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Abbreviations

A3P	Accelerated Pulses Production Program
AAY	Antyodaya Anna Yojana
Agmarknet	Agricultural Marketing Information Network
Agricoop	Department of Agriculture, Cooperation and Farmers Welfare, MoA, GoI
AP	Andhra Pradesh
APC	Agricultural Prices Commission
APEDA	Agricultural and Processed Food Products Export Development
APL	above poverty line
APMC	Agricultural Produce Market Committee Act
BAHS	Basic Animal Husbandry and Fisheries Statistics
BPL	below poverty line
Bt cotton	genetically modified organism (GMO) cotton variety
C&F Agents	carrying and forwarding agents
CACP	Commission for Agricultural Costs and Prices
CAGR	compound annual growth rate
CCI	Cotton Corporation of India
CGIAR	Consultative Group on International Agricultural Research
cif	cost, insurance, and freight
CIPs	central issue price
CPRI	Central Potato Research Institute
CWE	carcass weight equivalent
CY	calendar year
DES	Directorate of Economics and Statistics
DGAD	Directorate General of Anti-Dumping and Allied Duties
DGCIS	Directorate General of Commercial Intelligence and Statistics
DGFT	Directorate General of Foreign Trade
DOC	Department of Commerce
ECA	Essential Commodities Act, 1955
EDI	electronic data interchange
EIC	Export Inspection Council
EPC	effective protection coefficient
ESC	effective subsidy coefficient
EU	European Union
FA	financial assistance
FAO	Food and Agriculture Organization
FAS	USDA Foreign Agricultural Services
FCI	Food Corporation of India
FHP	farm harvest prices
fob	free on board

FPO	farmer-producer organization
FRP	fair and remunerative price
FTP	Foreign Trade Policy
FY	financial year
FYP	five-year plan
GATT	General Agreement on Tariffs and Trade
GCMMF	Gujarat Co-operative Milk Marketing Federation Ltd.
GDP	gross domestic product
GFC	Global Food Crisis of 2007–08
GM	genetically modified
GN	groundnut kernels
GoI	Government of India
H-4	hybrid 4
Ha	Hectare
HS	Harmonized Commodity Description and Coding System
HYV	High-yielding variety
HYVP	High-Yielding Variety Programme
ICAR	Indian Council of Agricultural Research
ICD	inland container depot
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
INRs	Indian national rupee
IOPEPC	Indian Oilseeed and Produce Export Promotion Council
ISMA	Indian Sugar Mills Association
ITC	Indian Tobacco Company
JNPT	Jawaharlal Nehru Port Trust, also called Nhava Sheva
KMS	kharif marketing season (October–September)
L	Lakh
MEIS	Merchandise Exports from India Scheme
MEP	minimum export price
MFN	most favored nation
Mha	million hectares
MMT	million metric tonnes
MT/An	Metric tonne per animal
MoA	Ministry of Agriculture
MP	Madhya Pradesh
MSP	minimum support prices
MY	marketing year
NAFED	National Agricultural Cooperative Marketing Federation of India Ltd.
NDDB	National Dairy Development Board
NFHS	National Family Health Survey
NFSA	National Food Security Act, 2013
NFSM	National Food Security Mission, 2007
NPC	nominal protection coefficient

NRA	nominal rate of assistance
NRP	nominal rate of protection
NSSO	National Sample Survey Organization
OGL	open general license
PDS	Public Distribution System
PL480	Public Law 480
PPP	peanut and peanut products
PSS	price support system
R&M seeds	rapeseed and mustard seed
RBI	Reserve Bank of India
RBS	rabi marketing season (April-June)
RCA	Revealed Comparative Advantage
RHS	right hand side
RRA	relative rates of assistance
RSF	revenue sharing formula
SAP	state advised price
SCH	single cross-hybrid seeds
SMP	skimmed milk powder
SMP	statutory minimum price
STC	State Trading Corporation of India
STE	state trading enterprise
SVD	special countervailing duty
TA	transport assistance
TE	triennium ending
TN	Tamil Nadu
TPDS	Targeted Public Distribution System
TPS	true potato seed
TRQ	tariff rate quota
UN comtrade	United Nation Commodity Trade statistics database
UNCTAD	United Nations Conference on Trade and Development
UP	Uttar Pradesh
US HRW	U.S. Hard red winter No.2 wheat variety
USDA	U.S. Department of Agriculture
USDA-ERS	USDA Economic Research Service
UT	union territory
UV	unit value
VKGUY	Vishesh Krishi and Gram Udyog Yojana
WH	state-wise wholesale prices
WTO	World Trade Organization

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Executive Summary

The current study is about estimating the extent to which domestic prices of major Indian agriculture commodities deviate from their corresponding free trade reference prices. The free trade reference prices are the estimated export-parity reference prices in cases of exported commodities and import parity reference prices in cases of imported commodities. The deviation between domestic and free trade reference prices is termed as "distortion" which can result from price- and trade-related policies.

The extent of price distortions is analyzed using estimates of the "nominal rates of protection" (NRPs) and "nominal protection coefficients" (NPCs). The estimates are at the wholesale market level. The study spans 15 agri-commodities, 11 Indian states that are the major producing states of the identified commodities, and 5 ports through which the majority of trade of identified commodities happens. The study period is 10 years, 2004–05 to 2013–14.

Analysis of estimated coefficients shows that the domestic prices of the 15 commodities over the 10–years (2004–05 to 2013–14) were on average 72 percent of the time below the export parity prices, 11 percent of the time above the import parity prices, and 17 percent of the time between export parity and import parity prices. In commodities like rice, groundnut, cotton, buffalo meat, onion, banana, and potato, Indian prices were 90 to 100 percent of the time below their corresponding export parity prices. For sugar and skimmed milk powder (SMP), domestic prices were above import parity prices in most of the years. India's soybean, maize, and wheat prices were largely in the non-tradable band. However, fluctuating global prices saw domestic prices of soybean, wheat, and maize appear sometimes larger than its import party prices and sometimes lower than its export reference prices. The study also observed the influence of the global food crisis of 2007–08 and the resultant increased export opportunities for several Indian agri-commodities.

In most years, for the majority of agri-products, the policy makers used restrictive export policies to keep domestic prices low. This showed the pro-consumer bias in the policy complex. This means that policies more than often harm the farmers' interests, whose scope of getting higher returns globally are curbed at the prospect of the trade translating into rising domestic prices. To compensate the farmers, the Government made significant advances in the minimum support prices (MSP) and input subsidies, especially for basic staples like rice and wheat.

The trade policies themselves were also subservient to the overall goal of ensuring food security to the country's poor consumers. After meeting domestic needs for consumption and stocking, the residual determined the broad direction of agri-trade policies in the country each year. Any possibility of price hikes in agriculture in general and food in particular led policy makers to restrict trade. Ensuring food security of its poor consumers takes policy precedence over any welfare-distorting global scenario.

Over the years, even though India's agri-trade as a percentage of agri-GDP increased from less than 5 percent in 1990–91 to about 20 percent by 2013–14, it still has not reached its full potential. In order to improve the sector, this study recommends the following policy reforms: (1)

phase-out the built-in consumer bias (that is anti-farmer) in agri-policies; (2) create business space for private players to have integrated markets across space and time; (3) use an income policy approach (through direct cash/benefit transfer) to protect both poor consumers and small farmers; (4) create a predictable and a stable agri-trade policy; and (5) streamline the high customs duties on India's export-competing products like rice.

Background of the Study

The current study updates the research done earlier by Garry Pursell, Ashok Gulati, and Kanupriya Gupta (Pursell, Gulati, and Gupta 2007) and Garry Pursell (1999). The 2007 Pursell et al. study had estimated the nominal rates of assistance (NRAs) and relative rates of assistance (RRAs) for 13 commodities for a period of 41 years between 1964 and 2004. The present study extends the work from 2004–05 to 2013–14 and estimates nominal rates of protection (NRPs) and nominal protection coefficients (NPCs) for 15 agri-commodities. Table 1 categorizes these 15 commodities.

Table 1 Commodity Coverage of the Study

Cereals and pulses	Common rice, wheat, maize/corn, gram/chickpea
Oilseeds	Groundnut, soybean, rape and mustard seed
Cash crops	Sugarcane (refined sugar), cotton (lint)
Dairy and livestock	Buffalo meat, skimmed milk powder (SMP)
Horticulture	Onion, potato, mango (alphonso), banana (Cavendish)

The listed commodities represent more than 67 percent of the total value of agricultural and livestock output in 2010–11 (Table 2). Milk (20 percent), paddy (10 percent), wheat (7 percent), and meat (5 percent) are the most important products, in that order.

Among cereals, the study focuses on rice (the common rice variety), wheat, and maize. India exports two main categories of rice: basmati and common rice. About 67 percent of India's rice export basket in the triennium ending (TE) 2014–15 was of common rice. The country follows different trade policies for both types of rice: while basmati rice is more open for exports, the common variety is subject to periodic bans and other restrictions.

Among pulses, the study focuses on gram. Although India is a net importer of pulses, at times it does export limited quantities, especially of chickpea and some organic pulses. India produces a large number of pulses, like gram (chickpea), tur (pigeon pea), moong (green gram), urad (black gram), and lentils, among others. In terms of share in production and export of pulses, gram is the most important pulse. In 2013–14, 48 percent of total pulses produced and 97 percent of total pulses exported from India were gram (chickpea/garbanzo).

Table 2 Percent Share in Value of Agriculture and Livestock Output (2004–05 Prices)

	1999–00	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11
Paddy	13.3	12.6	13.0	10.9	12.0	11.5	11.7	11.4	11.3	11.5	10.4	10.1
Wheat	9.0	8.2	8.1	7.9	7.9	7.5	7.0	7.7	7.5	7.6	7.4	7.3
Maize	1.1	1.1	1.2	1.1	1.3	1.2	1.2	1.2	1.4	1.4	1.2	1.4
Gram	1.3	1.0	1.3	1.1	1.3	1.2	1.2	1.4	1.2	1.4	1.5	1.4
Sugar cane	3.6	3.7	3.4	3.5	2.7	2.7	3.4	4.4	4.1	2.7	3.1	3.5
Kapas(cotton with seed)	2.0	1.6	1.6	1.5	2.2	2.7	2.8	3.0	3.5	2.9	2.9	3.5
Groundnut pod	1.4	1.8	1.9	1.2	2.2	1.7	2.0	1.6	2.1	1.5	1.2	1.7
Rapeseed	1.6	1.2	1.3	1.1	1.6	1.9	2.0	1.7	1.3	1.6	1.5	1.6
Soybean	1.7	1.3	1.3	1.1	1.7	1.5	1.8	1.8	2.0	1.7	1.9	2.1
Milk	18.0	18.7	18.3	20.2	18.8	19.4	19.3	19.2	18.8	19.9	20.4	19.7
Meat	4.3	4.4	4.4	5.0	4.7	4.9	4.7	4.9	4.9	5.1	5.3	5.3
Onion	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.6	0.5	0.7
Potato	1.5	1.4	1.4	1.5	1.3	1.4	1.7	1.7	1.8	1.6	2.3	2.3
Banana	1.4	1.4	1.4	1.5	1.2	1.3	1.6	1.9	1.9	2.0	2.7	2.9
Mango	0.0	0.0	0.0	0.0	0.0	2.2	2.4	2.5	2.5	2.7	3.2	3.6
Percent of output included	60.5	58.8	59.1	57.9	59.3	61.7	63.5	65.0	65.0	64.1	65.5	67.2

Source: Department of Agriculture, GoI

India is a very important player in the oilseed market. Its diverse agro-ecological conditions are favorable for growing as many as nine oilseeds, namely groundnut, rapeseed and mustard seed, soybean, sunflower, safflower, sesame, niger, castor, and linseed. In 2014–15, India produced 32.8 MMT of oilseeds comprising groundnut (30 percent), soybean (36 percent), rapeseed and mustard seed (24 percent), and the remaining 10 percent, others. For the current study, the trade and production patterns of groundnut, soybean, and rapeseed and mustard seed are studied. Even though India is not an important exporter of the seeds globally, it plays a significant role in global oil meal exports especially of oilseeds like groundnut and soybean.

India is the largest milk producer globally. Milk's share in the country's value of agricultural and livestock output is also the highest. India is largely self-sufficient in milk, with only very small quantities being exported or imported at times. The trade in milk is mainly in the form of milk powder and dairy products. In the triennium ending 2014–15, 66 percent of the country's dairy exports were in the form of skimmed milk powder (SMP). The current study focuses on SMP.

India emerged as the largest bovine meat (buffalo) exporter globally as per trade numbers for triennium ending 2014–15, qualifying buffalo meat's inclusion in the current study. There is a major transitional story behind this commodity and that is detailed in the commodity section on buffalo meat.

Sugarcane and kapas (raw cotton or seed cotton) hold about equal share in the value of output of India and are amongst the most important cash crops. As both crops are traded mostly in their processed or transformed forms i.e. sugarcane as sugar (raw and refined) and kapas as cotton

lint (cotton fiber separated from cottonseed), they are studied here in these transformed form. Additionally, as most of the traded sugar is in its refined form, the study focuses on refined sugar. As per the triennium ending 2014–15 trade numbers, India became the second largest cotton exporter in the world, second only to Unites States. In case of sugar, the largest exporter was Brazil followed by Thailand, Australia, Mexico, and India (in that order).

In the horticulture sector, covered commodities include banana, onion, potato, and mango. An average Indian plate has a greater share of fruits and vegetables now than it did 10 years ago (NSSO 2013). Potato, onion, mango, and banana are the most important vegetables and fruits for the country today.

The key question the authors seek to answer in this study is: How far do domestic prices of major Indian agri-commodities deviate from free trade reference prices (export parity or import parity)? In other words, what is the level of "distortion" between domestic and international reference prices? Further, the study investigates what policies—especially regarding trade and pricing, institutions, and infrastructure—cause these "distortions" in domestic prices. Answering the questions would also give an idea of whether Indian trade and price policies have a built-in bias toward consumers or producers. The study also looks at how Indian agricultural trade flows have evolved with respect to global markets, as well as to the domestic agri-GDP, giving a feel of the degree of domestic market integration with global markets. Of special interest, is the influence of the global food price crisis of 2007–08: How did it affect India's trade and domestic policies especially regarding its staples, rice, and wheat? And finally, what could explain the pattern of price distortions across commodities within India's agriculture sector?

The study answers these questions by estimating and analyzing nominal protection coefficients (NPCs) and nominal rates of protection (NRPs) for 15 agricultural commodities. NPC is a ratio between the average price received by the farmer (at wholesale market level) and the adjusted border price (at wholesale market level). By subtracting one from the NPC ratio, we estimate the NRP. The border prices are adjusted for quality, port-handling charges, marketing margins, and domestic transportation to be measured at the wholesale market level, for comparison with the farmer prices at the wholesale level. Analysis and interpretation of these ratios across time reveals extent of market and price distortions prevalent in a commodity's market. This report studies the extent and causes of such distortions.

It may be noted that NPCs and NRPs in this study are estimated at the wholesale market level rather than at the conventional farm-gate level, reasons for which are elaborated in upcoming sections. State-level data were calculated and analyzed. The analysis helps in identifying policy-level interventions that could promote overall efficiency in the Indian agri-landscape, especially the efficiency on its marketing and trade fronts.

The report is organized as follows: Section I provides the historical trade and policy landscape of India. Section II shares the methodology used for estimating NPCs. Section III presents relevant details for each of the 15 commodities. Each commodity section begins by putting India's trade and production performance in international perspective and progresses by mapping its domestic scenario, eventually estimating and analyzing the NPCs/NRPs. Section IV analyzes the entire set of NPCs, and synthesizes the work to identify conclusions from the study. It also encapsulates what was learned in the study and presents the way forward.

Section I:
India's Trade and Domestic Policy Landscape

Agriculture is an important sector of the Indian economy, even though its contribution to overall GDP has fallen from 52 percent in 1950–51 to about 30 percent in 1990–91 and 17.4 percent in 2014–15. (Source: NAS) The two important reasons for agriculture's centrality are: it still engages almost 55 percent of the country's workforce, as per the 2011 census, and an average Indian household still spends (in 2011–12) almost 45.5 percent of its expenditure on food (Source: NSSO).

The country's economic standing and its policy landscape have come a long way since the 1950s. A country that was once food-scarce and food importing is today grain-surplus and net grain exporting. Its production base is reasonably strong and growing. Its agriculture showed resilience during the 2014–15 and 2015–16 consecutive drought years when the annual grain production remained around 252 million metric tonnes (MMT). Globally, India is the largest producer of milk, cotton (in 2013–14), banana, and mango, and is among the largest exporters of rice, bovine/buffalo meat, onion, and cotton to the world. By ensuring enough supplies at the macro-level, the country has attained food security at the national level; however, at the micro-level, food insecurity is widespread and deep-rooted.

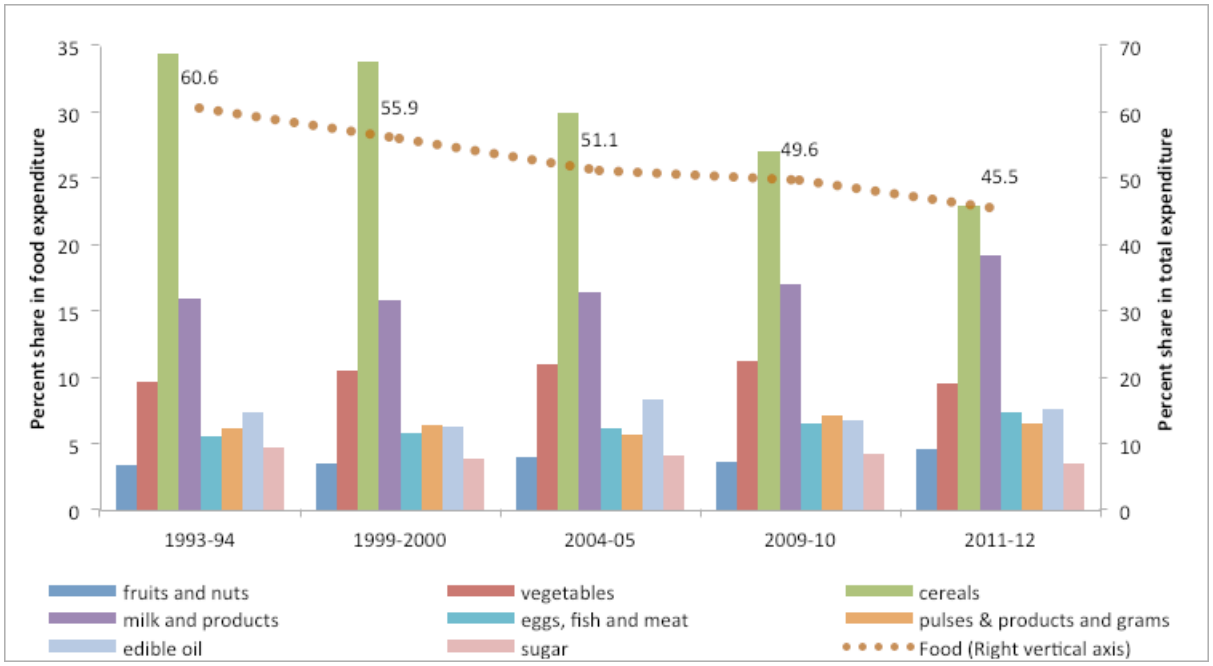
India has one-sixth of the world's population and one-third of the world's poor. One-third of the world's malnourished children are Indians (Foundation N. 2011). India's 2005–06 "National Family Health Survey" (NFHS-3) stated that almost half of India's children under the age of five years were chronically malnourished.[1]

Besides this, Indian agriculture is a small-holder agriculture. According to the Agriculture Census 2010–11, the total number of operational holdings in India was 138.35 million with an average holding size of 1.15 ha (MoAFW 2015). Of the total holdings, 85 per cent are in marginal and small farm categories of less than 2 ha. These small farms operate on 44 percent of the country's land under cultivation. They have limited access to technology, agricultural inputs, credit, capital, and markets but still play an important role as providers of food and nutritional security to the nation.

Despite improvements in per capita incomes, Indian consumption remains cereal-centric and food continues to be a large component of monthly consumption expenditures of an average Indian. India's consumption basket has, however, evolved overtime: the percent share of monthly expenditure spent on food has fallen from 60.6 percent in 1993–94 to 45.5 percent in 2011–12 and similarly, share of food expenditure spent on cereals has reduced from 34.4 percent to 22.9 percent (Source: NSSO 2011) (Figure 1).

[1] Chronic malnutrition is an indicator of linear growth retardation in children that results from failure to receive adequate nutrition over a long period and may be exacerbated by recurrent or chronic illness.

Figure 1 Changing Indian Food Consumption Patterns



Data Source: NSSO 2011

Even though cereals are increasingly substituted with high-value agriculture, which includes fruits, eggs, fish, meat, and milk, the relative nutrition dependence on cereals is still indisputably high for an average Indian household.

It is not surprising that in such an economy, which still centres on agriculture, where land-holdings are shrinking and where large percent of poor and food insecure people live, the Government has had to regularly devise food-security policies and programs. Even the country's agricultural trade policies are secondary to this goal of food-security. After meeting the domestic needs for consumption and stocking, the net position determines the broad direction of international trade in a year. Especially for basic staples like rice and wheat, the deep-rooted quest for self-sufficiency in food has long guided the country's agricultural domestic and trade policies for cereals. The next section provides a brief overview of Indian domestic and international agricultural policies.

India's Domestic Agricultural Policies

As mentioned, agriculture policy in India is heavily influenced by the overarching goal of food security at the national level. The Five-Year Plans (FYPs) prepared by Indian Planning Commission[2] are subservient to that goal and accordingly outline the country's policies. The currently implemented Plan is the 12th FYP (2012–17) and aims, among other things, to improve agricultural investments, income, products, and productivity and to promote research and extension and resource-use efficiency for ensuring profitable and sustainable agriculture. To these ends, the Government has identified measures to promote production, consumption, marketing, and international trade in the sector.

