukraine with %CSE of 14% in 2014-16) or through budgetary subsidies as in the United States (%CSE of 12% in 2014-16) (Table 3.13). In other countries with budgetary food subsidies the %CSE is nevertheless zero or negative because the domestic prices are kept higher than international prices, as in Brazil and Indonesia with a %CSE of 0% and -32%, respectively.

Figure 3.18. Consumer Support Estimate in India and selected countries, 2014-16



Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

Table 3.13. Diversity of %CSE in selected countries with budgetary food subsidies, 2014-16

Country	%CSE	Transfers to consumers from taxpayers as share of value of consumption
Brazil[1]	-0.2	1.1%
India	24.7	6.6%
Indonesia	-32.2	1.5%
Kazakhstan[2]	2.9	1.6%
Ukraine	13.8	0.0%
United States	11.9	14.0%

1. %CSE was positive in 2014 and 2015 and negative in 2016.
2. %CSE was negative in 2014 and 2015 and positive in 2016.
Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

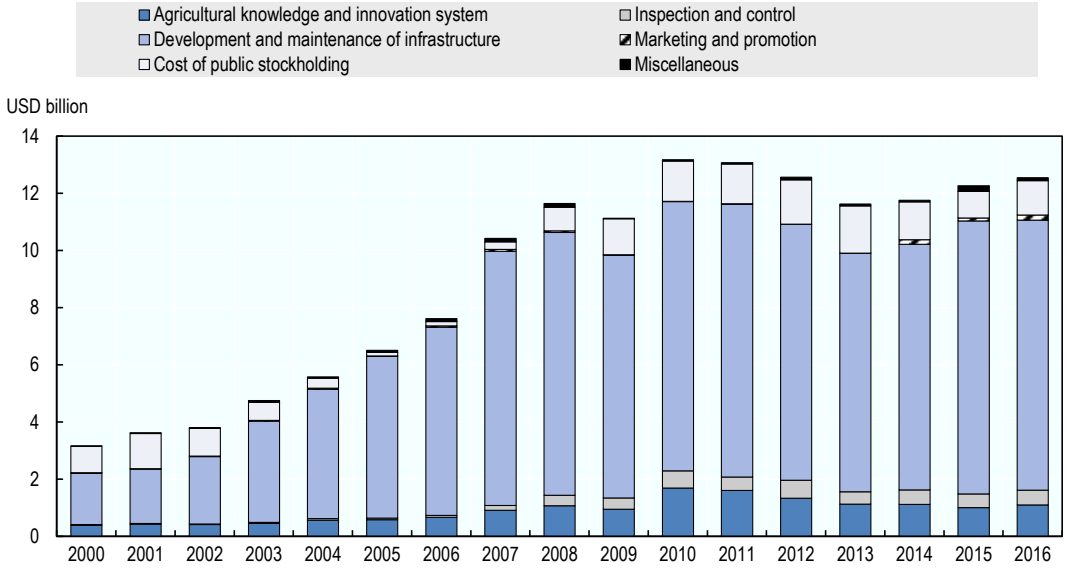
Support to general services for agriculture

In addition to support provided to individual producers, the agricultural sector is assisted through the financing of activities that provide general benefits, such as agricultural

research and development, training, inspection, marketing and promotion, and public stockholding. The General Services Support Estimate (GSSE) measures this support. The provision of common as opposed to individual benefits distinguishes the general services support from that measured by the PSE.

In India expenditure on general services followed an increasing trend from 2000 to 2010, after which such expenditure in USD terms has remained lower (Figure 3.19). Expressing GSSE as a percentage of gross farm receipts gives an indicator that supplements the standard OECD indicators, such as %PSE. This GSSE percentage was 2.9% in 2000-02 and 3.0% in 2014-16, revealing that expenditure on general services to the agriculture sector has just barely kept pace with the increases in value of production and budgetary transfers to producers, let alone outpaced those increases. The largest single expenditure category in GSSE is development and maintenance of infrastructure, almost all of which relates to hydrological infrastructure, specifically capital expenditure on irrigation. Hydrological infrastructure alone accounted for 75% of GSSE expenditures in 2014-16, followed by the cost of public stockholding, which accounted for 9% of GSSE. The cost of public stockholding has fluctuated considerably, having accounted for only about 2% of GSSE in 2005, 2006 and 2007, when wheat stocks and wheat procurement were very low as a result of production having been unusually low in 2004-05 and 2005-06. Expenditure on the agricultural knowledge and innovation system (knowledge generation, education, and extension) has rarely amounted to more than 10% of the GSSE expenditure. Knowledge generation and extension have in recent years accounted for some 6 and 3 percentage points, respectively, of that share, leaving a very small share for education.

Figure 3.19. Level and composition of GSSE in India, 2000-16



Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

Support to the agricultural sector as a whole

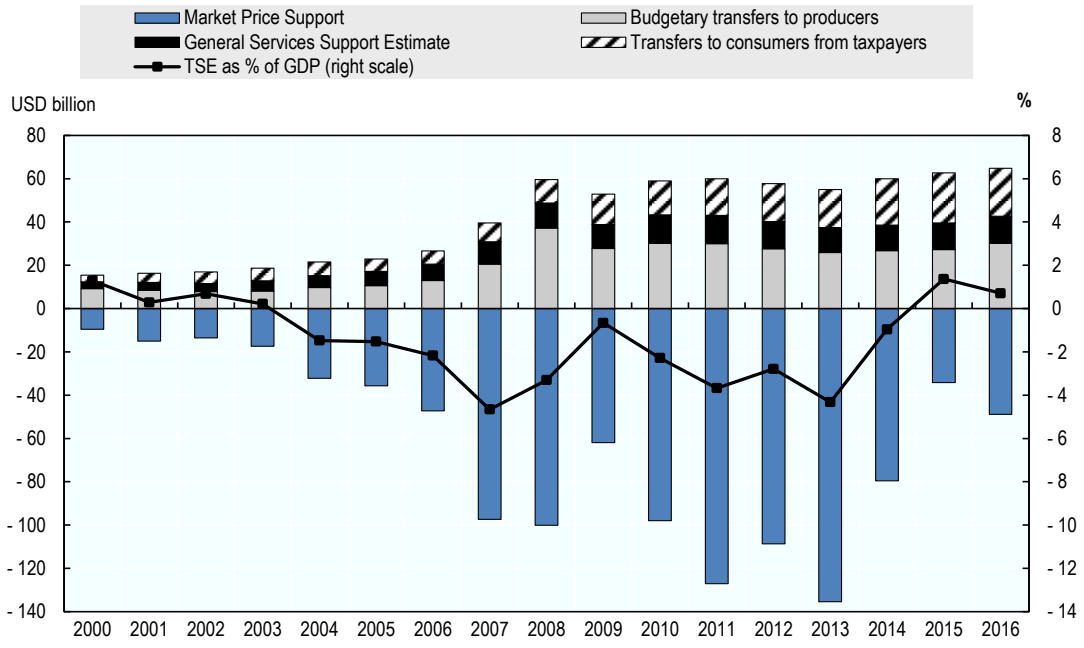
The Total Support Estimate (TSE) is the broadest indicator of support, representing the sum of transfers to agricultural producers individually (PSE) and collectively (GSSE),

and direct budgetary transfers to consumers. Expressed as a percentage of GDP, the %TSE provides an indication of the cost that support to the agricultural sector places on the overall economy. Its value depends on the degree to which the agricultural and food sector is supported in a country, the size of this sector and its importance relative to the overall economy. As with the PSE the presence of large negative amounts in the TSE requires careful interpretation of the resulting indicator.

India's TSE averaged INR 583 billion (USD 8 billion) per year in 2014-16, representing 0.4 % of GDP (Figure 3.20). Because of the large negative MPS in most of the 2000-16 period, the %TSE was negative from 2004 to 2014, becoming positive only in 2015 and 2016. This does not define a situation of negligible transfers. Rather, the relatively modest arithmetic TSE hides the existence of very large transfers among agricultural producers, consumers and taxpayers. They include the very large negative MPS in many years (a transfer away from producers) and the large input subsidies providing positive support to producers but with different economic effects, along with the large and growing transfer from taxpayers to consumers.

Focusing on the positive transfers altogether (i.e. sum of budgetary transfers to producers, GSSE and transfers to consumers from taxpayers, and not counting the negative market price support) these amounted to 2.5% of India's GDP in 2000-02, dropping to 1.9% of GDP in 2014-16. It is also instructive to consider the budgetary support element relative to value added in agriculture (an indicator of the size of the agriculture sector). The positive transfers to producers, to the agriculture sector and to consumers altogether corresponded to about 21% of gross value added in agriculture (crops and livestock) on average in 2014-16. The budgetary transfers to producers and the agriculture sector (i.e. input subsidies and GSSE) were by themselves at a level equal to 14% of gross value added in agriculture.

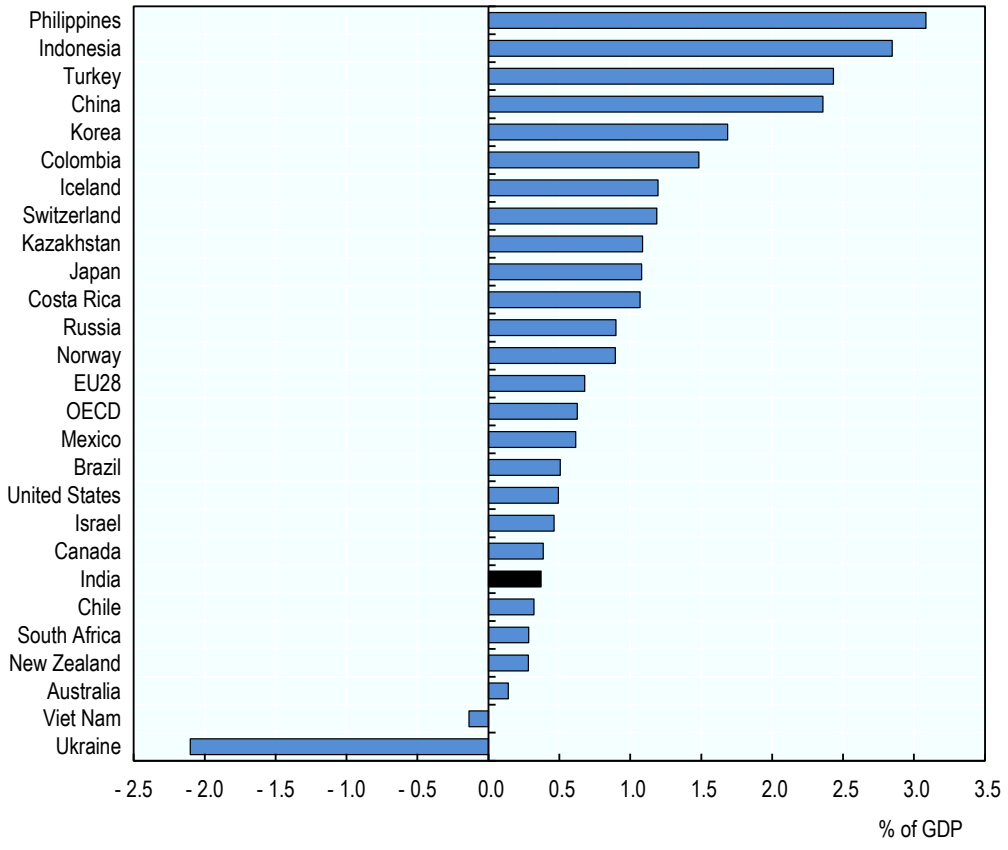
Figure 3.20. Level and composition of TSE in India, 2000-16



Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

With a level of total support to its agriculture sector and food consumption sector in 2014-16 amounting to 0.37% of GDP, India finds itself between Canada and Chile in the absolute size of this net transfer as a percentage of the country's GDP (Figure 3.21). In India's case the positive support to producers is mainly budgetary support in the form of input subsidies. The central government's budgetary producer support together with its sizeable budgetary subsidy on food grains to a large part of the population corresponds to as much as 20% of the total budgetary revenue expenditure of the central government.[19] This concentration of expenditure highlights the need to calibrate the amount of spending on agriculture and food so it remains in line with evidence on how well such spending contributes to the achievement of overall policy objectives. It also underscores the need to allocate and implement spending initiatives under the headings of agriculture and food in such ways that they reach the intended beneficiaries and have the desired effects.

Figure 3.21. TSE in India and selected countries, 2014-16



Source: OECD (2017), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics Database*.

The share of GSSE in total support (%GSSE) indicates the relative importance of these transfers within support to the agricultural sector. In the present situation for India, where the modest TSE is the net result of adding large positive and negative components, the %GSSE is difficult to interpret. As an alternative, the GSSE can be expressed as a share of the sum of the budgetary transfers in PSE (mainly input subsidies) and the GSSE. This share rose from an average of 29% in 2000-02 to a high of 38% in 2005, before declining

to an average of 30% in 2014-16. The decline seen in the last decade in the share of budgetary support that is provided as general services to the agricultural sector as a whole rather than to individual producers is of concern since it represents a move away from the less distorting forms of producer support expenditure. The kind of support provided through GSSE measures is also the kind that most effectively builds resilience and sustainability in the agriculture sector, in contrast to ongoing expenditures on input subsidies and, in some countries, on price support.

Notes

[1] For ease of reading, the text in this chapter often refers to states and Union Territories (UT) as states only. While India's Constitution identifies animal husbandry as distinct from agriculture, as does much analytical work in India, this text includes animal husbandry and livestock under the heading of agriculture.

[2] While a 4% growth rate in agriculture is often mentioned in policy documents, the indicator to which this growth rate or other growth objectives refers is rarely clear, such as total value of output in agriculture, value-added in agriculture, or farmers' income (Chand, 2017).

[3] Chaturvedi (2011) reviewed all CSS and certain other transfers, not only those in agriculture. Among the issues he identified was the difficulty of monitoring the flow of funds because of funds being released under CSS not only to state governments but also to independent societies, of which senior officials of a state government were in charge, or to district level organisations. He recommended that the variety of schemes be consolidated and reduced in number and reorganised for greater clarity and focus on priorities, while also allowing states adequate flexibility in using the funds. The review was informed by a review of inter-governmental transfers in Australia and Canada, while recognising the constitutional difference between those countries seeking to equalise the levels of service and India's more limited purpose of transferring resources to the states to meet their requirements for expenditure.

[4] These commodities are: onion, potato, tomato, wheat, rice, wheat flour, gram, tur, urad, moong, lentil/masoor, sugar, milk, groundnut oil (packed), mustard oil (packed), vanaspati (packed), soy oil (packed), sunflower oil (packed), palm oil (packed), gur, tea loose, and salt pack.

[5] The variety of labels attaching to various kinds of agricultural markets in India makes it difficult to find consistent numbers for markets. The total number of wholesale markets and rural primary markets was 27 326 in 2015, consisting of 20 580 rural periodical markets and 6 746 regulated wholesale markets (Government of India, 2015c).

[6] Neem coating also reduces nitrogen losses from the soil. Neem oil is derived from the fruit of the neem tree.

[7] *Deendayal Upadhyaya Gram Jyoti Yojana* (not translated in India's official texts in English). Deendayal Upadhyaya was a political philosopher. *Gram Jyoti Yojana* translates roughly as village light plan.

[8] For example, the Seed Village Program has subsidised half of the farmer's cost of certified seeds (up to a limit of ½ acre), provided farmer training in growing and processing seeds, and subsidised part of the farmer's cost of buying a bin for storing seeds (Government of India, 2017n).

[9] During two seasons in 2003 and 2004 a Farm Income Insurance Scheme operated on a limited pilot basis, going beyond insurance against yield loss only. The scheme sought to protect not only the income of the farmer, but also to reduce the government expenditure on procurement at MSP.

[10] No official translation appears to be available. AAY may be roughly translated as a plan for uplifting the weakest section of society.

[11] Giving a picture of budgetary outlays on agriculture and food in India is complicated by such factors as the participation of both the central and state governments in making such outlays, the not always explicit mention of what elements are included under particular headings when expenditures are analysed, and changing practices over time with regard to the level of detail and classification in expenditure reporting.

[12] The report converts this expenditure to a yearly average of about USD 78 billion in 2009-10 to 2013-14. The expenditure corresponds to between 4% and 5% of India's GDP.

[13] Complaints about India's quantitative restrictions had been initiated by Australia, Canada, the European Union, New Zealand, Switzerland, and the United States. The United States pursued its case through the WTO Appellate Body, resulting in India agreeing to eliminate its BOP restrictions in two instalments in 2000 and 2001 (Hoda and Gulati, 2007).

[14] Under the Customs Tariff Act, 1975, the MFN tariff is based on the statutory duty rates.

[15] For example, duties on imports of 50 000 tonnes of skim milk powder were zero in 2013-14; on peas, beans and lentils duties were zero from 2007-08 onwards; on wheat duties were zero for some time until 1 April 2013; and on rice the BCD of 70% was fully exempted between 2009-10 and 2011-12 (Hoda and Gulati, 2013).

[16] A cess in India is a central government tax levied for specific purpose as a percentage of and on top of another tax.

[17] The simple average bound rate for non-agricultural products is 34.5%.

[18] In 2014-15, 2015-16, and 2016-17 the duties on cereals were set high enough that no imports could normally take place, such as 70-80% for rice and 50-100% for wheat. However, when cyclical shortfalls in domestic production put an upward pressure on domestic prices, the government temporarily reduces the duty or exempts imports from duties altogether. The BCD on milled rice was exempted in 2009-10, 2010-11, and 2011-12, and imports were allowed on a duty free basis in those years, before tariffs were raised in 2012-13. Import of wheat was similarly exempted from duty during 2006-07 and 2007-08 and more recently between 2012-13 and 2014-15. The BCD is 30-50% for pulses, such as peas, beans and lentils, but these products have been exempted from duty from 2007-08. Duties had been exempted earlier on imports of edible oils, in which India has a structural shortfall in domestic production. Import duties on sugar were lifted for a short period in 2012 and then reinstated at 10%. Duties have then been raised more recently: for crude palm oil, the duty was 2.5%, 7.5% and 12.5% in 2014-15, 2015-16, and 2016-17, respectively. For other palm oil the duty was 10%, 15%, and 20% in the same years. While the BCD on raw sugar was 100%, the applied tariff rate was 10%, 15%, 25%, and 40%, respectively, from 2013-14 to 2016-17. A consistent increase is thus observed for the applied tariffs on palm oil and raw sugar, although they remain below the statutory duty. For certain tropical products in which India is a traditional exporter, such as tea, coffee and pepper, duties are set at levels as high as 70-100%. The import duty on frozen meat and frozen offal has in the last several years remained at 36.1%, after having been set at somewhat higher or lower rates in the early 2000s. Fresh and chilled meat imports face a lower duty of 30.9%.

[19] Budgetary producer support in this calculation includes only expenditure under the headings Agriculture & allied services and Rural development and Fertiliser subsidy. The revenue expenditure is the sum of Total non-development revenue expenditure and Total development revenue expenditure.

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Annex 3.A. Policy tables

Annex Table 3.A.1. Selected agriculture sector schemes and programmes, 2014

Scheme or programme	Budget allocation (INR billion)	Purpose
National Mission for Sustainable Agriculture (NMSA)	16.8	Seeks to address issues of "sustainable agriculture" in the context of climate change by devising appropriate strategies for ensuring food security, enhancing livelihood opportunities, and contributing to economic stability at national level. Aims at enhancing agricultural productivity in rain-fed areas focusing on integrated farming, water use efficiency, soil health management and synergising resource conservation
Mission for Integrated Development of Horticulture (MIDH)	22.6	Aims at holistic growth of horticulture sector covering fruits, vegetables and flowers with a view to augmenting farmers' income and nutritional security
National Mission on Oilseed and Oil Palm (NMOOP)	4.3	Aims at ensuring edible oil security through production improvement of traditional oilseed and tree-borne oilseed
National Mission on Agricultural Extension and Technology (NMAET)	13.2	Seeks to restructure, strengthen and promote agricultural extension to enable use of appropriate agro-technology and improved agronomic practices to farmers
National Food Security Mission (NFSM)	20.3	Seeks to ensure food security by reducing gaps between potential and actual yields and by providing extension and promotion services to agriculture and rural community
Rashtriya Krishi Vikas Yojana (RKVY)	99.5	Seeks to promote public investment in agriculture and related sector by the states, and provide flexibility and autonomy to states for planning and executing programmes/projects.
Modified National Agriculture Insurance Scheme (MNAIS)	28.2	Aims at providing relief to the farmers from crop failure due to natural disasters, pests and diseases
Integrated Scheme for Agricultural Marketing (ISAM)	8.0	Seeks to promote: (i) creation and improvement of marketing infrastructure, (ii) capacity-building of stakeholders, and (iii) access to market information
Integrated Scheme on Agriculture Cooperation (ISAC)	1.1	Seeks to promote co-operative action in agriculture by: (i) capacity-building of co-operatives to undertake value addition; (ii) providing managerial and technical inputs including training; (iii) fostering diversification of activities; and (iv) boosting creation of co-operative storage/cold facilities
Integrated Scheme on Agriculture Census and Statistics (ISAC&S)	2.6	Aims at collecting statistics relating to the agricultural holdings, land use, cropping patterns, irrigation status, tenancy, and deriving facets of agriculture in the country
Secretariat Economic Services	0.1	Aims at carrying out agro-economic evaluations and research and providing expert services to the department on various economic and statistical issues

Source: WTO (2015b) (WTO Secretariat, based on information provided by the Indian authorities).

Annex Table 3.A.2. Sales taxes and other taxes levied in agricultural marketing, by states

State	Sales tax	Taxes (% of MSP)	Remarks
Andhra Pradesh	4%: all commodities except maize, jowar, ragi, bajra, coarse grains	-	-
Bihar	-	3%	-
Assam	4% to 8%: all commodities except rice, wheat, wheat flour, pulses, fruit and vegetables, gur	-	Not collected as markets not operating
Chattisgarh	-	2.2%	-
Delhi	3%: oilseeds; fruit and vegetables: nil; fenugreek: 7%	-	-
Gujarat	4%: cotton; 2-3%: certain spices; other agricultural commodities exempted from sales tax	0.8%	Octroi: 0.2 to 4%
Goa	2%: betelnut and cashewnut; coconut, fruit and vegetables, cattle and milk exempted from sales tax	-	Entry fee: cattle INR 10 per head; vehicle INR 10 per truck
Jharkhand	-	1%	-
Haryana	4%: food grains, pulses and oilseeds; nil: fruit and vegetables	11.5%	-
Himachal Pradesh	-	5%	-
Karnataka	Nil: food grains; 2%: pulses; 4%: oilseeds	-	Market fee exempted for industrial and export purchases
Kerala	INR 4 to 8%	-	No market regulation, hence no prescribed fees
Madhya Pradesh	Not available	9.2%	Development cess from traders only: 1 to 5%
Maharashtra	All agricultural commodities exempt from sales tax	3.8%	Entry fee: INR 10 per truck
Punjab	-	14.5%	-
Rajasthan	4%: food grains; nil: coarse grains; 2%: pulses and oilseeds; nil: fruit and vegetables	3.6%	Surcharge on sales tax: 15%
Tripura	Nil: all agricultural commodities	-	Entry fee: INR 1 per head
Uttar Pradesh	4%: food grains; 2%: pulses; 4%: oilseeds and others	16.71%	-
Uttarakhand	-	7.5%	-
West Bengal	Not available	2.5%	Purchase tax on jute: 4%

Source: Government of India (2015f).