[2] Under the current Modi government, the Planning Commission has become the NITI Aayog (National Institution for Transforming India) and the concept of FYP is no longer applicable. There is no plan succeeding the current 12th FYP.

The Government supports farmers through myriad policies. On the output price front, it announces minimum support prices (MSPs) for 23 commodities for every marketing year, although actual procurement is done primarily for wheat and rice in a limited number of states. On the input side, the GoI gives subsidies to farmers, which have increased from Indian National Rupee (INR) 49,700 crore (about US$10.9 billion) in 2000–01 to INR 1,42,132 crore (US$26.1 billion) in 2012–13. In 2012–13, input subsidies were close to 7 percent of the total value of agricultural output.

The share of fertilizer in total subsidies in 2014–15 was almost 27 per cent in the Government's revised budget estimates. The only other sectors that received as much or higher subsidies from the Government are food and petroleum. Irrigation subsides have increased from INR 19,048 crore (US$4.2 billion) in 2000–01 to INR 27,682 crore (US$5.1 billion) in 2012–13, in current prices. Although the potential area created under major and medium irrigation schemes increased from 9.72 Mha (million hectares) in 1950–51 to 48 Mha in 2011–12, the gap between potential-created and potential-utilized has been rising. The value of electricity subsidies have also increased from INR 16,852 crore (US$3.7 billion) in 2000–01 to INR 43,437 crore (US$7.98 billion) in 2012–13, but this support faces problems such as high commercial losses even after cross-subsidization, theft, and poor plant load factors (73 percent in 2011–12). The introduction of a credit subsidy in 2006–07 has made available short-term lending to farmers at the rate of 7 percent (subject to a credit ceiling of INR 3 lakhs [US$4,478]), and 4 percent if the payments are regular. The prevalence of low interest rates has tempted farmers to divert credit to non-agricultural uses. Apart from this, the Government supplies its farmers with subsidized high yielding variety (HYV) seeds. Through its various agencies, programs, and policies, the Government also supports agricultural research and extension services.

The government also monitors the marketing of farmers' produce. In order to protect the interests of consumers and farmers from exploitation by private traders, the government has in place the Essential Commodities Act, 1955 (ECA) and the Agricultural Produce Market Committee Act, 2003 (APMC). While the former imposes restrictions on storage and movement of *essential* commodities by private players, the latter restricts the market place for the farmers to an APMC mandi (the local name for a wholesale market). Ad-hoc implementation of the ECA and existence of inefficient APMC models, have led to reduced private participation and investments in these markets, increased incentives for rent-seeking, and greater burden on the government to act as 'buyer-of-last-resort'.

The government supports consumers by providing subsidized food, mainly rice and wheat. This system of rationing and distributing subsidized food has been in existence since 1942, when under the British regime of pre-independence India basic principles for establishing a public distribution system (PDS) were first laid out (Saini and Kozicka 2014). Interestingly, this scheme that predates Indian independence has continued and evolved over time under the independent national regime.

Rising population and expanding incomes and inequalities over the years necessitated changes in the PDS. From distributing subsidized food to all, the system became "targeted," restricting distribution to the needy in all areas. This targeting happened in 1997 and the PDS system consequently was now called the targeted PDS or TPDS. The subsidized prices at which grains are distributed to beneficiaries are known as the "central issue prices" or CIPs. Targeting or identifi-

cation of a beneficiary is based on enumerated socioeconomic vulnerabilities. As the extent and type of vulnerabilities vary across states, the Central Government relies on state governments to identify the beneficiaries. The Food Corporation of India (FCI) is the Government agency that procures grain under minimum support prices (MSP), stores it, and then distributes it to various state agencies for distribution under the TPDS.

Centered on the poverty line, the "targeted" beneficiaries until 2001 were marked into two categories: APL, above poverty line, and BPL, below poverty line. To better tackle the pervasive problem of malnutrition among the poorest of the poor of the country, in 2002 the Government decided to segregate the identified BPL beneficiaries into two categories: the Antyodaya Anna Yojana (AAY) or the poorest-of-the-poor, and the remaining BPL. The Targeted Public Distribution System (TPDS) thus delivered food (mainly rice and wheat) to AAY, BPL, and APL beneficiaries with CIPs increasing in that order. The system has been criticized on the grounds of excessive grain leakage and inclusion (where the relatively better-off people are wrongly included in the system) and exclusion (where the really poor and needy are excluded) errors.

In 2013, the Government enacted the National Food Security Act (NFSA), expanding the coverage, depth, and scope of the TPDS. Almost 814 million people, or 67 percent of the population, got a legal right to receive 5 kilograms of rice, wheat, and/or maize (or other coarse cereals) per person per month, at central issue prices (CIPs) of INR 3 (US 4 cents), INR 2 (US 3 cents), and INR 1 (US 1.5 cents) per kg, respectively. The entitlement of an AAY family was the same as under the TPDS at 35 kg/month.

The three big changes between the TPDS and the NFSA are: legal enforcement of the entitlement; excessively low CIPs, which are same for all categories of beneficiaries (there are only two categories of beneficiaries under NFSA, i.e., AAY and priority); and lower grain entitlement to BPL families (under TPDS a BPL family of five got 35 kg/month and under NFSA they get 25 kg).

Unlike TPDS, NFSA gives its beneficiaries a legal right to their entitlements and, in situations of non-supply of the entitlement, the centre commits to giving a food security allowance. Under, TPDS there was no such legal provision protecting a beneficiary's right to subsidized food. Barring situations of extreme events of nature (like flood, drought, cyclone, and earthquake) that disrupt food supplies, the legal enforceability of entitlements apply under the new Act.

The categorization of beneficiaries is also revised under NFSA. The three categories of beneficiaries under the TPDS, i.e. AAY, BPL and APL, are replaced with two categories under the NFSA, i.e. AAY and Priority. While the poorest-of-the-poor or the AAY beneficiaries under TPDS stay the same under NFSA, the other two categories of BPL and APL beneficiaries combine under one category of priority individuals under NFSA. However, not all BPL and APL beneficiaries of TPDS were included under the NFSA because of a pre-defined cap on the maximum number of beneficiaries permissible under the new Act.

The NFSA fixed the CIPs at extremely low levels, implying close to 90 percent subsidization leading thus to an inflated food subsidy burden on the Government. The annual food grain requirement under the NFSA is 61.43 million tonnes and the annual food subsidy implication is around INR 1.31 lakh crore (US$20 billion). To please the consumer (and the voter), the then-ruling

Government fixed the CIPs at these lower levels for three years, until July 4, 2016. As of November 2016, all Indian states and union territories (UTs) had implemented the provisions of the NFSA and the CIPs are unchanged.

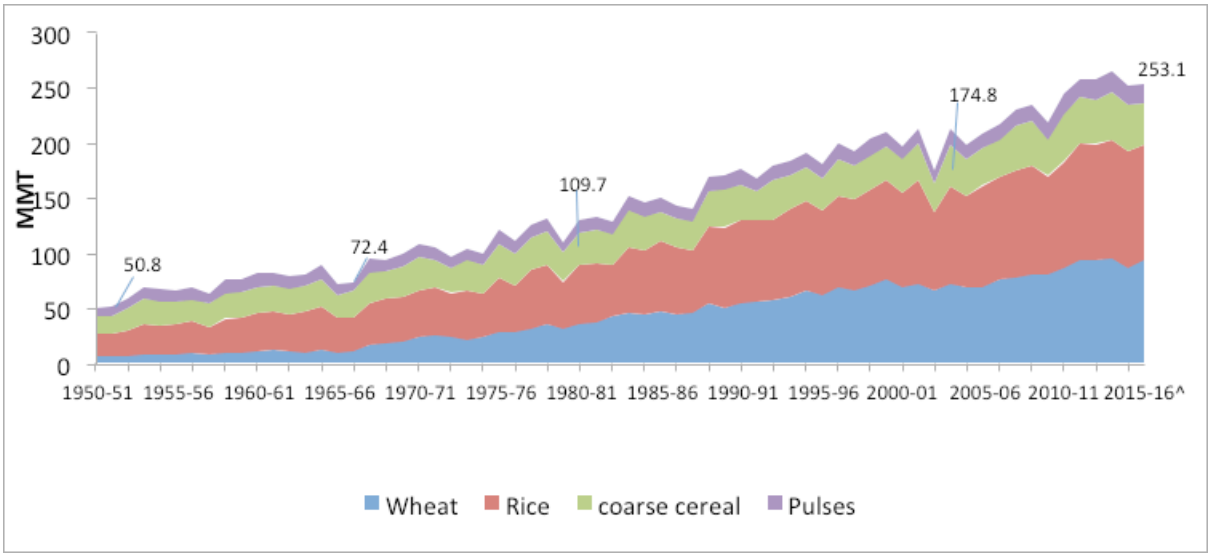
India's Production Trends

Aggressive promotion of high yielding variety (HYV) seeds, access to better technology and credit, investments in irrigation, and relative price incentives since the late 1960s catapulted the country's farm sector to an important economic position both domestically and globally. The country has gone through a series of commodity-specific revolutions, where concerted efforts in terms of programs/policies/institutions have resulted in many crop- and area-specific success stories.

From the Green (wheat) Revolution of the late 1960s, to Operation Flood (milk) of the late 1970s, to the Gene (mainly cotton) Revolution of the 2000s, and its achievement of major strides in the production of maize and basmati rice, several fruits and vegetables, and even in poultry and fisheries, the story of agricultural growth in India has been fairly satisfactory and even inspiring at times. New technologies, innovations in institutional engineering, and better marketing infrastructures were the catalysts in the various commodity revolutions.

India produced close to 50 MMT of food grains in 1950–51, an amount that increased more than five times in 64 years to 265 MMT in 2013–14 (Figure 2). Better incentives for farmers induced them to adopt better technologies and farming practices and to invest more in agriculture—especially irrigation and farm machinery—raising overall productivity and production.

Figure 2 India's Cereal and Pulses' Production



Data Source: Agricultural Statistics at a Glance, various issues. Ministry of Agriculture, GoI

However, there are problems within the system. Massive government involvement, systemic inefficiencies, volatile production and yields, insufficient markets and market access, as well as inadequate infrastructure, investment, and technology – all contribute to reducing the sector's resilience to changes thereby making it highly vulnerable particularly to market and climatic

and weather changes. A socio-political and economic explanation for existence of an unpredictable and an ad-hoc agricultural trade policy stems from this ubiquitous instance of volatile food supplies. This when combined with the fact that the country is home to the world's largest number of poor and malnourished and that there is high dependence on the agriculture sector- for both food security and livelihood- complicates the policy-drive aimed at ensuring stability and predictability in the agricultural trade policy. The next section summarizes the evolution of the country's trade policy in agriculture since 2003–04.

India's Agricultural Trade Policy

India is a founding member of the World Trade Organization (WTO) since 1995 and a member of the General Agreement on Tariffs and Trade (GATT) since 1948. It has accepted the 4th and 5th protocol of the General Agreement on Trade in Services (GATS). WTO-India gives most favored nation (MFN) treatment to all WTO members, and about 15 regional trade agreements are currently in force.

Policy Framework

India's overall trade policy is formulated and implemented by the GoI Department of Commerce (DOC) in the Ministry of Commerce and Industry and is stipulated in the Foreign Trade Policy (FTP). A new FTP is issued every five years and revised as needed within that time, depending on internal and external developments. The FTP for 2016 was issued on April 1, 2015 and defines the trade strategy for 2015–20.

Ministries and agencies such as the Ministry of Finance, Reserve Bank of India, Ministry of Agriculture, and the Ministry of Consumer Affairs, Food and Public Distribution, assist the DOC on formulating FTPs. Some Government offices are associated with the DOC, including the Directorate General of Foreign Trade (DGFT) which assists the DOC in formulating and implementing the FTP; the Directorate General of Anti-Dumping and Allied Duties (DGAD) which administers anti-dumping and anti-subsidies and countervailing measures; the Tariff Commission, which looks at the impact of tariffs on domestic industry and export potential; the Directorate General of Commercial Intelligence and Statistics (DGCIS), which collects, compiles, and disseminates trade data; the Agricultural and Processed Food Export Development Authority (APEDA), which promotes exports of 14 agricultural and processed food products and monitors imports of sugar; and the Export Inspection Council (EIC), which checks and controls the quality of exports.

The DOC also is in charge of a number of public sector undertakings involved in international trade, most notable of which for current purposes is the State Trading Corporation of India (STC), which is responsible for trade of some agri-commodities.

Trade Performance

Amidst a severe economic crisis, India started its process of financial liberalization in 1991 when it devalued its currency, de-licensed industries, and reduced industrial tariffs (Gulati and Saini 2016). Indian agriculture, however, was only subsequently opened to global markets in 1995–96, albeit with much caution as the policy oscillated between periods of free trade and complete

bans and restrictive duties. The two big periods of bans, particularly on rice and wheat exports, were 1997–98 to 2000–01 (mainly for wheat) and 2007–08 to 2011–12 (for rice and wheat). Despite these hiccups, India is more integrated with the global markets today than was the case when economic reforms started in 1991.

Figure 3 India's Exports and Imports of Agri-Commodities

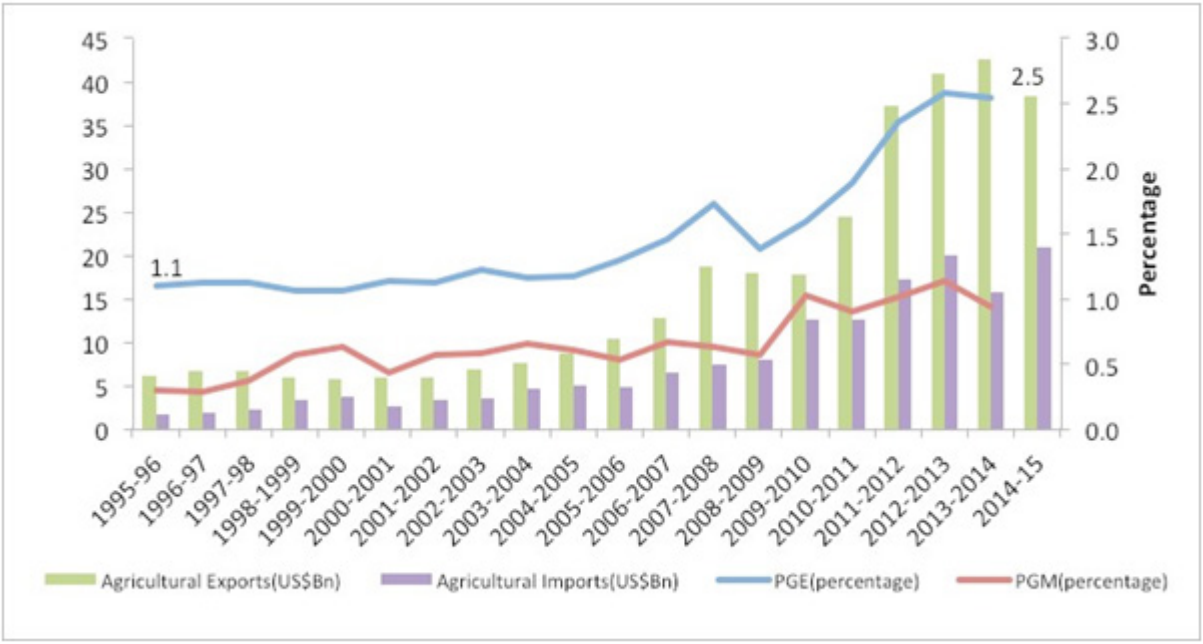


Diagram key: PGE is Indian agricultural exports as percent of global agricultural exports and PGM is Indian agricultural imports as percent of global agricultural imports

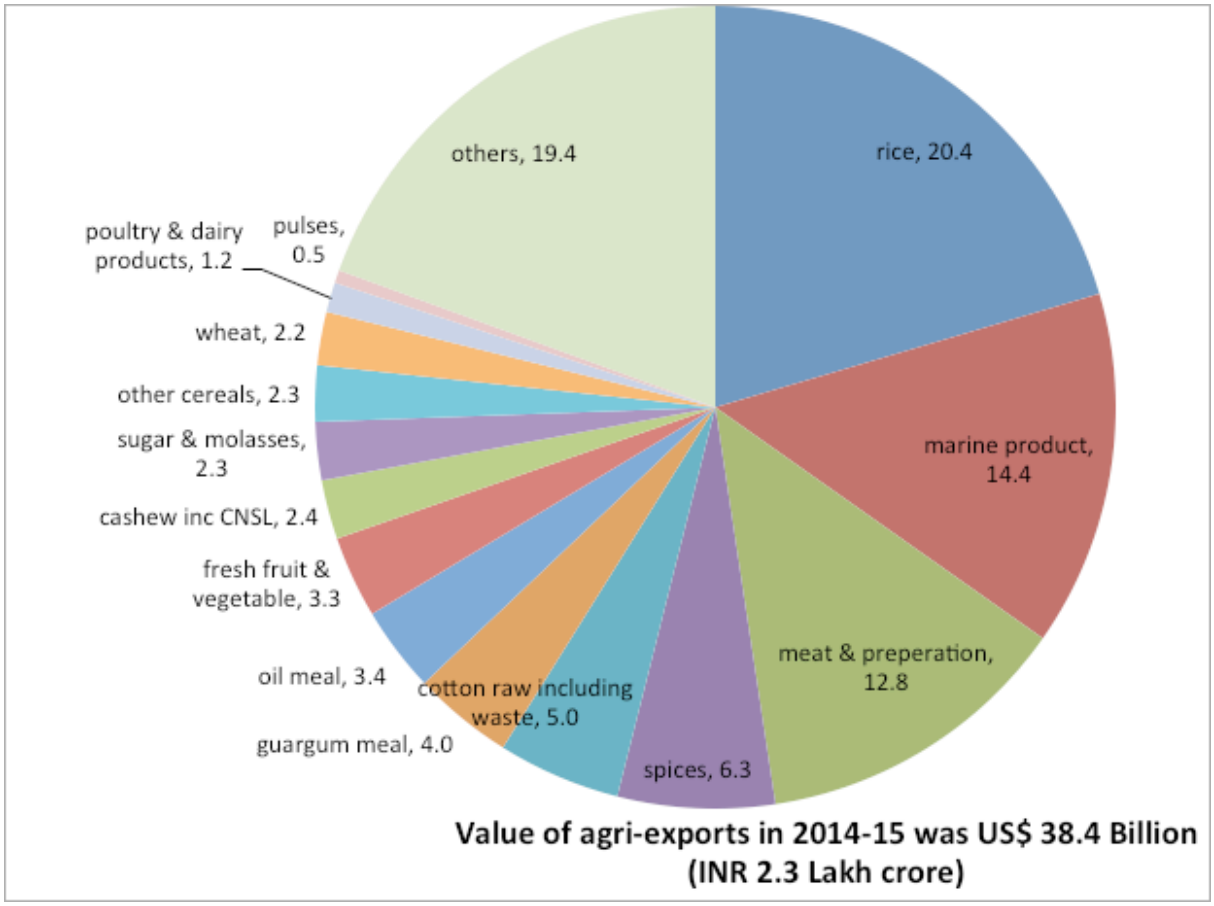
Data Sources: WTO Trade Statistics and Agricultural Statistics at a Glance (various issues) and Department of Commerce

Note: Figures for 2014–15 are estimates.

In 2013–14, India exported US$42.6 billion worth of agricultural products and imported close to US$16 billion worth of agri-commodities, making a net surplus in its agriculture trade account. As per the WTO, India's share in total global exports of agri-products has increased from 1.1 percent in 1995–96 to 2.6 percent in 2012 (Figure 3). As a percentage of total national exports and imports, agricultural exports and imports were 13.7 percent and 5.3 percent, respectively, in 2000–01. In the following 14 years, the percentage fell to 12.4 percent and 4.5 percent, respectively, in 2014–15.

In the last 19 years since 1995–96, the country's agricultural GDP showed a cumulative increase of 550 percent, and its agricultural trade (exports plus imports) showed a cumulative increase of more than 1,000 percent, from INR 26,287 crores (US$ 7.86 billion) in 1995–96 to INR 373,618 crores (US$ 58.49 billion) in 2013–14. Close to 60 percent of India's 2014–15 agricultural export basket was rice (basmati and common), marine products, meat, cotton, and spices (Figure 4).

Figure 4 Composition of Indian Agricultural Exports FY2015



Data Source: DGCIS; Note: CNSL = cashew nut shell liquid

Indian farming has been slowly but consistently globalizing. In fact, overtime the sector is gaining more importance globally than India's traditionally known sectors like manufacturing. Estimates of the Balassa index of Revealed Comparative Advantage[3] (RCA) for India can support this observation. For 2013, the RCA value for agriculture was 1.37, while that for manufacturing was 0.8 or for combined manufacturing and services sector it was 1.03, indicating the competitive edge that Indian agriculture sector has over its manufacturing sector. The sharp rises in global food prices during the Global Food Price Crisis of 2007–08 also helped India exploit export opportunities in commodities like guar gum, grape, cotton, cereal, mango, and fish.

Import and Export Policies

Imports

Customs duties, tariffs, additional and special additional duties, tariff rate quotas (TRQ), preferential tariffs, prohibitions, restrictions and licensing, state trading, anti-dumping, and countervailing and safeguard measures, are some of the measures used by policy makers to influence Indian imports.

[3] The revealed comparative advantage is an index used in international economics for calculating the relative advantage or disadvantage of a certain country in a certain class of goods or services as evidenced by trade flows. It is based on the Ricardian comparative advantage concept. It most commonly refers to an index introduced by Béla Balassa (1965): RCA = (Eij / Eit) / (Enj / Ent), that is, the RCA is equal to the proportion of the country's exports that are of the class under consideration (Eij / Eit) divided by the proportion of world exports that are of that class (Enj / Ent).