Annex Table 3.A.3. Cases where recommended MSP and fixed MSP are different

Season	Status of MSP	Paddy common	Paddy Grade A	Jowar	Bajra	Tur (Arhar)	Moong	Urad	Wheat	Barley	Rapeseed and mustard
2000-01	Rec.								580	460	
	Fixed								610	500	
2001-02	Rec.	520							610		
	Fixed	530							620		
2005-06	Rec.	560							650		
	Fixed	570							650		
2006-07	Rec.	570							700		1 600
	Fixed	580							750		1 715
2007-08	Rec.	645	675			1 550	1 700	1 700			
	Fixed	645	675			1 550	1 700	1 700			
2008-09	Rec.	1 000	1 050								
	Fixed	850	850								
2009-10	Rec.	950	950								
	Fixed	950	950								
2010-11	Rec.					2 800	3 170	2 900	1 120		
	Fixed					3 000	3 170	2 900	1 120		
2011-12	Rec.					3 100	3 400	3 300			
	Fixed					3 200	3 500	3 300			
2012-13	Rec.		NR	NR					1 285		
	Fixed		1 280	1 520					1 350		
2013-14	Rec.				1 175	3 850					
	Fixed				1 250	4 300					
2015-16	Rec.					4 425	4 650	4 425			
	Fixed					4 625	4 850	4 625			

1. MSPs are in INR per 100 kg. NR: not recommended.
2. MSPs are recommended by CACP and fixed by CCEA.
3. Where the recommended and fixed MSP are the same, CCEA fixed the MSP at the recommended level and decided on an additional bonus.
Source: Government of India (2015i).

Annex Table 3.A.4. State government bonuses in procuring wheat and rice, 2010-11 to 2013-14

	Wheat				Rice (paddy)			
	2010-11	2011-12	2012-13	2013-14	2010-11	2011-12	2012-13	2013-14
	MSP (INR/tonne)							
	11 000	11 700	12 850	13 500	10 000	10 800	12 500	13 100
State	**Bonus (INR/tonne)**							
Bihar								2 500
Chhattisgarh					500		2 700	
Karnataka					1 000	2 500	2 500	
Kerala					4 000	4 200	4 500	
Madhya Pradesh	1 000	1 000	1 500	1 500	1 000	500	1 000	500
Maharashtra								2 000
Odisha								1 000
Rajasthan		1 000	1 000	1 500				
Tamil Nadu					500	500	500	500
Uttar Pradesh		500						
	Total bonus amount (INR million)							
Total	3 538	7 998.5	14 703.5	11 434.5	4 134.5	3 567.9	15 333.3	3 862.1

Note: MSP is Minimum Support Price. Not all bonus rates are included. Total bonus amount is calculated by multiplying each state's bonus rate by the quantity procured in the state (procurement at MSP or with a bonus does not necessarily take place in all identified states in all years).
Source: U.S. Department of Agriculture (2014); Saini and Kozicka (2014).

Annex Table 3.A.5. Schemes incorporated in the National Livestock Mission

Central Scheme	Centrally Sponsored Scheme
Central fodder development organisations	Centrally sponsored fodder and feed development scheme
Central sheep breeding farm	Conservation of threatened breeds of livestock
Central poultry development organisations	Poultry development
Integrated development of small ruminants and rabbits	Utilisation of fallen animals
Piggery development	Livestock insurance
Poultry venture capital fund	Establishment/modernisation of rural slaughterhouses, including mobile slaughter plants
Salvaging and rearing of male buffalo calves	Livestock extension and delivery services

Source: Government of India (2017t).

Annex Table 3.A.6. Evolution of ad valorem duties (%), selected cereals, pulses and oilseeds, 2000-15

	Rice[1]	Wheat[4]	Maize	Chickpeas	Groundnut	Rapeseed[9]	Soybean
2000-01	80-70[2]	50	72.6	5.5	44	44	44
2001-02	80-70[2]	50	15.1-51[6]	5	44	44	44
2002-03	87.2-76.8[2]	50	15.1-51[6]	10	35.2	35.2	35.2
2003-04	80-70[2]	50	15.1-51[6]	10.2	30	30	30
2004-05	81.6-71.4[2]	50	61.2	10.2	30.6	30.6	30.6
2005-06	80-70[2]	50	61.2	10.2	30.6	30.6	30.6
2006-07	80-702	50-5-0[4]	61.2	10.2	35.9	35.9	35.9
2007-08	82.4-72[2]	0	0	0	30.1	30.1	30.1
2008-09	82.4-72[2]	0	0	0	30.1	30.1	30.1
2009-10	0	0	0-51.5[7]	0	30.1	30.1	30.1
2010-11	0	0	0-51.5[7]	10.3	30.1	30.1	30.1
2011-12	0-82.4-72.1[3]	0	0-51.5[7]	0	30.1	30.1	30.1
2012-13	82.4-72.1	0	0-51.5[7]	0	30.1	30.1	30.1
2013-14	80-70	0	0-51.5[7]	0	30.1	30.1	30.1
2014-15	80-70	0	0-50[7]	0	30.1	30.1	30.1
2015-16	80-70	0-10-25[5]	0-50[7]	0	30.1	30.1	30.1

1. Duties for two varieties: Broken rice and Other rice (excluding basmati).
2. Import of common varieties of rice with 50% or more broken are permitted free for import.
3. Duties for Other wheat and Durum Wheat
4. Duty until June 2006; duty between June and September 2006; duty September 2006 onwards.
5. Duty till August 2015; duty between August and October 2015; duty October 2015 onwards.
6. Tariff Rate Quota (TRQ) for import up to (i) 400 000 tonnes in 2001-02; (ii) 450 000 tonnes in 2002-03; (iii) 500 000 tonnes in 2003-04; beyond TRQ duties separate.
7. TRQ for import up to 500 000 tonnes; beyond TRQ separate duties apply.
8. Duty exemption up to January 2008; normal TRQ duty applicable beyond.
9. Includes mustard seed.

Source: Saini and Gulati (2017), drawing on Goyal (various issues). Includes basic duty and, where applicable, educational cess, countervailing duties, and special countervailing duties.

Annex Table 3.A.7. Evolution of ad valorem duties (%), selected fruit, vegetables, and livestock, 2000-15

	Potato	Onion	Mango	Banana	Meat (bovine meat)	Milk powder	Sugarcane
2000-01	44	0	44	49.8	44	0	44
2001-02	44	0	44	49.8	44	0	44
2002-03	35.2	5	35.2	35.2	35.2	15-60[1]	35.2
2003-04	30.6	5	30.6	30.6	30	15-60[1]	30
2004-05	30.6	5	30.6	30.6	30.6	15-60[1]	30.6
2005-06	30.6	5.1	30.6	30.6	30.6	15-60[1]	30.6
2006-07	30.6	5.1	30	30.6	35.9	20-67.7[1]	35.9
2007-08	30.9	5.15	30	30.9	36.1	20.1-68.3[1]	30.1
2008-09	30.9	5.15	30	30.9	36.1	9.4- 20.1- 68.3[2]	30.1
2009-10	30.9	5.15	30	30.9	36.1	9.4-68.3[2]	30.1
2010-11	30.9	5.15	30	30.9	36.1	9.4-68.3[1]	30.1
2011-12	30.9	5.15	30	30.9	36.1	9.4- 68.3[1]	30.1
2012-13	30.9	0	36.1	30.9	36.1	0- 68.3[1]	30.1
2013-14	30.9	0	36.1	30.9	36.1	15- 68.3[1]	30.1
2014-15	30.9	0	36.1	30.9	36.1	15-68.3[1]	30.1
2015-16	30.9	0	36.1	30.9	36.1	15-68.3[1]	30.1

1. TRQ for import up to 10 000 tonnes; normal duties apply beyond TRQ.
2. Duty exemption up to January 2008; normal TRQ duty applicable beyond.
Source: Saini and Gulati (2017), drawing on Goyal (various issues). Includes basic duty and, where applicable, educational cess, countervailing duties, and special countervailing duties.

Annex Table 3.A.8. Summary of stock limits for pulses, oilseeds and oils by state

State	Type of dealer	Stock limits		
		Pulses	Edible oilseeds	Edible oils
Andhra Pradesh	Wholesalers and retailers in given cities	No limit	Different specific limits between 7.5 and 225 tonnes	No limit
Chhattisgarh	Not specified	100 tonnes	100 tonnes	50 tonnes
Gujarat	Not specified	No stock limit on any commodity under ECA but limit applies when price fluctuates in the market. Government may decide when it is required under ECA.		
Haryana	Dal mills	1/24th of grinding capacity (raw); 1/48th of grinding capacity (finished)	No limit	1/24th of grinding capacity (raw); 1/48th of grinding capacity (finished)
	Dealers	25 tonnes	150 tonnes	150 tonnes
	Retailers	No limit	2.5 tonnes	No limit
Maharashtra	Wholesalers and retailers in given types of cities	Different specific limits between 15 and 350 tonnes	Different specific limits between 200 and 2 000 tonnes	Different specific limits between 2 and 100 tonnes
Odisha	Producer	1/6th of quantity used in earlier years		
	Dealer	75 tonnes	50 tonnes	75 tonnes
Punjab	Dealers, wholesalers, distributors, retailers	50 tonnes or 1 000 tonnes	No limit	4 tonnes or 100 tonnes
Rajasthan	Wholesalers	200 tonnes	No limit	No limit
	Retailers	2.5 tonnes	No limit	No limit

Note: Source does not indicate applicable year but is likely around 2015.
Source: Government of India (2016o).

Annex Table 3.A.9. Descriptions of legal provisions regarding slaughter of cow and buffalo, selected states

State	Law	Details
Andhra Pradesh	The Andhra Pradesh Prohibition of Cow Slaughter and Animal Preservation Act, 1977	Slaughter of cows (includes a heifer or a calf, male or female of a cow) or calves of she buffaloes is prohibited. No certificate shall be granted to slaughter if the animal is fit for: breeding, draught or any kind of agricultural operations, giving milk or bearing offspring. Buffalos below age of 8 are not allowed.
Assam	Assam Cattle Preservation Act, 1951, amended in 1963	Prohibits slaughter of cattle. No certificate shall be issued unless: the cattle is over 14 years, unfit for working or breeding, the animal has become permanently incapacitated.
Gujarat	The Bombay Animal Preservation Act, 1954 (applied to Gujarat)	No certificate for slaughter shall be granted in respect of a cow, the calf of a cow, whether male or female and if male, whether castrated or not, a bull or a bullock; total ban on slaughter of bull and bullock was not upheld by the honourable Gujarat high court.
Himachal Pradesh	Cow Slaughter Act, 1979	Cow slaughter is banned.
Jammu and Kashmir	The Ranbir Penal Court, 1932	Cow slaughter is banned. Buffalo allowed for slaughter and industrial production of meat for domestic and export of meat.
Jharkhand	There is no law related to beef consumption	Cow slaughter is permitted.
Karnataka	Prevention of Cow Slaughter and Cattle Preservation Act, 1964. Amended in 1975	Prohibits the slaughter of cow or calf of she buffalo. A certificate for slaughter shall be granted if (a) the animal is over the age of twelve years or (b) the animal has become permanently incapacitated for breeding, draught or giving milk due to injury, deformity or any other cause.
Kerala	No state legislation – only Panchayat Act and Rules	Beef is widely consumed in Kerala and is the cheapest meat available.
Madhya Pradesh	*Gauvansh Vadh Pratishedh (Sanshodhan) Vidbeyak*, 2007	Total ban on cow slaughter.
Maharashtra	Maharashtra Animal Preservation Act, 1976	Permits slaughtering and production of beef through authorised abattoirs set up by local municipal corporations. Buffalo and bullocks above the age of 12-13 years can be slaughtered.
Odisha	Prevention of Cow Slaughter Act, 1960	Killing of cows totally prohibited; bull, bullock is allowed on production of fit for slaughter certificate if the animal is over 14 years of age or has become permanently unfit for breeding.
Punjab	Cow Slaughter Act, 1955	Complete ban on cow slaughter in Punjab.
Rajasthan	Rajasthan Bovine Animal Act, 1995	Slaughter of “bovines” is prohibited. Section 2(b) of the Act defines a "Bovine animal" to mean and include Cow, Calf, Heifer, Bull or Bullock. Section 2(e) defines "Calf" to mean a castrated or uncastrated male of the age of three years and below belonging to the species of bovine animal. (Bovine literally includes cow and buffalo. But in Rajasthan buffalo slaughter is permitted whereas cow slaughter is banned).
Tamil Nadu	Tamil Nadu Animal Prevention Act, 1958	Slaughter of cows and heifers is banned in all slaughterhouses in Tamil Nadu.
Uttar Pradesh	The Uttar Pradesh Cow Slaughter (Prevention) Act, 1955; Amended in 2002	Blanket ban on cow slaughter; no person shall slaughter or cause to be slaughtered or offer or cause to be offered for slaughter a cow, bull or bullock in any place in Uttar Pradesh.
West Bengal	The West Bengal Animal Slaughter Act, 1950	Fit for slaughter certificate is required. Animals included in the Act are bulls, bullocks, cows, calves and buffaloes of all types/ages. Animal must be over 14 years of age and unfit for work or breeding, or have become permanently incapacitated for work and breeding due to age, injury, deformity, or any incurable disease.

State	Law	Details
Delhi	Delhi Agricultural Cattle Preservation Act, 1994	Cow slaughter is banned. Total prohibition on the slaughter of cows, calves, bulls and bullocks defined as "agriculture cattle".
Goa	The Goa, Daman & Diu Prevention of Cow Slaughter Act, 1978.Goa Animal Preservation Act, 1995; amended in 2010.	No person shall slaughter or cause to be slaughtered any scheduled animal in any place in Goa, unless he has obtained in respect of such animal a certificate in writing from the competent authority that the animal is fit for slaughter. No certificate shall be provided if in the opinion of the competent authority 1) the scheduled animal, if male is likely to become economical for the purpose of draught or any kind of agricultural operation, 2) for breeding, if male, 3) if female, milking, bearing offspring.

Note: Interpretations and imprecision in source are reproduced without further clarification.
Source: FICCI (2013), referring to NABCONS report, *Report of the National Commission on Cattle*, Chapter III, Annex III (1), and Annex II (8).

Annex 3.B. Policy review for other commodities than food grains

Pulses and oilseeds

A large share of India's crop production consists of protein rich crops, such as pulses (dry beans, dry peas, and lentils). Pulses are relatively rich in protein and are therefore a major component of the diet of many consumers who do not consume protein in the form of meat or eggs. India's production of chickpeas has increased considerably since the mid-2000s, accounting for between 43% and 48% of India's yearly pulse production in 2013-14, 2014-15 and 2015-16. Oilseeds production is dominated by soybeans, accounting in some years for close to half of the quantity produced, with groundnuts and rapeseed making up most of the rest.

India is a major importer of pulses, such that about 75% of the availability of pulses for consumption is met by imports. India's exports of pulses, dominated by chickpeas, are much smaller than imports. India's chickpea production consists of Bengal *gram* and white *gram* in roughly an 80:20 proportion. India's chickpeas are exported in the reverse proportion of 20:80. India exports only small quantities of oilseeds but is a significant exporter of oilseeds meal, particularly soybean meal. Some oilseed meal is used in livestock feed rations in India. The situation is different with regard to edible oils, of which about 55% of India's consumption was supplied by imports in 2016-17. However, more than 60% of India's imports of edible oil usually consist of palm oil, leaving minor shares for soybean oil and sunflower seed oil.

The policy environment for, especially, pulses has been very dynamic in recent years. The prices of pulses and oilseeds for some farmers occasionally fall below the MSP (Government of India, 2016g, 2017c). Over a period of several years from 2000 onwards, oilseeds (mainly mustard seed) and pulses (mainly chickpeas) in small or very small quantities, such as a few hundred tonnes, were procured under the PSS implemented by NAFED. Larger quantities were procured in 2004 and 2005. In 2007 to 2012, the wholesale prices of several oilseeds and pulses were generally higher than the MSP in key producing states, although occasional time-limited dips below the MSP occurred for pulses. In the 2010-11 to 2015-16 seasons the actual or recommended MSPs for most oilseeds and pulses were raised in most years, as were the MSPs for rice and wheat. When the production of oilseeds and pulses reached new records in 2013-14, the market price of many of these crops stayed below the MSP for several months and also remained low into the following year in many states. Although groundnuts were procured in 2013-14 and chickpeas in 2014-15, no or almost no procurement took place of other oilseeds and pulses in some years in the 2010-11 to 2016-17 period.

Policy attention has been directed towards ways to enhance the incentives for pulse production not only through the MSPs but also through different practices in procuring, stocking, and disposing of pulses, in the treatment of pulses in the ECA and APMC Act, and in the use of trade policy measures, such as export bans, to influence domestic prices (Government of India, 2016g). However, recent years have seen larger price swings and also higher prices of pulses in India than before, and pulses experienced exceptionally

high domestic market prices in 2015, attributable both to lower production and to market distortions (Government of India, 2016n). The government took the following steps to check the increase in the prices of pulses seen in 2015 (Government of India 2016r):

- Decided to import pulses through the Metals and Minerals Trading Corporation of India (MMTC) with assistance from the Price Stabilisation Fund (PSF).
- Approved the creation of buffer stock of pulses and procurement of about 150 000 tonnes of pulses at market prices above MSP through FCI, NAFED, and SFAC, the latter through Farmer Producer Organisations (FPOs). The target quantity of 50 000 tonnes of *kharif* pulses (urad and tur) was met in 2015, with 100 000 tonnes of *rabi* pulses (chickpeas and lentils) to be procured in 2016.
- Increased the MSP for *kharif* pulses in 2015-16 and provided an additional bonus of INR 2 000 per tonne.
- Designated FCI as the nodal agency for procurement of pulses and oilseeds. SFAC and NAFED the efforts of FCI in procuring pulses and oilseeds.
- Extended the zero import duty on pulses through September 2016.
- Imposed stock holding limits and co-ordinated de-hoarding operations to increase the availability of pulses in the market.

The recommended MSPs for pulses and oilseeds continued to be raised for 2016-17, on grounds that it would help moving towards self-sufficiency in pulses and, it was argued, the domestic price of some oilseeds was below the MSP (Government of India, 2015i). For 2017-18 the CACP justified its recommendations for chickpeas and lentils by a need to provide incentives to farmers to grow pulses. In 2015-16, 2016-17, and 2017-18 a bonus was added to the MSP, at levels corresponding to from 2% to 9% of the MSP, depending on the kind of pulse and the season. The CCEA explained that this was expected to give a strong price signal to farmers to increase acreage and invest to increase productivity of pulses (Government of India, 2015h).

It has been pointed out that procurement at MSP has favoured rice and wheat in spite of attempts to realign the price incentives in favour of pulses and oilseeds (Government of India, 2013d). While the procurement infrastructure for pulses and oilseeds is said to be weak, other factors influencing the extent of procurement at MSP include the limited period when procurement is authorised (Government of India, 2014f, 2016o). Based on a view that procurement was not significant enough to assure farmers of remunerative prices, it has been suggested that decentralised procurement be extended for pulses to state agencies, private agencies and NAFED (Government of India, 2016o).

Other policies affecting the pulses and oilseeds sectors include the efforts in the National Food Security Mission from 2007 and the provision of improved seeds. The Accelerated Pulse Production Program was launched in 2010-11, emphasising plant nutrients and plant protection. Many states impose a variety of limits on the stocks of pulses, edible oilseeds and edible oils that may be held by various actors in the marketing chain, such as producers and wholesalers. These limits can take the form of a specified maximum quantity or a maximum proportion of the quantity the actor used in earlier years (Annex Table 3.A.8).

Sugarcane and sugar

Sugarcane is a major crop in India, accounting for almost 5% of the value of output in agriculture. About 64% of the sugarcane is used to produce sugar, with the rest being used to produce primarily gur and khandsari (Government of India, 2016p).

Dhiwedi (2010) suggests that a much smaller share of sugarcane is used to produce sugar, with a larger share used for gur. Gur, or jaggery, is a crude non-centrifugal sugar in lump form, and khandsari is a low recovery centrifugal sugar. Both are produced using the open pan evaporation method (Reddy, 2011). Gur is mostly consumed in rural households and for feed use, and most khandsari sugar is consumed by local sweet shops (U.S. Department of Agriculture, 2016a). More than 500 mills produce sugar, while more artisan methods are used to produce gur and khandsari.

Sugarcane and sugar are essential commodities under the ECA. They are subject to the Sugarcane (Control) Order, 1966, the Sugar (Control) Order, 1966 and numerous other central and state government regulations. Before 2009 the central government fixed a Statutory Minimum Price (SMP) for sugarcane, and farmers were entitled to half of the profit of sugar mills. However, the profit sharing remained virtually unimplemented and the SMP was replaced by a Fair and Remunerative Price (FRP), established by the CCEA on the recommendation of the CACP. The FRP in 2009-10 was 60% higher than the SMP in 2008-09, which had previously been raised only slowly. The FRP was subsequently raised from INR 1 298.4 per tonne in 2009-10 to INR 2 550 per tonne in 2017-18 (recommended).

Some states announce a State Advised Price (SAP) for sugarcane, usually much higher than the FRP. This is the price sugar mills are required to pay sugarcane producers. For example, in 2012-13, when the FRP price was INR 1 700 per tonne, the SAP in Andhra Pradesh was INR 2 500 per tonne. The SAPs in other states were lower or higher.

Sugar mills have often fallen short in how much of the full price, such as the SAP, they pay to sugarcane producers. This shortfall, called cane price arrears, was 3% of the price payable in 2009-10 but increased to 30% in 2014-15 (observed on 31 May; the percentage is higher on 31 December). In later years the arrears have declined. While the Sugar (Control) Order, 1966 requires payments of interest on arrears, it appears interest has not been paid (Government of India, 2016p). Almost all of the arrears due to farmers were subsequently cleared through several central government policy decisions assisting sugar mills (Government of India, 2017a). Loans were extended through banks on behalf of sugar mills, credited directly to farmers' accounts, along with interest subsidies. Contingent on sugar mills exporting and supplying ethanol, they received a subsidy (INR 45 per tonne of sugarcane) which was payable to farmers against the arrears due to them. Sugar mills were also relieved of excise duty on supply of ethanol for a limited period.

For many years a central government policy required sugar mills to supply 10% of their production to meet the need of the PDS. The release of sugar on the open market was regulated. After a partial deregulation of the sugar sector in 2013, sugar mills are free to sell their total production commercially. State governments are required to purchase sugar for their TPDS needs in the open market. Since the states sell TPDS sugar at a policy-determined Retail Issue Price (INR 13.5 per kg) that is lower than their purchase price, the central government provides a subsidy to the states of INR 18.5 per kg. From 2017 only AAY families (households) are entitled to TPDS sugar (Government of India, 2017aa).

The sugarcane and sugar sectors remain subject to many kinds of regulations (Government of India, 2014g, 2016p). For instance, every designated mill is obligated to purchase sugarcane from farmers within a specified cane reservation area and, conversely, farmers are bound to sell to that mill. The central government has prescribed a minimum radial distance of 15 km between any two sugar mills. A limit on the stock of

sugar a sugar mill can hold applied in certain months in 2016. The central government's Sugar Development Fund supports the development of sugarcane and the industry using sugarcane, including ethanol production. It receives revenue from a levy and a cess imposed on sugar. The centrally sponsored scheme, National Food Security Mission-Commercial crops (sugarcane), operates in many states from 2014-15, aiming to enhance production and productivity in sugarcane based cropping systems.

Exports of sugar have at various times been supported through export subsidies and restricted or prohibited (Saini and Gulati, 2017). An export duty of 20% applied in 2016 (Government of India, 2017a). Import duties on sugar have varied greatly (Annex Table 3.B.1). Duty free imports of 0.5 million tonnes of raw sugar were allowed in 2016-17 (Government of India, 2017a).

Annex Table 3.B.1. Import duty on sugar

Starting date	Duty (%)
February 2000	60+
June 2006	0
October 2006	60+
April 2009	0
July 2012	10
July 2013	15
July 2014	25
April 2015	40

Source: Saini and Gulati (2017) (from Indian Sugar Mills Association).

Cotton and jute

Between 2000-01 and 2013-14, India's cotton production increased by 184% from 2.4 to 6.0 million tonnes, a result of area increasing by 39% and yield by 104% (Growth of Indian Cotton, Government of India, 2017s). Although yield stayed about the same in 2013-14 and 2016-17, India's cotton area declined, such that 2016-17 production was projected to fall below its 2013-14 peak. India was the world's largest producer and second largest exporter of cotton in 2014-16, accounting for about 26% of world production and 13% of world exports (OECD/FAO, 2017). While India imports significant quantities of cotton, its share in world imports is much smaller than that of exports.