In 2011 India adopted a system of self-assessment of the customs duty obligation, to be made directly by the exporter/importer. Around 97.6 percent of India's imports were administratively processed using a risk management system in 2011. Despite the adoption of such facilitation measures, India's import regime is complex, mainly because of its licensing and permit system and its tariff structure, which has multiple exemptions where rates vary according to product, user, or export promotion program (WTO 2015).

Tariffs are announced every year in the annual budget; however, changes can be made during the year in particular commodities. India's tariff mainly comprises ad valorem rates (around 94 percent of tariff lines), levied on cif (cost, insurance and freight) import value, and some alternate or specific duties (6.1 percent of tariff lines). India's simple average MFN tariff rate was 13 percent in 2014–15, which was higher than its 10 percent in 2010–11. The rise was mainly on account of agriculture, particularly for cereal, oilseed, and sugar. The average rate of MFN tariffs for agricultural products and nonagricultural products was 36.4 percent and 9.5 percent, respectively, according to WTO definitions.

Around 56 percent of agricultural goods have tariffs of 30 percent, and about 17.2 percent bear a tariff rate above 30 percent. Within product groups too, there is significant variability in the applied tariff rates on various commodities. For example, while the average applied MFN tariff rate on animals and animal products is 30 percent, the rate on imported fresh and frozen chicken cuts is 100 percent. In cereals, while the tariff rate on rye and oats is zero, it is 80 percent for rice and 25 percent for wheat. Table 3 shows customs duties for commodities covered in the current study over the period 2004–05 to 2015–16.

There is a wide gap between bound and applied tariff rates. For agriculture, the gap between bound tariffs (10–300 percent) and applied tariffs (0–150 percent) allows the Government to modify tariff rates substantially without conflicting with its WTO commitments. This policy variability and unpredictability creates uncertainty in the country's trade flows.

Imports are also allowed under tariff rate quotas (TRQs), but only through eligible entities or designated agencies. India has state trading requirements on imports of certain agri-commodities, like wheat, rice, maize, rye, oats, and milk or cream, and on exports of onion, gum karaya, and sugar (WTO 2015).

Exports

As stated earlier, India's trade policies focus on supporting domestic agricultural policy objectives. For example: for purposes of ensuring better marketing and prices, exports of sugar (under preferential quota) and onions are restricted to state trading enterprises. Periodically, other agri-commodities, like milk powder, wheat, edible oil, pulses, non-basmati rice, and wheat products are subjected to export prohibitions or quotas. Apart from this, minimum export price (MEP) is also maintained for sensitive commodities in order to regulate their prices and supplies in the domestic market. These sensitive commodities include edible oils, region-specific rose varieties, onions, and potatoes.

In order to promote exports of specific commodities to selected countries, India has been offering rewards for exports under the Merchandise Exports from India Scheme (MEIS) since 2015. The rewards are payable as a percentage of realized fob (free on board) value (in free

foreign exchange). The reward duty is transferable and can be used for adjustment in payment of customs duty for import of inputs, or in payment of excise duty on domestically procured inputs or good, or toward payment of service tax on procurement of services. Horticulture crops, marine products, and processed foods are some of the product categories whose exports are encouraged under the MEIS.

Table 3 Trends in Customs Duties for Agri-commodities

Year	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Cereal and pulses																
Rice[1]	80–70[2]	80–70[2]	87.2–76.8[2]	80–70[2]	81.6–71.4[2]	80–70[2]	80–70[2]	82.4–72[2]	82.4–72[2]	0	0	0–82.4–72.1[3]	82.4–72.1	80–70	80–70	80–70
Wheat[3]	50	50	50	50	50	50	50–5–04	0	0	0	0	0	0	0	0	0–10–25[5]
Maize	72.6	15.1–51[6]	15.1–51[6]	15.1–51[6]	61.2	61.2	61.2	0	0	0–51.5[7]	0–51.5[7]	0–51.5[7]	0–51.5[7]	0–51.5[7]	0–50[7]	0–50[7]
Gram (Chickpea)	5.5	5	10	10.2	10.2	10.2	10.2	0	0	0	10.3	0	0	0	0	0
Protein																
Bovine meat	44.0	44.0	35.2	30	30.6	30.6	35.9	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1
Milk powder	0	0	15–60[8]	15–60[8]	15–60[8]	15–60[8]	20–67.7[8]	20.1–68.3[8]	9.4–20.1–68.3[9]	9.4–68.3[9]	9.4–68.3[8]	9.4–68.3[8]	0–68.3[8]	15–68.3[8]	15–68.3[8]	15–68.3[8]
Fruit and Vegetable																
Potato	44.0	44.0	35.2	30.6	30.6	30.6	30.6	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9
Onion*	0	0	5	5	5	5.1	5.1	5.15	5.15	5.15	5.15	5.15	0	0	0	0
Mango	44.0	44.0	35.2	30.6	30.6	30.6	30	30	30	30	30	30	36.1	36.1	36.1	36.1
Banana	49.8	49.8	35.2	30.6	30.6	30.6	30.6	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9
Oilseed																
Groundnut	44.0	44.0	35.2	30	30.6	30.6	35.9	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1
Rapeseed/ mustard seed	44.0	44.0	35.2	30	30.6	30.6	35.9	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1
Soybean	44.0	44.0	35.2	30	30.6	30.6	35.9	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1
Sugarcane	44.0	44.0	35.2	30	30.6	30.6	35.9	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1

^Mentioned duties include basic duty and wherever applicable includes educational cess, countervailing duties (CVD), and special countervailing duties (SCVD).

Notes: 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 06; Duty between June and Sept. 06; Duty Sept. 06 onwards; 5. Duty till August, 15; Duty between August and Oct, 2015; Duty Oct, 2015 onwards; 6. Tariff Rate Quota for import upto (i) 4 Lakh MT in 2001–02; (ii) 4.5 Lakh MT in 2002–03; (iii) 5 Lakh MT in 2003–04; beyond TRQ duties separate; 7. TRQ for import upto 5 lakh MT; beyond TRQ duties separate; 8. TRQ for import upto 0.1 Lakh MT; normal duties applicable beyond TRQ; 9. Duty exemption upto Jan, 2008; normal TRQ duty applicable beyond.

Data Source: Goyal A. (various issues)

In addition, APEDA gives transport assistance; financial assistance; and assistance for infrastructure development, market development, and quality development to exporters of horticulture products, poultry products, and processed food products.

A summary of the country's current trade policy regime is given in Table 4.

Table 4 India's Agricultural Trade Policy (2015)

HS No.	Item	Trade Policy		Bound Rate*	Statutory duty**	Currently Applied Rate***
India's Agriculture Trade Policy and status under Trade Agreements						
	PULSES	Export	Import			
713.10	Peas	Prohibited*	Free	50	50	0
713.20	Chickpeas	Allowed		100	30	
713.31	Moong and urad	Prohibited*				
713.40	Lentils			100	30	
713.50	Broad beans	Prohibited*		100	30	
* Import for value addition and subsequent export under Advance Authorization Scheme allowed since 14.11.2013						
	CEREALS	Export	Import			
10.01	Wheat and meslin	Free	Import allowed through STE	100/80	100	0
1006.10	Rice in the husk	Free		80	80	80
1006.20	Brown rice	Free		80	80	80
1006.30	Semi-milled and wholly milled rice			70	80	70
1006.40	Broken rice	Free		80	80	80
	OIL SEEDS	Export	Import			
12.01	Soya beans	Free	Free	100	30	30
12.02	Ground-nuts shelled	Free	Free	100	30	30
12.03	Copra	Free	Import Allowed through STE	100	70	70
12.05	Rape/mustard seeds	Free	Free	100	30	30
12.06	Sunflower seeds,	Free	Free	100	30	30
1207.10	Palm nuts and kernels	Free	Free	100	30	30
1207.20	Cotton seeds	Free	Free	100	30	30
1207.40	Sesamum 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	Export	Import			
15.07	Soyabean oil	Prohibited	Free	45	45	7.5–15
15.08	Groundnut oil	Prohibited		300	100	7.5–15
1511.10	Crude oil (palm oil)	Prohibited		300	100	7.5
1511.90	Other oil (palm oil)	Prohibited		300	100	15
1512.00	Sunflower seed, safflower or cotton seed oil	Prohibited		300	100	7.5–15
1513.11	Crude oil (coconut oil)	Free	Import Allowed through STE	300	100	7.5
1513.19	Other (coconut oil)	Free		300	100	15
1513.21	Crude oil (palm kernnel or babassu oil)	Prohibited	Free	300	100	7.5
1513.29	(Palm kernnel or babassu oil)	Prohibited		300	100	15
1514.11	Crude oil (rapeseed/mustard oil)	Prohibited		75	75	7.5
	SUGARS	Export	Import			
1701.11	Cane sugar	Free	Free	150	100	40
1701.12	Beet sugar	Free		150	100	40
1701.91	Sugar refined containing added flavouring or colouring matter	Free		150	100	40
1701.99	Sugar refined not containing added flavouring or colouring matter	Free		150	100	40
	COTTON					
5201.00	Cotton, not carded or combed	Free		100	10	0
5203.00	Cotton, carded or combed	Free		150	10	0

Data Source: Ministry of Agriculture. Note: STE = State Trading Enterprises

India imposes trade restrictions mainly for reasons of food security, domestic supply, price volatility, and marketing and environmental factors. Export prohibitions, restrictions, and quotas are notified annually for specific periods, and they are subject to change.

Details of the trade policy stance for commodities in the study are given in the respective commodity sections of this report.

India's Response to the 2007–08 Food Price Crisis

Indian policy makers were keeping a close watch on international prices of staples, especially after having imported large quantities of wheat (about 6 MMT) in 2006–07. These imports were an unexpected and undesirable event for policy makers as this was the largest wheat import India had undertaken in more than two decades, and they did not want to repeat it. When global prices began to rise in 2007–08, the policy makers anticipated transmission of the rising global prices into domestic markets and they reacted by restricting exports, mainly of rice and wheat.

In the case of wheat, the Indian Government maintained an export ban between February 9, 2007 and September 9, 2011. However, in the case of rice, mainly common rice, the exports were restricted through alternate use of MEPs and bans in that period. The changes in the rice trade policy regime, as shown through a chronological list of policy modifications/events for 2007–11, are as follows: (Source: DGFT, GoI Notifications).

- Even though the Government had banned wheat exports in February 2007 (DGFT Notification No. 44 (RE-2006) 2004–2009), it let rice, mainly common rice, exports continue free without restriction until October 2007.
- On October 15, 2007, an export ban was imposed on non-basmati rice (DGFT Notification No. 38 (RE-2007) 2004–2009). Basmati rice, nevertheless, was permitted to be freely exported.
- Fifteen days after its imposition, on October 31, 2007, the ban on non-basmati rice was replaced with a MEP of US$425/MT or INR 17,000/MT (DGFT Notification No. 45 (RE-2007) 2004–2009).
- The MEP was increased to US$500/MT or INR 20,000/MT on December 27, 2007 (DGFT Notification No. 68 (RE-2007) 2004–2009).
- Exports, however, were banned again on February 7, 2008 (DGFT Notification No. 77 (RE-2007) 2004–2009).
- On March 5, 2008, the ban was removed and replaced with a MEP of US$650/MT or INR 26,000/MT (DGFT Notification No. 82 RE-07 2004–2009).
- On March 27, 2008, the MEP on non-basmati rice was increased to US$1,000/MT or INR 40,000/MT (DGFT Notification 89 RE-07 2004–2009).
- On April 1, 2008, non-basmati exports were banned again (DGFT Notification 93 RE-07 2004–2009).
- On September 3, 2008, exports of the PUSA 1121 rice variety were allowed as an exception, but subject to a MEP of US$1,200/MT or INR 48,000/MT; these exports were allowed export only through six ports: Kandla, Kakinada, Kolkata, JNPT, Mundra, and Pipavav (DGFT Notification 37 RE-08 2004–2009).

» During the ban on non-basmati exports, certain exceptions were made for exporting to countries in Asia and Africa. Additionally, organic non-basmati rice was excluded from the ban but subject to a quantity limit of only 10,000 MT and through customs EDI ports (DGFT Notification No. 20 (RE-2009) 2004–2009 issued on December 7, 2009).

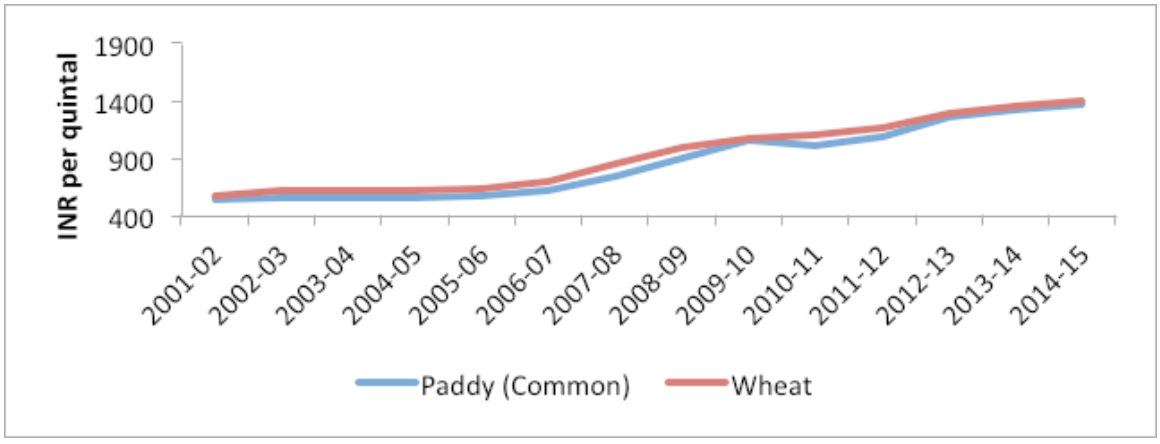
» On September 9, 2011, the ban was finally removed (DGFT Notification No. 71 (RE-2010) 2009–2014).

Fluctuating rice supplies and eventual withdrawal from the rice export market by India—coupled with similar withdrawal acts by other rice-exporting countries like Vietnam, China, and Cambodia—further pushed up the already soaring global rice prices, worsening the situation for food-importing countries, which in their search for food had lowered import duties and some of whom were willing to pay import subsidies.

Upon lifting the ban in September 2011, exports of rice in FY 2011–12 surged, while that of wheat remained subdued due to its lower international prices. Exports of cereals picked up in the subsequent three years, FY 2012–13 to FY 2014–15. India annually exported more than 10 MMT of rice, even reaching 12 MMT in FY 2014–15. Overall, India exported about 20 MMT of cereals, on an average, each year from FY 2012–13 to FY 2014–15.

India could export that much in these years because of its overflowing Government granaries. In response to the wheat imports of 2006–07, the government initiated in 2007–08 a program to maximize its cereal self-sufficiency. The Government undertook an intensive program to increase the production of its food grains by 20 MMT in five years, i.e., between 2007 and 2012. The program was called the National Food Security Mission (NFSM), launched in 2007 accompanied by massive increases in the MSPs of these crops (Figure 5) and in input subsidies on inputs like fertilizers, mainly urea. As a result of these large increases in MSPs, coupled with favorable weather in most of these years, production went up by 42 MMT in 2011–12 over 2006–07, i.e., more than double the target set out under the NFSM. As exports were banned, the Government became the "buyer of last resort" resulting in bulging stocks. As against a stock norm requirement of 31.9 MMT on June 1 of the year, Government granary stocks reached 82 MMT by June 2012. As the export bans were lifted, exports of cereals took a quantum jump.

Figure 5 Trends in the MSP of Rice and Wheat Since 2001–02



Data Source: CACP

The whole idea of initiating an export ban was to give consumers a hedge against global food price volatility. India was able to hold down food price inflation to within 5–7 percent in FY 2007–08. However, this shield was short lived, as studies showed the convergence between India's domestic food prices and global food prices in the longer run (Saini and Gulati 2015).

Another interesting fallout of the 2007–08 turmoil for the Indian consumer was passing the National Food Security Act of 2013 (NFSA). Buoyed by the impressive production increases resulting from the implementation of the NFSM of 2007 and political-economic motivations, the Government decided to expand the coverage of the subsidized grain distribution system of the Public Distribution System (PDS), thus enacting the NFSA in 2013.

Section II:
Study Methodology

As noted, the present study builds on a considerable body of literature and uses the pre-defined methodology from Anderson et al. (2008) for studying price and market distortions in agricultural markets. Continuity in method between the two studies ensures international comparability and conceptual consistency.

It is important to bear in mind that for some of the studied agricultural commodities, exports or imports, or both, have been nonexistent, very low, or specialized, with the result that they may not be reliable indicators of the likely border prices of India's domestic products. In order to resolve this, the study compared domestic wholesale prices with an estimated international reference price, which was adjusted for delivery and selling terms, specifications, and quality differences, as well as freight and insurance to and from the Indian borders, freight and insurance between foreign destinations in case the border prices of the international supplier are not given, Indian port handling costs, domestic transportation costs, and marketing margins.

The steps followed in the study are as follows:

1. Map the commodity with the states that specialize in its production.
2. Identify the ports through which the commodity from that state is exported.
3. Identify the stakeholders involved in this complete chain.
4. Estimate the commodity cost-drivers en route to the port.
5. Identify the international competitor and collect its historical prices at its port—this would act as the fob price for the analysis.
6. In cases where fob prices are not available:
    a. fob prices are then estimated using time-series data on freight costs between the two international ports. Subtracting freight costs from the cif price gives estimates of fob prices.
    b. In case any international price series are unavailable, the unit value (UV) of exports at Indian ports, are taken as the proxy for fob prices. UV is calculated by dividing the value of exports by the volume of exports for each year.
7. Collect international freight between the Indian port and the competitor's port.

In total, for the 15 commodities studied the results were as follows in Table 5.

Table 5 Major Producing States and Ports

Commodity	Producing States	Ports
Common rice	Punjab, AP, UP	Mundra and Kakinada
Wheat	Punjab, Haryana, UP	Mundra
Maize	AP, Karnataka, Maharashtra, UP	JNPT, Mundra
Gram	MP, Maharashtra, Rajasthan, UP	Mundra/Kandla
Groundnut kernels	AP, Gujarat	Mundra/Vishakhapatnam
Soybean	MP	Mundra
Rapeseed and mustard seed	Rajasthan, UP	JNPT
Cotton (lint)	Gujarat	Mundra
Refined sugar	Maharashtra, UP	JNPT
Buffalo meat	Tamil Nadu	JNPT
Skimmed milk powder	UP	Mundra
Onion	Maharashtra	JNPT
Potato	UP, West Bengal	JNPT, Haldia Sea Port
Mango	Maharashtra, Gujarat	JNPT, Mundra
Banana	Gujarat	Mundra

Note: UP = Uttar Pradesh; AP = Andhra Pradesh; MP = Madhya Pradesh; JNPT = Jawaharlal Nehru Port Trust

In total, the research involves 11 states and 5 ports.

For estimating NPCs/NRPs for the 15 commodities, time series data were sorted under six headings as follows:

- **Product and variety-specific wholesale market prices** in the identified markets of the selected states
- **International prices**: the fob price of the traded commodity at the global competitor's port (the principle of comparing "like with the like" was adhered to) or the cif prices if the fob prices were not available
- **Unit value of exports (UV):** in case the international price series of comparable product varieties were not available, then UVs had to be estimated
- **Cost of domestic transportation** between identified states, their inland container depots (ICDs), and ports; the distances traveled by trains and trucks were estimated.
- **Port handling charges** for the commodities: The ports were identified with the help of the primary survey.
- **International Freight Rates**
  - between respective Indian ports and global competitor of the commodity
  - between international ports in order to trace back cif prices to fob levels
- **Trading/marketing margins** were collected from various commodity traders through primary interviews.

Using the data, two reference prices were estimated: one is the import reference price (M_r) and the other is the export reference price (X_r). As noted earlier, these are derived by starting with the international fob prices or the unit value of export series (fob).

To estimate the import reference price, M_r, add to the fob prices the international freight charges, and port handling charges and then subtract from the result the domestic transportation and marketing margins on shipments from the wholesale market to the port. As these fob prices are those of India's biggest international competitor, they reflect the prices that India would have to pay if it were to import that commodity.

To estimate export reference prices, i.e., X_r, subtract from fob prices (which are treated as our border prices) the port handling charges, domestic transportation, and margins including marketing costs and trader's margins.

For the domestic wholesale (WH) prices, the price data were collected for the top producing states of the crop/commodity. In case there is more than one state, the price series are combined using production weights.[4] For most of the commodities, rather than taking the average prices for a financial year, the prices for the harvest months are collected. Due to lack of storage and marketing facilities, for most seasonal crops the prices during the harvest months are lower than during other months in a year. Besides, these harvest prices also closely represent the price actually received by the farmer.

Another point to note is that the WH prices differ under importable and exportable hypotheses for some commodities. Average prices of the top producing states of a commodity in India, combined using production-weights, will give the WH price under the exportable hypothesis. Under the importable hypothesis, for some commodities, the wholesale prices of a net-deficit state were included within the top producing states noted above. The combined WH price is then estimated as the weighted average of the WH prices in identified surplus and deficit states. Thus, the two price series under the exportable and importable hypotheses differ. This practice was also followed in the Pursell, Gulati and Gupta (2007) study.