The doubling in cotton yield is in large measure related to the adoption of Bt (*Bacillus thuringiensis*) cotton. In early 2002 India's Genetic Engineering Appraisal Committee (GEAC), under the Ministry of Environment, Forest and Climate Change, approved the use of three Bt hybrids for commercial cultivation, followed by the approval of additional Bt hybrids (Government of India, no date; Shah, 2012). Adoption of insect-resistant Bt cotton was rapid, such that already by 2008 Bt cotton was grown on about 80% of the total cotton area (ISAAA, 2016). The Bt share reached 96% of total cotton area in 2016. The total cotton area and Bt cotton area had peaked in 2014 and 2015, respectively, but the adoption rates in those years were lower than in 2016.

Raw cotton (seed cotton, kapas) is an essential commodity under the ECA. It is subject to the APMC Acts of various states, requiring producers to sell through designated market yards. Cotton seed, an oilseed that is a joint product with cotton lint, has at various times been an essential commodity under the ECA (Government of India, 2009). The Cotton

Corporation of India (CCI), operating under the Ministry of Textiles, buys seed cotton directly from cotton farmers through auctions conducted by APMCs in APMC yards (Operations, Government of India, 2017s). Operating in all eleven cotton growing states in 341 (in 2017) procurement centres and satellite centres, the CCI purchases seed cotton through open auction in competition with other traders under the supervision of APMC officials. The CCI purchases seed cotton either at MSP or in commercial operations (Procurement, Government of India, 2017s). In 2015-16, the CCI undertook a "massive MSP operation in all the cotton growing states and there was no commercial operation" (Government of India, 2016a). It is reported that the CCI was not involved in any MSP procurement in early 2016-17 but it made some commercial purchases (U.S. Department of Agriculture, 2017). The CCI sells the processed or baled cotton at market prices. Any losses incurred in the operation are borne by the government.

The CCEA determines the MSP for two basic varieties of seed cotton. The Office of the Textile Commissioner then fixes the MSP for other varieties of seed cotton. When the price of seed cotton touches the MSP, the CCI immediately purchases seed cotton at the MSP without any quantitative limits (Procurement, Government of India, 2017s). When the quality grade of the raw cotton offered falls below the prescribed grade for MSP, the CCI purchases it at reduced prices. While the CCI purchases most of the procured raw cotton, procurement of smaller quantities at MSP is also carried out by NAFED and the Maharashtra State Cooperative Cotton Growers' Marketing Federation, acting as a sub-agent of the CCI (Government of India, 2017e). State government officials, including APMC officials, have been requested to ensure that only bona fide cotton farmers sell cotton to the designated agencies, without involving agents, middlemen or traders (Government of India, 2017e).

A Price Deficiency Payment System (PDPS) to ensure the provision of MSP to cotton farmers was under consideration in 2016, pending pilot testing and study to ensure its operational feasibility (Government of India, 2016n). It would require tracking of market prices, prices realised by farmers and the quality of cotton. A mechanism to transfer the deficit payment to farmers would be needed.

The CCI has carried out a variety of activities to develop cotton production (Developmental Activities, Government of India, 2017s). While most such activities have been shifted into the Technology Mission on Cotton, the CCI supplements the efforts of other central government schemes and of state agricultural departments. The CCI activities have included development of contract farming and supply of inputs, such as seeds and fertiliser. Against a background of several states having fixed different levels of sales price of Bt cotton seed, the central government in December 2015 issued a control order under the ECA, authorising the fixing of a uniform India-wide maximum sales price of Bt cotton seed to farmers (Government of India, 2015d). A decision in March 2016 then fixed the price of cotton seed slightly below the price earlier observed (Government of India, 2016e; Gulati and Sarkar, 2016). The decision also regulates how much a seed producing company would need to pay to the company holding the patent on the technology.

From 2001 India's quantity restrictions on exports of cotton were removed, and exports of raw cotton were free, needing only registration with the Textile Commissioner. A large increase in MSP in 2008-09 raised domestic prices, which made India's cotton less competitive in export markets. An export duty was imposed in April 2010, and cotton exports were restricted in May 2010. Exports were allowed at zero export duty in August 2010, with the restriction that export contracts be registered with DGFT. A ban on

cotton exports applied for a week in 2012. Exports of cotton have since been free and the registration requirement has been lifted. India's applied import duties on cotton (H-4 variety) were 5.5% in 2000-01, then rising to a high of 14.7% in 2007-08 and 2008-09. From 2012-13 they were set at zero (Saini and Gulati, 2017).

India produces more than half of the world's jute. Jute is produced in the eastern and north-eastern regions of India, where it can be an important rainfed crop. While yields per hectare have increased from 2000-01 to 2016-17, hectarage and production have followed a declining trend (Government of India, 2016m). A major policy interest in jute comes from the requirement that 90% of food grains, such as wheat and rice, and 20% of sugar be packed in jute bags under the Jute Packaging Materials (Compulsory Use in Packing Commodities) Act, 1987, as amended. In recent years sacking has accounted for more than 70% of the total production of jute goods. Most of the sacking required for food grains packing is purchased by the government directly from jute mills.

The Jute Corporation of India (JCI) undertakes procurement of jute from producers at MSP set by the CCEA. Since market prices have generally been above the MSP, procurement has ranged only from zero to 3.7% of market arrivals of total raw jute in the 2010-11 to 2015-16 period (Government of India, 2016m). Somewhat larger shares of arrivals were procured in the early 2000s. Several jute development programmes aim at increasing jute production and enhancing productivity, including the Jute Technology Mission and a part of the National Food Security Mission. India is a net importer of raw jute and net exporter of jute products. Exports of both commodities are free and no export duty applies. The import duties on raw jute and on jute products have been reduced over time to the 5% and 10% applying in 2017.

Fruit and vegetables

Fruit and vegetables account for as much as 16% of the value of output in India's agriculture (average 2011-12 to 2013-14). The number of different fruits and vegetables produced is large: the Government of India tracks value of output of 53 individual fruits and vegetables, not counting floriculture (Government of India, 2016s). The individual vegetables with the largest values of production are potatoes, onion, tomatoes and eggplant (brinjal), each accounting for roughly 1% of value of production in agriculture on average in 2011-12 to 2013-14. The individual fruits with the largest values are mango (2%) and bananas (1%). India ranks as the second largest producer in the world in terms of quantity of potatoes, onion, tomatoes and eggplant, and the largest producer of mango and bananas. The quantity of production in horticulture has over many years increased more rapidly than the production of food grain, a result of increases in both area and yield (Government of India, 2016r).

The government has encouraged the production of fruit and vegetables, especially from 2005-06 when the National Horticulture Mission (NHM) was launched. This was a centrally sponsored scheme to promote growth of the horticulture sector through regionally differentiated strategies. These involved diversification from traditional crops, extension of appropriate technology, and improved post-harvest management and capacity building. In 2010 the mission was reformulated such that, in addition to research, extension and farmer training, financial assistance and subsidies were provided for numerous activities: nurseries for production of seeds and planting materials, infrastructure for production of vegetable seeds, rejuvenating out-of-date plantations, creating water sources and protected cultivation (greenhouses etc.), developing precision farming, setting up post-harvest facilities, and many more.

In 2014-15 the NHM was subsumed as part of another centrally sponsored scheme, the Mission for Integrated Development of Horticulture (MIDH). This scheme includes also the National Horticulture Board (NHB) and several minor missions. As well as carrying out many activities similar to those of the NHM, the MIDH provides assistance for cold storage and market infrastructure (Government of India, 2014e). The NHB develops and promotes horticulture, subsidises investment in cold storage facilities, and operates a market information service.

In contrast to other crops, government-set minimum support prices do not apply for horticultural crops. The prices producers receive are conditioned by the structure and conduct of the marketing chain from producers to consumers, whether in India or abroad. Numerous studies have identified shortcomings, including poor transport and storage infrastructure and fragmentation of the supply chain attributable to policies that inhibit integration and competition (e.g. Mattoo et al., 2007). Low market efficiency in horticulture has been attributed to factors such as the large number of intermediaries, malpractices in auctions, inadequate storage and marketing facilities, and high market fees (NCAP, 2010). Such factors could be behind the phenomenon that the producer prices of the fruits and vegetables studied here mostly fall below the border price adjusted downwards by a standard margin.

While India imports only minuscule quantities of most fruit and vegetables, tariff protection against imports applies at levels somewhat higher than 30% for potato, mango, and banana (Annex Table 3.A.7; also section 3.4). Tariffs on onion imports, while having been much lower at around 5% and even set to nil since 2012-13, have varied over time. In contrast to other vegetables, exports of onion are affected by a variety of policy measures, applied differently in different years (Table 3.10). They include minimum export prices, export restrictions, export bans, state trading requirements, and other measures.

Commodity boards are active with regard to plantation crops (tea, coffee, rubber, spices, cardamom, cashew nut, and coconut), coir, silk, and tobacco. These boards have a broad range of functions relating to the production, processing and marketing of the respective commodities.

Milk and dairy

India is the world's largest producer and consumer of milk and has by far the world's largest milking herd. Milk accounts for as much as 20% of the value of output in India's agriculture. India's herd of milk producing bovine animals consists of an exotic/crossbred category, an indigenous category, and buffaloes (Annex Table 3.B.2). The herd of exotic/crossbred animals is expanding faster than the other categories. The exotic/crossbred category, comprising many crosses, has in general higher milk yield per cow per day than buffalo and, in particular, indigenous breeds. Buffalo milk has considerably higher contents of fat and somewhat higher contents of protein than milk from the other categories of animals. Buffalo cows account for more than half India's bovine milk production. A few per cent of total milk production derives from goats, sheep and camels.

Annex Table 3.B.2. Share of bovine herd and milk production, by breed category, 2014-15

	Exotic/crossbred	Indigenous	Buffalo	Total
	%	%	%	%
Share of bovine milk animals	16.5	37.1	46.4	100.0
Share of bovine milk production	26.2	20.9	52.9	100.0

Note: Some observers with industry experience indicate that the share of buffalo in bovine milk production is a couple of percentage points larger than shown here.
Source: Calculated from Table 89, Government of India (2015b).

An enabling institutional and policy environment stimulated rapid growth in milk production from about 1970. This initiative emphasised farmers' access to markets, and animal productivity. A three-tier co-operative structure developed, where co-operative societies at the village-level form a milk union at the district level, which form a federation of milk unions at the state level. Almost half of India's milk production is consumed by the household in which it is produced and is not marketed (Landes et al., 2017). About 33% of milk production is channelled to consumers through the small and informal sector, such as local sweet shops and other retail (Government of India, 2017w). Most of the marketed milk is thus handled by small-scale vendors. Cooperatives and private firms each handle, respectively, about 8% and 7% of all milk produced (Landes et al., 2017). Milk prices are determined by the co-operative and private dairy sectors on the basis of market conditions and are not regulated by the central government (Singh, 2014).

Improved animal productivity is now pursued under the National Dairy Plan (NDP), in effect until 2019. It emphasises genetic improvement through high genetic merit cattle, high-quality semen, and artificial insemination delivery and animal nutrition through feed development and balanced rations. A very large share of dairy animal feed in India consists of crop residues rather than the compound feeds used in many other countries (Landes et al., 2017). The NDP also seeks to strengthen village milk collection through milk weighing, testing, and cooling, and to develop milk-producer companies in order to improve the business orientation of the milk purchasing network.

The National Dairy Development Board (NDDB) is primarily responsible for implementing the NDP, along with numerous initiatives under the Department of Animal Husbandry, Dairying, and Fisheries (DAHDF) of the MAFW. These include the Livestock Health and Disease Control, which provides financial assistance to state governments to support animal disease control through immunisation and improve veterinary capacity and diagnostic laboratories for many animal diseases. The NDDB was created in 1965 to promote, finance and support producer-owned and controlled organisations. Operating under the DAHDF, it seeks to strengthen farmer co-operatives and support national policies that are favourable to the growth of such institutions. Cooperative principles and strategies are fundamental to NDDB's efforts.

After many years as a net importer of milk powder and butter oil, India is since the early 2000s a growing net exporter of mainly milk powder and casein products as well as some butterfat products and infant formula. The main imports have in recent years shifted from milk powders to lactose and whey products.

Dairy import policy has been subject to change based on domestic market conditions. Most dairy products face a basic tariff of either 30% or 60%, and also require import permits and sanitary certificates. Imports of skimmed milk powder (SMP) and butter oil

imports are regulated by tariff rate quotas (TRQs). In early 2017, the TRQ for SMP was 10 000 tonnes at a tariff of 15%, with an above-quota tariff of 60%. The TRQ for butter oil was 15 000 tonnes at a tariff of zero% and an above-quota tariff of 40% (Annex Table 3.B.3). For SMP, the import quantity allowed under the TRQ has been raised, and the in-quota tariff reduced to zero when domestic supplies are tight. Designated public and private Indian organisations can apply to the Ministry of Commerce and Industry for TRQ allocations.

Annex Table 3.B.3. Tariff rate quotas (TRQ) on skimmed milk powder and butter oil, early 2017

Product	TRQ	In-quota tariff	Out-of-quota tariff
	Tonnes	%	%
Skimmed milk powder	10 000	15	60
Butter oil	15 000	0	40

Source: Saini and Gulati (2017).

Import policies for animals and genetics to upgrade India's bovine herd give preference to import of semen and embryos rather than live animals. The MAFW requires strict health, progeny testing, and animal traceability standards for imports of bovine semen and embryos. Some state governments impose additional requirements. Imports of dairy products from some countries can be affected by India's rules on the feed used to produce the milk, such as excluding ingredients of certain animal origin. A ban on imports of milk and dairy products from China was imposed in 2008 and remains in place.

Exports of dairy products are regulated under the Export (Quality Control and Inspection) Act of 1963, its Export (Quality Control and Inspection) Rules (1964), and the Export of Milk Products (Quality Control, Inspection, and Monitoring) Rules set in 2000. Exporters require a certificate from the Export Inspection Council of India approving the manufacturing unit, and a health certificate by an Export Inspection Agency for the products processed in the approved plant, in addition to which exported dairy products must meet various central and state government statutory requirements. While there are no tariffs, taxes, levies, or quantitative restrictions on exports, *ad hoc* changes in export policy are made. A ban on exports of SMP and certain other dairy products, which applied from February 2011 in an effort to curb increases in the price of milk, was partially lifted in June 2012 and completely lifted in November 2012. In June 2012, the government included SMP under the VKGUY export support scheme concerning transport costs. However, when the possibility of lower milk production due to a feed shortage emerged because of deficient monsoons, this support was withdrawn in July 2014 due (Saini and Gulati, 2017).

Bovine meat

The bovine meat sector in India separates into two distinct components, based on genus: cattle (*Bos* spp.) and water buffalo (*Bubalus* spp.) In 2015 buffalo meat accounted for 90% of India's total production of buffalo meat and cattle meat (Landes et al., 2016). Slightly more than half of India's production of buffalo meat was exported, making India the world's largest exporter of bovine meat.

Particularly restrictive rules apply to the production and exports of cattle meat (beef). India's Constitution assigns specific responsibilities to the states, as opposed to the

centre. The Constitution articulates as a "Directive Principle" that the states shall take steps to prohibit the slaughter of cows, calves, and other milk and draught cattle. Among the responsibilities assigned to the states are the "Preservation, protection and improvement of stock and prevention of animal diseases; veterinary training and practice." It has been interpreted as giving the states the legislative power to prevent slaughter. The Constitution also gives the centre and the states the concurrent responsibility to prevent cruelty to animals.[1]

Many Indian states and union territories have policies addressing cattle slaughter and the interstate movement and trade of live cattle and animal products. However, the legislation is often dissimilar across states, including the legal definitions for calves, bulls, and bullocks, which makes it difficult to generalise (Annex Table 3.A.9). One source indicates that cow slaughter is banned in 17 states, while cow slaughter is allowed in three other states with a certificate of fitness for slaughter (U.S. Department of Agriculture, 2015). Slaughter of bulls and bullocks is allowed in a larger number of states with such a certificate. The criteria for a certificate vary across states but can require, e.g. that the animal be over 14 years of age, unfit for work or breeding, or permanently incapacitated for work and breeding due to age, injury, deformity, or any incurable disease.

Buffalo meat produced in India is primarily from animals raised by dairy farmers, not on dedicated farms for meat production. Feed materials consist of dry roughage supplemented with seasonal green fodder and concentrates. Farmers rear buffalo until they reach an unproductive age and thereafter sell them at the livestock market or, more commonly, to traders who also buy at livestock markets. Traders use the services of butchers at municipal slaughterhouses. For domestic sales, the buffalo meat is collected by wholesale meat dealers or directly by retailers. For export sales, traders sell animals to exporters for slaughter at the exporter's unit from where the meat is shipped. The rules for meat exports are summarised in the trade policy section below.

In connection with the observations that farmers do not see raising male buffalo calves as remunerative and that the mortality of male buffalo calves is high, the central government funds the programme for Salvaging of Male Buffalo Calves (Government of India, 2016l). Implemented by state governments or by APEDA (for industrial scale rearing units), it seeks to increase the availability of meat for exports and the domestic market and enlarge the raw material base for the leather industry. The beneficiary is required to take a bank loan and the subsidy is thus channelled through NABARD.

About 4 000 registered slaughterhouses, along with more than 25 000 unregistered slaughtering premises, serve the domestic market (Government of India, 2017o). The export market is served by 27 integrated meat processing plants (abattoir and processing), along with 67 plants for processing only.[2] Plants are required to meet the standards of APEDA, including slaughter according to halal standards. Since 2008 the central government's Ministry of Food Processing Industries has operated a scheme to set up and modernise abattoirs, first as a central scheme and from 2014 as a centrally sponsored scheme in co-operation with state governments (Government of India, 2013c, 2016j). The National Livestock Mission of the MAFW operates a scheme to establish, modernise and expand rural slaughterhouses.

The prevention of cruelty to animals is a central government subject, administered by the Ministry of Environment, Forest and Climate Change. In May 2017 it issued new rules restricting the sale and purchase of animals through livestock markets for slaughter (Government of India, 2017x). The owner of the animal (or his agent) must state in

writing that the animal is not brought to the market for sale for slaughter. The purchaser of the animal, who must be a farmer ("agriculturist"), is not allowed to sell the animal for the purpose of slaughter. The restrictions apply to both cattle and buffaloes and could have significant implications for the structure of India's meat and milk industries.

Sheep meat, poultry meat and eggs

For this report, sheep meat and goat meat are treated as one under the heading 'sheep meat'. Sheep and goats together accounted for as much as 20% of India's meat production in 2015-16 (Government of India, 2015b). In contrast to the corresponding sectors in many other countries, goat meat production was almost twice as large as sheep meat production. The production of meat from sheep and goats is combined with the production of milk and wool from these animals. Support for the production of sheep and goats under the National Livestock Mission focuses on the improvement of breeds and strengthening of the animal health status. The applied MFN tariff on imports of sheep meat and goat meat is 30%, while the bound rate on most such imports is 100%. The Merchandise Export from India Scheme (MEIS) and duty drawbacks through APEDA do not apply to exports of sheep meat and goat meat. Between 1% and 2% of the total production of sheep meat and goat meat is exported.

Poultry accounts for a major and growing part of all meat production in India. In 2013-14 poultry meat made up 36% of all meat production and in 2015-16 that share was 46% (Government of India, 2015b). This large share resulted from several decades of rapid production growth. The industry structure in poultry meat differs in several ways from that of other agricultural commodities in India. More than 80% of India's chicken output is produced by organised commercial farms, among which vertically integrated operations produce 60-70% of India's total chicken production (U.S. Department of Agriculture, 2016b). The vertical integration encompasses hatcheries, feed mills, and slaughter facilities and can also include the provision of credit, veterinary medicines and extension services. An integrator contracts the raising of chicks to slaughter weight with multiple, sometimes hundreds, of farmers ranging in size from a couple of hundred to 50 000 birds. Maize and soybean meal make up about three-quarters and one-quarter, respectively, of all poultry feed, and it is estimated that more than half of India's maize production is used for poultry feed (U.S. Department of Agriculture, 2016b). More than 90% of the sales of poultry meat is in the form of live birds rather than freshly slaughtered meat. In the egg sector, production more than doubled between 2000-01 and 2015-16 (Government of India, 2017v).

A part of the central government's National Livestock Mission, operating since 2014-15, supports the poultry sector through the development and modernisation of breeding infrastructure and central poultry development organisations offering training for productivity improvement, with some focus on backyard production. The Ministry of Food Processing Industries' scheme for Modernization of Abattoirs assists the establishment of modern abattoirs and the modernisation of existing ones through financial grants, and the ministry also assists the creation of integrated cold chain and cold storage facilities (U.S. Department of Agriculture, 2016b). Some states support the establishment and operation of egg and broiler production. For example, Uttar Pradesh supports such enterprises by means of interest subsidies and exemption from several duties and taxes, while Andhra Pradesh and Odisha support both poultry producers and processors through similar means as well as through capital subsidies or loan guarantees. The FSSAI regulates the poultry slaughter and processing sector through, e.g., the

enforcement of sanitary standards. India permits 100% foreign direct investment in the food processing sector.

Imports of poultry meat to India face applied MFN tariffs ranging between 30% (whole chicken, fresh or chilled) and 100% (fresh and frozen cuts) (WTO, 2015b). Sanitary import permits, issued by the Department of Animal Husbandry, Dairy and Fisheries, must be obtained prior to shipment from the country of origin. The bound rate on most poultry meat imports is 100%. India's exports of poultry meat are small, having been hindered by weak standards in slaughtering and processing, inadequate cold chains, and periodic outbreaks of avian influenza. APEDA is charged with promoting and developing exports of poultry and poultry products. APEDA supports the exports of certain egg products through the MEIS and duty drawbacks.

Notes

[1] The Directive Principle about slaughter is Article 48 of the Constitution: "The State shall endeavour to organise agriculture and animal husbandry on modern and scientific lines and shall, in particular, take steps for preserving and improving the breeds, and prohibiting the slaughter, of cows and calves and other milch and draught cattle." The states' responsibility for preserving stock is item 15 of the constitution's "List II – State List". The item about preventing cruelty is item 17 of "List III–Concurrent List".

[2] It is also reported that there are 49 registered export-oriented buffalo slaughter and processing facilities, along with 39 facilities that handle only processing and 11 that handle only slaughter (Landes et al., 2016).

Chapter 4. Making India food secure while ensuring farmer income security in an inclusive and sustainable manner

The chapter describes the food security policy instruments used in India, with a focus on the Targeted Public Distribution System (TPDS). Scenarios developed for the purposes of this report examine what would happen over the medium term if the TPDS remains in place compared to a situation where the public grain distribution is gradually and partially replaced by cash transfers. The analysis shows that significant benefits could accrue, across many dimensions of policy performance. As India's TPDS is also used to support producer incomes, special attention is given to what reforms are needed to ensure producer incomes do not suffer as a result of policy moves to enhance the effectiveness and efficiency of the TPDS.

4.1. Introduction

India is the world's second most populous nation, home to 18% of the world's population in 2015 (World Bank, 2017a). As a developing country, it also contains a significant proportion of the world's poor and undernourished. The FAO estimates that in India alone 191 million people were undernourished in 2014-16 – representing 24% of the total number of undernourished people worldwide. For this reason, addressing food security represents an enormous challenge for the Indian Government.

Food security is a multidimensional problem requiring policy interventions across a range of different areas. According to the FAO definition agreed at the 1996 World Food Summit and expanded upon at the 2001 Summit, food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. This definition suggest that people will only be food secure when sufficient food is available, they have access to it, and it is well utilised. The fourth requirement is that those three dimensions are stable over time.