The ratio of the domestic prices to the import reference price (M_r) and to the export reference price (X_r), results in the two estimates of NPCs, i.e., NPC under importable hypothesis (NPC_M) and NPC under exportable hypothesis (NPC_X).

$$\textit{NPC at wholesale level} = \frac{\textit{Domestic price at wholesale level}}{\textit{International reference wholesale price}}$$

[4] Where more than one state is studied for a crop, the wholesale price series of each of the studied states is collected and then combined using state-wise production weights. By dividing a state's annual production (in quantity) by the national production (in quantity), a state's production weight for a particular crop can be estimated. For each studied state, these weights are estimated for three years—2011–12, 2012–13, and 2013–14—which are then averaged to represent the state's weight for the triennium ending (TE) 2013–14. The averaged TE weight of states is used to combine individual state price series (2004–05 to 2013–14) to finally estimate the national average price series for that crop.

The estimated domestic and international prices and NPCs are used to estimate three things:

» **The trade status of each commodity:** The estimated time series of the NPC values i.e. the ratio between the domestic price and the estimated international reference price should determine the direction of trade in that year. In a year if the domestic price is greater than the import reference price, i.e. the NPC value is greater than 1, the commodity is deduced to be 'import-competing'. If the domestic price is less than the export reference price, i.e., and the estimated NPC is less than 1, the commodity in that year is taken as an exportable. Where the domestic price is less than the import reference price but greater than the export reference price, the commodity is said to be in a non-tradable zone. Items in this zone have an NPC value closer to 1. The annual trade-status of each commodity is estimated using this price comparison approach.[5]

» **Trade-adjusted NPCs:** Combining the two: NPC_M and NPC_X with the trade status estimated above, the time-series of "trade adjusted NPCs" for each commodity can be determined. The relevant NPC series depends on a commodity's trade status each year. For example, in years when the commodity is exportable, the NPC_X is taken, and in years when the commodity is import-competing the NPC_M is taken. For years when the commodity is non-tradable, the NPC is taken as 1.

» **Nominal rates of protection (NRPs):** Subtracting 1 from the respective NPC values, provides the estimates for the nominal rates of protection (NRPs). The NRP is estimated as:

$$\text{NPR at wholesale level} = \frac{\text{Domestic price at wholesale level}}{\text{International reference wholesale price}} - 1$$

Consistently negative NRPs indicate a pro-consumer policy bias.

Both secondary and primary sources were used for collecting information on the variables. The international price series were taken from the World Bank Commodities Price Data (Pink Sheets), United Nations Conference on Trade and Development (UNCTAD), United States Department of Agriculture (USDA), Food and Agriculture Organization (FAO), and FAO statistics (FAOstat). The unit values of exports were estimated using data from the United Nations Commodity Trade statistics database (UN Comtrade), and the Indian Government's Directorate General of Commercial Intelligence and Statistics (DGCIS), Directorate General of Foreign Trade (DGFT), and Agricultural and Processed Food Products Export Development (APEDA). The domestic wholesale prices were collected from India's Directorate of Economics and Statistics (DES) and Agricultural Marketing Information Network (Agmarknet). Domestic transportation costs were estimated using secondary sources (Indian Railways) and primary discussions (with truckers and logistics companies). The time-series for the international freight charges was created through primary discussions and meetings with shippers and forwarding agents. Estimates for the trading and marketing margins again required interactions with stakeholders, like farmers, traders, millers, and aggregators, among others.

[5] Apart from the stated price-based method, there is also a quantity-based method for estimating a commodity's yearly trade status. Based on the actual net trade flows (MMT), annual trade status is determined. However, the existence of trade restrictions or outright bans and/or limited trading volumes in certain commodities in certain years makes the quantity-based method less useful for the current study. Besides, the price-based methodology for estimating the trade status continues the 2007 study by Pursell, Gulati, and Gupta.

Two important points need an explicit mention before starting the analysis: the treatment of tariffs and the usage of wholesale data series instead of farm-gate prices.

First, for the country's primary and processed agricultural products, tariffs have been and continue to remain close to irrelevant as indicators of the actual difference between domestic and world prices. Table 3 gives a time-series of customs duties on many of India's agri-commodities. It is interesting to note that India periodically puts restrictively high duties, even on commodities where it has a relative export advantage globally. For example, in the case of rice, where India is one of the top exporters (with NPCs consistently below 1 as will be seen), the customs duties range between 70 and 80 percent. In addition, Indian tariffs on some commodities are counter-cyclical to global prices. For example, in the case of edible oils, it was observed that tariffs were lowered in years when global prices were up and were increased when global prices fell.

Second, following the methodology of Pursell, Gulati, and Gupta (2007), the current study uses wholesale prices instead of farm-gate prices for estimating the domestic reference price series. Even though the farm-harvest prices are available through the Government's Directorate of Economics and Statistics (DES), these data have two big problems: gaps in the available time-series and failure to differentiate between commodity varieties and qualities. Both of these problems are adequately addressed by looking at the wholesale prices: data are available for the time periods of this study and the data differentiates between product varieties and qualities so that just the right quality could be identified for comparison with an international counterpart, keeping to the principle of "comparing like with like."

An effort to estimate the costs involved in this first layer between the farmer's field and the wholesale markets is a daunting task, due to two factors. First, to carry the produce from the farmer to the wholesale market, a farmer may use a rented tractor, sell it to an aggregator/trader/processor, and/or collaborate with fellow farmers to carry the produce economically to the closest wholesale market. This function varies across states, districts, and even between *talukas* (groups of villages). Second, the varying geographical proximity between the location of the farmer's land and that of the wholesale market varies not just between states/villages but also across commodity lines. This difference is because of the relative influence of Government procurement operations, monopsony in some markets/commodities, inadequate financing and logistical infrastructure, the lobbying powers of the intermediaries/farmers, and the existence of farmer-producer organizations (FPOs), among others. By basing the current analysis on wholesale market prices instead of farm-gate prices, the study loses a vital layer of players and costs, which are crucial to the policy recommendations emanating from this study. However, since the information to go from wholesale markets to the farm level is sparse and irregular, there was little choice but to estimate the study's indicators at the wholesale level.

Section III:
Commodity-Wise Analysis

Cereal: Wheat

Wheat is an important crop for the country as it is the second largest consumed grain (first being rice) by Indians. It is the second most important crop in terms of agricultural value of output, and the third most important agri-product after milk and paddy.

In 2014–15, India produced 13 percent of the world's 725.4 MMT of wheat (USDA). Despite having the largest area under wheat globally, India ranks second to China in terms of production (FAO 2013). While China produced about 5.1 tn/ha, India produced about 3.2 tn/ha. When considered as a group, the European Union countries emerges as the largest wheat producer in the world (Table 6).

Table 6 Global Wheat Area, Production, and Yields 2013

Country	% Area Harvested	% Production	Yields, tn/ha
Argentina	1.4	1.1	2.54
Australia	5.7	3.2	1.83
China	11.0	17.1	5.05
Egypt	0.6	1.3	6.67
India	13.6	13.1	3.15
Pakistan	4.0	3.4	2.79
Russia	10.7	7.3	2.23
Ukraine	3.0	3.2	3.47
United States	8.4	8.1	3.17
European Union	11.8	20.1	5.58
World	100.0	100.0	3.26

Data Source: FAOstat.

Interestingly, the volatility (coefficient of variation) of Indian wheat yields is close to the world average, and wheat's high share of irrigation (more than 90 percent of the area under wheat is irrigated in India) most likely explains this stability. In fact, having crop volatility closer to the world's, which benefits from a diversified crop portfolio, is rather unusual, since the volatility of yields in individual markets is usually greater than the volatility of global production, which is much more diversified than production in individual countries.

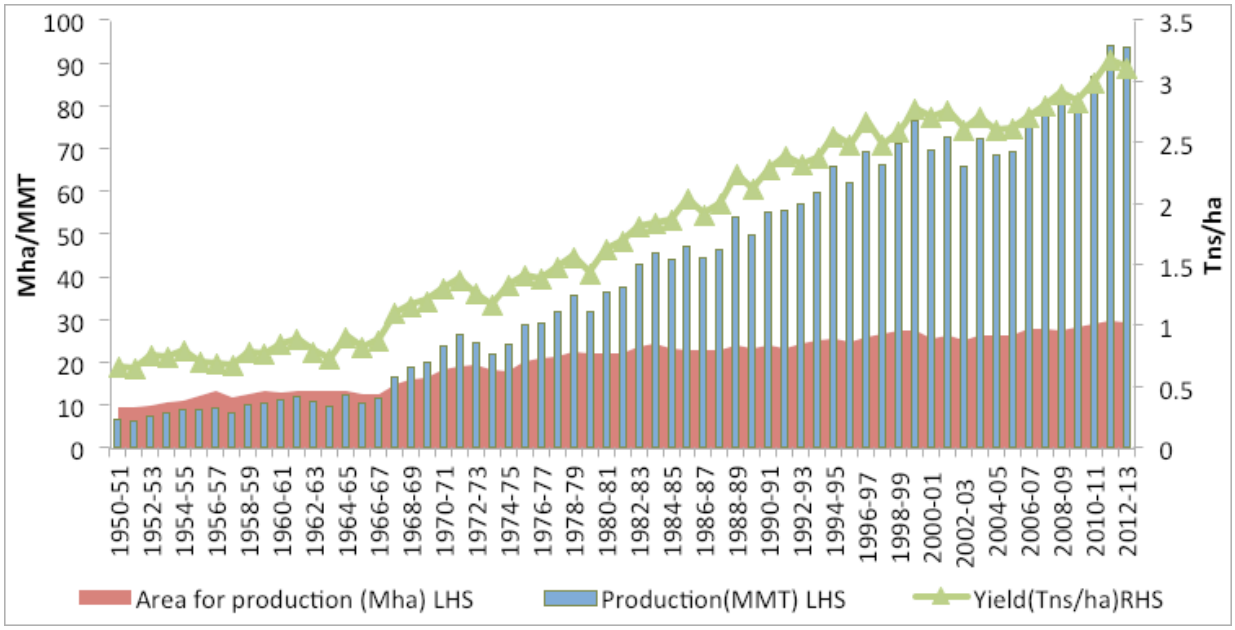
India consumes most of the wheat it produces (almost 97 percent), therefore its share in world exports is much less than its share in world production. India exports its wheat to Bangladesh, United Arab Emirates, Saudi Arabia, and Indonesia, among others. Since September 2011, when the country lifted the export ban, India has exported larger quantities of wheat. For triennium ending 2014–15, India exported more than 15 MMT of wheat globally (DGCIS) and had a 3 percent share in world exports of wheat.

India's Trade and Domestic Wheat Policy

Wheat is a very important cereal crop for the country and is largely grown during the rabi (winter) season. In 2011–12, close to 93 percent of the wheat area was irrigated. The famous green revolution of the late 1960s and several dedicated programs and policies since have strongly influenced wheat production in India.

In the 10 years between 2003–04 and 2013–14, India's area under wheat and its production increased at a compound annual growth rate (CAGR) of 1.6 and 2.9 percent, respectively (Figure 6).

Figure 6 India's Wheat Area, Production, and Yields



Data Source: Directorate of Economics and Statistics, Ministry of Agriculture, GoI

Figure Key: LHS refers to the left hand side vertical axis and RHS refers to the right hand side vertical axis

As mentioned under the common rice profile, the NFSM which launched in 2007 also entailed increasing MSPs for wheat. In 2007–08 and 2008–09, the MSPs were increased by an annual rate of about 20 percent. The increase in MSPs, coupled with increased focused support and extension services to wheat farmers, increased wheat production from 75.8 MMT in 2006–07 to 93.9 MMT in 2011–12. India produced 96 MMT of wheat from an area of 31.2 Mha in 2013–14. More than 76 percent of this was produced in the four states of Uttar Pradesh, Punjab, Haryana, and Madhya Pradesh. While India produces on average approximately 3 tn/ha, these four states together produce anything between 3 and 5 tn/ha.

Wheat and paddy are the two crops for which the Government's procurement system is relatively[6] robust and effective, and the procurement machinery is effective only in selective states. For wheat, it is effective only in Punjab, Haryana, and Madhya Pradesh (MP). For example, in the *rabi* marketing season (RBS) of 2013–14, 86 percent of annual procurement was from these three states. Interestingly, the biggest wheat producing state of UP contributed only 6 percent to procurement, despite having a share of 32 percent in total production.

[6] As mentioned earlier, GoI declares MSP for 23 crops; however, the procurement system is functional only for 3–4 states, and rice and wheat are the crops with the most effective procurement machinery.

Another interesting feature of the wheat market is the Government's prominent position in the wheat market. Despite increasing private participation over time, the Government continues to be the largest buyer of the crop (CACP). In RBS 2013–14, the Government procured around 28 percent of the total wheat production which was around 40 percent of the marketable surplus (CACP).

The current study focuses on the three wheat-producing states of UP, Punjab, and Haryana.

Wheat Trade Policy

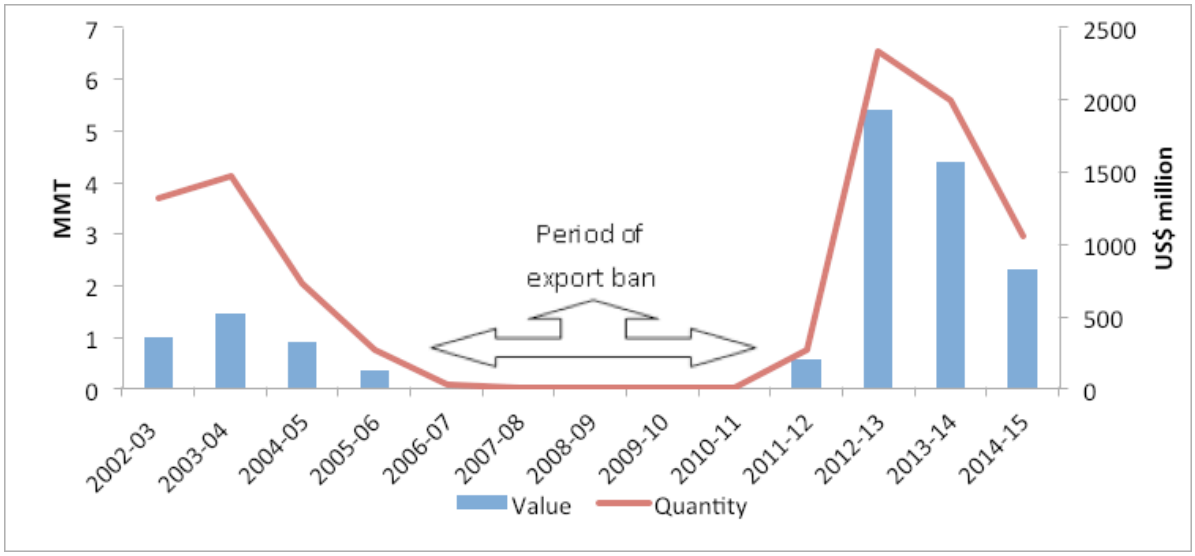
Encouraged by the phenomenal growth in rice exports, India opened its wheat exports in May 1995 (Mitra and Jostling 2009). Increasing exports squeezed domestic market supplies, thus building pressure on domestic prices. Within a year, rising domestic prices drove policy makers to reverse the trade decision and completely ban wheat exports in 1996–1997 (Hoda and Gulati 2008). Increased production incentivized by rising MSPs, falling global grain prices owing to many factors like the 1997 East Asian Financial Crisis, falling PDS grain offtake due to the "targeted" focus of the system in 1997, and export bans were among the many factors that resulted in the accumulation of wheat stocks in the country, much in excess of the buffer stock norms. This forced the Government to remove the export bans in 2000.

However, it was not until 2005–06 that Indian wheat regained its competitiveness because global prices by then had recovered from their trough in 2001–02 (Hoda and Gulati 2008). Wheat exports were thus expected to rise; however, contrary to expectations, the government had to import wheat in 2006.

The year 2006–07 was an interesting year for the food sector of the country. Owing to farmers (mainly wheat) getting a better price for their produce from the private market, the FCI (which under its current mandate, has to procure grains at no price higher[7] than the Government declared minimum support price [MSP]) was unable to meet its annual procurement targets, and thus its granaries fell below the desired stock norm level. Consequently, the Government had to import about 5.6 MMT of wheat in that year. This is when India first decided to ban wheat exports in February 2007 in reaction to rising prices and supply fears, both domestically and globally (Sharma 2011). It was only in late 2011 that the export ban on wheat was lifted, after which exports surged (Figure 7).

[7] In certain eastern Indian states like Bihar, Odisha the procurement prices at which the FCI designated agencies procures grains from farmers falls below the GoI declared MSP. The whole system of procurement is marred by inefficiencies and corruption.

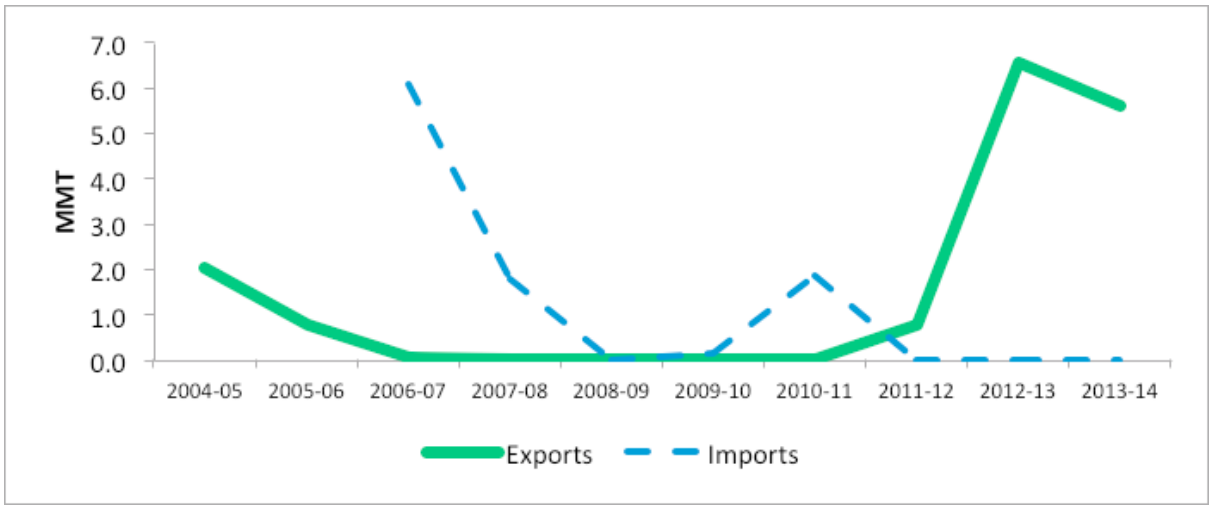
Figure 7 Trends in Value and Volume of Wheat Exports, 2002–03 to 2014–15



Data Source: DGCIS

Apart from 2006–07, India has had to import wheat, albeit in small quantities, in years like 2006–07, 2007–08, 2009–10, and 2010–11. Fluctuations in production owing to droughts, greater offtake of wheat under the PDS implying greater procurement pressures on the Government, and the fluctuations in the yearly procurement to feed the PDS occasionally compelled the Government to import wheat. However, India appears to be a net exporter of wheat on average.

Figure 8 India's Wheat Trade



Data Source: DGCIS

In terms of trade policy, wheat exports are currently free from regulation, but imports are regulated and can be undertaken only through State Trading Enterprises (STE). The customs duty of wheat in the studied periods fluctuated between zero and 50 percent (Table 7).

Table 7 Customs Duty on Wheat

Year	2003–04	2004–05	2005–06	2006–07*	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14
%duties	50	50	50	50–5–0	0	0	0	0	0	0	0

*Duties for Other Wheat and Durum Wheat;*Duty till June 06, Duty between June and Sept. 06 and Duty Sept. 06 onwards.*
Source: Goyal A. various issues

In 2015–16, a 25 percent duty was imposed on wheat imports, which was reduced to 10 percent in September 2016 and to zero percent in December 2016.

The Value-Chain for Wheat Exports

The players involved in the value-chain of wheat-exports in India include the farmer producing it, the aggregator collecting it and carrying it to the nearest local or wholesale market, the trader who buys at the wholesale market, the exporter who buys from the trader/wholesaler to export (who may also be a trader), the carrying and forwarding (C&F) agents, and the shippers.

Trade Distortions in Indian Wheat

Indian wheat is best compared to U.S. hard red winter wheat number 2 (or US HRW No. 2). For estimating the NPCs/NRPs, the price series for the two types of wheat (Indian wheat and the US HRW No. 2) must first be determined for the rabi marketing season of April–June.

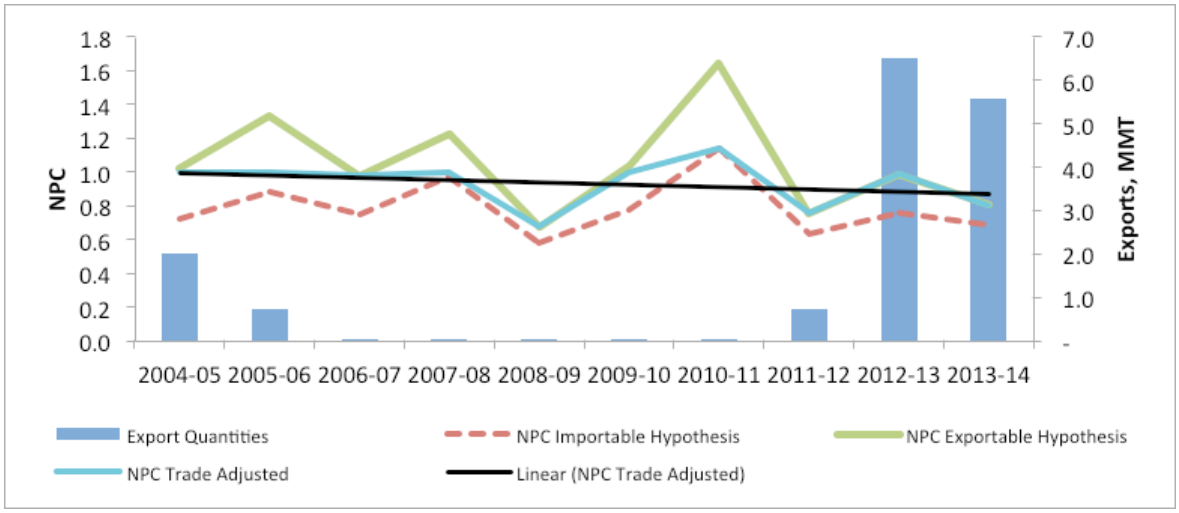
The international prices of U.S. wheat, for April–June are taken from Food and Agriculture Organization (FAO), while the domestic wholesale price series is taken from the DES Agmarknet. The wholesale prices for April–June are estimated for the three states of Punjab, Haryana and Uttar Pradesh, under the importable hypothesis, and only for Punjab and Haryana under the exportable hypothesis. The individual state price series are combined using state production weights.

Following the methodology defined earlier, the following key variables for the domestic wheat trade were estimated:

- Domestic transportation in the three states of UP, Haryana and Punjab:
  - Transportation between the wholesale market and the ICDs by railway and truck
  - Transportation between the ICD and the port by railway)
- Traders' margin and marketing costs: assumed to be 5 percent of the domestic price, WH, in this case
- Port handling charges at the Mundra Port of Gujarat
- International freight charges between the U.S. (Gulf) and Mundra Port are included when wheat is an importable, but not when it is an exportable.

Utilizing the data, NPCs for wheat at the wholesale level are estimated. The graphical representation of the three estimated NPCs: two for the exportable and importable hypothesis and one for the trade-adjusted NPCs is given below in Figure 9.

Figure 9 NPCs of Wheat at Wholesale Level



Data Source: DGCIS

Note: Importable hypothesis also involves estimates for the state of UP, taken as a net-deficit state

Indian wheat was exportable in five of the 10 studied years. It was non-tradable in four and import-competitive in one year. During the four years of the export ban on wheat, 2008–09 to 2011–12, the trade-adjusted average NPC was 0.86. Indian wheat was non-tradable in 2009–10 and import-competing in 2010–11 (due to moderation in global wheat prices). The implicit export tax on the wheat farmers was compensated for by large increases in their procurement prices or MSP (under NFSM 2007) during this ban period. Higher MSPs strangled the private sector, and the Government became the "buyer-of-last-resort" in places where it procured much more than its norm (against the June 1 norm of 31.9 MMT for rice and wheat, the Government procured 81 MMT in September 2012). Just as in the case of rice, the ban on international exports and missing private markets made the Government incur huge costs and losses: economic loss due to excessive purchase of grains and physical loss due to damage to the procured grains because of inadequate storage. Upon opening up exports in September 2011, exports surged. In retrospect, the Indian policy makers learned about the inefficiencies associated with a ban and their inability to insulate domestic markets in this time of growing globalization.

Cereal: Rice

Paddy rice made up more than 10 percent of the total output value of India's agriculture and livestock sector in 2010–11. With regard to area, production, and consumer preference, rice is the most important food crop for India. Based on the percent of value of output covered under the study, paddy is the second most important agri-product, the first being milk.

Globally, China is the largest producer of paddy, and India ranks second. Compared to wheat and maize, global rice markets are thin. Between 2013 and 2014, the global rice trade was only 9 percent of the world's total produce; wheat was 23 percent and maize, 13 percent. In addition, the rice supply in global markets is highly concentrated: in 2013–14, 80.4 percent of the global rice supply came from five countries: India, Pakistan, Thailand, Vietnam, and the United States. In terms of yields, in 2013, the world produced 4.5 tons of paddy per hectare on average, China produced about 6.7 tons/ha and India about 3.7 tons/ha. India consumes more than 90 percent of what it produces (USDA).

India's Trade and Domestic Rice Policy

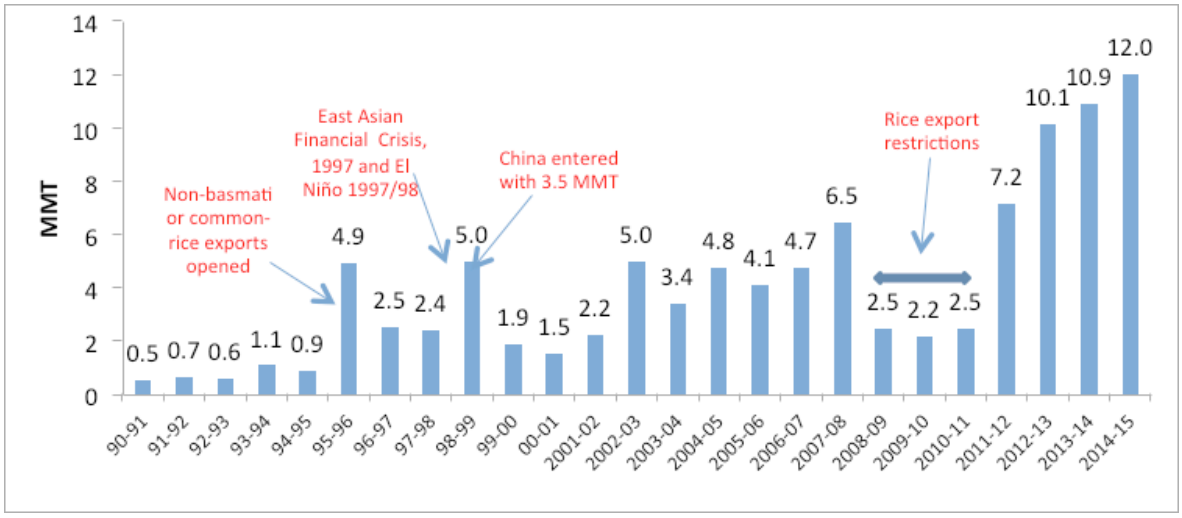
Paddy Rice Trade

India exports mainly three varieties of rice: common, fine, and super-fine. The exported rice is milled and can be either raw or parboiled. The fine and super-fine varieties of Indian rice, with basmati being one of super-fine rice varieties, are exported to niche markets in the Arab countries including Saudi Arabia, Iran, UAE, Iraq, and in the United States, and Europe. The common variety of rice supplied by India compares internationally to the type of rice supplied by Thailand (25 per cent broken). In 2014–15, India exported 12 MMT of rice and close to 70 percent of this was common rice. Major export destinations for India's common rice include Iran, Nigeria, Saudi Arabia, Senegal, and the United Arab Emirates.

India follows different trade policies for common and basmati rice. While there have been few and scattered episodes of restrictions on the export of the basmati rice, at least since the late 1980s, common rice trade has been subject to several restrictions like minimum export prices (MEP), export quotas, and even complete bans. Until 1991, exports of common rice were tightly restricted using quotas and an MEP requirement. An over-valued exchange rate—which distorted the markets by making imports look cheaper and exports costlier compared to domestic prices— acted as an implicit tax on exportables. This was reinforced with other export restrictions, such as high MEPs, limited export quotas, and even outright export bans. Together, these policies implicitly taxed the Indian farm sector. The situation changed with the devaluation of the Indian rupee in 1991, which made basmati rice more price-competitive in the global market, resulting in increased exports. However, common rice exports, despite being highly price-competitive, were restricted until 1994. The Government removed these restrictions in 1995–96 and rice exports surged to 4.9 MMT in 1995–96 (from 0.9 MMT in 1994–95), making India the second largest exporter of rice globally.

The situation changed again during the East Asian Financial Crisis of 1997, when global demand plummeted and prices for rice fell to unprecedented low levels. Bumper crops caused an over-supply of rice into global markets. In 1998, China entered the rice market with 3.5 MMT of rice adding to supplies. Even though there was large demand from countries like Indonesia and the Philippines (which undertook record rice purchases as their economies recovered from the worst El Niño of history in the year 1997–98), prices collapsed in the over-supplied rice market (USDA-ERS 1999). India still managed to export about five MMT in that year. However, increased subsidization of rice farmers by some countries further reduced world prices (Hoda and Gulati 2008), and India suffered a loss of export opportunities. Exports in 1999–2000 and 2000–01 were very low. In November 2000, India introduced subsidies for internal and international freight and rationalized other marketing costs associated with exports, after which rice exports increased. Eventually, rising global prices after 2001 saw Indian exports rise too (Figure 10).

Figure 10 India's Rice Exports in MMT, 1990–1991 to 2014–2015

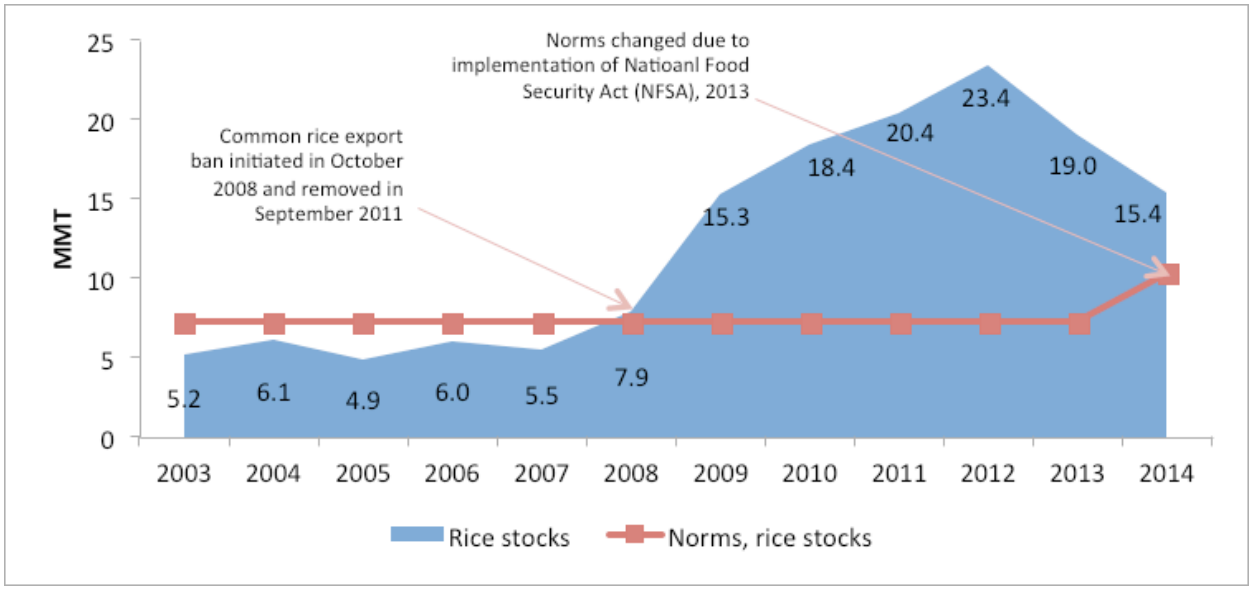


Data Source: Ministry of Commerce, GoI.

The global food crisis of 2007 was the next important event in India's rice export history. To stop global price increases from spreading into domestic markets, the Government started imposing export restrictions on common rice. (The exact trade policy was detailed in Section I under the sub section "India's Agricultural Trade Policy"). However, India's decision to ban/restrict exports of common rice came under severe criticism from several rice importing countries, which in their desperation for rice lowered import duties and, in some cases, were even willing to give import subsidies (Dawe and Slayton 2010). As noted earlier, India did open a window to export common rice at "concessional" prices compared to prevailing global prices of rice to some neighboring countries, like Bangladesh and Bhutan, and to some low-income African countries. However, not much rice was actually exported.

As mentioned earlier, India procures rice and wheat to feed its various food-based welfare programs like the TPDS/NFSA, and procured grains are stored with the Food Corporation of India (FCI). These stocks are called buffer stocks, and FCI has defined a norm for each quarter that forms the minimum level of stocks that FCI aims to maintain. When India imposed an export ban on common rice in 2007–08, the stocks with the FCI started to grow and, on average, they were about 150 percent of the norm levels in the three years of the ban (2009–11) (Figure 11). The stock levels surged for two reasons: (1) lower market opportunities due to export bans and restrictive domestic trade policies from such laws as the APMC and the ECA, and (2) growing production and yields domestically because of Government efforts under the National Food Security Mission 2007 (NFSM).

Figure 11 October 2003–14 Rice Stock Levels with FCI



Source: Food Corporation of India (FCI)

The FCI October rice stocks peaked in 2012 (23.4 MMT) when they were more than three times the norm level. However, the stock levels fell thereafter. Incidentally, India lifted its common rice export ban in September 2011; since then the common-rice exports from India have increased. The Government's Foodgrain Bulletin does not show any exports of rice from the central pool of stocks in the years post 2012–13, with the country's growing rice exports mainly undertaken by the private sector. Active buying of rice by private players is reflected in lower government stocks, which otherwise would have been higher in the absence of private sector buying. Once the ban was lifted, India exported about 21 MMT of rice in the two years 2012–13 and 2013–14.

Another interesting trend in Indian rice exports is that, over time, the share of common rice in the total rice-export earnings has been increasing: It was 28.2 percent in 1994–95 (before the common rice exports opened), fell to 2 percent in 2010–11 (during the ban period), and then rose to 42.6 percent in 2012–13.

On the import side, as shown in Table 4, India imposes high import duties on rice-70 percent on semi-milled or wholly milled rice and 80 percent on paddy, brown rice, and broken rice. India does not allow import of genetically modified (GM) rice.

Overall, India's agricultural trade policy in general and its rice trade policy in particular, link closely with domestic agricultural policy objectives. The unstable policy environment makes India's trade pattern unpredictable. On the domestic front, too, restrictive import and export policies have led to a widening gap between the cif and fob prices, resulting in the burden of adjustment falling on inefficient and expensive government (FCI) storage machinery.

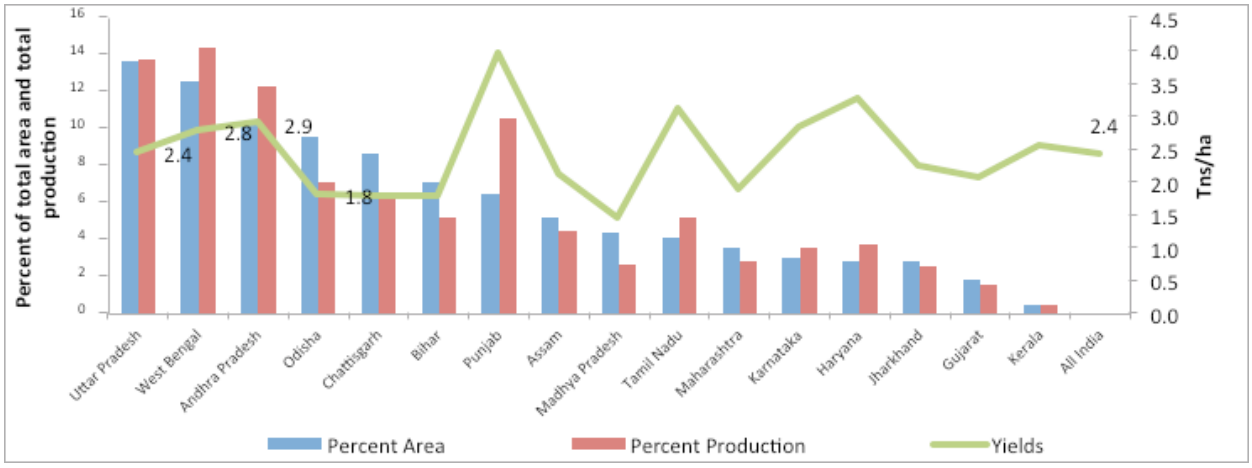
Domestic Policy for Rice

India has close to 199 million hectares of gross cropped area, and more than 21 per cent, i.e., 42.9 million hectares, is under paddy. Close to 60 percent of the area under rice in 2011–12 was under irrigation. The country produced 106.5 MMT of rice in 2013–14, which was 22.3 percent of the world rice production in that year (USDA) (Figure 2).

There are three seasons for growing rice in India: *pre-kharif, kharif*, and *rabi*. The main rice growing season in the country is kharif, in which the crop is sown during the Indian monsoon season, June-July, and harvested in November–December. About 84 percent of the annual crop of the country is grown in this season.

Four states, West Bengal, Uttar Pradesh, Andhra Pradesh, and Punjab, are the biggest players in paddy in the country; in 2013–14 these states had about 43 percent of the country's area under rice and produced more than 50 percent of the country's paddy (Figure 12).

Figure 12 India's Rice Area, Production and Yield, 2013–14



Data Source: Agricultural Statistics at a Glance

The present research studied the rice markets of Andhra Pradesh, Uttar Pradesh, and Punjab. Even though Uttar Pradesh has the largest area under rice production in the country, owing to lower yields it ranks second to West Bengal, which produces more than 15 MMT of rice from an area of 5.5 Mha, with a yield of 2.8 tn/ha. The north Indian state of Punjab is the most productive state for rice, with an average yield of 4 tn/ha, almost twice the country's average yield.

To increase rice production, the Government offered higher minimum support prices (MSPs) for paddy to farmers. As mentioned in the section on agricultural policy, MSPs for paddy (rice) were increased by an average of 20 percent per annum during the three years 2007–08 to 2009–10. The five years (2007–12) under the NFSM witnessed substantial MSP increases and increased support from policies and programs for cereal farmers. Except for the drought year of 2009, production levels responded to the price incentives. Close to 12 MMT of rice was added in production within those five years.

Rice is a water-intensive crop. The rising production of rice, and wheat and sugarcane to some extent, especially from the states of Punjab and Haryana, has contributed to over-exploitation of ground water in these states. Thus policy makers and economists alike today feel the need to undertake a "second green revolution," wherein the rice production base is shifted away from the states of Punjab and Haryana (which face threats due to plummeting groundwater tables) to the more water-abundant eastern states of Bihar, Uttar Pradesh, and Odisha.

The Value-Chain for Rice Exports

There are numerous players in the value-chain of rice exports: the farmers producing it; aggre-

gators collecting it and carrying it to the nearest local or wholesale market; traders who route it to millers; millers buying directly at the local market; exporters who buy from the miller to export; millers who export to international and national markets; and the carrying and forwarding agents and the shippers.

Trade Distortions in Indian Common Rice

Analysis of the domestic prices of common rice and the international prices for rice of comparable quality, for the period between October–January (the main rice marketing season) provides insights into the price comparison of the two countries. Internationally, India's common rice is comparable to the 25 percent broken rice supplied by Thailand. The historical price series of the latter is taken from the World Bank Pink Sheets, which provide its fob Bangkok price.

To derive domestic prices, the wholesale paddy prices (WH) are taken from the Agricultural Marketing Information Network (Agmarknet) of the GoI. Prices, for comparable quality of paddy, were taken for the three states of Uttar Pradesh (UP), Punjab, and Andhra Pradesh (AP), under the importable hypothesis, and for Punjab and Andhra Pradesh under the exportable hypothesis. Paddy prices are converted to rice prices using 0.67 as the conversion factor.

Estimating the Nominal Protection Coefficients (NPCs):

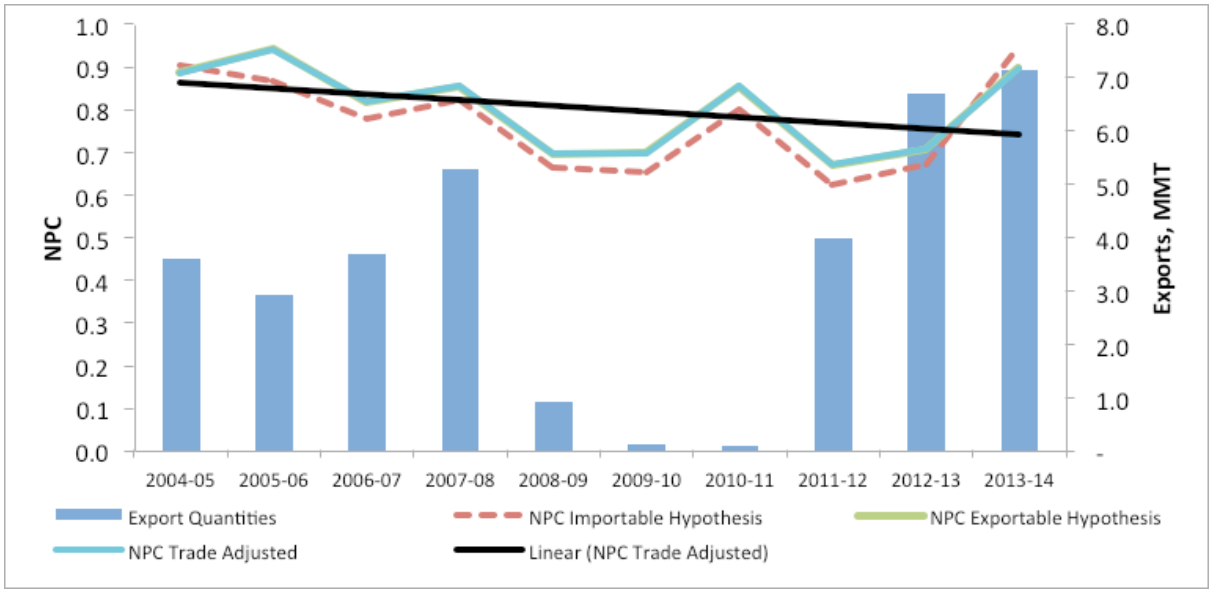
Following the methodology defined earlier, the following key variables for common rice domestic trade were estimated:

- Domestic transportation in the three states of UP, AP and Punjab:
  - Transportation between the wholesale market and the inland container depots (ICDs) by railway and truck
  - Transportation between the ICD and the port by railway
- Traders' margin and marketing costs: assumed to be 5 percent of the domestic price
- Port handling charges at Mundra Port of Gujarat and Kakinada Port of Andhra Pradesh
- International freight charges between Bangkok Port and the Mundra Port and Bangkok Port and Kakinada Port are included when rice is an importable, but not when it is an exportable.