In response to the food insecurity challenge that India faces, the Indian Government has in place a number of programmes and policies that seek to ameliorate the problem. Some of these programmes are vast and supported by a large governmental infrastructure that purchases food grains, mainly wheat and rice, from producers and subsequently supplies it at low cost to vulnerable households and individuals (Chapter 3). It is unquestioned that in implementing these programmes there have been successes and the Indian Government has been able to make inroads into addressing the issues of food security faced by a large number of its population. However, as with all government programmes, questions remain whether more could be done, or given tight and scarce fiscal resources, whether what is being done can be delivered in a more efficient and effective manner. In this light, some of the current programmes used have not been without criticism. Various studies have argued that changes could be made to improve the effectiveness of the programmes in achieving government's legitimate objective of addressing food insecurity, and at the same time, there are options which would help to reduce the costs of food security related interventions. With the high cost of current programmes and the unaddressed large size of the problem, exploring such 'win-win' outcomes is worthwhile.

This chapter takes a look at the major agriculture-based food security programme used in India – that of the Targeted Public Distribution System (TPDS) – and explores its impacts on agricultural production, markets and food security. It also explores the effects of possible reforms and alternatives to test whether there are other approaches or adjustments that may help the Indian Government to improve its efforts to address food security while providing a framework for the market to also play its role through both improving consumer access to food and enhancing producer incomes.

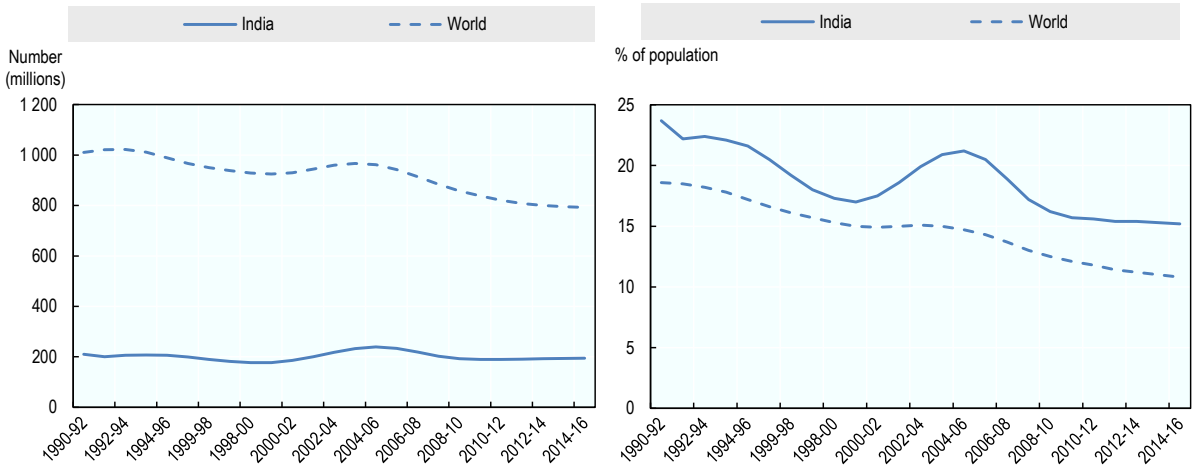
The rest of the chapter is structured as follows. In section 4.2 a brief overview of India's current food security situation is provided. Section 4.3 details the current major agriculture-based food security programmes. Their effectiveness is discussed in section 4.4. Alternative policies are then assessed in section 4.5 in terms of their impacts on markets and food security as measured by rates of undernourishment. Alternatives to address issues of producer incomes are discussed in section 4.6.

4.2. Overview of food security in India

India's share of the world's undernourished population exceeds its share of the world's population indicating that it houses a disproportionate number of the world's poor. Since the early 1990s, the number of undernourished people in India has remained relatively stable – with only a reduction of 15 million in the number of undernourished between 1990-92 and 2014-16 (Figure 4.1). This relatively small change in the number of undernourished is due to strong population growth among the poor, with more significant changes seen in the proportion of the population who are undernourished – falling from around 24% in 1990-92 to 15% in 2014-16 (FAO, 2017).

Figure 4.1. Undernourishment in India

1990-92 to 2014-16



Source: FAO (2017).

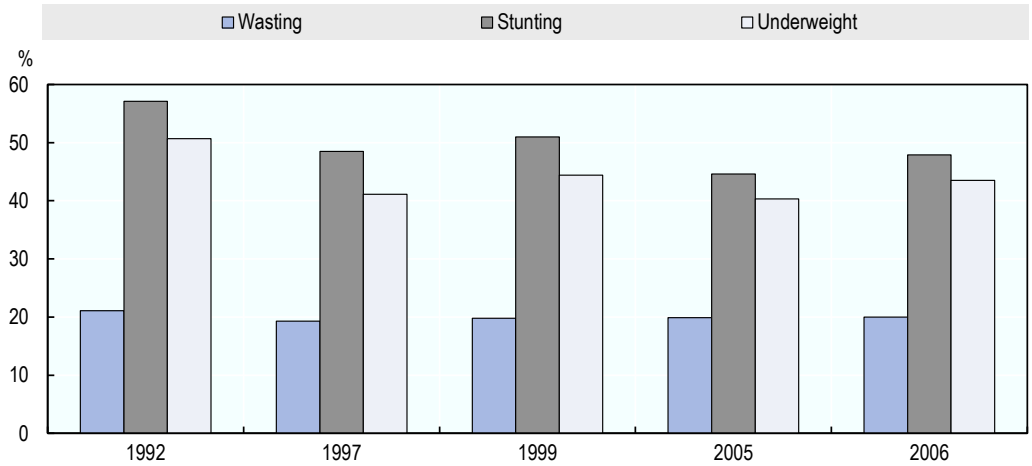
Changes in the proportion of the population who are undernourished also point to a large share of households who are at risk of undernourishment. For example, between 2002-04 and 2008-10 undernourishment rates increased significantly, offsetting past gains. This impact was partly driven by stronger food price rises over the period. Since then, levels of food insecurity have fallen again but the pace at which this is occurring in recent years is slower than that seen in the early 1990s.

Other indicators show mixed trends in food security. Rates of stunting (being short for a child's age relative to population and demographic benchmarks) in children under 5 years of age point to a lack of food, nutrition or utilisation of food to a significant enough degree that it limits a child's growth. Thus it shows the cumulative impact of food insecurity that may occur over time but which may not be fully captured in annual statistics of undernourishment. Rates of wasting (low weight for height) on the other hand, generally depict more acute episodes of food insecurity. Underweight estimates combine information about growth retardation and weight for height and thus point to the combined effect of both. While data for India is not frequent, and latest available estimates relate to 2006 (around the time of the spike seen in undernourishment figures), the indicators point to contradictory changes in food security. Rates of both stunting and underweight in children under 5 years of age fell between 1992 and 2006 by around 10

and 7 percentage points respectively (Figure 4.2). Rates of wasting, however, remained stable. These trends point to some general improvements for the population, but suggest that there remains a core disadvantaged group who are vulnerable to food insecurity and this has persisted over the period.

Figure 4.2. Wasting, stunting and underweight children in India

% of children under 5 years of age, available years



Source: FAO (2017).

There are also broader issues of malnutrition. India has both significant number of people that are undernourished (as shown above) and a significant number who are overweight and obese. Further, micronutrient deficiencies are high with, for example, 53% of women aged 15-49 and 22.7% of men aged 15-49 being anaemic in 2015-16 (International Institute for Population Sciences, 2017).

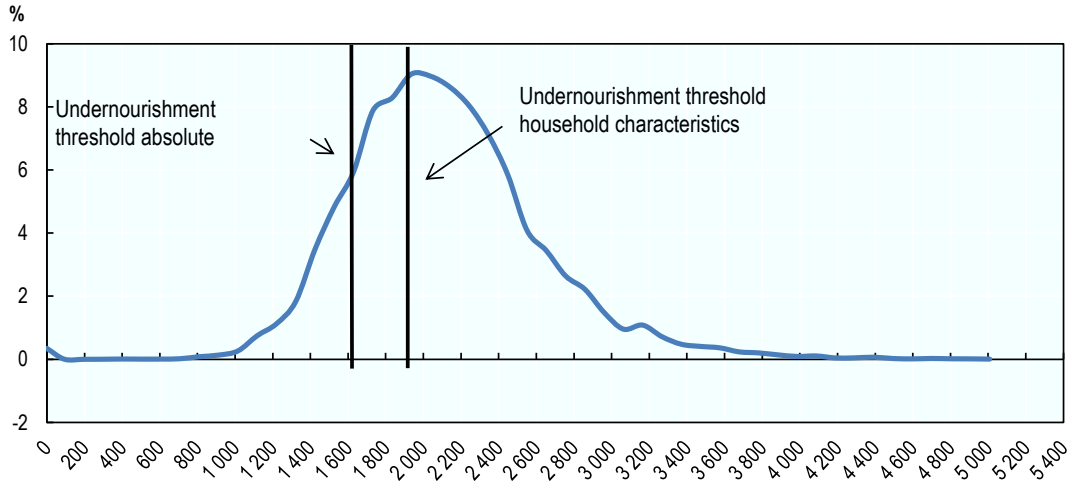
Exploring consumption patterns in the 2011-12 National Household Expenditure survey provides another lens to examine undernourishment. Due to the differences in the accounting of food availability (based on stated purchases as opposed to computed from national level food balance sheets as done by the FAO), the proportion of population that appears to be undernourished can differ significantly from the FAO estimates. There are numerous reasons for this – ranging from underreporting of food purchases to the significant difficulties associated with working out the calorie content of purchased foods and meals taken outside the home. As such, it is more useful to explore the distribution of undernourishment and its properties to gain a picture or how many households sit close to any undernourishment threshold. Given the issues in calculating undernourishment levels, two thresholds are explored – one which balances the numbers of undernourished in the survey approximately to the numbers calculated by the FAO, and one that accounts for household member characteristics and where they live.[1]

The distribution of calorie intake derived from the survey shows that a significant proportion of individuals have calorie consumption levels that are close to the thresholds. For example, approximately 16% of the population is situated between the two thresholds (Figure 4.3). The results suggest that at any given level of undernourishment, there are a significant amount of people who are at risk of undernourishment in India. This high number of people who lie close to the undernourishment thresholds, however, do not only

pose risks for India but also offers it opportunities. Most notable, the risks relate to events that may push large numbers or people into undernourishment – such events have been seen in the past. In contrast, for policy makers opportunities exist in significantly reducing the number of undernourished people in India. The large share of the population close to the threshold suggests that the impact from improvements in food security policy performance is likely to have large payoffs in terms of improving food security.

Figure 4.3. The distribution of per person calorie intake in India

% individuals' daily calorie intake, 2011-12



Source: OECD estimates based on NSS68.

4.3. Policy responses to food security

India's policies to increase food security emphasise the availability and access dimensions of food security. For availability, policies seek to guarantee adequate supply by incentivising production using multiple types of producer support (detailed in Chapter 3). Access to food is mostly addressed by offering food grains at affordable prices to the population. This section focuses on India's recently implemented National Food Security Act (NFSA), which aims to provide subsidised food grains to approximately two thirds of India's population. It also discusses the domestic and trade policies that have been employed in an attempt to guarantee the stability of supply and keep non-subsidised domestic food prices at low levels.

Evolution of the PDS – The National Food Security Act (2013)

India's food security policy has historically been centred on the physical distribution of subsidised grains. The principles of India's Public Distribution System (PDS) were introduced following the 1943 Bengal famine and the scheme has evolved considerably since (Government of India, 2017a).

At its inception, the PDS was designed as a general entitlement scheme for all consumers without a specific target. During those initial years, the PDS delivered food grains only to urban food-scarce areas. In 1992, the scheme was revamped to improve access of food grains to people in hilly, remote and inaccessible regions, where many of India's poor

lived. This Revamped PDS scheme (RPDS) was then replaced by the Targeted PDS (TPDS) in 1997. Whereas the RPDS focused on all people in poor areas, the TPDS targeted the poor in all areas (Government of India, 2017a).

Under the TPDS, beneficiaries were divided into two categories: households below the poverty line (BPL) and households above the poverty line (APL). BPL households could buy rationed quantities of food and fuel (kerosene) at subsidised prices. APL households could also benefit from the scheme, but at higher prices. In 2000, the Government of India launched the *Antyodaya Anna Yojana* (AAY) scheme, which was targeted at the poorest of the BPL families. Households in the AAY category could buy food (mainly wheat and rice) at highly subsidised prices.

In September 2013, the Parliament enacted the National Food Security Act (NFSA). The NFSA combines and expands various existing policies that are based on subsidised food distribution, namely the TPDS, the Wheat-Based Nutrition Programme and the Mid-Day Meal scheme. It also includes an existing conditional cash transfer scheme, which transfers a fixed cash amount per pregnancy to pregnant and lactating women, the *Indira Gandhi Matritva Sahyog Yojana* (Government of India, 2013).

The TPDS forms the largest component of the NFSA. Table 4.1 lists the major changes that were made to the TPDS under the NFSA. The NFSA extends the previous TPDS by covering a larger share of the population, lowering the issue prices and making the right to food a legal entitlement. Certain states and UTs implemented the NFSA faster than others, but by November 2016, all 36 Indian states and UTs had implemented the NFSA provisions (Government of India, 2016).

Under the NFSA, 75% of the rural population and 50% of the urban population are entitled to subsidised grains. Unlike under the previous TPDS, the coverage under the NFSA has been delinked from poverty estimates and the state-wise coverage has been determined by the Planning Commission (now NITI Aayog) on the basis of National Sample Survey Office (NSSO) data for 2011-12 on consumption expenditure. Accordingly, the categorisations of beneficiaries changed under the NFSA, which distinguishes between priority households and the AAY. The AAY households are the same as under the previous TPDS, while the priority households include all BPL households as well as some APL households. AAY households are entitled to 35 kg of grains per household per month. People belonging to the priority category are entitled to 5 kg of grains per person per month. Both groups can buy the food grains at the same issue prices, which were fixed at INR 3, INR 2 and INR 1 per kg, for rice, wheat and coarse grains, respectively. The issue price was fixed for 3 years from the start date of the Act, i.e. September 2013. However, the prices were never revised after three years and continue to be at the same levels even in September 2017. The Act prescribes that changes to the issue price should be made by the Central Government so that the issue price does not exceed the minimum support price.

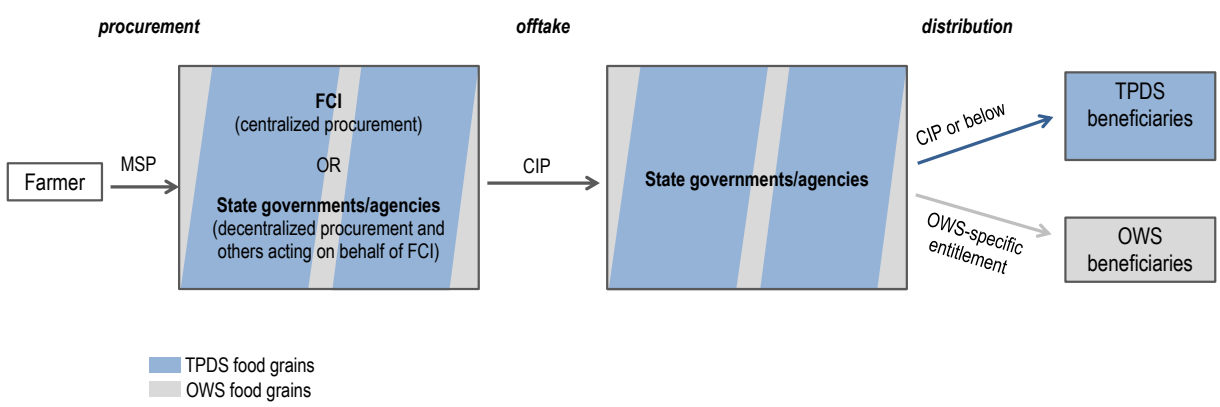
In addition to the TPDS, food grains are also distributed under the Other Welfare Schemes (OWS). There are seven OWS in total, of which the Wheat-Based Nutrition Programme and the Mid-Day Meal scheme have been brought under the ambit of the NFSA (Government of India, 2013). The TPDS and OWS are operated under the joint responsibilities of the central and state governments. Figure 4.4 illustrates the process of procurement, offtake and distribution of food grains under the TPDS and OWS.

Table 4.1. Major changes made to the TPDS under the NFSA

Provision	Previous TPDS (1997-2013)[1]	TPDS under NFSA (2013-current)
Right to food	Administrative order, no legal backing	Legal right to food
Categories of beneficiaries	AAY, BPL, APL	AAY and Priority
Entitlements per categories	AAY and BPL: 35 kg/household/month APL: 15-35 kg/household/month	AAY: 35 kg/household/month Priority: 5 kg/person/month
Prices of food grains (INR/kg)	Rice / Wheat / Coarse grains AAY: 3 / 2 / 1.5 BPL: 5.65 / 4.15 / 3 APL: 7.95 / 6.10 / 4.5	Rice / Wheat / Coarse grains AAY and priority: 3 / 2 / 1
Coverage	AAY: 25 million families BPL: 40.2 million families APL: 115 million families Total: 180.2 million families (or 180*5=901 million people)	Up to 75% of rural population and 50% of urban population Total: 165.7 million households (or 813.5 million people)
Identification of beneficiaries	Centre: • Releases state-wise estimates of population to be covered • Creates criteria for identification • Linked to poverty States: • Identify eligible households	Centre: • Releases state-wise estimates of population to be covered • Delinked with poverty States: • Create criteria for identification • Identify eligible households

[1] Numbers refer to most recent values. For example, the AAY scheme was created in 2000 and expanded in size over time.
Source: Adapted from Balani (2013).

Figure 4.4. Schematic representation of food grain procurement, offtake and distribution under the TPDS and OWS



There are two types of procurement systems: centralised and decentralised procurement. Under the centralised procurement system, the central government, through the Food Corporation of India (FCI), procures food grains (mostly wheat and rice) from farmers at the Minimum Support Price (MSP). The grains are physically procured by state agencies

and they hold it on behalf of FCI until the time FCI needs them for moving from surplus to deficient states. In some other states, grains are procured under the decentralised procurement system. In this case, State Governments of India or its agencies procure, store and distribute the food grains. Any stocks in excess of those required for the state's TPDS are handed over to the FCI (FCI, 2017). Decentralised procurement has been encouraged by the government in recent years as it targets non-traditional states to procure the grains from local farmers, which enhances efficiency and reduces transit losses and costs (Government of India, 2015a).

The MSP is announced before planting starts and is set by the Cabinet Committee on Economic Affairs, mostly following the recommendations of the Commission for Agricultural Costs and Prices (CACP). It takes into consideration several factors, including the cost of production and domestic and international price trends (Government of India, 2017b). The procurement system is open-ended since the government guarantees that it will buy all food grains offered by the farmers at the MSP, provided the grains meet certain quality specifications. In some years some states declare a bonus to be paid over and above the MSP for wheat and paddy.

The procured food grains are stored in storage facilities spread throughout the country. A distinction in accounting is made between operational stocks and food security stocks (FCI, 2017). Operational stocks are used for the distribution of grains through the TPDS and OWS. Food security stocks are kept to meet shortfalls in procurement and to smoothen any inter or intra year supply fluctuations.

The central government, through the FCI, issues the food grains for the TPDS and OWS to the state governments at the Central Issue Price (CIP), which is much lower than the price at which the centre procures the grains, the MSP. States are responsible for transporting the food grains to the beneficiaries. In the case of the TPDS, the grains are transported from the storage facilities to the fair price shops, where grains are then distributed at CIP or below. In case of the different OWS (Table 4.2), the method of distribution varies. Grains for Annapurna scheme are sold through the fair price shops, while all other OWS are managed by the respective departments of State governments. For example, under the Mid-Day Meal Scheme, a state department designated officer or a contractor appointed by them will offtake grains from the FCI or the state storage facilities and directly distribute it to the designated officials for distribution to the beneficiaries.

In certain states, consumers can buy TPDS grains at prices that are below the CIP as the states give further subsidy from state budgets. Indeed, states are allowed to extend the TPDS system as desired. The four most common ways in which the TPDS has been extended are: i) lowering the CIP price or even distributing the grains for free, ii) increasing the coverage, iii) increasing the entitlements, and iv) distributing other commodities in addition to the TPDS commodities (Saini and Gulati, 2015).

The FCI, on directions of the Government, occasionally releases food grains from its stocks in the domestic market under the Open Market Sales Scheme (OMSS) or exports them through state trading enterprises (STE) or through private exporters. Under the OMSS, the grains are sold at pre-determined prices, called the Minimum Issue Price. These types of sales in domestic market occur especially during the lean season and are meant to stabilise market prices.

Table 4.2. Overview of Other Welfare Schemes (OWS)

Name of Scheme	Issue price	Beneficiaries	Scale of allotment
Mid-Day Meal Scheme	Free of cost to States	Students of Class I-VIII of Government and Government aided schools, Education Guarantee Scheme/Alternative and innovative Education Centres	I-V Class: 100 gr/child/school/day VI-VIII Class: 150 gr/child/school/day
Wheat-Based Nutrition Programme	Wheat: INR 200/QtlRice: INR 300/Qtl	Children below 6 years of age and expectant/lactating women	Not given
Annapurna	Wheat: INR 415/QtlRice: INR 565/Qtl	Senior citizens of 65 years of age or above who are not getting pension under the National Old Age Pension Scheme	10 kg/month
Welfare Institutions Scheme	Wheat: INR 415/QtlRice: INR 565/Qtl	Charitable Institutions such as beggar homes, nariniketans and other similar welfare institutions not covered under TPDS or under any other Welfare Schemes	5 kg/cap/month
SC/ST/OBC Hostels	Wheat: INR 415/QtlRice: INR 565/Qtl	Residents of the hostels having 2/3rd students belonging to SC/ST/OBC	15 kg/resident/month
Rajiv Gandhi Programme for Empowerment of Adolescent Girls- "SABLA"	Wheat: INR 415/QtlRice: INR 565/Qtl	Adolescent girls of 11-18 years	6 kg/month
Defence/Para-Military Forces	At economic cost	Food grains are allocated to Battalions State-wise	--
Additional Allocations	At MSP/CIP/Economic Cost of FCI/Open Sale rate	Victims of natural calamities, additional requirement for festivals etc.	Not fixed

Note: Qtl stands for quintal (=100 kg).
Source: FCI (2017).

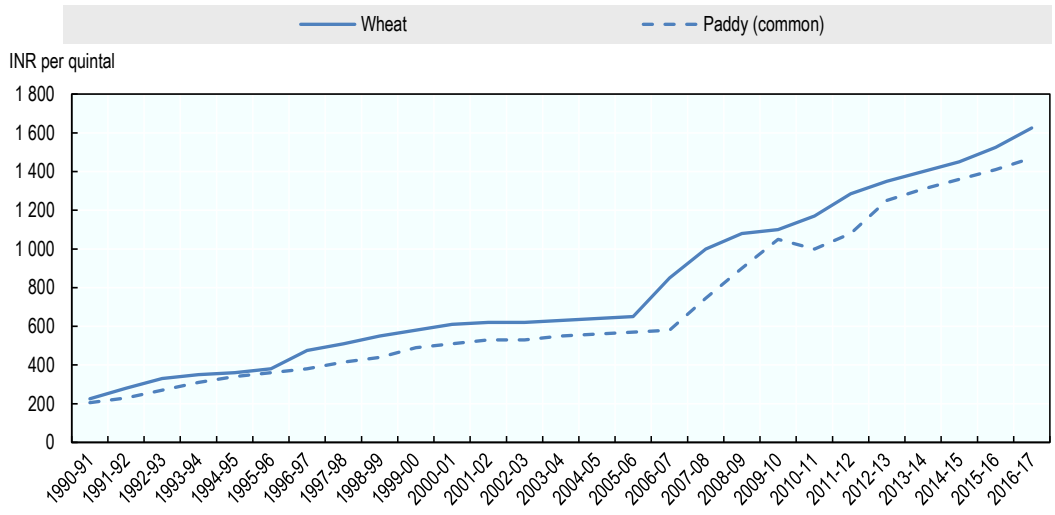
Domestic and trade policies to enhance food security

To achieve its national food security goals, India supplements its grain distribution programmes with domestic and trade policies. These domestic policies are mostly aimed at guaranteeing a large and stable supply of food crops by providing support to farmers. The most prominent types of producer support are price support and input subsidies. Chapter 3 provides a detailed description of all types of producer support and of the trade policies.

The government uses the MSP to increase agricultural production and productivity by offering a stable and remunerative price environment (Government of India, 2017c). Occasionally, the central government or states announce a bonus payable over and above the MSP to incentivise cultivation of certain commodities during specific periods. Even though MSPs are announced for 24 commodities[2], procurement occurs mainly for rice and wheat and only from a limited set of states (Saini and Gulati, 2017).

The MSP for paddy rice and wheat increased significantly during the period 2007-12 (Figure 4.5). During this period, India implemented the National Food Security Mission (NFSM), which was an intensive programme to increase the production of food grains by 20 million tonnes (comprising an additional 10 million tonnes of rice, 8 million tonnes of wheat and 2 million tonnes of pulses) in five years. Besides raising the MSP for paddy rice and wheat by almost 40% between 2007-08 and 2009-10, this programme also provided farmers with input subsidies and better technology (seeds). The NFSM is continued during the 12th five year plan (2012-17), with a stronger target for pulses (additional 4 million tonnes by 2017) and the inclusion of coarse grains (additional 3 million tonnes by 2017) on top of the additional 10 and 8 million tonnes of rice and wheat, respectively (Government of India, 2017d).

Figure 4.5. Minimum Support Price of paddy and wheat, marketing years 1990-91 until 2016-17



Source: Government of India (2017b)

Under NFSM, production of food grains increased by 42 million tonnes between 2007 and 2012, which was more than twice the target. As a result, India increased its rice exports and is now one of the largest rice exporters in the world. In addition, the strong production increases also led to an accumulation of large public stocks, which gave the government the confidence to introduce the NFSA in 2013 (Saini and Gulati, 2016b).

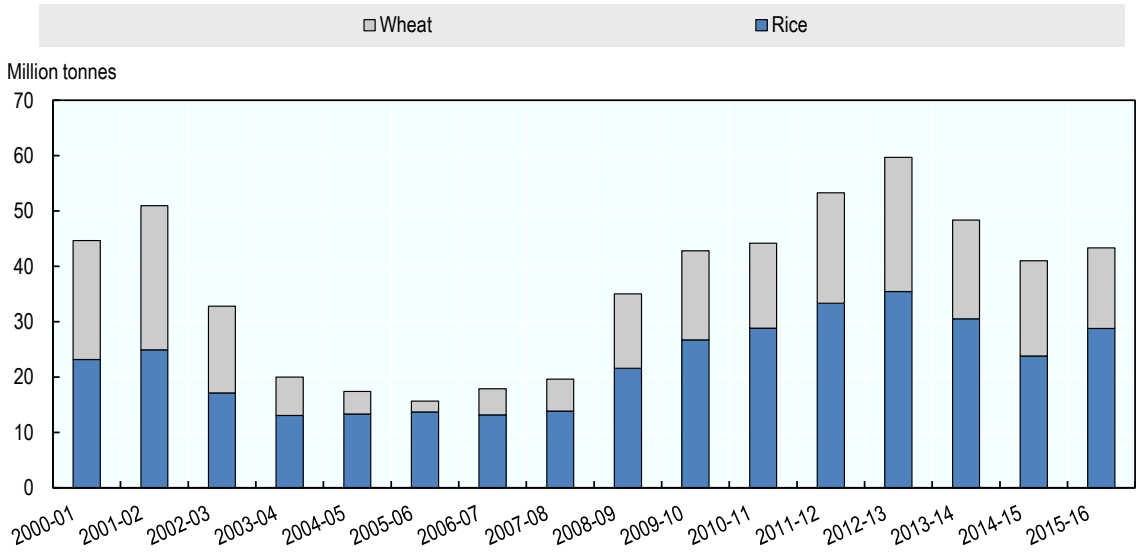
India's public stockholding policies are closely tied to its national food security objectives. Public stocks are built in order to make food grains available at reasonable prices, maintain buffer stocks as a measure of food security, and intervene in markets for price stabilisation (FCI, 2017). Stocking norms are set for each quarter and are specified for operational stocks (stocks for distribution under TPDS and OWS) and food security stocks (to meet shortfall in procurement)[3]. Unlike most countries, information related to publicly held stocks in India (stock levels, procurement targets, procurement levels, offtake, distribution volumes, MSP, distribution prices, costs, etc.) is publicly available.

Table 4.3. Buffer norms of food grains (million tonnes)

	Operational stock			Strategic reserve		Grand total
As on	Rice	Wheat	Total	Rice	Wheat	
1st April	11.58	4.46	16.04	3	2	21.04
1st July	11.54	24.58	36.12	2	3	41.12
1st October	8.25	17.52	25.77	3	2	30.77
1st January	5.61	10.8	16.41	3	2	21.41

Note: The last revision of the buffer norms was done in July 2013.
Source: FCI (2017).

Figure 4.6. Evolution of publicly held stocks of wheat and rice in India, 2000-16



Source: RBI (2016).

Besides its involvement in domestic markets through farmer support policies, public stockholding policies and food grain distribution, the government also implemented other domestic policies to protect the interests of consumers and producers. The Essential Commodities Act, 1955 (ECA) aims to shield consumers from spikes in the prices of essential commodities by giving the central government powers to control the production, supply and distribution of these commodities. One of the implications of this Act is that States can impose limits on private stockholding, which has led to a marginalisation of private stocks (Kozicka et al., 2015). The Agricultural Produce Market Committee (APMC) Model Act of 2003 seeks to ensure that farmers are not exploited by private traders to sell their produce at farm gate for very low prices by requiring farmers to sell their produce via auction at APMC *mandi* (wholesale markets) (discussed in more detail below).

India's agricultural trade policies are described in detail in Chapter 3. Export restrictions have been frequently used to support national food security objectives as they are implemented in order to keep domestic prices low and protected from international price shocks. The most notable export restrictive policies were the export bans of rice from October 2007 until September 2011 and of wheat between February 2007 and September 2011 (Saini and Gulati, 2017). The authors, however, show that these bans

were only able to temporarily protect domestic prices from international price inflation and that domestic food prices tend to converge with world prices over the long run (Gulati and Saini, 2015).

4.4. Assessment of current food security policy instruments

As described in the previous section, India's main food security policy instrument is the NFSA. The assessment of current food security policy instruments hence focuses on analysing the effectiveness of the NFSA, and the TPDS in particular, in achieving its goal of improving the food security situation of the Indian population. In addition to examining the coverage and targeting of the NFSA, this section also reviews the efficiency of the programme and its impacts on markets.

Coverage and targeting of the NFSA

In recent years, availability of food has been less of a concern in India because of its strong growth in agricultural production and past productivity improvements. Economic access to food, on the other hand, is more problematic, especially in the context of making sure that food insecure people can afford to buy enough food in the open market to supplement what they receive from the TPDS in order to have a healthy and nutritious diet. In this context, issues have arisen over both coverage of the scheme and its targeting.

Coverage: population and products

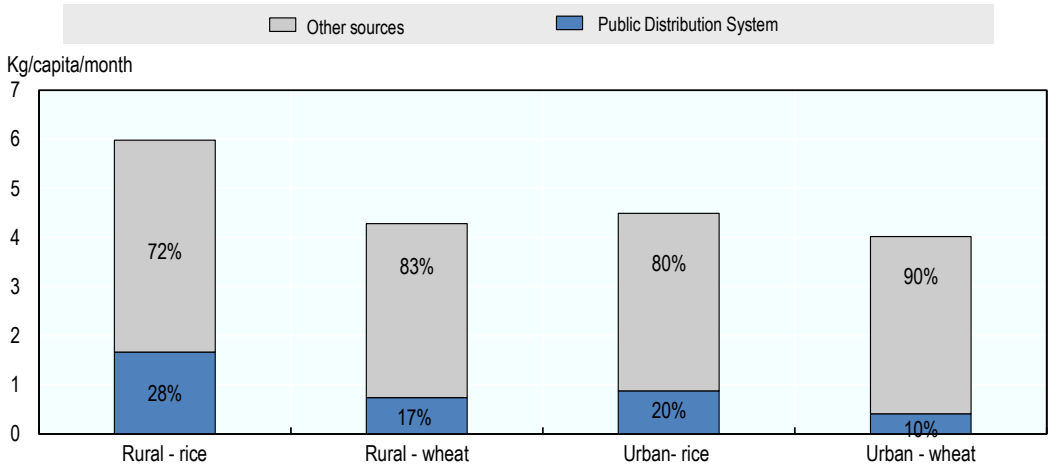
The large coverage of the NFSA, which aims to reach 67% of the population, implies that exclusion errors in the TPDS are reduced. The low CIP prices, which have not been increased since 2013 and are in some states even lowered or set at zero (e.g. Tamil Nadu has free distribution), also contribute to making food grains more affordable to a larger group of people.

However, the redefinition of beneficiaries under the NFSA leads to lower entitlements for certain people compared to the old TPDS. Under the TPDS, BPL families were entitled to 35 kg of food grains per household per month, and under the NFSA, they receive 5 kg per capita, which means that a family of 5 members receives 25 kg per month under the NFSA compared to 35 kg under the old TPDS (Table 4.1). Even though the BPL individuals who are included as priority under NFSA benefit from lower CIPs, they are worse-off because of the lower entitlements (Mishra, 2013; Saini and Gulati, 2015). The other groups of beneficiaries, i.e. AAY and the included APL, are either as well off or better off under the NFSA. Because of the continuity of the entitlements, coverage and CIPs, the group of AAY beneficiaries remains unaffected under NFSA. For the eligible people in the APL group, they are better off under NFSA because of the lower CIPs.

Another issue raised by Saini and Gulati (2015) is that the number of beneficiaries under the NFSA 2013 is estimated using the 2011 Census data. The provisions in the Act fix these numbers up until the next Census data are released (Census enumeration is a decadal exercise). With a fixed number of beneficiaries, the distribution commitment of grains gets fixed as well. As a result, states where the population increased since 2011 will have either lower entitlements per person, or will cover a lower proportion of the population or both. Even though a large share of the population can purchase food grains at low prices under the NFSA, they still need to buy additional food grains in the open market in order to meet their daily requirements (NSSO, 2014). Figure 4.7 shows that in 2011-12, per capita consumption of rice was 6 kg per month in rural areas, of which more

than 70% was obtained from other sources than the PDS. This share reached 90% for urban wheat consumption. These shares might have changed since the introduction of the NFSA, but even in the absence of more recent consumption data it is clear that part of rice and wheat consumption is purchased from other sources than the PDS. However, prices of rice and wheat have been rising steadily (Figure 4.8) in the open market and the benefit of receiving cheaper grains through the NFSA is hence partially offset by the higher prices that are paid in the open markets.

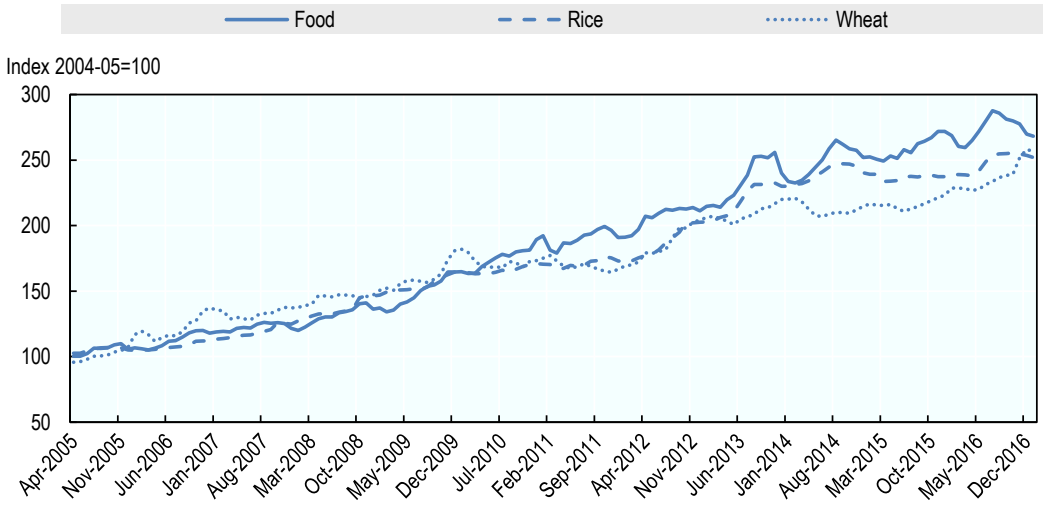
Figure 4.7. Per capita monthly consumption of rice and wheat from PDS and other sources in 2011-12, rural and urban India



Note: Excludes rice and wheat products.
Source: NSSO (2014).

Another critique of the TPDS is its focus on distributing rice and wheat, which ignores the changing food preferences of the Indian population and the importance of micro-nutrients in people's diets. During the last decades, Indian diets have become more diversified with relatively more high value food products such as milk, egg, meat, fruits and vegetables. This trend towards diversification and higher consumption of more nutritious food items translates into higher expenditures on protein-rich and high-value food products. However, access to these food items and the possibility of higher quality diets is limited due to high food inflation rates (Figure 4.8) (Narayanan, 2015).

Figure 4.8. Monthly food, rice and wheat price inflation, April 2005-January 2017



Note: Price inflation is measured with the wholesale price index (WPI).
Source: RBI (2017).

Targeting: against income and need

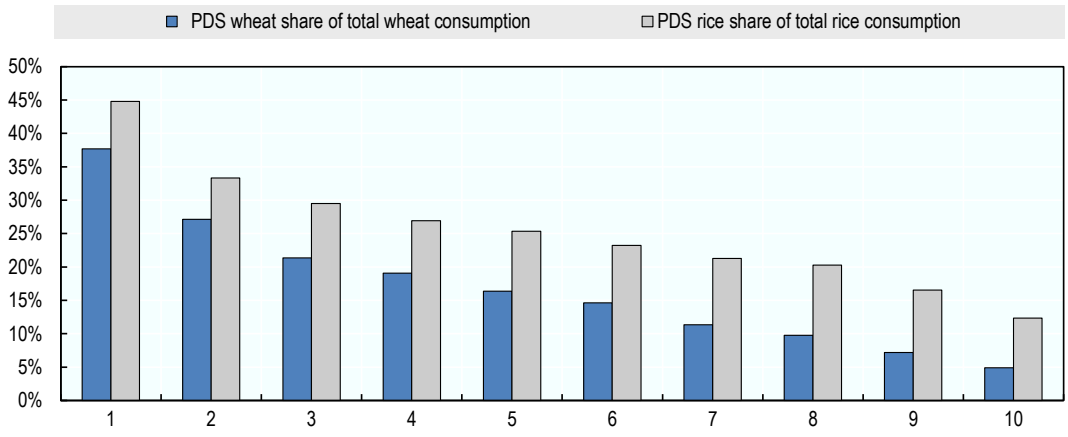
The effectiveness of the TPDS in terms of targeting to poorer and undernourished households is an important element in understanding the effectiveness of the programme in reaching intended recipients. To explore these issues of targeting, consumption patterns from the 68th round of the NSS Household Expenditure Survey from 2011-12 were analysed. This survey has the advantage of separating TPDS and market consumption. However, as the survey took place in 2011-12 it is dated and so does not include the effects of the changes to the TPDS that were brought about by the NFSA. The effects of these changes to the TPDS on its targeting compared with 2011-12 are difficult to assess. On one hand, the greater entitlements and lower prices for some disadvantaged groups may have led to better targeting, but on the other hand, extending it to a larger share of the population is likely to mean that consumption by relatively better off and non-food insecure households has likely increased, leading to worse targeting. Despite these difficulties, due to the similarities in the schemes the information from the 2011-12 survey should still provide relevant insights into targeting. Information in the survey is used to assess the incidence of consumption from the TPDS across the household expenditure groups[4] and undernourishment levels.

The results from the household survey suggest that while both TPDS programmes favour poorer households, there is significant consumption of rice and wheat from the TPDS by relatively better off households. For example, while households in the bottom two income deciles (those with average total household expenditures less than INR 3181 in 2011-12) receive close to 31% of all TPDS rice reported as consumed (in quantity terms), those in the top four deciles (including and above the 7th decile) consume 25% of total TPDS rice reported as consumed – the numbers for wheat are approximately the same. Equating this to implicit subsidy amounts (based on the average price of TPDS rice and wheat observed), around INR 4 269 million in 2011-12 (USD 85 million based on exchange rates at that time) per month went to households in the top four expenditure deciles in 2011-12. In terms of shares of total rice and wheat intake across income thresholds,

consumption data reveals that households in lower income deciles are far more reliant on the TPDS as the source of their staples. For example, those households in the lowest deciles got around 45% of the rice they consumed from the TPDS and 38% of their wheat (Figure 4.9). These numbers, however, also suggest that a significant share of rice and wheat consumption is sourced from the open market or from their own production (home production accounts for 13% of rice consumption for the bottom two deciles and 16% of wheat consumption).

Figure 4.9. Consumption of TPDS rice and wheat across household expenditure deciles, 2011-12

Average % of total household rice and wheat consumption by monthly household expenditure decile



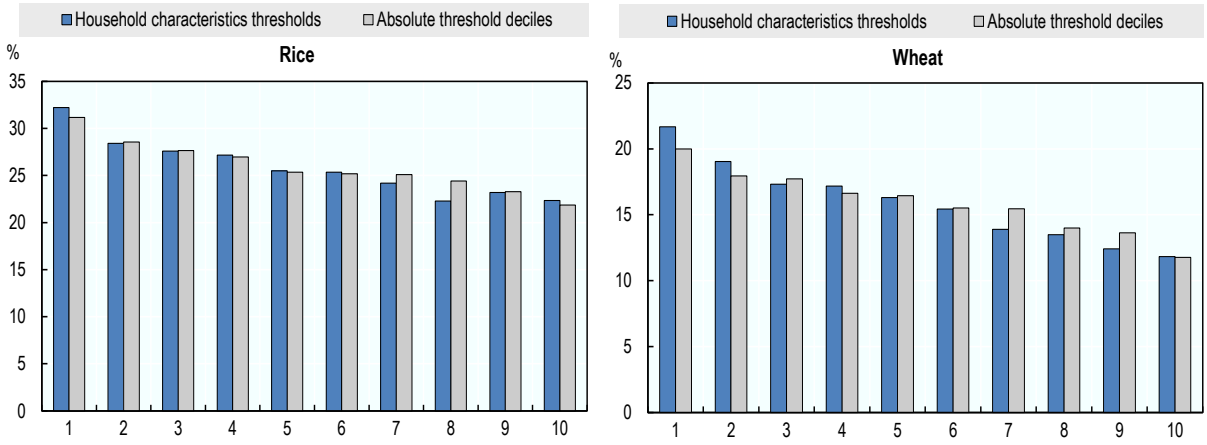
Source: OECD estimates.

Expenditure deciles provide one way to explore targeting. However, as the TPDS is seeking to ameliorate food insecurity, it is also worth exploring whether the rice and wheat is provided to food insecure individuals and households and disproportionally so. Using the two thresholds shown in Figure 4.3 – both absolute set at 1 600 kcal per day, and that based on characteristics of household members – a distribution of undernourishment can be calculated. For the household characteristics based threshold (varying by sex, age and location), undernourishment is present in the first 3 deciles with a significant number close to the threshold present in the 4th decile. For the absolute threshold (set at 1 600 kcal per person per day), undernourishment exists in the first two deciles, with a number at risk in the third decile.

Targeting of the TPDS on a food insecurity basis in 2011-12 was much less effective (Figure 4.10). Those in households who had the greatest depth of undernourishment only consumed around 32% of their total rice and around 20% of their wheat from the TPDS. The rest was sourced from the open market or home production. While the most undernourished and those at risk of undernourishment consume more of their rice and wheat from the TPDS, a significant share of rice and wheat by households who are not food insecure is sourced from the TPDS. For example, using the higher threshold of daily calorie needs, households in the top 2 deciles of calorie consumption – that is, they consume the highest levels above the threshold – consume around 22% of their total rice and 12% of their total wheat from the TPDS. These households had average per person calorie consumption around 1 000 kcal above the undernourishment thresholds.

Figure 4.10. Consumption of TPDS rice and wheat across depth of undernourishment deciles, 2011-12

Average % of total household rice and wheat consumption by household depth of undernourishment decile



Note: Household characteristic threshold represents that calculated based on the age and sex of household members. The Absolute threshold represents 1 600 kcal per day per person.
Source: OECD estimates.

Market impacts and inefficiencies of the NFSA

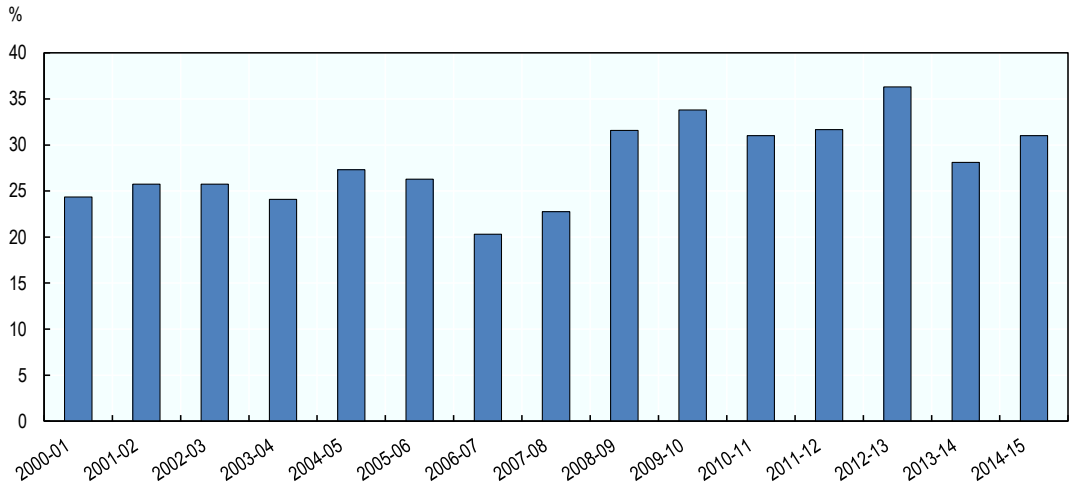
In addition to its design limitations which cannot guarantee access to high quality diets, the functioning of the NFSA programme creates market distortions that undermine the programme's food security objectives. The principal cause of these market distortions are the large procurement requirements of the programme. To fulfil its commitment to 67% of the population, around 61.4 million tonnes of food grains need to be procured under the NFSA (Saini and Gulati, 2015). This translates into around 30% of domestic production during the last 7 years (Figure 4.11). These percentages increase during times of domestic shortfalls given that the NFSA needs to maintain its procurement requirements. As a result, less food grain will be available for the domestic market which puts upwards pressure on prices.

The system of PDS/NFSA is also criticised for skewing production in favour of wheat and rice and away from other crops which might offer farmers higher and more stable farm incomes (Banerjee, 2011). These other crops could be high value crops or crops that are better suited to the agro-climatic conditions in the cultivation area. Rice is a water-intensive crop and some of the main procurement states, such as Punjab and Haryana, are facing rapid groundwater depletion. Balani (2013) shows that rice cultivation in north-west India led to a decrease in the water table by 33 cm per year during 2002-08 (Box 2.7 in Chapter 2). This environmental stress leads to higher production costs and hence increases the cost of implementing NFSA.

In addition, the large government involvement in the rice and wheat markets discourages the private sector from participating in trading activities. This is especially the case in states that contribute heavily to the NFSA (Saini and Kozicka, 2014). The private sector is also crowded out from stockholding activities because of the large public stocks and limits to private stockholding[5] under the ECA. As the private sector withdraws from trading and stockholding, the role of the government increases, which in turn adds pressure on the budget.