After adjusting the international price for the costs above, the international reference price under the exportable and the importable hypothesis was estimated. The ratio of the domestic price with the estimated reference price gives us the NPCs under the exportable and the importable hypotheses. A trade-adjusted NPC series was also estimated.

The graphical representation of the three NPC series: two under the exportable and importable hypothesis and third being the trade-adjusted series reveals an interesting picture about the common rice trade distortions in India (Figure 13). The results of all three NPC series are consistently below 1, indicating India has a comparative advantage in supplying common rice to the global markets compared to its international competition from Thailand.

Figure 13 NPCs of Common Rice at Wholesale Level



Data Source: DGCIS

Common rice export restrictions during 2007–08 to 2011–12 created an implicit export tax, which varied with domestic market conditions and global prices. Before the ban, between 2004–05 and 2007–08, domestic prices were about 80 to 90 percent of world reference prices; however, during the ban period, these prices were 70 percent of world prices (except for the year 2010–11 when international prices fell). A ban on exports during this period generated an implicit tax on net sellers of rice to the benefit of net buyers of rice, indicating a pro-consumer bias. However, as highlighted earlier, domestic prices adjusted to the international counterpart over the medium to longer run. More recently, in 2013–14, moderating global prices coupled with rising domestic prices have reduced the gap between the two price series, but rice is still estimated to be exportable in that year.

Indian policymakers endeavor at all times to maintain a long-term equilibrium level in the country's food markets while representing the interests of both producers and consumers. Rising prices, nevertheless, attract ad hoc reactions, such as quantitative restrictions on trade and bans that favor the vociferous consumer lobbies. But, for a developing country chasing the objective of self-sufficiency, maintaining a sustainable and a profitable agriculture is mandatory and so farmer prices/profits are adjusted over time through two conduits: higher prices through MSP and greater input subsidies. Once the supply response is in place and the country has had time to adjust to the new global equilibrium, the bans or quantitative restrictions are removed. This apparent policy ad-hocism in a staple crop like rice, may in fact find support from Grossman and Helpman (1994), who found that for a commodity, the long-term rate of protection does not depend as much on the world prices as it does on the domestic forces like the elasticity of demand and share of production supplied domestically. But this policy is surely not a desired strategy in the longer run, more so because the burden of adjustment then falls on the country's storage facilities. This leads to a sub-optimal equilibrium that is inefficient both domestically and globally, notwithstanding the damage that such policy-adhocism has on India's global image.

Cereal: Maize

Maize is one of the most versatile emerging crops because it has wide adaptability under varied agro-climatic conditions. It is India's third most important cereal crop, and it is by far the largest component of the global coarse grain trade, which also includes sorghum, barley, oats, and rye.

Maize is useful for multiple purposes: it is an important food staple in some areas, particularly in Africa; yellow maize in particular is widely used as an animal feed and it can also be processed into a variety of food and industrial products including beverages, sweeteners, starch, oil, glue, industrial alcohol, and fuel ethanol. In the last 10 years, the use of maize for producing fuel has increased significantly. The United States used 40 percent of its maize production for this purpose alone (Ranum et al. 2014). This shift in demand for grain use in biofuels is widely thought to have triggered grain price volatility globally, particularly since 2005 (see, for example, Wright 2014).

Different types of maize are grown throughout the world. They differ in color, kernel size, and endosperm composition. Many countries also grow genetically modified (GM) maize. The United States is the largest player in maize in terms of area, production, and yields. The world produces 5–6 tn/ha and the United States produces 10–11 tn/ha. With about 19 percent of the world's area under maize, the United States produces 34 percent of the world supply and has a share of 32 percent in world exports. The major maize exporters globally are the United States, Brazil, Argentina, Ukraine, India, and Russia (in that order).

Japan, South Korea, the European Union, and China are among the biggest importers of the crop globally. China is an interesting case in this regard. China had more than 100 MMT of maize closing stocks in 2014–15 (USDA-ERS), while it produced about 215.7 MMT and consumed about 94 percent of that production. China's main demand for maize is for animal feed. Gale, Jewison, and Hansen (2014) claim that China will emerge as a big net importer of the crop owing to an increasing gap between its consumption and domestic supply.

Maize Trade and Domestic Production

Historically India may not be a very big player in the maize market, but in recent years it has emerged as a competitive supplier of the crop. India exported an annual average of 4 MMT of maize per triennium ending 2014–15 trade data (Figure 14).

Figure 14 Value and Volume of Indian Maize Exports since 2002–03

Data Source: DGCIS

Indian maize exports suffered during the 2007–08 food crisis. Maize exports were completely banned in July through October 2008; however, before and after this ban period, exports were completely free.

India maintains tariff rate quotas on maize imports. For example, the customs duty in 2015–16 was zero on maize imports up to 5 lakh (500,00) MT; for imports greater than that the import duty was 50 percent (Table 8). This ratio has varied over the years. However, the Government can decide to free imports via notifications during any given year.

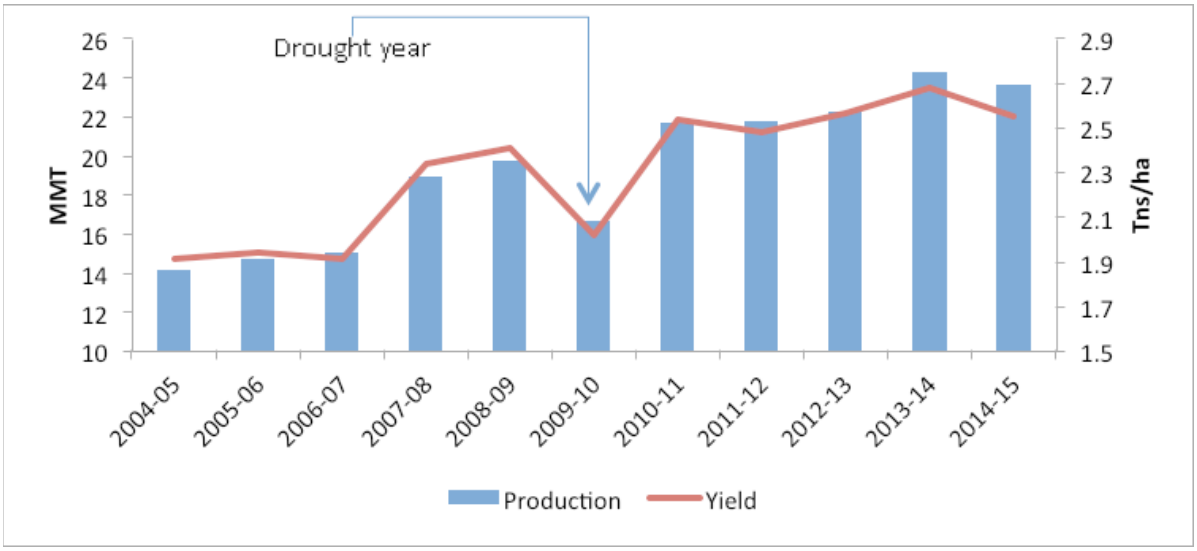
Table 8 Customs Duty on Maize Imports

Year	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14
% duties	15.1–51[6]	61.2	61.2	61.2	0	0	0–51.5[7]	0–51.5[7]	0–51.5[7]	0–51.5[7]	0–51.5[7]

Source: Goyal A. various issues. Notes: 6. Tariff Rate Quota for import upto (i) 4 Lakh MT in 2001–02; (ii) 4.5 Lakh MT in 2002–03; (iii) 5 Lakh MT in 2003–04; beyond TRQ duties separate 7. TRQ for import upto 5 lakh MT; beyond TRQ duties separate

Increased maize exports from India were possible due to increases in domestic production, which has more than doubled since the start of the 21st century. From producing 12.04 MMT in 2000–01, India's production rose to more than 24 MMT in 2013–14 (Figure 15). The area under the crop also increased by close to 3 Mha during that period.

Figure 15 Trends in India's Maize Production and Yield



Data Source: USDA-ERS and Agricultural Statistics at a Glance

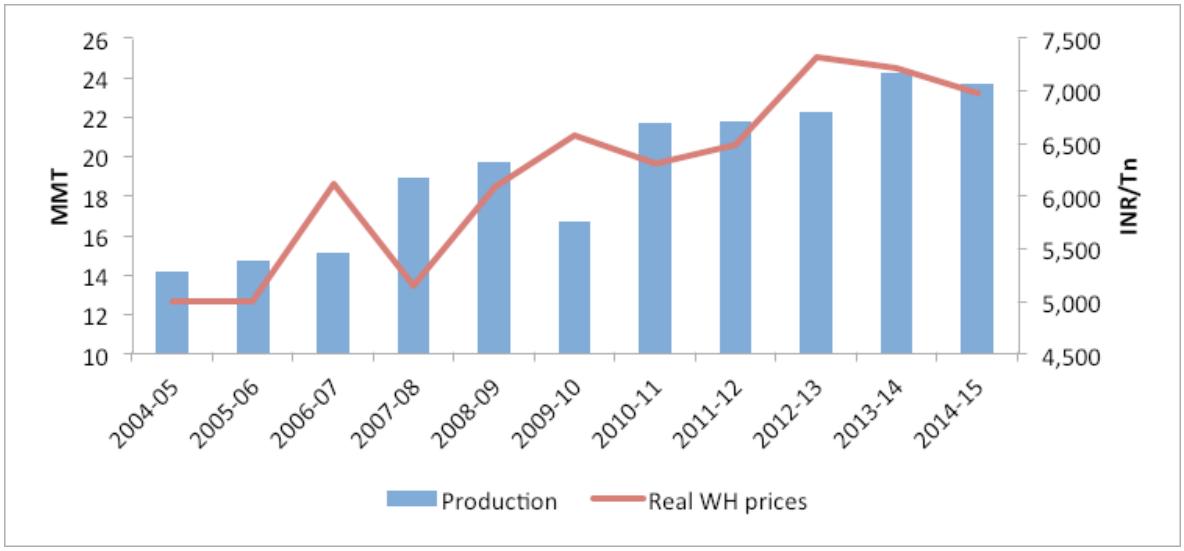
Since 1950–51, the area cultivated, production, and yield of maize have risen 3 times, 14 times, and 5 times, respectively. The increase in production (and yield) can be attributed to price incentives and technology adoption, among other things.

Maize in India contributes about 9 percent to the national food basket (NSSO 2011). Apart from being a staple crop for human consumption (yellow maize) and a quality feed, it is also used in India for manufacturing products like starch, oil, alcoholic beverages, pharma, cosmetics, textiles, gum, and paper. According to the Ministry of Agriculture, in 2008–09, India used maize as poultry feed (51 percent), human food (23 percent), animal feed (12 percent), in industrial

products, such as starch (12 percent), beverages (1 percent), and seed (1 percent). Rising demand has led over time to rising prices for maize. A look at the price and the production trends for maize over the last 10 years shows how the two have moved together in the past (Figure 16).

The simple correlation between wholesale prices (WH) (at the 2004–05 base) of maize and its production over the 10–year period is 0.77, indicating to a possible role played by price incentives in promoting maize production.

Figure 16 Production and Prices of Maize since 2004–05



Data Source: Agricultural Statistics at a Glance and DES

In addition to price incentives, adoption of single cross-hybrid seeds (SCH) has played a pivotal role in raising maize yields in the country. Andhra Pradesh, Karnataka, and Maharashtra are key producers of the crop in India, producing half of the country's annual production. The area using hybrid seeds in 2010–11 was estimated to be 60 percent of the total cropped area. The states with higher area under hybrid seeds invariably boasted higher yields. More recently, Tamil Nadu has overtaken AP in terms of yields: AP produced close to 4.7 tn/ha while TN produced about 5.5 tn/ha in 2013–14. India is currently carrying out field trials in the state of Maharashtra for GM-corn.

The current research studied the markets of AP, Karnataka, and Maharashtra.

The Value-Chain for Maize Exports

Stakeholders in the value-chain of maize-exports include the farmer producing it, threshing, and winnowing it; the sheller, who removes kernels from the cob; buyers who could be fellow farmers using the maize as feed for poultry and cattle farms; and industries using it as a raw material. Farmers frequently take their maize cobs to the wholesale market, although they may also sell their produce at the farm to an aggregator who collects and carries the maize to the nearest local or wholesale market. Traders buy from these wholesale markets and sell in domestic and global markets. There may be some maize exporters who buy from these traders or directly from wholesale markets. Apart from these, there are C&F agents and the shippers involved in the value-chain.

Trade Distortions in Indian Maize

India produces mainly "zea mays indurata" or "flint corn," which is yellow or white and compares well with U.S. yellow corn no. 2. Maize is cultivated throughout the year in India; however, kharif is the main marketing season for the crop, during which more than 70 percent of the annual crop is harvested. Therefore, October–January average price series for Indian and US corn were used for this study.

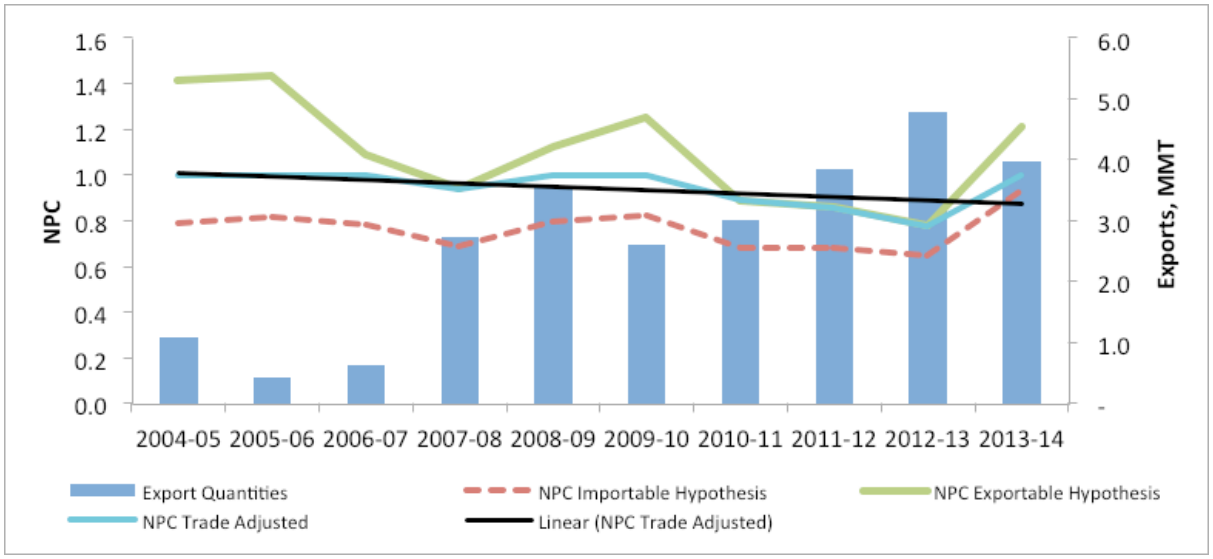
International prices of U.S. yellow corn No.2 variety (at Gulf Port), for the months October–January were taken from World Bank Pink Sheets, while domestic wholesale price data were taken from Agmarknet. The wholesale prices for October–January are estimated for all three states and then a combined series of wholesale prices (WH) was estimated as the production-weighted average wholesale price in the three states.

Following the methodology stated before, we estimated the following key variables for maize domestic trade:

- Domestic transportation in the states of AP, Karnataka, and Maharashtra:
  - Transportation between the wholesale market and the ICDs by railway and truck
  - Transportation between the ICD and the port by railway
- Trader margin and marketing costs: assumed to be 5 percent of the domestic price, WH in this case
- Port handling charges at Mundra Port of Gujarat and Nava Sheva (JNPT) of Maharashtra;
- International freight charges between the United States (Gulf) and the JNPT/Mundra Port when maize is an importable but not when it is an exportable.

Using the above data, NPCs for maize at the wholesale level were estimated. The graphical representation of the three NPC curves reveals the changing trade status of Indian maize (Figure 17).

Figure 17 NPCs of Maize at Wholesale Level



Data Source: DGCIS

Note: For the importable hypothesis, the domestic numbers for the state of UP were also used in the calculations, having been treated as the net-deficit state.

Of the 10 studied years, Indian maize was an exportable in four years and trade-neutral or non-tradable in the remaining six years. India prices were on an average about 80 to 100 percent of the international reference prices in the studied years. Higher global maize prices between 2007–08 and 2012–13 contributed to expanding Indian maize exports. More recently, falling global maize prices due to an over-supplied market, have again shifted Indian maize into the non-tradable zone. India exported about 4.8 MMT of maize in 2012–13, on account of a low U.S. harvest that raised global maize prices, thus making the Indian maize NPC the lowest in the studied years. India has been exporting maize despite NPCs close to 1 by supplying neighboring countries where it has a freight advantage over the United States.

Gram-Chickpea

India is the largest producer and importer of pulses. Nearly 68 percent of Indian pulses are rabi crops (October–January) and about 62 percent of this is gram (chickpea) alone; in fact 45 to 50 percent of India's total pulses production is of gram itself. India exports about 0.2 to 0.3 MMT of pulses in a year. Chickpea is the leading pulse exported from India, contributing about 90 percent of the total exports of pulses by India (Table 9).

Table 9 India's Major Pulse Exports

HS Code	Pulses/Year	2012–13	Share in total exports (%)	2013–14	Share in total exports (%)	2014–15 (Apr–Dec)	Share in total exports (%)
7131000	Peas (Pisum sativum)	0.6	0.3	0.9	0.3	1.9	1.0
7132000	Chickpeas (garbanzos)	194.9	96.6	333.8	97.2	158.7	86.8
7133100	Moong/ urad	1.6	0.8	1.7	0.5	2.1	1.2
7134000	Lentils (Masur)	1.0	0.5	0.7	0.2	7.3	4.0
7136000	Pigeon peas (tur)	1.6	0.8	0.1	0.0	0.7	0.4
Total Pulses		201.7		343.5		182.8	

Data Source: DGCIS

Note: HS Code is the Harmonized System Code of a commodity taken from the List of Indian HS Classification

India also imports substantial amounts of pulses for its own consumption. The most imports are peas, followed by lentils and moong (2014–15) (Table 10).

Table 10 Major Pulse Imports of India

HS Code	Pulse/ year	2012–13	Share in total imports (%)	2013–14	Share in total imports (%)	2014–15 (Apr–Dec)	Share in total imports (%)
7131000	Peas (Pisum sativum)	1370.8	34.2	1330.4	36.4	1647.8	45.0
7132000	Chickpeas (garbanzos)	697.6	17.4	276.1	7.6	309.7	8.5
7133100	Moong/urad	642.8	16.0	624.1	17.1	499.9	13.6
7134000	Lentils (Masur)	506.4	12.6	708.7	19.4	609.0	16.6
7136000	Pigeon peas (tur)	506.4	12.6	465.6	12.7	443.9	12.1
Total Pulses		4013.2		3654.8		3663.6	

Data Source: DGCIS

This study researched the most important export pulse of India, gram or chickpea or garbanzo. There are two main types of chickpea produced in India: desi and kabuli. While the desi chickpea is a dark brown, smaller sized seed, the kabuli chana is wheatish-cream and a bigger seed. This study used kabuli chana as that is the main type of chickpea exported from India.

India exports its chickpeas to Pakistan, Turkey, Algeria, Sri Lanka, and the United Arab Emirates; it also imports garbanzos from Australia, Russia, Myanmar, and the United States (Table 11).

Table 11 Top Export and Import Destinations of Major Pulses from India

HS Code	Pulses/Year	Top 5 Export Destinations	Top 5 Import Sources
7131000	Peas (Pisum sativum)	Myanmar (84.7%), Pakistan (7.37%), Nepal (5%), Sri Lanka (2.8%), Malaysia (0.04%)	Canada (70.6%), Russia (11.1%), US (8.4%), Australia (6.2%), France (1.7%)
7132000	Chickpeas (garbanzos)	Pakistan (29.9%), Turkey (18.1%), Algeria (17.2%), Sri Lanka (5.3%), UAE (4.43%)	Australia (61.43%), Russia (22.77%), Tanzania (7.84%), Myanmar (6.4%), United States (0.47%)
7133100	Moong/ urad	USA(49.7%), Sri Lanka (7%), Canada (7.7%), Kenya (4.3%)	Myanmar (82.8%), Tanzania (4.2%), Kenya (3.6%), Australia (3.1%), Mozambique (1.61%)
7134000	Lentils (Masur)	Myanmar (35.2%), US (25.2%), Kuwait (7.2%), Bhutan (6.6%), Singapore (5.9%)	Canada (79.3%), US (10.7%), Australia (9.9%), Uzbekistan (0.01%), Turkey (0.01%)
7136000	Pigeon peas (tur)	Nepal (78.8%), Canada (19.2%), Israel (1.92%), Korea (0.1%)	Myanmar (51.4%), Tanzania (27.4%), Mozambique (14.7%), Malawi (4.5%), Kenya (1.8%)

Data Source: DOC, (GoI)

Table 12 Global Gram Statistics 2013

Country	% Area	% Production	Yields (tn/ha)
India	70.9	67.4	0.9
Pakistan	7.3	5.7	0.8
Australia	4.2	6.2	1.4
Iran (Islamic Republic of)	4.1	2.3	0.5
Turkey	3.1	3.9	1.2
Myanmar	2.5	3.7	1.5
Ethiopia	0.9	1.9	2.0
Tanzania	0.9	0.9	1.0
Mexico	0.9	1.6	1.8
United States	0.6	1.2	1.8
Canada	0.5	1.3	2.4
Other	4.1	3.9	1.1
World	100	100	1.0

Data Source: FAOstat

Globally an area of about 13.5 Mha was under gram, and of this, 70 percent was in India alone. India is also the largest producer of gram in the world, with about a 67 percent share in world gram production in 2013 (Table 12).