Finally, the fiscal costs of running the NFSA are very high and these costs are compounded by its various malfunctions (Kozicka et al., 2015; Saini and Kozicka, 2014). The food subsidy bill, which is the difference between the economic cost (sum of MSP, other procurement incidentals, and distribution costs) and the price at which food grains are issued to beneficiaries under the TPDS (i.e. the CIP), has increased six-fold over the last decade (Table 4.4). It is estimated that the food subsidy bill will be INR 1 453.4 billion in 2017-18, which is around 7% of the total central government's Union Budget.

Figure 4.11. Procurement of rice and wheat as a percentage of production, 2000-15



Source: FCI (2017) for procurement data, RBI (2017) for production data.

Table 4.4. Food subsidy bill, 2007-18

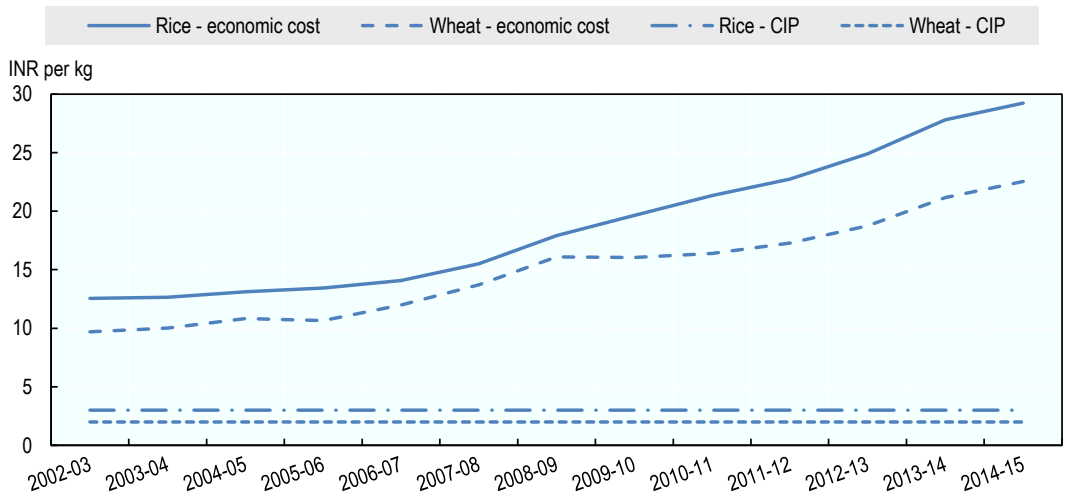
Year	INR billion	% increase previous year	% of total budget
2007-08	313.28	30%	4.4%
2008-09	437.51	40%	4.9%
2009-10	584.43	34%	7.8%
2010-11	638.44	9%	5.3%
2011-12	728.22	14%	5.6%
2012-13	850.00	17%	6.0%
2013-14	920.00	8%	5.9%
2014-15	1176.71	28%	7.1%
2015-16	1394.19	18%	7.8%
2016-17	1351.73	-3%	6.7%
2017-18	1453.39	8%	6.8%

Note: Figures for 2016-17 are revised estimates; and for 2017-18 are budget estimates.
Source: PRS (2017).

The ballooning of the food subsidy bill is a result of the huge procurement volumes, the increased economic cost of buying food grains, and the stagnant CIP. Figure 4.12 illustrates how the gap between the economic cost of rice and wheat and their respective CIP's has been widening over time. Whereas the economic cost of rice has increased from INR 12.9 per kg in 2001-02 to INR 29.2 per kg in 2014-15 (an increase of 151%) and for

wheat from INR 10.3/kg to INR 22.5/kg (or 134%) over the same period, the CIP's for the AAY have remained constant since 2002 and in fact have even reduced for BPL/priority beneficiaries (Table 4.1).

Figure 4.12. Economic cost of rice and wheat and CIP's for the AAY, 2002-15



Note: The economic cost is calculated by the government as the sum of MSP, other procurement incidentals, and distribution costs.
Source: Government of India (2015b).

Apart from these direct fiscal costs there are also additional costs, which arise from leakages (illegal diversion of subsidised food grains from PDS to the open market) and wastage due to poor storage and transport facilities (Shreedhar et al., 2012). Even though there is no consensus on the exact numbers of the leakage, the scale is undoubtedly high as the lowest estimates for 2011-12 report leakage of 34.6% (Himanshu and Sen, 2013). The exact scale of storage losses is also unclear; a recent study estimates that the loss in storage is about 0.5% (Nanda et al., 2012).

4.5. Medium term market and food security impacts of implementing direct cash transfers

The above review shows that the NFSA is criticised because it is ineffective, inefficient and unsustainably expensive. In 2015, the High Level Committee on Restructuring of FCI (HLC) constituted by GOI, recommended to deeply restructure the system and among other reforms, to gradually replace the physical distribution of grains with cash transfers (Government of India, 2015b). Making the shift from the TPDS to direct benefit transfers (DBT) is possible under the NFSA because the Act itself allows for delivering cash instead of in-kind food delivery in case of non-supply[6] and also promotes the introduction of direct cash transfers[7].

This section explores the impacts of replacing the physical grain distribution under the traditional PDS with direct benefit transfers or DBT. DBT refers to the process of transferring an unconditional cash transfer amount, estimated using a pre-defined formula based on the monthly NFSA entitlement, into the Aadhaar-linked[8] bank account of identified beneficiaries. This transfer is in lieu of NFSA's physical grain entitlement and

is made into the bank account of the female head of the family. There are certain pre-requisites to the DBT: an updated list of beneficiaries with continuous efforts to remove exclusion and inclusion errors, a digital payment platform managed by the government, and a financial infrastructure that is inclusive of all its citizens.

This section first discusses the main advantages and disadvantages of the DBT and highlights some of its challenges. The second part of the section examines how partially and gradually replacing the PDS with DBT would influence India's markets and food security situation over the next ten years.

Comparing grain distribution with direct cash transfers

Cash transfers have several advantages over the PDS (Table 4.5). First, cash transfers have lower transaction and administrative costs and are easier to implement since they do not require huge amounts of food grains to be procured, stored, transported and distributed. They also offer beneficiaries expanded choices. Beneficiaries may use the cash to buy other food items, which might lead to more balanced or high quality diets – and in doing so better address food and *nutrition* security compared with the current focus on rice and wheat. Or they could spend it on health or education, or use it to relieve financial constraints – which have the potential to improve the utilisation and stability elements of food security. In addition, by replacing physical grain handling with a centrally controlled system of targeted cash transfers, the problems of high grain wastages, pilferages and leakages in the PDS can be addressed efficiently. Furthermore, the introduction of Aadhaar (Box 3.1 in Chapter 3) has the potential to reduce inclusion errors, with early studies showing that the mapping of digitised ration card data with Aadhaar numbers facilitates identifying and eliminating bogus ration cards (Saini et al., 2017).

However, beneficiaries risk being exposed to food price increases and volatility if the cash transfers are not adequately adjusted for inflation or if they are responsive to sudden dramatic price movements. In that case, beneficiaries could be worse off as they cannot buy the same amount of food as they receive under the TPDS. Additionally, the need to ensure availability of enough grains in the open market cannot be overemphasised. Beneficiaries with a high reliance on PDS grains (e.g. those located in remote areas or net-consumption states) may be subjected to exploitation by traders and retailers unless the government encourages participation from the private sector to ensure adequate amounts of grain in the market. Cash transfer programmes also require that people have access to banks or post offices and know how to use these services, which is a challenge especially in rural parts of the country (Box 4.1). Furthermore, when people receive cash instead of food from the fair price shops, they have to make at least two trips (one to the bank and one to the market) instead of one (to the fair price shop). There are also some problems with the TPDS which cannot be solved by switching to DBT. Most notably, exclusion errors are equally prone in both systems.

Box 4.1. How India's financial system could challenge the implementation of DBT

India's financial system is characterised by three main problems: low banking density, high financial illiteracy, and low financial inclusiveness. The banking density in a specific state can be calculated as the sum of the number of post offices, bank branches, ATMs and business correspondents in that state divided by the state's population as per Census 2011[1]. Based on this formula, India has on average 48 branches for every 100 000 people. The Union Territories of Chandigarh and Puducherry have banking densities of 128 and 72, respectively, which is one of the reasons why these two Union Territories were short-listed for the pilot studies. States like Bihar, Uttar Pradesh and Madhya Pradesh have banking densities of 30, 34 and 37, respectively.

But even in states with relatively higher banking densities, there is still the problem of high levels of financial illiteracy which leads to widespread inconvenience in accessing and using banking services. This encourages the proliferation of middlemen who in return for a fee offer to withdraw money on behalf of the poor and illiterate beneficiaries, thereby reducing the delivered subsidy and making the transfer inadequate to support consumption.

In 2011, only 35% of Indian adults had a bank account (World Bank, 2017b). To address these low levels of financial inclusiveness, the government launched an initiative in August 2014 to "bank the unbanked", which encouraged every adult to open a bank account. Between 15 October 2014 and 18 October 2017, the number of bank accounts increased from 44 to 305 million (PMJDY, 2017). While it is unclear how many of these accounts were for first-time account holders and how large and frequent the transactions were on these accounts, there is notable progress towards providing universal financial access to bank accounts.

However, mainstreaming the country's poor and illiterate living in remote areas is a long haul and this makes the structure and depth of financial infrastructure one of the pillars which will determine the success of country's drive towards DBT.

1. Since the population has been growing at a higher rate than the number of banking facilities, these estimates of banking density are an overestimation.

Table 4.5. Main advantages and disadvantages of cash transfers compared to PDS

Advantages	Disadvantages
• Lower administrative and transaction costs • Expanded choices for beneficiaries • Less leakage	• Beneficiaries are exposed to food price inflation and volatility • Limited access to banking, financial illiteracy and underdeveloped banking infrastructure, especially in rural areas (Chapter 2) • Diversion of funds to support undesirable expenses like gambling or alcohol

Since 2015, three Union Territories of Chandigarh, Puducherry and Dadra and Nagar Haveli have introduced the Act in DBT mode as a pilot project. The experiences with DBT in the pilot studies show that the cash transfer system still faces several challenges. In the surveys that evaluate these pilots, some beneficiaries report that they did not

receive the subsidy, received the subsidy with a delay or received an amount of subsidy that was not sufficient to buy the same amount of grains as they did under the PDS. There were also some practical issues with the banking system such as overcrowding of the branches and cash withdrawal problems. The reported problems in the pilot studies are serious issues which jeopardise people's food security situation. Before the DBT is rolled out in more states, it is imperative that these and other reported problems[9] are addressed.

Over the medium term, the HLC recommends a gradual and partial replacement of the PDS by cash transfers. In particular, the HLC proposes that DBT are started in large cities with more than 1 million inhabitants; then extended to grain surplus states and finally the deficit states are given the option between cash or physical grain distribution (Government of India, 2015b). The last point, which refers to partially preserving the TPDS, has preference-based, access and political justifications. Results from a survey by Khera (2011) show that most respondents who live in states where the TPDS does not function well preferred cash transfers over the TPDS, while the opposite was true for respondents who lived in states where the TPDS did work well. In areas where people do not have access to markets to buy grains or to banks, distributing grain is more appropriate than providing cash. Finally, there are also socio-political forces dominant in certain areas that discourage the switch away from grains (Narayanan, 2015).

Medium term market and food security impacts of implementing direct cash transfers

Replacing physical grain distributions by direct cash transfers not only influences consumption and production patterns in the short run, but also affects markets in the longer run. The medium term impacts of gradually and partially replacing the TPDS with DBT are examined using the Aglink-Cosimo Model. This partial equilibrium model provides projections for the production, consumption, stocks, trade, and prices of 25 agricultural products in many individual countries (including India) and for regional aggregates. The model is employed to examine what would happen over the period 2017-25 if the NFSA remains in place (*baseline scenario*) compared to a situation where the TPDS is gradually and partially replaced by DBT (*DBT scenario*).

One of the limitations of the model is that data are aggregated at the country level. When examining indicators related to food security, it is interesting to disaggregate the consumption trends by different population groups, organised by location and vulnerability status. While the model is not capable of disaggregating the data at the state-level, it is possible to construct different demand groups, based on the NFSA obligations.

Demand groups

Four demand groups are constructed: urban low income, urban high income, rural low income and rural high income. The low income groups correspond to the population that is eligible for the TPDS and hence cover 75% of the rural population and 50% of the urban population. The demand groups are created using expenditure data (as a proxy for income) of the 68th round of the NSS (2011-12). The rural low income group is composed of the bottom 75% of the rural expenditure distribution and the urban low income group consists of the bottom 50% of the urban expenditure distribution. The remaining 25% of the rural population and 50% of the urban population form the non-poor (high income) groups.

Under the NFSA, entitlements vary between the priority households and the AAY households (see section 4.3). The AAY households are entitled to 35 kg food grains per month per household, while the priority households are entitled to 5 kg of food grains per person. In the model, the shares of AAY households in the rural and urban populations are assumed to stay constant, following the estimates from the NSS survey. This implies that the rest of the households in the low income groups are allocated to the priority group. Table 4.6 illustrates the share of the priority and AAY households in the total rural and urban population.

Table 4.6. Share of AAY and priority cardholder shares in the total rural and urban population and in rural and urban lower income groups

	AAY	Priority
Share in rural population	4.66%	70.34%
Share in urban population	2.22%	47.78%
Share in rural low income population	6.21%	93.79%
Share in urban low income population	4.44%	95.56%
Consumption (kg/cap/month)	7	5

Note: The average AAY household size was estimated to be 5 people.
Source: Own calculations based on the NSS, 68th round.

The baseline scenario and DBT scenario

Under the *baseline scenario* the TPDS food grains continue to be distributed during the period 2017-25 to 75% of the rural population and 50% of the urban population at the subsidised prices of INR 3 per kg for rice and INR 2 per kg for wheat in nominal terms. Even though India's TPDS also provides for distribution of coarse grains, the model simulations only consider wheat and rice since these are the main components of NFSA. The baseline scenario hence implies that India keeps procuring substantial amounts of rice and wheat from farmers at the MSP and maintains its large public stocks. The MSP is assumed to be constant in real terms and to stay marginally below the trend of the market prices[10]. It also assumes that current policies remain in place, such as the prohibition to hold private stocks, and that no new policies are implemented that could influence consumption, production, trade or prices.

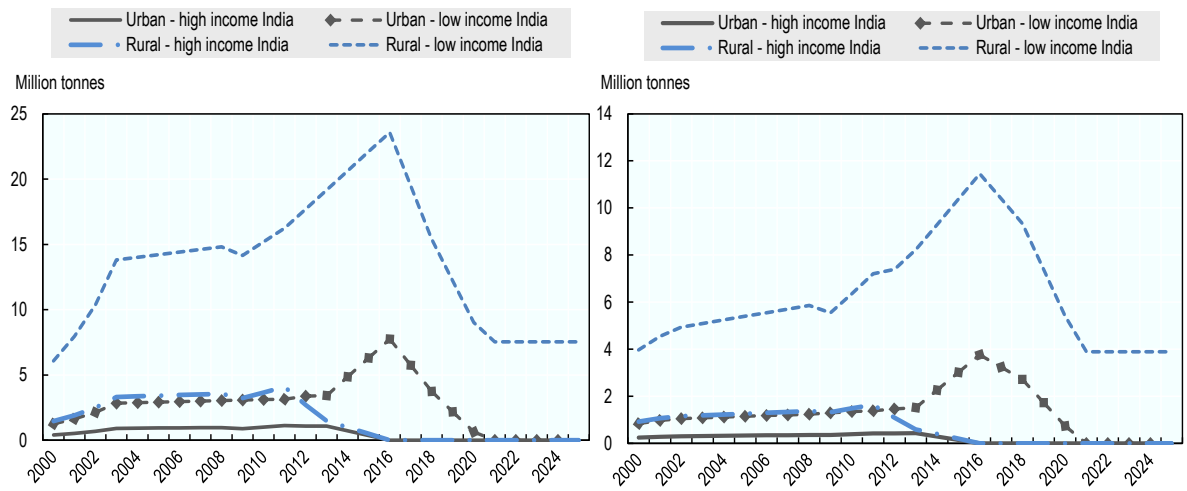
The *DBT scenario* examines what would happen to markets (and to consumption in particular) if the physical grain distribution is gradually and partially replaced by DBT. The cash transfer is modelled to be introduced gradually over the course of five years (from 2017 until 2021) to account for the fact that not all states are equally ready to implement cash transfers (Saini et al., 2017). To incorporate a partial replacement, the *DBT scenario* assumes that 30% of the original TPDS is maintained in the rural areas beyond 2021.

Figure 4.13 illustrates how much rice and wheat from the TPDS were consumed by each of the demand groups from 2000 until 2016. The figure also demonstrates how this consumption is modelled under the DBT scenario from 2017 onwards. From 2000 until the introduction of the NFSA in 2013, the groups of beneficiaries were different than under the NFSA: this explains why there is non-zero consumption in all groups during that period. With the introduction of the NFSA in 2013, the high income groups were no longer eligible which has been assumed to have led to a decrease in consumption of subsidised grains by these two groups. In effect, it is assumed that the NFSA has been

able to achieve its better targeting and the subsidised grain consumption in the high income groups drops to zero in 2016 with full implementation of the NFSA in all states and UTs. In contrast, consumption for low income groups increases with the NFSA, peaking in 2016.

From 2017 onwards, the TPDS in the low income groups is gradually replaced by DBT, which is modelled to be fully implemented by 2021 in the urban areas while in the rural areas 30% of the 2016 TPDS is assumed to remain to represent the need to maintain physical delivery of food to areas where the DBT system would not work either because of lack of market supply or the inability for participants to access the necessary financial services to receive the payment. The public stock level from 2021 onwards is hence assumed to remain constant at 7.5 million tonnes of rice and 3.9 million tonnes of wheat. Most of this public stock would serve the reduced version of the TPDS/NFSA, while 3 million tonnes would be earmarked as emergency stock.

Figure 4.13. Consumption of TPDS rice and wheat by the four demand groups



Source: OECD simulation results.

The monthly cash transfer in the DBT scenario is based on the formula that was applied in the pilot studies in the Union Territories of Chandigarh and Puducherry, where the food subsidy was calculated as 1.25*MSP-CIP. However, under the DBT scenario the cash transfer is slightly higher than the one used in the pilot studies because the MSP is multiplied by a factor 1.5 instead of 1.25. The 1.5 factor was selected following Saini et al. (2017) who report that the current cash transfer in the pilot studies did not allow beneficiaries to buy the same quantities and qualities of rice and wheat in the open market as they could obtain from the TPDS.

Only people in the rural and urban low income groups will receive cash transfers. The total cash transfer for each of these two low income demand groups, denoted by i, is calculated as:

$$Cash\ transfer_i = TPDS_{ri,i} * \{(1.5 * MSP_{ri}) - CIP_{ri}\} + TPDS_{wt,i} * \{(1.5 * MSP_{wt}) - CIP_{wt}\}$$

where $TPDS_{ri,i}$ refers to the total TPDS consumption of rice by low income group i under the baseline, and $TPDS_{wt,i}$ refers to the total TPDS consumption of wheat by low income group i under the baseline.

The DBT scenario also implements changes to the producer side, since the introduction of the DBT implies that the government no longer needs to buy and store large quantities of rice and wheat. Under the DBT scenario, it is assumed that regulatory reforms are introduced which close the gap between the international and domestic prices over the next 10 years. These regulatory reforms would be aimed at improving the functioning of markets and include reforms related to trade policies (e.g. reduce or eliminate the use of quantitative export restrictions), allowing private stockholding and improving infrastructure (roads and communication). In addition, there are no longer any procurement targets under the DBT scenario, but since 30% of the TPDS remains available in rural areas, the government continues to keep public stock. Farmers will still be able to sell their rice and wheat to the government at the MSP.

Consumer side impacts

Given that the objective of the NFSA is to ensure food security in India, the analysis focuses on the impacts on the consumers. In particular, several consumption-related indicators are compared between the baseline and the DBT scenario: the evolution of total caloric intake (supply), the composition of diets, total per capita expenditures on food and the consumer prices of rice and wheat.

Food consumption in this analysis refers to food availability, which is calculated based on FAO's Food Balance Sheets. Figure 4.14 compares the evolution of total caloric intake (supply) for the 4 demand groups for the baseline and the DBT scenarios. The figure illustrates that the high income groups consume more calories per capita than the low income groups and that within the income groups, people in the rural areas on average consume more calories than people in the urban areas. Under the DBT scenario, people in the high income groups are projected to consume slightly fewer calories than under the baseline. One of the reasons behind this evolution might be their increased consumption of fruits and vegetables, which have a lower caloric content than other food items. Even though the caloric intake in the high income groups is projected to be slightly lower in the DBT scenario, it is still much higher than the intake in the low income groups.

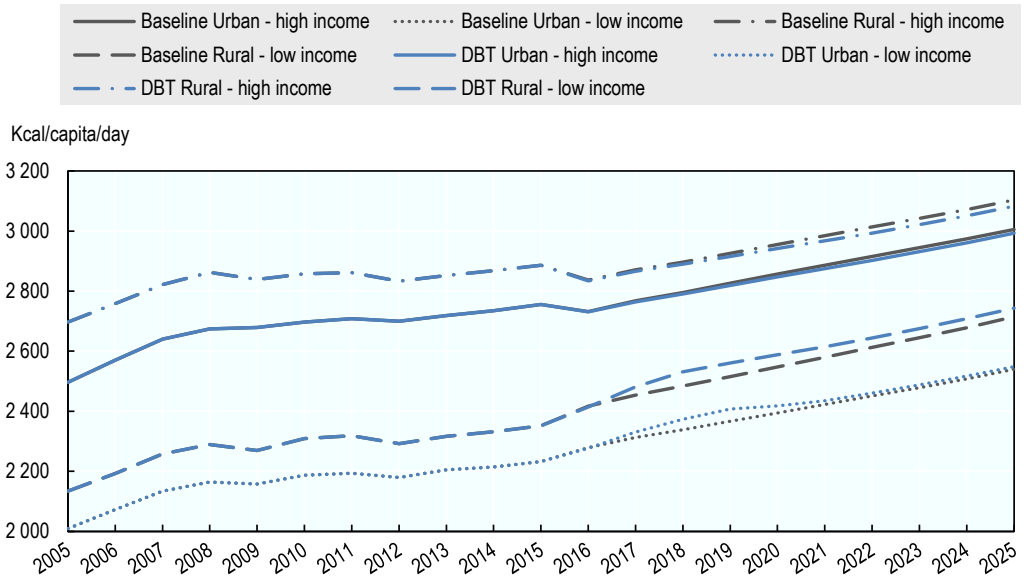
People who were entitled to TPDS/NFSA food grains, that is, the low income groups, would be at least as well off in terms of per capita calorie consumption when they receive cash transfers instead of physical grain. The per capita calorie consumption in the rural low income group is projected to be higher under the DBT scenario than under the baseline. In the urban low income group, which is the group with the lowest calorie consumption, the average increase in calorie intake under the DBT scenario is less pronounced than in the rural low income group.

One of the main critiques of the NFSA is that it skews consumption towards rice and wheat. If the TPDS beneficiaries receive cash instead of physical food grains, they can choose which items to buy, which could lead to a more diverse and nutritious diet.

The simulations demonstrate that the composition of diets is projected to be more varied when consumers receive cash than when they can buy rice and wheat at subsidised prices (Figure 4.15). In 2025, per capita rice and wheat consumption will increase under both scenarios, but the increase is much more pronounced under the baseline. Compared to the urban low income group, the rural low income group will experience a smaller drop in wheat and rice consumption in the DBT scenario. This is explained by the fact that the DBT scenario assumes that 30% of the TPDS is still available to the rural low income group. In the DBT scenario, the relatively lower consumption growth in wheat and rice is compensated by a consumption increase of all other food items. For example, in the rural

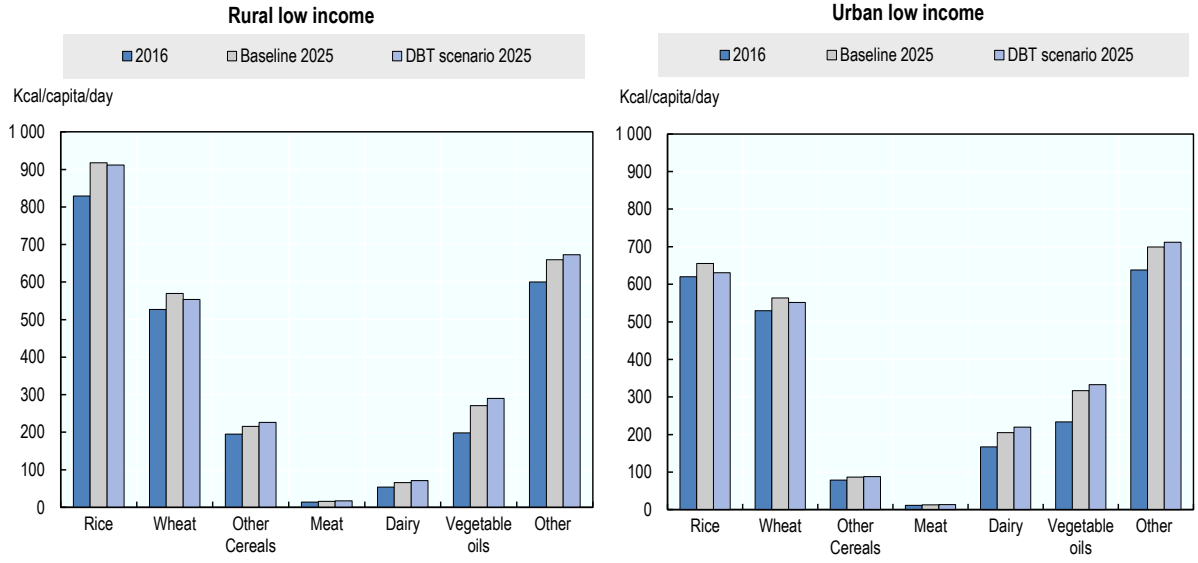
low income group under the baseline, per capita meat and dairy consumption in calorie terms is projected to increase by 14% and 23%, respectively, between 2016 and 2025. Under the DBT scenario, consumption growth in these food groups is projected to be around 10 percentage points higher, namely 23% and 33%, respectively.

Figure 4.14. Daily calorie intake (supply) per capita in four demand groups under baseline and DBT scenario



Note: Calorie intake is calculated based on total food availability, as reported in FAO's Food Balance Sheets.
Source: OECD simulation results.

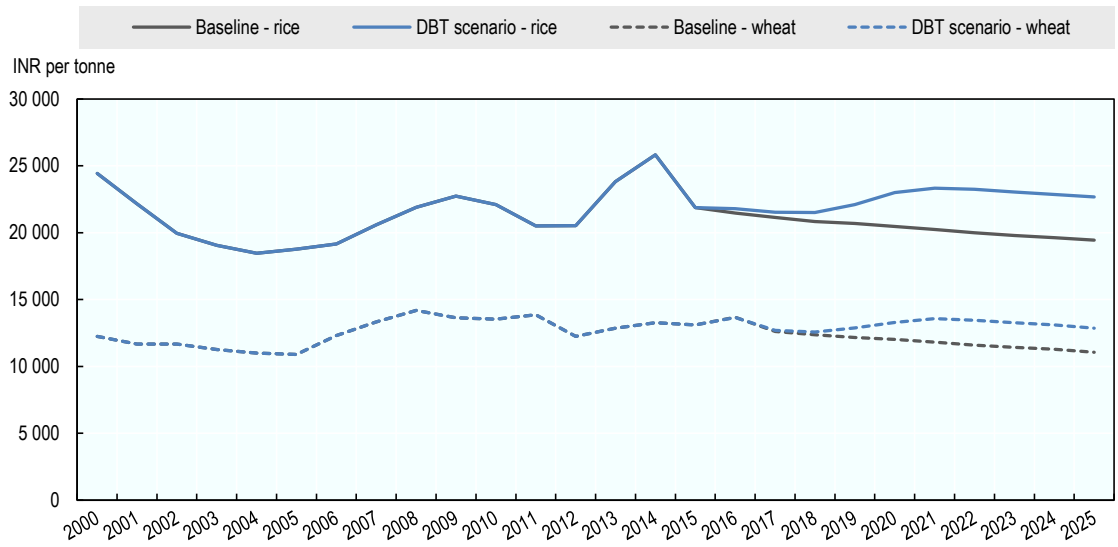
Figure 4.15. Calorie decomposition under baseline and DBT scenario, in rural and urban low income groups



Note: The category "other" contains all food commodities that are represented in FAO's Food Balance Sheets.
Source: OECD simulation results.

The introduction of cash transfers combined with better functioning markets under the DBT scenario lead to relatively higher consumer prices for rice and wheat than under the baseline (Figure 4.16). As illustrated above, the consumption of rice and wheat will be relatively lower under the DBT scenario. On the producer side, farmers experience a lower demand from consumers but also from the government, which procures much less rice and wheat under the DBT scenario. In addition, the reforms implemented under the DBT scenario improve the working of markets, where the market price will rise above MSP. The MSP thus would no longer determine production decisions and farmers have more freedom in their choice of which crops to grow.

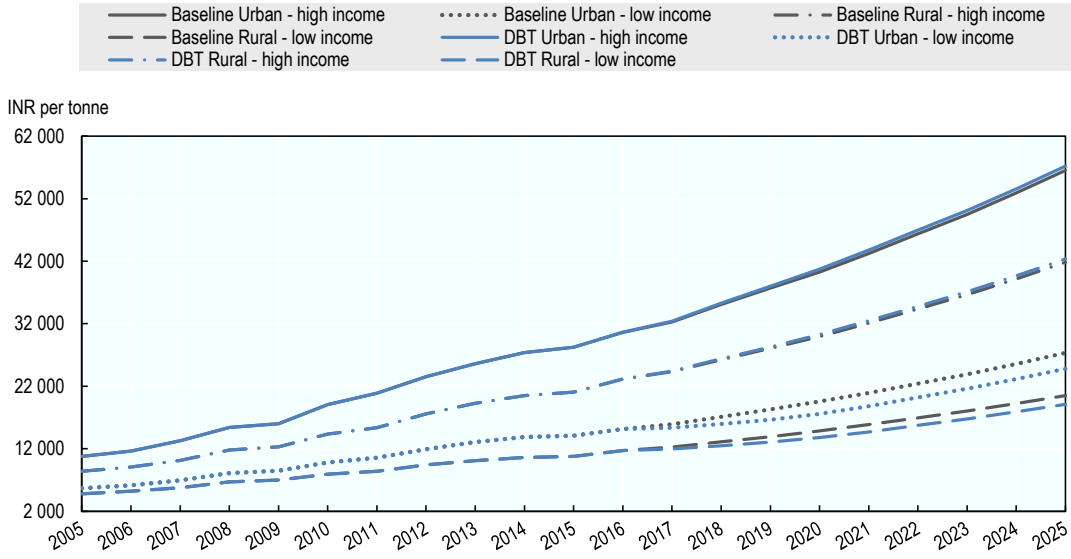
Figure 4.16. Consumer prices in real terms



Source: OECD simulation results.

The higher consumer prices for wheat and rice under the DBT scenario would not negatively affect the overall food security situation in the country. First, consumers receive cash which allows them to buy cheaper or higher quality food than wheat or rice. This is illustrated in Figure 4.17, which shows that the flexibility in consumption decisions in fact reduces total food expenditures for the low income groups, once the cash transfer is accounted for. Because they receive the cash transfer, the people in the low income groups have to use less of their own financial resources to buy food. This in turn means that more money is available to spend on other items, including higher quality food, but also education and health care. Second, the TPDS is not completely abolished under the DBT scenario and consumers who prefer to buy (or have less opportunity to buy food from the market) rice and wheat at subsidised prices are still able to do so. Finally, the higher consumer prices for rice and wheat coupled with better functioning markets imply that farmers who produce a marketable surplus receive higher prices for these commodities.

Figure 4.17. Per capita spending on food from own financial resources (net of cash transfer)

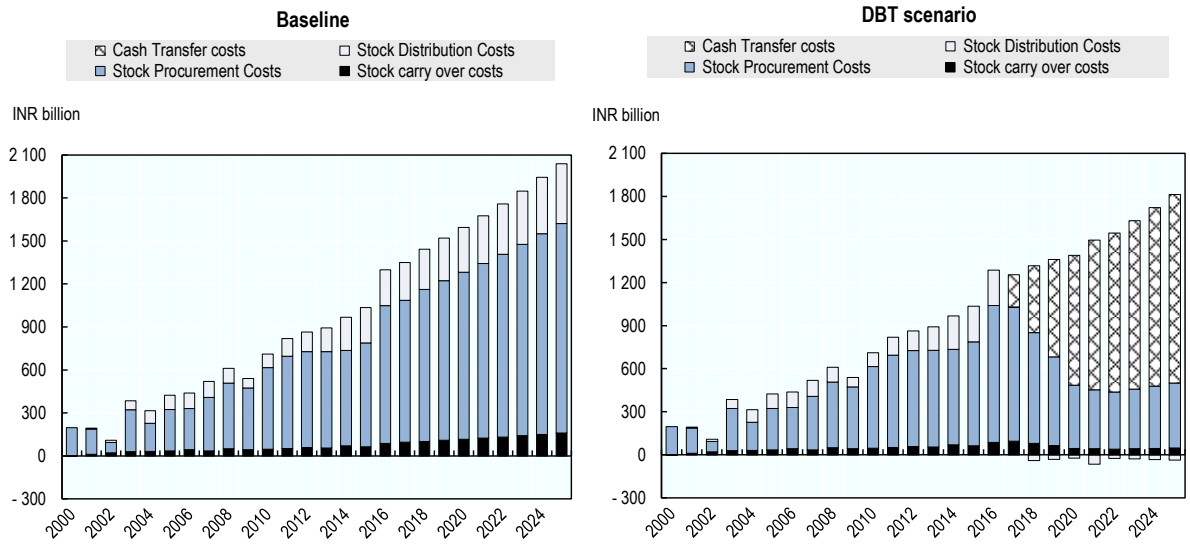


Note: Food expenditures are only represented for the food commodities included in Aglink-Cosimo (cereals, meat, oilseeds, sugar, dairy and fish). For the low income groups, the cash transfer is subtracted from the food expenditure to obtain the per capita spending on food from own financial resources.
Source: OECD simulation results.

Partially replacing the TPDS by DBT will result in much lower overall costs of procurement, stock carry over and distribution for the government (Figure 4.18). The cash transfer programme will of course require a substantial amount of government funds, which will depend on the way in which the government implements the DBT. If the cash transfer is calculated based on the formula used in the DBT scenario, then the total fiscal costs for the government are projected to amount to INR 1 778 billion by 2025, which is well below the INR 2 039 billion cost of the TPDS under the baseline. These amounts are purely budgetary based and do not incorporate all potential costs and savings that result from switching to DBT. In particular, they do not incorporate the costs of reforms, which could lower the savings in the short term but could create second round savings over the medium term when the effects of these reforms start to pay off. They also do not account for the fact that leakages will be substantially decreased under the DBT, which would increase the savings considerably.

The above estimated funds that are saved by partially switching to DBT can then be invested in other programmes that improve the food security situation in the country, such as investments in irrigation and market infrastructure, market reform and R&D to enhance agricultural productivity and mitigate the impacts of climate change. Reinvesting these savings into the agriculture sector will not only boost the sector's growth rate but will also support the government's drive to increase farmers' incomes and improve their profitability.

Figure 4.18. Composition of the cost of the food subsidy programme under baseline and DBT scenario



Note: Negative distribution costs occur when the revenues of selling rice and wheat are higher than the costs.
Source: OECD simulation results.

The move to DBT and accompanied investments in the market also brings with it other impacts for producers. Not only do open market prices increase, but there is also an increase in exports, meaning that producers, if equipped to participate better in markets, are likely to be able to take advantage of India's relative comparative advantage in both crops and find alternative markets to compensate for the lower quantities sold on the domestic market (to the government).

Policy performance in the face of risk

The food security situation in India can be influenced by a myriad of factors, including temporary shortfalls in production due to bad weather, macroeconomic conditions, energy prices and policy interventions (Box 4.2). When designing a food security policy, it is crucial to examine how these types of shocks could affect the performance of the policy.

The performance of the current policies (baseline) and the DBT scenario is examined under the combination of two different types of risks: a period of high international prices combined with a domestic yield shock. The high international price period is modelled to start in 2017 and last for the entire projection period that is until 2025. This high price period is implemented by assuming that the GDP in the world excluding India will grow by an additional 1% each year. In addition, the shock scenario also introduces a drop in domestic rice and wheat yields. This low yield shock is modelled as a short-term event, in which both wheat and rice yields are 10% lower during the years 2022 and 2023.

Box 4.2. Risks to food security in India

For households in India, external events can pose significant risks to food security. As noted there is a significant number of households that sit close to the undernourishment threshold (however defined). Events that cause movement in prices without commensurate increases in income can therefore push large numbers into food insecurity. Food insecurity risks in India can be divided into two broad categories; risks due to natural phenomena and risks due to market and other economic situations. Natural phenomena that cause food insecurity include droughts, floods, cyclones and earthquakes, which could affect both the availability and the access to crops in the country. The macroeconomic risks include international and domestic economic crises as well as spikes in food prices in the international market.

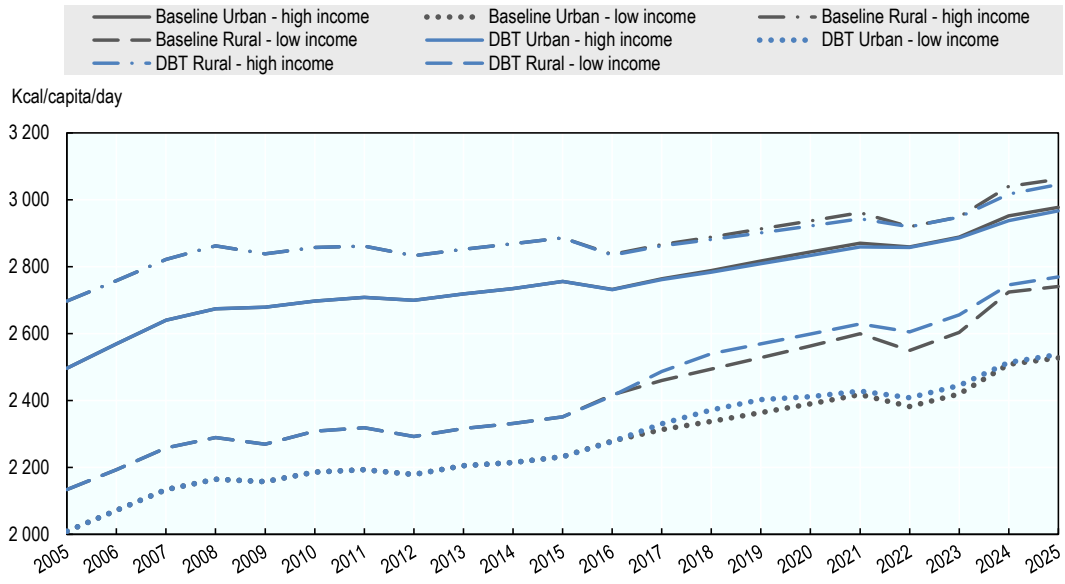
Droughts represent the most significant natural event that affects production in India (Chapter 2). One of the reasons for this is that about 56% of India's gross cropped area is rain-fed and depends on the monsoon rains in the four months of June to September which together account for about 76% to 80% of annual precipitation of the country. Any event that disrupts monsoons, affects the country's agricultural production broadly. Key staple crops are particularly vulnerable, with the amount of rice area drought prone, for example, estimated to be around 13.6 million ha out of a total 22.3 million ha (Pandey and Bhandari, 2009). The most severe droughts in the past have affected more than 60% of the area of the entire country (De, Dube and Rao, 2005). Overall, the frequency of droughts in India is estimated to be between 1 in every 4 and 1 in every 5 years (Pandey and Bhandari, 2009; Tyalagadi, Gadgil and Krishnakumar, 2015; Saini and Gulati, 2014; Mall et al., 2006).

While the use of irrigation for staple crops is significant and has decreased the exposure of many farmers, droughts still have a substantial impact on the production of crops and the income of farmers. For example, a study on three states of eastern India, Chhattisgarh, Jharkhand and Orissa, shows that the estimated loss of crops during drought years is 36% of the average value of production in the area (Pandey and Bhandari, 2009). The same study shows that when the loss by droughts is averaged over a span of drought and non-drought years, the estimate of the annual loss is USD 162 million or 7% of the average of outputs in eastern India. The household-level data analysis from the study indicates a substantial loss of 40% to 80% of the total agricultural income, as well as 13 million additional people who fall back into poverty in drought years. Going forward, as much of India's water resources are under pressure and are subject to decreased availability with climate change, the severity of future events is likely to increase.

Beyond natural events, international price movement can also negatively impact food security – particularly if they are sudden. Recent history shows the potential for sudden and often policy exacerbated price movements on international markets such as those seen in 2007/08 and 2010/11. While the reasons varied, the price rises can pose a significant risk to food security if the incomes of households do not increase to cover the rising cost of food.

A temporary decrease in the domestic supply of wheat and rice due to lower yields is projected to lead to temporary reductions in per capita food consumption under both the baseline and the DBT scenario (Figure 4.19). However, the outcomes under DBT are better than with food distribution alone as the average per capita calorie intake in the low income groups is projected to remain higher under the DBT scenario compared to the baseline. Under the DBT scenario, the functioning of domestic markets mean they are better able to deal with this temporary supply shortfall and as such they are more responsive to consumer needs (including in the supply of substitute products) than what is possible with the release of rice and wheat from public stocks under the baseline.

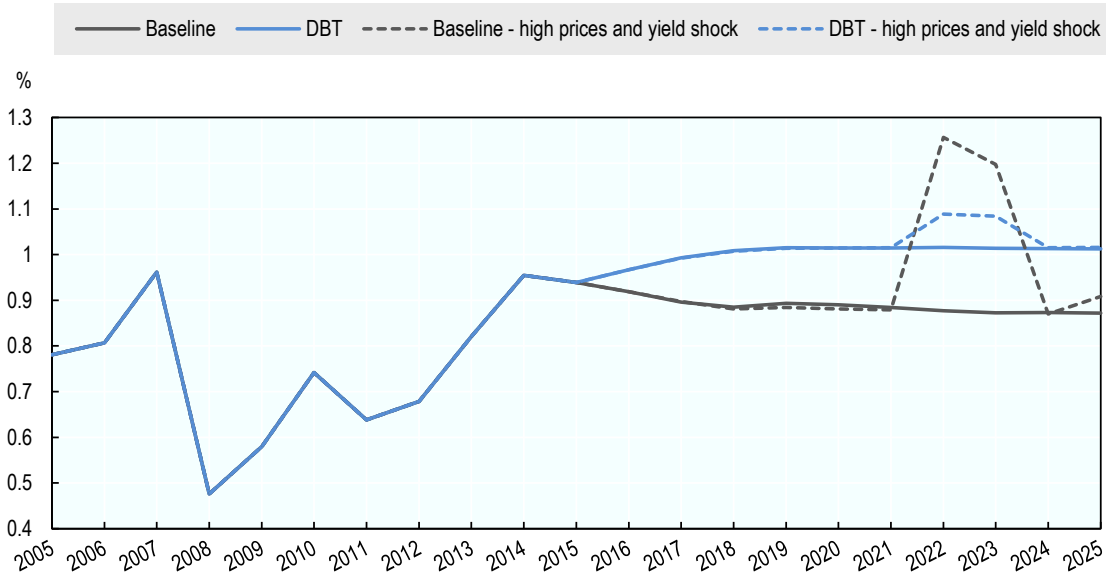
Figure 4.19. Daily calorie intake (supply) per capita in four demand groups during high international price period combined with domestic yield drops for wheat and rice, for baseline and DBT scenario



Note: Calorie intake is calculated based on total food availability.
Source: OECD simulation results.

The improved role of markets under the DBT scenario becomes evident when examining how domestic prices relate to the international price. Figure 4.20 illustrates for rice the ratio of domestic prices over international prices under the baseline and the DBT scenario, without and with shocks. In the absence of high international prices and a domestic yield shock (without shocks), the ratio under the DBT scenario is close to 1, while the ratio under the baseline is below 1. This illustrates that prices are modelled to be better integrated under the DBT scenario. If international prices are higher during the projection period and India experiences a yield shock (with shocks), then the price ratio will surge during the years of lower yields.

Figure 4.20. Domestic price of rice as a share of the international price under baseline and DBT scenario, without and with shocks

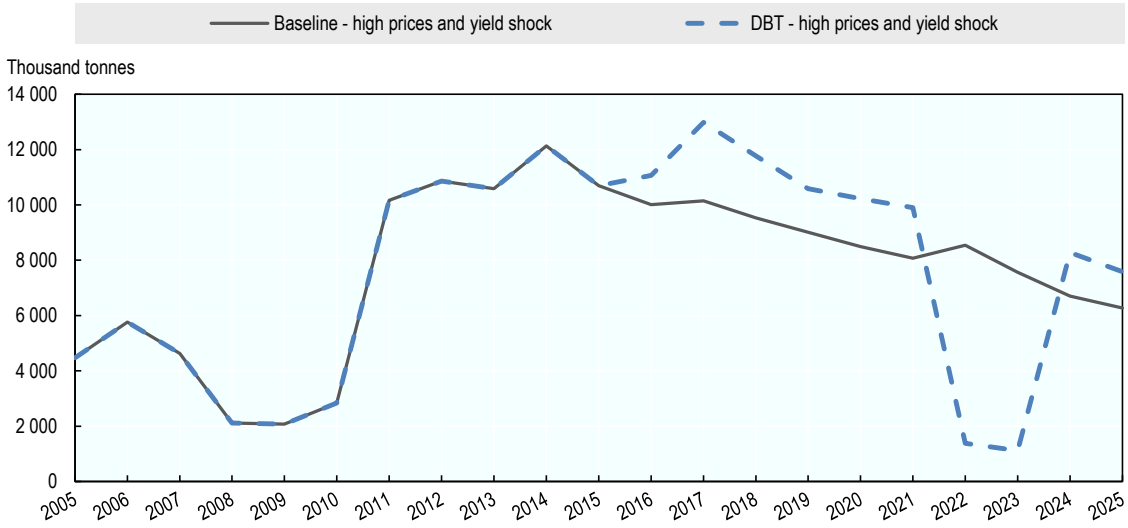


Source: OECD simulation results.

This surge will be much more pronounced under the baseline than under the DBT scenario because of two factors. First, domestic prices will increase less under the DBT scenario given that India will significantly reduce its exports when it is faced with low domestic supply (Figure 4.21). Second, international prices will rise more under the DBT scenario than under the baseline. Since India is the largest rice exporter in the world, the fall in yield and therefore supply (both in aggregate and because Indian consumers have more resources available to consume the higher priced rice domestically) means that this event has a significant impact on international prices. When India reduces its exports, this will negatively affect the international availability of rice and hence lead to an increase in international prices. In the case of wheat, the international impacts are more subdued given that India is not a large exporter.

While the baseline shows less of an impact on international prices, there is a possibility that they may be influenced significantly if India repeats its past use of export restrictions. It is not unlikely that India might reinstate an export ban, particularly when faced with high international prices. Unless there are regulatory reforms that explicitly prohibit the use of quantitative export restrictions, as is the case under the DBT scenario, it is possible that exports are banned or restricted using policy measures. In this case, the impacts on the international markets could be significant and would not be driven by market developments, but instead determined by policies.

Figure 4.21. Rice exports during period of high international prices (2017-25) combined with low yield in India (2022-23), for baseline and DBT scenario



Source: OECD simulation results.