However, Indian gram yields are very low compared to the rest of the world. While India produces about 0.9 tn/ha, Canada produces 2.4 tn/ha. Even the United States, Mexico, Myanmar, Australia, and Ethiopia produce much more gram than India on a per ha basis.

In terms of share in global exports, India with a share of 13 percent ranked second, next to Australia, which alone supplies about 42 percent of global exports. In the triennium ending 2012, 19 percent of world gram imports went to India, with Pakistan importing about the same amount.

India's Gram Trade and Domestic Production

Pulses are an important component in the diet of a large number of vegetarians in India. About 6–7 percent of total food expenditure by an average Indian is on pulses and their products. Rich in proteins, pulses balance an otherwise carbohydrate-rich Indian diet. Close to 20 percent of India's pulse consumption is met via imports. The country's dependence on imports makes pulses a sensitive commodity due to the sheer importance of pulses in the Indian diet.

Although import duties are zero on gram, (Table 13), exports of many pulses are highly restricted. However, the restrictions have not applied to kabuli chana (the variety studied here) and up to 10,000 metric tonnes of organic pulses and lentils per annum. Barring one episode of 2006–07, exports of kabuli chana have been free. In 2006–07, rising prices for pulses in domestic markets (when pulse prices increased at the wholesale level by close to 32 percent annually and the overall food price inflation was at 10 percent) resulted in the Government banning exports of all pulses, including kabuli chana, in June 2006. The ban continued until March 2007. However, since then the exports of this gram have been free. All export contracts are required to be registered with APEDA before shipment, and exports can only be shipped through customs electronic data interchange (EDI) ports.

Regarding imports there is a huge gap between the bound duty (50–100 percent) and applied duty (0 percent), thereby giving the Government enormous space for maneuvering the duties without conflicting with its WTO commitments on tariffs.

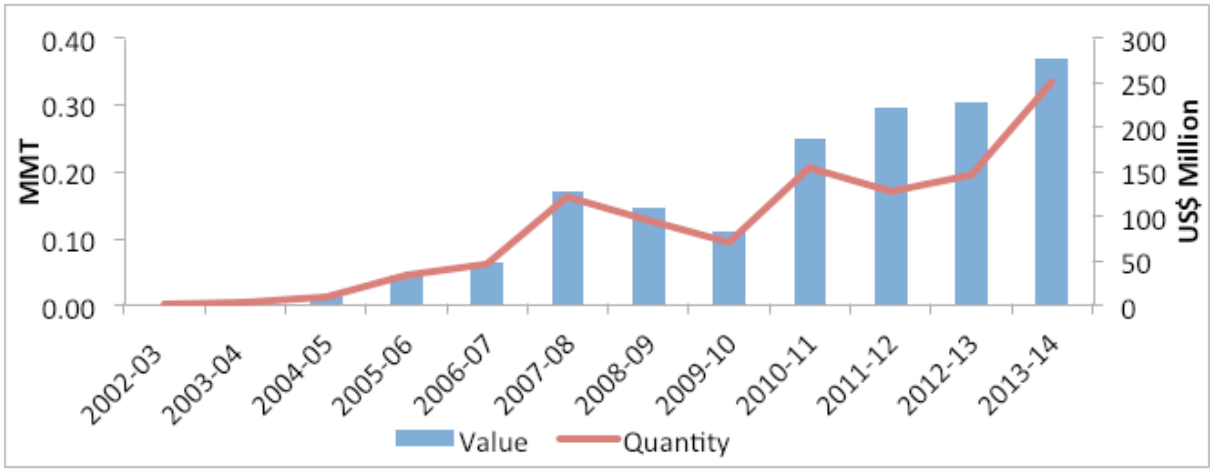
Table 13 Import Policy for Pulses as of January 2016

HS Code	Commodity	Tariff Schedule		
		Bound Duty, %	Statutory Duty, %	Applied Duty, %
0713 10 00	Peas	50	50	0
0713 20 00	Chickpeas(gram)	100	30	0
0713 31 00	Moong/urad	100	30	0
0713 40 00	Lentil (masur)	100	30	0
0713 60 00	Pigeon peas (tur)	100	30	0

Source: Agricoop, GoI

Rising global prices of gram have resulted in several export opportunities for India. In the 10 years between 2004–05 and 2013–14, Indian gram exports increased at an average annual rate of 80 percent. (Figure 18)

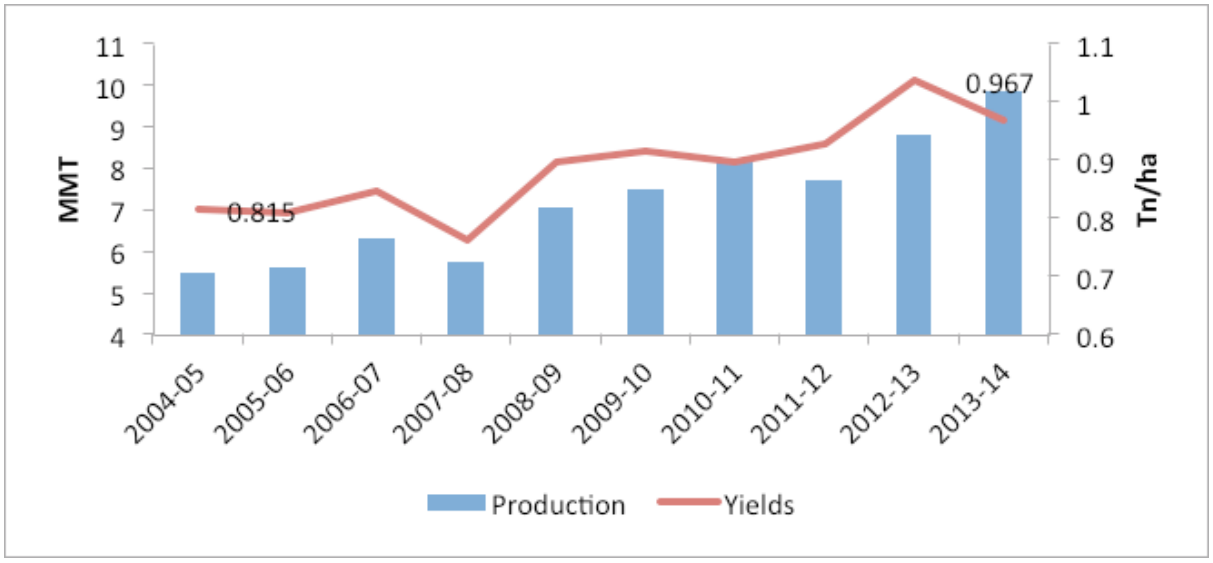
Figure 18 Value and Volume of Indian Gram Exports Since 2002–03



Data Source: DGCIS

India has been able to increase gram exports, partly because of greater export opportunities and partly because of growing domestic production levels (Figure 19). Today an Indian pulse field produces on average about 1 tn/ha, which is close to the world average. Still there are countries like Canada, the United States, and Mexico that produce double this yield.

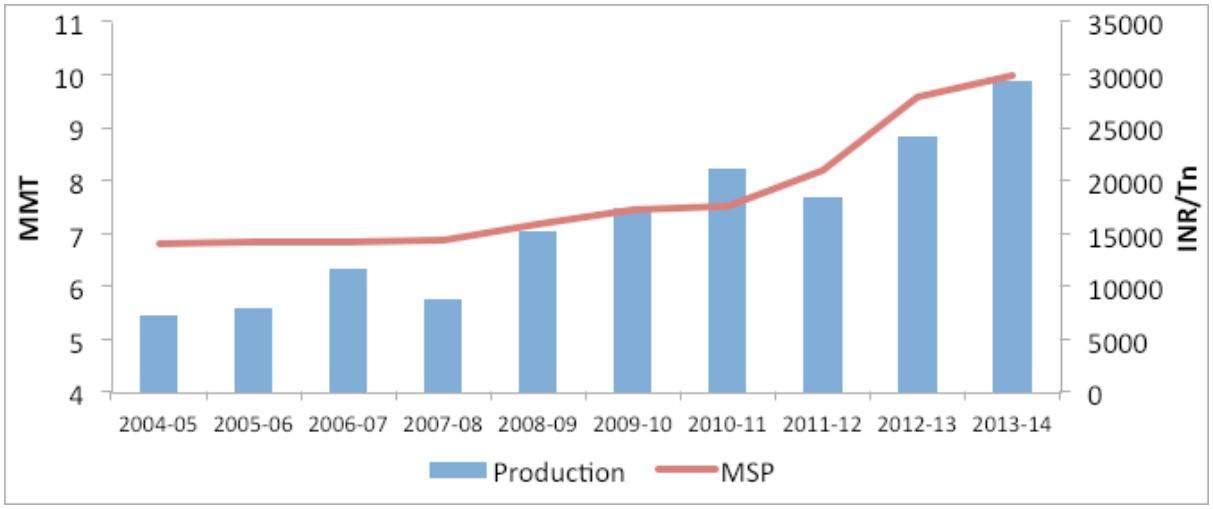
Figure 19 Trends in India's Gram Production and Yield



Data Source: Agricultural Statistics at a Glance

As shown above, India's gram production increased from 5.5 MMT in 2004–05 to close to 10 MMT in 2013–14. Several intensive efforts were behind this progress, one of which was the focus given to gram under National Food Security Mission (NFSM) 2007. In particular, efforts were made to restore soil fertility and productivity at the individual farmer level; as well, MSPs were raised substantially and at the same time improved seeds were provided to farmers. Institutions like the Indian Council of Agricultural Research (ICAR) and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) were actively involved in this program.

Figure 20 Gram MSPs and Production Response

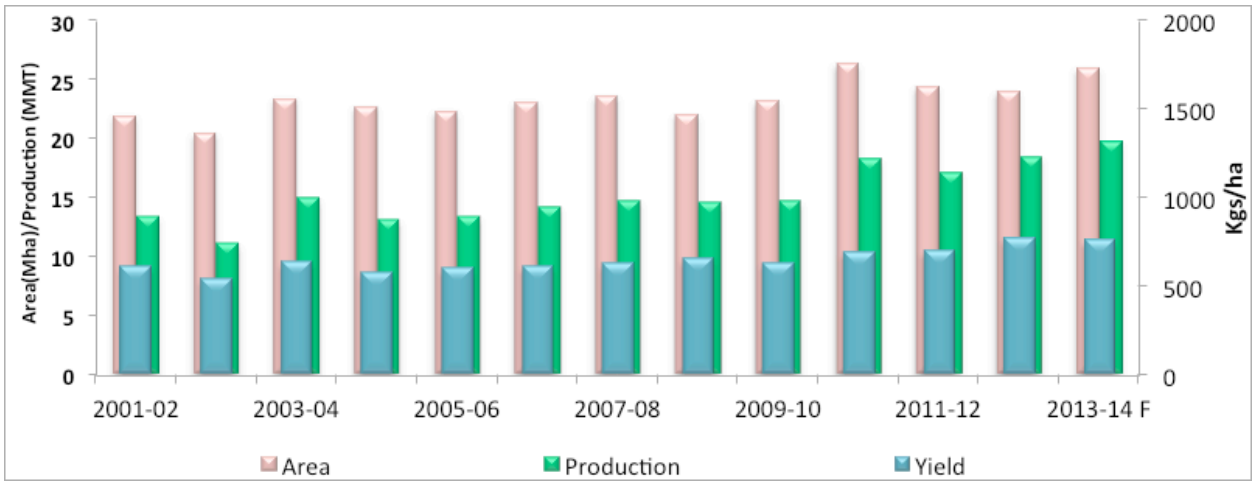


Data Source: Commission for Agricultural Costs and Prices (CACP) and Agricultural Statistics at a Glance

Research shows that Indian farmers have been responsive to relative price incentives. As shown by Gulati, Saini, and Jain (2013), 95 percent of historical variation in India's agri-GDP was explained by three factors, namely, rainfall, agri-capital formation, and price-incentives, in that order. With a simple correlation of 0.9, one can see the synergies between the MSP for gram and its production figures. Figure 20, with the risk of over-simplification, shows that price incentives have a clear and positive influence on gram production.

The Accelerated Pulses Production Programme (A3P) launched in 2010–11 demonstrated technologies and practices centered on plant nutrients and plant protection. Several other programs were also launched to increase production and productivity of pulse crops by disseminating production technologies at the individual farm level. The result was that pulse production increased by more than 4.5 MMT within the six years since 2007–08, and 4.1 MMT of this increase was in gram production alone (Figure 21).

Figure 21 Pulses' Production, Area and Yields



Data Source: Agricultural Statistics at a Glance

In 2011–12, only about 33.5 percent of India's cultivated area under the crop was under assured irrigation. Being a rabi season crop, gram depends on the moisture in the soil left from monsoon rains and on irrigation, more than on the rains of the winter season.

Gram is grown widely in India. In 2013–14, it was sown in 10.2 Mha of land, producing about 10 MMT of gram. With 34 percent of India's land under gram, Madhya Pradesh is the leader, producing 39 percent of all India's gram in 2013–14. MP is closely followed by Rajasthan, Maharashtra, and Andhra Pradesh. Even though MP is the leader, Andhra Pradesh boasts the highest gram yield by producing about 1.5 tn/ha.

For purposes of this research, gram from Madhya Pradesh was studied under the exportable hypothesis, and Maharashtra, UP, and Rajasthan were studied for the importable hypothesis.

Trade Distortions in Indian Gram

Indian gram (kabuli) is best compared with Australian or American garbanzos. Given that the fob or cif price series for either were unavailable, the unit value of Indian gram exports was used instead.

Since gram is a *rabi* crop, the wholesale price series for this was taken from the Agmarknet site for the months of April–June, the post-harvest months when much of gram is sold in the market.

To calculate the NPCs of gram, following the methodology, the following key variables were estimated for the gram domestic trade:

- Domestic transportation in the states of Madhya Pradesh, Maharashtra, UP, and Rajasthan:
  - Transportation between the wholesale market and the ICDs by railway and truck
  - Transportation between the ICD and the port by railway

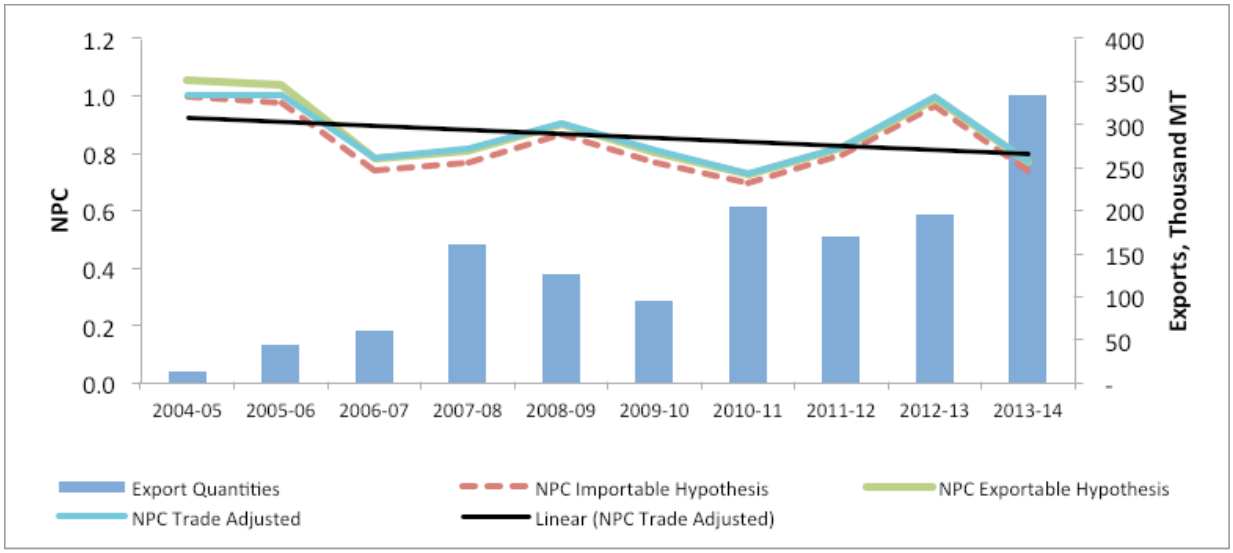
» Traders' margin and marketing costs: assumed to be 5.5 percent of the domestic price, WH in this case

» Port handling charges at Mundra/Kandla Port of Gujarat

» International freight charges between Australia Port and the Mundra/Kandla Port are included when gram is an importable, but not when it is an exportable.

Utilizing these estimates, the NPCs for gram at the wholesale level were calculated. The graphical representation of the NPCs for the exportable and the importable hypothesis is given in Figure 22.

Figure 22 NPCs of Gram at Wholesale Level



Data Source: DGCIS

The NPCs since 2005–06 have been consistently below 1, except in 2012–13 when the NPC exportable reached 0.96 due to a rise in domestic gram prices owing to a bad 2011–12 pulse crop. India imposed a ban on exports of all pulses in 2006–07 in order to manage domestic supplies. Apart from settling some previous contractual exports, exports of pulses plummeted despite domestic prices being below world prices. The ban was removed in the same year, 2006–07, and exports increased thereafter.

According to the study analysis, India's kabuli chana has been a net exportable commodity since 2006–07, apart from the beginning two years of 2004–05 and 2005–06. Increased openness to trade, a predictable export policy, and domestic thrust to its production and yields, have all contributed to gram's export growth.

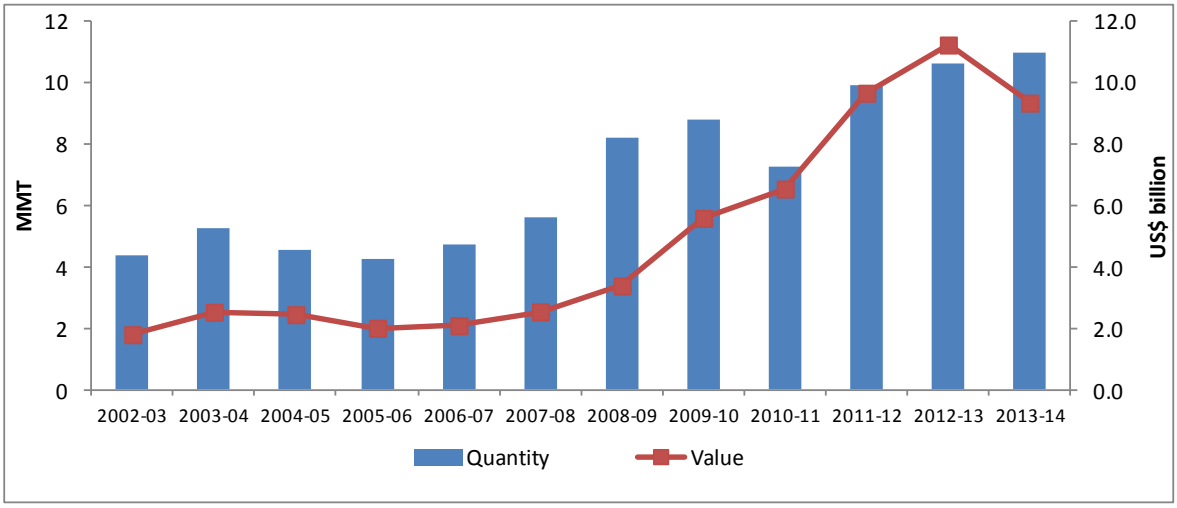
Oilseeds: Groundnut, Soybean, and Rapeseed and Mustard Seed

Oilseeds and edible oils are two of the most sensitive and essential commodities in India and worldwide. India is among the largest producers of oilseeds in the world, and the sector holds an important position in the country's agricultural economy. In 2014–15, India produced 32.8 MMT of oilseeds, including groundnut (30 percent), soybean (36 percent), rapeseed and mus-

tard seed (24 percent), castor seed (5 percent), sesamum and sunflower (2 percent each), and niger seed, linseed, and safflower (1.1 percent).

India is a big producer and a marginal exporter of oilseeds, a large importer of edible oils and an exporter of oil meals produced from crushing oilseeds. The National Sample Survey Organization found that 7.6 percent of an average Indian's food expenditure is on edible oils (NSSO 2011) and more than half of the consumption is met through imported oils. For example, more than 52 percent of the total 21.1 MMT of edible oil consumed by India in 2013–14 was imported. Almost three-fourths of these edible oil imports are palm oil from Indonesia and Malaysia.

Figure 23 Indian Edible Oil Imports- Value and Volume



Data Source: DGCIS

India increased its edible oil imports at an average rate of 10 percent per annum in the 11 years between 2003–04 and 2013–14. In 2013–14, India's edible oil import bill was more than US$9 billion (Figure 23). Edible oil comprised about 46 percent of India's total agricultural imports.

Domestic Procurement Policy under MSP

In order to ensure remunerative prices for their produce, and sustained production and productivity growth in oilseeds, the Government declares MSPs for oilseed farmers. The National Agricultural Cooperative Marketing Federation (NAFED), Central Warehousing Corporation, National Cooperative Consumers' Federation, and Small Farmers Agri-Business Consortium are the nodal Indian Government agencies for procurement of oilseeds.

Based on recent recommendations, the Government's main cereal procurement agency, the Food Corporation of India (FCI), has also been added to the list of oilseed procurement agencies. NAFED procures oilseeds under the price support system (PSS). Under this scheme, the PSS is opened for operation for 90 days in each *kharif* and *rabi* season whenever the market price falls below the MSP. However, the scale of NAFED's interventions is small and irregular, which has sometimes resulted in farm prices falling below the declared MSPs. Recent policy proposals have recommended that the Food Corporation of India (FCI) take a bigger role in procurement of oilseeds. Since the 2015–16 crop season, the Government has declared FCI an additional central agency for procurement of oilseeds.

Trade Policy for Oilseeds and Oils

India's export of oilseeds is free, and imports are under open general license (OGL) with an import duty of 30 percent since 2003 (Table 18).