Key messages

Simulations using the Aglink-Cosimo model examine what would happen over the period 2017-25 if the NFSA remains in place (*baseline*) compared to a situation where the TPDS is gradually and partially replaced by DBT and regulatory reforms are introduced (*DBT scenario*). The key findings are as follows:

- People entitled to TPDS food grains are at least as well off in terms of per capita calorie consumption (availability) when they receive cash transfers instead of physical grain.
- The composition of diets is projected to be more varied when consumers receive cash than when they can buy rice and wheat at subsidised prices. Increased consumption of fruits and vegetables, milk, dairy products and pulses makes diets more balanced and meals more nutritive. This way the missing *absorption* element of food security from the current system of TPDS/NFSA is addressed effectively.
- The introduction of cash transfers combined with better functioning markets under the DBT scenario leads to relatively higher consumer prices for rice and wheat than under the baseline. These higher consumer prices under the DBT scenario would not negatively affect the overall food security situation in the country because i) consumers can use the cash transfer to buy cheaper or higher quality food than wheat or rice, ii) some consumers with limited access to markets or where cash transfers are not feasible can still rely on a reduced TPDS and iii) farmers with marketable surpluses will receive higher prices and hence more revenues.
- The cash transfer programme will be less costly than the TDPS. The funds that are saved by partially switching to DBT can then be invested in other programmes that improve the food security situation in the country, such as investments in irrigation and market infrastructure, market reform and R&D to enhance agricultural productivity and mitigate the impacts of climate change.

- A move to DBT will also perform better, in terms of food security outcomes, in the face of high international prices or domestic yield shocks that can result from droughts. In this way, moving towards DBT is also a better strategy for India to manage the risk of food insecurity.

4.6. Addressing producers' incomes

India's TPDS is indicative of its approach to food policy. The TPDS both targets food insecure consumers and attempts to help provide stable and secure incomes for India's producers. Given this, reforms to one aspect of the scheme – more effective and efficient outcomes for poor consumers – will mean that there are flow on impacts on producers. The focus of the above analysis has been on policy reforms that could improve the efficiency and effectiveness of government interventions aimed at improving food security, focusing on individuals as consumers. This has been shown to be possible through the implementation of a system of DBT. In moving towards a more efficient and effective system with the use of DBT, however, the need for significant government purchases of wheat and rice under a system of MSPs would be drastically reduced. But for producers, lower government purchases at a MSP would have an impact. In Chapter 3 it is shown that for both wheat and rice, market prices follow the MSP due to the large volumes purchased. This shows the direct impact that MSPs have on producers and indicates that specific policy responses directed towards them will be required under a system of DBT. Despite the importance of MSP, the analysis in Chapter 3 also reveals that negative price gaps for wheat and rice existed over much of the period examined (2000 to 2016) suggesting that the market is key to any response directed at producers. The negative price gap between the domestic and international markets for both products have arisen from a number of sources, but in sum, are due to the interaction of the various policy measures that are depressing producer prices. Such policies, even under MSP, have had a negative impact on producers. With a significantly scaled back procurement system, these effects will continue and likely have a greater impact on producers.

While negative price gaps have existed over most of the period examined, in recent years, the Indian Government has used its system of MSP in rice (non-basmati) and wheat to push domestic prices above international prices. This situation creates additional complications for India. As an exporter, such a situation is untenable as India cannot make use of export subsidies to dispose of excess stocks created by the higher prices – policies which all WTO members agreed to eliminate at the 10th Ministerial Conference in Nairobi in 2016. In this sense, pursing further reform is both necessary to avoid farm gate price falls that may result from a scaled back government procurement system under a DBT scheme, and to avoid complications over dealing with excess production. Such reforms will help place India's agricultural producers on a stronger footing and promote income growth due to better participation in both domestic and international markets – the latter a significant buyer of rice produced by Indian farmers.

In the assessment above, it was assumed that negative price gaps between domestic and international markets would be closed at the same time as a system of DBT was introduced. In this section, some of the changes that would be required for the price gaps to be eliminated are discussed. While a wider range of policy reforms are required for the Indian agricultural sector to meet all of its future challenges, some key areas of focus for reform that will specifically influence the gaps between domestic and international markets are highlighted. The steps required under each of these areas are varied and will take time to have an impact on producer incomes. They will also need to be taken by the

government at various levels. Further, unlike DBT for consumers, the impacts of these reforms on producer incomes will be more diffused, and therefore less obvious to the intended beneficiaries. The diffuse nature of the gains thus creates political economy difficulties as when hard times hit, the government will face pressure to implement more interventionist measures. However, notwithstanding these challenges, the results presented above indicate that real benefits are on offer from these reforms. They have the potential to both help promote food security and to enhance India's place in the global agro-food market.

Putting in place more stable trade policies

India has a long history of the use of various policy instruments to restrict the export of some agricultural products – particularly those which align with food security policy (Chapter 3). India has made use of various tools including export prohibitions, export licensing requirements, export quotas, export duties, minimum export prices, and state trading requirements. Combined with public procurement, export restrictions have been applied to both rice and wheat in times where the government held concerns over movements in international prices or when supply was feared to be short.

A number of authors have shown that the imposition of export restrictions achieved their objective of lowering domestic prices during periods of high international price movements (Ivanic and Martin, 2014; Timmer, 2010; OECD, 2008). However, the impacts of these policies have both an international and domestic element. On international markets, as India is a large exporter of rice, the imposition of export restrictions effectively 'exports' its possible price increase to the world market, re-enforcing (or potentially triggering) the price spikes that were observed in 2007/08. On a global scale, Anderson, Ivanic and Martin (2012) found that export restrictions in India and elsewhere, along with modifications to import policies exaggerated overall world price movements – particularly for net food-importing countries with low trade barriers. The exaggerated price movements created worse outcomes globally than what would have otherwise occurred, increasing levels of food insecurity across the world. Anderson, Ivanic and Martin (2012) find that the trade-based food price insulation policies implemented in 2008 could have actually increased the number of people living in poverty around the world. Furthermore, a recent OECD study shows that countries that traditionally imported rice from India started to rely less on international markets following the introduction of rice export bans in India (Deuss, 2017).

On the domestic front, the policies used to control exports sought to avoid a sharp rise in domestic prices. In doing so, the policies effectively tax producers and indirectly redistribute these pseudo tax revenues to poor households via lower staple food prices. The policies did successfully maintain lower prices in India compared with elsewhere in the world but were also indiscriminate and so of benefit to both needy and less needy households. However, the impacts of these policies are not simply one off or short term. They persist beyond the period of high prices. For example, in other countries the application of ad hoc export restrictions has discouraged private investment, increased the risk of sourcing product from the countries that use them, and potentially caused sudden swings in trade volumes in the anticipation of the application of restrictions (in the case of Lao PDR – see Durevall and van der Weide, 2014). In non-high price years, such policies can depress domestic market prices, creating an effective ongoing tax on domestic producers – that is, they bear the cost of the uncertainty that is created.

Jacoby (2013) suggests that using export restrictions to lower domestic prices – both in times of international spikes or when international prices rise in response to market conditions – will be net costly, particularly so for poor rural households. In examining the medium to long term impacts of India's agricultural export restrictions on poverty, Jacoby found that these policies dampen or eliminate the wage response to higher commodity prices (as producers are prevented from benefiting from the higher prices). When coupled with food price increases that occur despite the domestic policies being in place, many rural poor are likely to be adversely effected by the export bans. Indeed, findings of the empirical analysis suggest that in the absence of export bans, rural wage adjustment appears to play a much greater role in protecting the welfare of the poor than India's Public Distribution System (Jacoby, 2013).

Reforming regulatory restrictions and increasing private sector involvement in the wholesale market

India's wholesale market development has been heavily reliant on government involvement over the longer term. Since the 1960s, state and central governments have played a key role in the regulation of wholesale markets and also have directly intervened through participating in them as buyers of some commodities. One of the main regulatory instruments that have been put in place is the Agricultural Produce Marketing Committee (APMC) Act. The use of the APMC Acts since the 2000s has been put in place to develop an organised system of marketing through a network of regulated markets across the country. The APMC Acts (of various forms) have been developed as a 'model Act' by the central government as the central government does not have jurisdiction over wholesale market activities. The purpose of the model Act is to provide a template with the aim that each state enacts the model to govern functioning of the wholesale markets with its jurisdictions thereby achieving consistency across the country. These Acts make the regulated markets the mandatory conduit for trading agricultural produce and thereby prevent private players from setting up markets and investing in market infrastructure (Chapter 3). It has been variously updated over time and currently a new Model Act has been developed (Chapter 3). The APMC Act is only one of a series of wholesale market regulations. In 2001, an expert review of the sector identified 25 regulations that have been used to govern food and agricultural markets enacted between the 1930s and 1990s (Reardon and Minten, 2011). The APMC sets the legislative groundwork for the establishment of government bodies to implement the regulations described and sets out the investments that have been made in market infrastructure.

The APMC Act imposes the requirement that all wholesale trade is required to pass through an APMC and in doing so various agents are subjected to certain levies and taxes. One of the implications of this requirement is that it effectively prohibits the establishment of contract farming, the development of private markets (and thus private sector investment) and the direct trade of agricultural products from farmers to consumers (Reardon and Minten, 2011). While the majority of production flows to APMC markets directly from primary producers, in some areas, to work around the requirements and due to small quantities being offered for sale, a vast array of marketing agents operate as intermediaries between the farmer and the market. These agents act as the interface between farmers and the wholesale markets themselves and operate at various stages along the supply chain – be they at the first point after farm-gate or when they directly interact in APMC regulated wholesale markets. Furthermore, the various degree of implementation of the model APMC Act, along with a number of states which have not

implemented it at all, have led to a myriad of different conditions in wholesale markets across the country. These differences act as a constraint to interstate trade and cause markets in different areas to become fragmented (a common concern of past reviews of the system – see Chapter 3). For key producing states, the higher costs to interstate trade create additional downward pressure on prices in seasons where production is high.

Ultimately, despite the original intention of the APMC Act to prevent the exploitation of farmers, the effect of these provisions, along with other measures discussed in this section, has been to contribute to the negative price gaps between domestic and international markets for a number of commodities (Chapter 3). Essentially, the arrangements have contributed to increasing the transaction costs associated with transferring goods from the farmer to the end consumer. With the large number of farmers in India, and the disadvantage many face in terms of information available to them and their levels of education, many of these costs are passed on and so the higher transaction costs act to depress farm gate prices.

In the context of the two key food security crops examined here, the government has tried to ameliorate this through the use of MSPs. However, even with these, and the government acting as the largest buyer of these products, over recent history farm gate prices have followed the MSP but remained below international benchmarks (Chapter 3). While the buying arrangements may prevent prices from being even lower, it suggests that deregulation of these markets could also help improve farm-gate prices for rice and wheat.

However, deregulation of the market does not imply disengagement. The government would still need to play a key role in providing the necessary infrastructure to support the markets (including physical infrastructure; human capital investments related to education, training; and information provision such as accessible information about prices across key markets) (discussed below). Governments also have a key oversight role in ensuring that competitive forces do not lead to exploitation of farmers. Key to this will be allowing free trade in rice and wheat (and other agricultural products) across the states. This would provide farmers with the choice of markets and create competition between wholesale markets themselves.

For choice and deregulation to have positive impacts, there is also a need to allow greater private storage for all agricultural products. Private traders and farmers collectively through co-operatives (who act as private traders) should have the option to be able to store production (where relevant and possible) for sale at a time of their choosing. Similarly, private traders and processors also need scope to hold stocks. A recent OECD report shows that private stocks are a key mechanism to help reduce domestic market price volatility and can help with the stabilisation of farmer incomes (Beaujeu, 2016). As discussed in Chapter 3, there are a number of controls in place on private storage, either in terms of limits on the ability to do so, or through legislation that provides the government with certain rights over stocks in particular circumstances (such as sale to the government when shortages exist). These controls are mostly brought about through the ECA. Furthermore, allowing private traders and processors to hold stocks could also allow for the development of other contracting arrangements (apart from contract farming) that can provide better outcomes for farmers. Allowing a broader range of contracting arrangements could have flow on impacts on the development of upstream sectors with both implications for farmers (in terms of better prices) and job creation elsewhere in the food value chain (which could help with rural development and structural adjustment). While linked to a much broader set of trade, regulatory and

institutional factors, a key question remains as to why with prices for many agricultural products being below international benchmarks, there has not been a rise of a large and internationally competitive food sector in India – recent OECD work has suggested that here too, a range of regulatory reforms could promote the manufacturing sector's performance (OECD, 2016).

The rise of supermarkets in India is also placing pressure on APMC mandis (wholesale markets) and traditional wholesale arrangements (Reardon and Minten, 2011). While the development of supermarkets and retail chains has a long history, Reardon (2011) describes the wave of development of modern retail chains since the mid-2000s to help meet the changing demand of a growing middle class in major cities, largely driven by domestic capital. A key feature of India's retail chain development has been the strong position of co-operative retail chains (such as Mother Dairy). Modern retail was estimated to have grown by 49% per year between 2005 and 2011 in USD terms – a rate that had the potential to be higher if not for restrictions on FDI that existed over the period (Reardon and Minten, 2011). It is argued that the mix of demand for processed and non-processed products can have flow on effects on wholesale markets and the development of food processing. In India, while there is a large reliance on the wholesale markets, some authors have suggested that there has been a trend to source more directly from farmers where possible (Reardon and Minten, 2011) – a process that can usually work to the advantage of farmers – indicating some market demand for doing so. For food security, evidence on the price effects of supermarkets, in terms of providing lower priced staple foods (Minten et al., 2010), suggests that in urban areas at least such developments have also been positive.

In terms of steps being taken to reduce the regulatory barriers in wholesale markets, recent changes (in 2017) to the model APMC Act have sought to address some of the concerns with the regulation of wholesale markets (Government of India, 2017f, 2017g). The changes seek to reduce the transactions costs associated with accessing and participating in wholesale markets through the establishment of a single licence and single point of entry levy. These changes come on the back of the establishment of the infrastructure to support the development of an electronic National Agricultural Market (e- NAM) – a national electronic portal which aims to link APMCs and other market yards across the country (Government of India, 2017e). The e-NAM is intended to provide information on product arrivals and prices; the buy and sell offers made by traders; and allow to respond to trade offers. In this way, it seeks to reduce market transaction costs and information asymmetries. It covers 69 approved commodities and as of September 2016 250 *mandis* (out of a planned 585) across 10 states were live on the portal.

Improving agricultural infrastructure and producer capabilities

To help improve producer prices a number of investments are needed in agricultural infrastructure and capabilities of producers. Key among these will be the removal of restrictions on private storage. This will encourage private investment and new marketing channels and will help address some of the agricultural infrastructure gaps and create benefits for producers and consumers. However, more is needed. Investments in both physical agriculture infrastructure and in education, extension and research and development will all be important in helping close the gaps between domestic and international prices.

India currently lags in agricultural infrastructure provision and in aspects of sustainability compared with countries at a similar level of development. Scores from the Agricultural Growth Enabling Index (AGEI) – developed by the OECD and IFPRI – show that across the various aspects of the enabling environment measures related to agriculture and sustainability, India scores below average suggesting improvements are possible (Figure 4.22) (OECD, 2017). Within the agriculture set of factors that have been shown to promote growth in the sector, India scores below comparable countries in the provision of agricultural infrastructure, agricultural R&D, land rights and access and capital intensification. At the same time, India's pressure on water and land availability is greater than those in other countries at a similar level of development.

The gaps that exist between India and other countries at similar levels of development suggest there is scope to refocus government support to the sector towards investments to promote growth in the sector. In particular, investments are needed in agricultural market infrastructure – both the connectivity infrastructure to better connect producers to markets along with wholesale infrastructure including that which supports price transparency (such as the e-NAM initiative). Further, other forms of agricultural infrastructure that will promote sustainable productivity growth (related to appropriate investments in irrigation and land tenure and trading systems) will also be required. The shift away from the use of a government procurement system to underpin the functioning of wholesale markets should also provide increased scope for the provision of more stable funds for such investments. While the benefits to flow from these will take time to materialise, however, they will continue to accrue over a longer period.

The reduced government regulation of wholesale markets should mean that not all investment will need to come from the public sector. Allowing greater private sector involvement in the wholesale sector should also provide incentives for private sector investment, both domestically sourced and that which may come from international investors. This additional source of investment, and increased competition for farmer produce, should have a positive impact on producer prices in an era where demand for food is expected to increase. It should also help to provide better signals to producers to be able to better respond to the changing patterns of demand, helping Indian farmers make better production decisions with their limited resources.

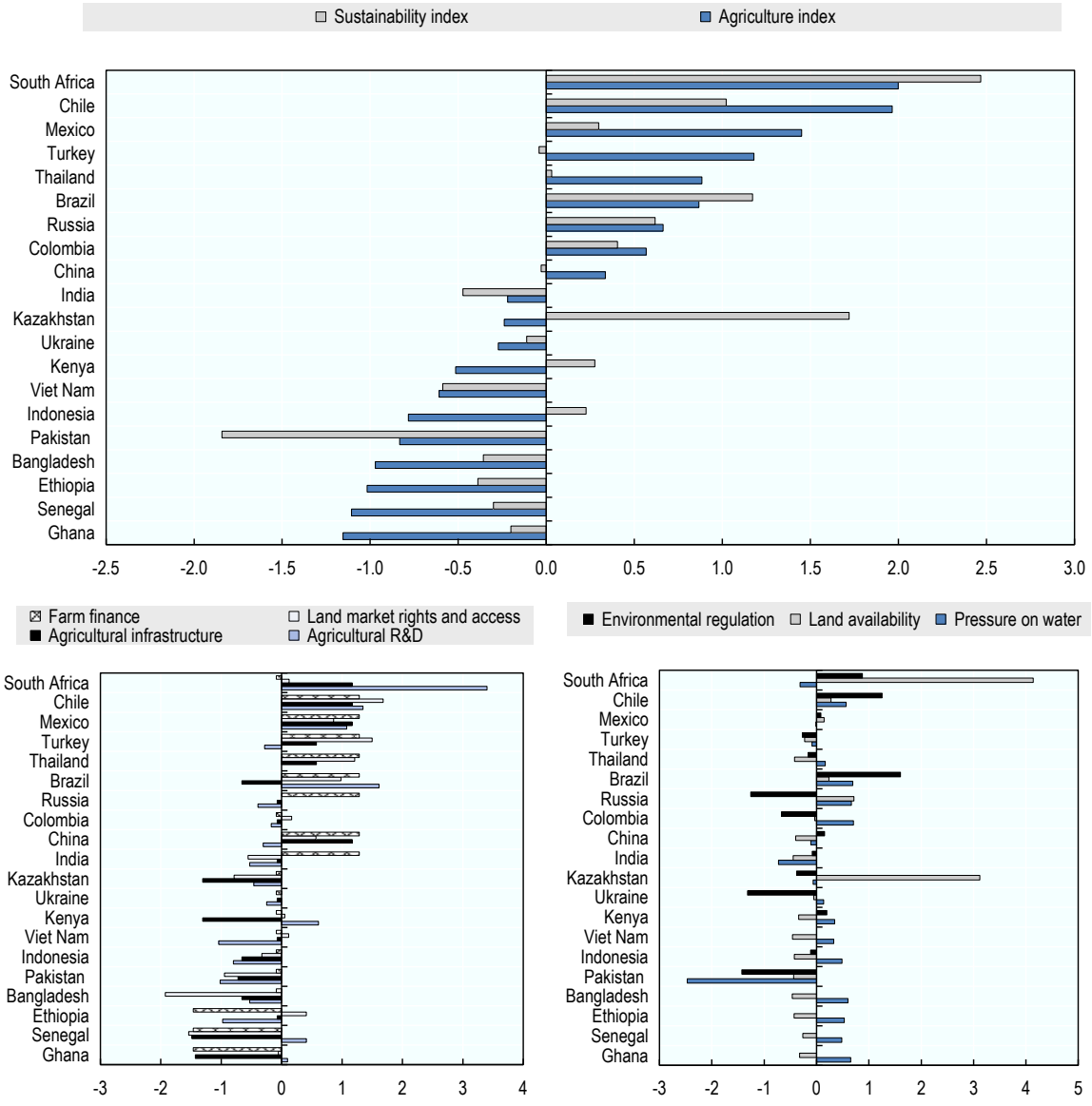
As discussed above, other forms of financial infrastructure to support the development of the DBT system should also have positive spillovers for producers. Access to credit, particularly by smaller producers and to that of a long term nature is lacking (albeit India preforms better than a number of its peers) – due to issues of coverage of the financial system and due to issues around tenure insecurity (aligned to the need for more investments in the land system).

However, to complement moves that increase investment in infrastructure, investments that improve producer capabilities are also needed so allow them to get the most out of markets and respond to the changing nature of demand that has begun and will continue as India develops. As for physical infrastructure, many of the recommendations that are discussed based on analysis in Chapters 2 and 3 will be of importance here. In deregulating wholesale markets there will be greater need for farmers to know and be able to deliver products of specific quality to the market (or markets of their choosing). It will also be necessary for buyers, as it will help build confidence in making purchases in markets in other areas or states through the e-NAM system. Improvements in the extension system, access to ICT (such as mobile phones and other mobile technology)

along with better provision of basic education will all be needed to help close the gap as government intervention in the market is reduced.

Figure 4.22. Agricultural growth enabling index scores for India

Agriculture and sustainability dimensions, 2015



Note: Agricultural Growth Enabling Index (AGEI) normalised scores for each country relative to average for the 32 countries included within the AGEI. Normalised scores for each country on the AGEI index and on each component block and indicator are calculated by subtracting the average for the 32 countries from each country value, and then dividing the resulting country value by the standard deviation for the series. This creates a series with zero mean and unit standard error.
Source: OECD (2017).

Notes

[1] For the purposes of this chapter, two undernourishment thresholds have been examined. The first is a threshold of 1 600 kcal per person per day which yields an undernourishment figure that approximates the one calculated by the FAO. This is chosen so that numbers of the undernourished population approximately match those published by the FAO. The second approach varies calorie requirements by age and sex and by households in rural and urban areas due to differences in calorie requirements. The base thresholds for an adult male are 2 400 kcal in rural areas and 2 100 in urban areas.

[2] These 24 commodities comprise 7 cereals (paddy, wheat, maize, sorghum, pearl millet, barley and ragi), 5 pulses (gram, tur, moong, urad, lentil), 7 oilseeds (groundnut, rapeseed-mustard, soyabean, sesamum, sunflower, safflower, nigerseed), 4 commercial crops (copra, sugarcane, cotton and raw jute), and toria.

[3] The bifurcation of stocks under strategic and operational heads is more for accounting purposes and does not imply a physical bifurcation of the grain stocks.

[4] Household expenditure in this chapter is used as a proxy for household income and is normalised to account for household size. Normalisation is used to account for expenditure amounts of households of different sizes and to account for household composition. The process recognises that the income requirements of households of different sizes are not linear – that is, a household of three persons does not need nor consume three times the housing space, electricity, food and other factors of a one person household. The method used in this paper applies the method used in other OECD publications since 2008 – that of dividing household income (expenditure) by the square root of household size.

[5] ECA imposes stock limits on crops/commodities during their supply shortfalls and later revokes them when supplies smoothen.

[6] "In case of non-supply of the entitled quantities of food grains or meals to entitled persons under Chapter II, such persons shall be entitled to receive such food security allowance from the concerned State Government to be paid to each person, within such time and manner as may be prescribed by the Central Government" (Government of India, 2013).

[7] "…introducing schemes, such as, cash transfer, food coupons, or other schemes, to the targeted beneficiaries in order to ensure their food grain entitlements specified" (Government of India, 2013).

[8] Aadhaar refers to a unique identification number issued by Unique Identification Authority of India (UIDAI), Government of India to all residents of India "that is (a) robust enough to eliminate duplicate and fake identities, and (b) can be verified and authenticated in an easy, cost-effective way" (UIDAI 2017).

[9] See, for example, Saini et al. (2017) for a detailed evaluation of the pilot studies.

[10] Keeping the support prices marginally below the normal trend of market prices is suggested in Gulati and Saini (forthcoming).

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