Trade policy for edible oils has however been subject to change. Until April 1994, edible oil imports were under the negative list of imports. In April 1994, palmolein import was placed under OGL with 65 percent import duty. By early 2000s, imports of other edible oils were also placed under OGL with an import duty of 80 percent on crude and about 92.2 percent on refined. In April 2008, the duty on both crude and refined edible oils was reduced to zero and 7.5 percent respectively. Later in 2013 and 2014, the duties were again increased. Currently, the duty on import of crude and refined edible oils is 7.5 percent and 15 percent respectively (Table14).

Table 14 India's Oilseeds and Edible Oil Trade Policy 2015

HS No.	Item	Trade Policy		Bound Rate	Statutory duty	Currently Applied Rate
India's Agriculture Trade Policy and Status under Trade Agreements						
	OIL SEEDS	Export	Import			
12.01	Soyabean	Free	Free	100	30	30
12.02	Groundnut shelled	Free	Free	100	30	30
12.03	Copra	Free	Import Allowed through STE	100	70	70
12.05	Rape/mustard seeds	Free	Free	100	30	30
12.06	Sunflower seeds	Free	Free	100	30	30
1207.10	Palm nuts and kernel	Free	Free	100	30	30
1207.20	Cotton seeds	Free	Free	100	30	30
1207.40	Sesamum 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	Export	Import			
15.07	Soyabean oil	Prohibited	Free	45	45	7.5–15
15.08	Groundnut oil	Prohibited		300	100	7.5–15
1511.10	Crude oil (palm oil)	Prohibited		300	100	7.5
1511.90	Other oil (palm oil)	Prohibited		300	100	15
1512.00	Sunflower seed, safflower or cotton seed oil	Prohibited		300	100	7.5–15
1513.11	Crude oil (coconut oil)	Free	Import Allowed through STE	300	100	7.5
1513.19	Other (coconut oil)	Free		300	100	15
1513.21	Crude oil (palm kernel or babassu oil)	Prohibited	Free	300	100	7.5
1513.29	(Palm kernel or babassu oil)	Prohibited		300	100	15
1514.11	Crude oil (rapeseed/mustard oil)	Prohibited		75	75	7.5

Source: Agricultural Statistics at a Glance and Arun Goyal 2015–16. Note: STE = State Trading Enterprises.

For the current study, research focused on the top three oilseeds produced and exported by India, namely soybean, groundnut (kernels), and rapeseed/mustard seed. The three oilseeds accounted for close to 8 percent of the agricultural output value in 2010–11 constant prices.

Soybean

Nearly 85 percent of the world's soybean is crushed to produce byproducts. Crushing soybean seeds yields around18 percent soy oil with the rest being soymeal. Soybean seeds, soy oil, and soy meal are all traded. India is not a big player in the soybean seed market but is among the major exporters of soybean meal, which serves as an animal feed and fertilizer. This study deals with price distortions in India's soybean seed market.

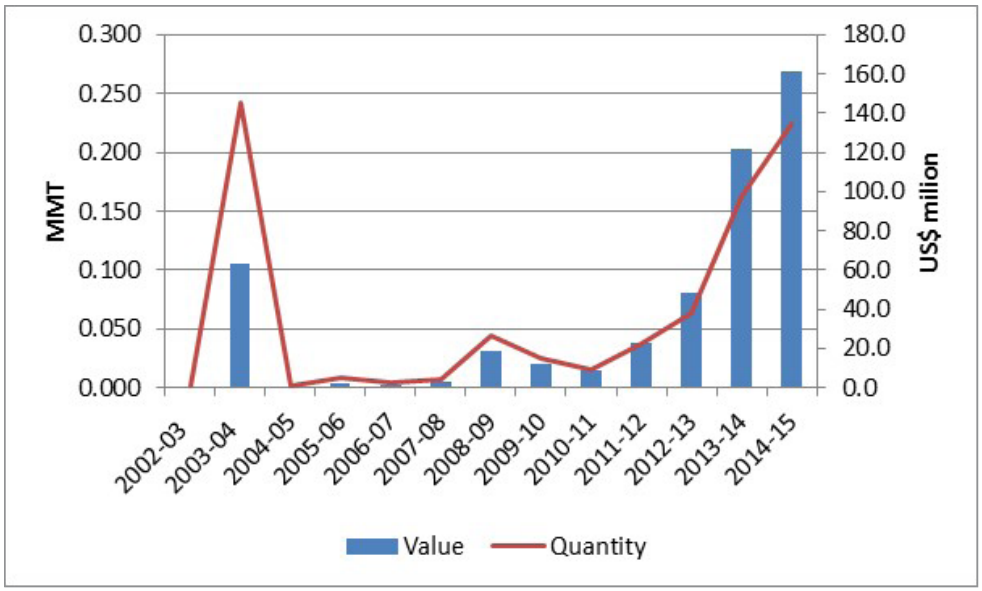
More than 80 percent of the world's soybean is produced by the United States, Brazil, and Argentina, with India ranking fifth in production. The world average soybean yield is 2.5 tn/ha. The yields of the top three soybean producing countries are U.S. 2.9 tn/ha, Brazil, 2.9 tn/ha, and Argentina 2.5 tn/ha, while Indian yields hover around 1 tn/ha, with a lot of volatility. In 2013, with a little more than half of India's area under soybean, China produced more soybean than India due to its near double yield rates.

Close to 80 percent of soybean globally exported emanated from Brazil and the United States, followed closely by Argentina and to some extent Paraguay and Canada. China, the European Union, Japan, and Mexico are the largest importers of the crop. Of the total world imports of 110 MMT in triennium ending 2014–15, China alone imported about 63 percent.

India's Soybean Trade and Production

In terms of production share, soybean is the most important oilseed crop in India today. Exports of soybean were negligible for India until recent years (Figure 24). Less than 0.5 percent of the annual production was exported on average, in the studied 10 years. However, in 2013–14 this percentage rose to 1.4 percent. The export of soybean seed was mainly to Bangladesh, Indonesia, Sri Lanka, Nepal, Singapore, among others. Soybean imports have been negligible. However, India is a valued contributor to the soybean-meal export market.

Figure 24 Indian Soybean Exports: Quantity and Value

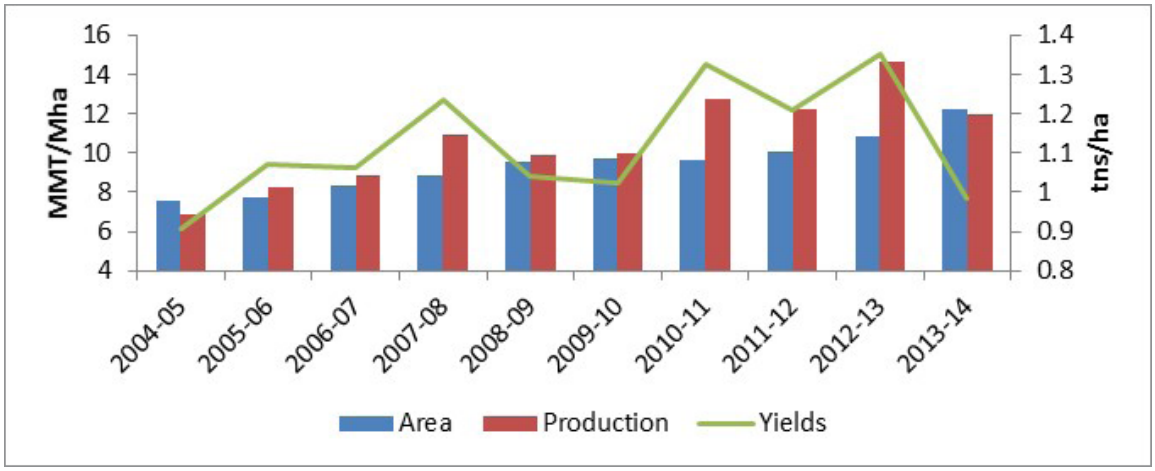


Data Source: DGCIS

Recently, soybean cultivation has increased many fold. Since 1970–71, the area and production of soybean has increased from 0.03 Mha and 0.01 MMT, respectively, to 12.2 Mha and 12 MMT in 2013–14. In 2012–13, however, India's production of soybean was higher at about 15 MMT, the highest level recorded during this period (Figure 25).

Soybean is a *kharif* crop in India, harvested during the months October-January. Less than 1 percent of area under soybean is under assured irrigation, thus the variability of the monsoon rains plays out in the production levels of the crop.

Figure 25 India's Soybean area, Production, and Yields



Data Source: Agricultural Statistics at a Glance

With 94 percent of India's area under soybean, the three states of Madhya Pradesh, Maharashtra, and Rajasthan account for 93 percent of the annual soybean production of the country. Amongst the three states, Maharashtra has the highest yields, producing 1.2 tn/ha. Both Madhya Pradesh and Rajasthan yields were lower than the country's yield rate of 0.98 tn/ha in 2013–14. The current research studied the Madhya Pradesh soybean market.

The Value-Chain for Soybean Exports

There are numerous players in the value-chain of soy exports. A private company called the Indian Tobacco Company (ITC) launched an internet-based marketing channel for soybean in MP in 2000. The system, called *soya-choupal*, is part of the bigger system called *e-choupal*, which aims to eliminate the layers of players in the supply chain and bridge a close link between ITC's collection/processing center and the farmer.

In addition, the National Agricultural Co-operative Marketing Federation (NAFED) procures oilseeds like groundnut, soybean, rapeseed and mustard seeds, from the farmers under the price support scheme (PSS). They purchase from farmers when needed to support the PSS. However, the scale of operations of NAFED, as mentioned earlier, has been low and occasional. This is one of the many marketing channels for India's oilseeds.

Trade Distortions in Indian Soybean Seed

The United States is the world's biggest soybean exporter, so a comparison of the fob U.S. (Gulf) soybean prices with Indian wholesale prices at the Ujjain Mandi of Madhya Pradesh is used to illustrate the nature of agricultural distortions in India.

The U.S. (Gulf) cif Rotterdam prices of soybean were taken from the World Bank Pink Sheets. The Netherlands is supposed to be Europe's largest soybean crusher, thus the prices for international trade for soybean are generally given as cif Rotterdam. These cif prices were traced back to get the U.S. (Gulf) fob prices by subtracting the freight charges between US gulf ports and Rotterdam.

The wholesale prices for soybean were taken from Agmarknet/DES. Both the price series are average of the prices between October and January.

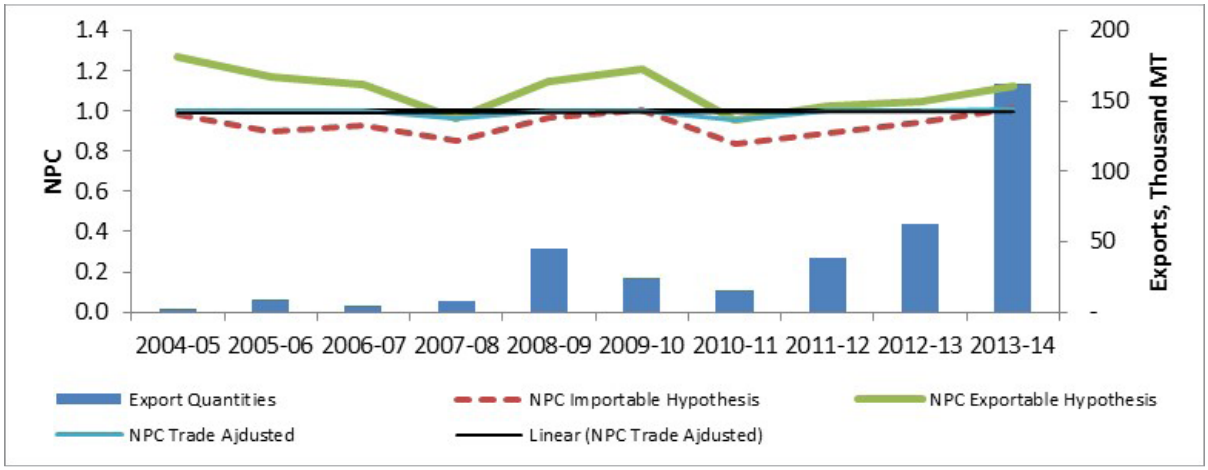
To understand the stance of policy, the NPCs for soybean between the United States and the Indian (MP) markets were estimated.

Following the methodology introduced earlier, the following key variables for soybean domestic trade were estimated:

- Domestic transportation in the Ujjain Mandi in MP:
  - Transportation between the wholesale market and the ICDs by railway and truck
  - Transportation between the ICD and the port by railway
- Traders' margin and marketing costs: assumed to be 5 percent of the domestic price, WH in this case
- Port handling charges at Mundra Port of Gujarat
- International freight charges between U.S. (Gulf) and Rotterdam and between U.S. (Gulf) and the Mundra Port are included when soybean is an importable, but not when it is an exportable.

Utilizing these estimates, NPCs for soybean at the wholesale level were estimated. The graphical representation of the NPCs for the exportable and the importable hypothesis (Figure 26) reveals an interesting picture.

Figure 26 Estimates of NPCs at Wholesale Level



Data Source: DGCIS

In the absence of export restrictions, the difference between domestic and international prices, domestic production levels, and international export demand for oil meals drives the exports of Indian soybean. In the studied 10 years, India's soybean was non-tradable in 6 years, exportable in 2 years (2007–08 and 2010–11) and import-competing in 2 years (2009–10 and 2013–14).

Groundnut—Kernels

Groundnuts, also called peanuts, have much higher oil content (almost 40 percent) than soybeans (18 percent). Since the overall global soybean production exceeds groundnut by a wide margin, the contribution of soybeans to the global supply of edible oils is much greater than groundnut. However, in the case of India, where soybean production is only a little higher, the contribution of groundnuts to domestic edible oil production is higher than for soybean.

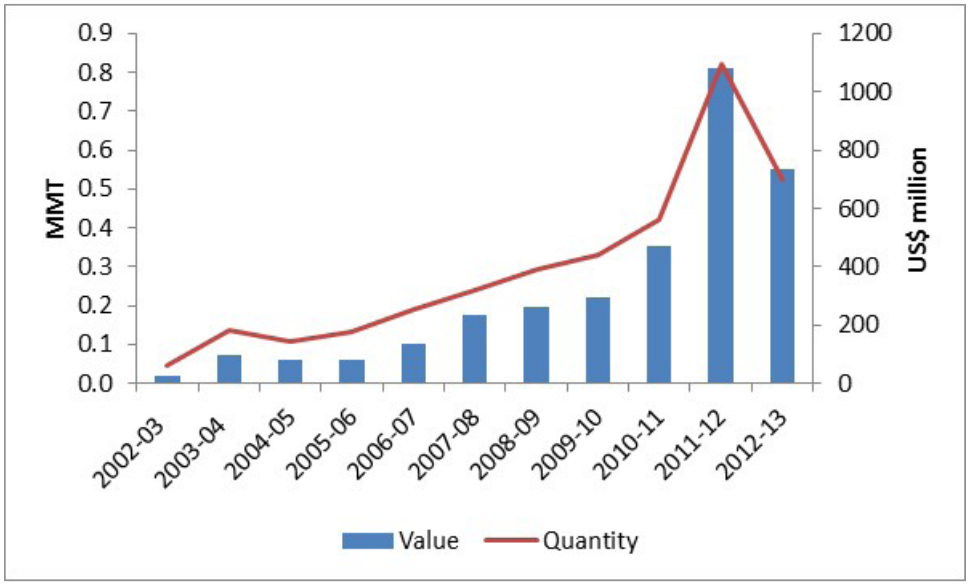
Groundnuts are traded in many forms: as pods, shelled with the skin, shelled without the skin, broken, as groundnut oil, groundnut oil cakes, and other. Its kernels also vary in terms of their size, color, texture, and flavor. Groundnut kernels are used for oil extraction, food, and as an ingredient in food products. The residual cake, left after extraction, is processed largely for animal feed. The current study looks at the trade trends and price distortions in the shelled groundnut kernel market.

In 2014–15, groundnuts were planted on about 23.6 Mha worldwide. India (20.5 percent), China (19.1 percent), and Nigeria (10.5 percent) together accounted for half this area. Total groundnut production was about 40 MMT in triennium ending 2014–15. Developing countries in Asia, Africa, and South America account for about 90 percent of the area under groundnut and about the same percent of production. Since the 2000s, the share of developing countries in groundnut production has grown and this trend is expected to continue for at least the next three decades (CGIAR). India produces about 13 percent of global groundnut production and has an export share of about 25 percent. China, as is the case with many agricultural commodities, produces more from a smaller area under the crop compared to India. For triennium ending 2014–15, India emerged as the top exporter of groundnuts in the world, closely followed by Argentina and China.

India's Groundnut Trade and Production

In triennium ending 2013–14, world production of groundnut was 39.5 MMT and the largest producer was China (42 percent share), followed by India (13 percent). With a share of 28 percent in world exports, India is the largest exporter of groundnut, followed by China (20 percent), Argentina (20 percent), and the United States (16 percent). Only 7 percent of world groundnuts were traded in triennium ending 2013–14. India is also a net exporter of shelled groundnut. Rising global prices since 2007 have led to a jump in the volume and value of groundnut exports from India (Figure 27). In 2012–13, India exported about 0.52 MMT of hand-picked and selected (HPS) groundnut kernel valued at about US$727 million.

Figure 27 Indian Groundnut Exports: Value and Volume



Data Source: DGCIS

From an area of 5.5 million hectares, in 2013–14 India produced about 10 MMT of groundnut, with a yield of about 1.8 tn/ha. Gujarat, Andhra Pradesh, Tamil Nadu, and Rajasthan are the key groundnut producing states. Of the 10 MMT produced in 2013–14, Gujarat alone produced 51 percent of it, followed by Andhra Pradesh and Tamil Nadu, which produced about 13 percent and 10 percent, respectively.

In terms of area under the crop and the production share, Gujarat is the top state. However, in terms of yields, Tamil Nadu at 2.8 tn/ha and Gujarat at 2.7 tn/ha are almost equal. The research focused on the two states of Andhra Pradesh and Gujarat.

Table 15 Stages of Marketing Groundnut

	Marketing Stage	Transportation	Transport Means
1	From field to village market or primary market	Farmer	Head load, tractors, or trolley
2	From primary market to secondary wholesale market and miller	Traders/millers	Trucks, railways
3	From miller and wholesale markets to retailers	Millers/retailers	Trucks, railways
4	From wholesale markets/millers to shippers	Exporter/traders	Trucks, railways

Data Source: Agmarknet. Note: Groundnut pods are generally transported in bulk at farm level, but the shelled kernels are transported in bags/containers.

Trade Policy for Groundnut Kernels

Exports of groundnut kernels, as stated earlier, are free. However, in the recent past, compliance with the maximum permissible levels of aflatoxins (a poison produced by the *aspergillus flavus*), quarantine requirements, and quality parameters have been of major concern. Consequently, the export procedures for groundnuts now follow strict rules. Exports of groundnut are permitted subject to registration with APEDA, along with a controlled aflatoxin level certificate issued by APEDA-recognized laboratories. Some restrictive export norms have come into existence since 2013–14, in response to complaints received by the Government from various Indian

peanut and peanut product (PPP) importers. Under this system, all PPP importers have to register with the Indian Oilseed and Produce Export Promotion Council (IOPEPC), a trade body recognized by the Ministry of Commerce. APEDA will issue a certificate of export only to the PPP importers registered with the IOPEPC. Increased costs due to the new norms have made the smaller processors feel at a loss relative to the larger processors.

Groundnut imports are under an open general license, with an import duty of 30 percent.

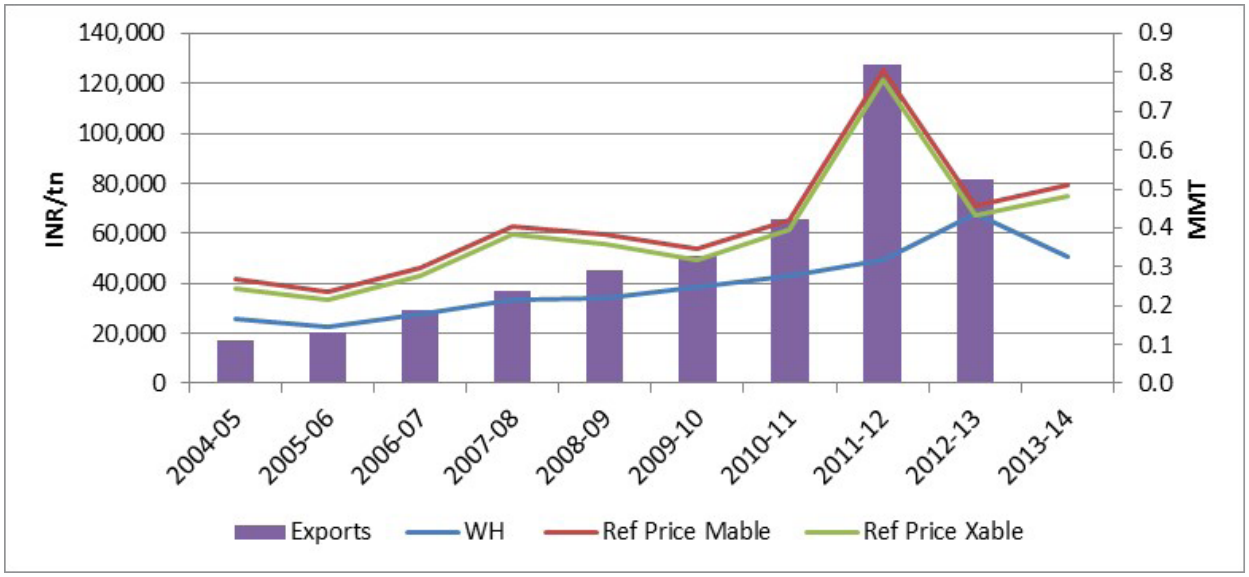
Trade Distortions in Indian Groundnut-shelled

Groundnut is a *kharif* crop, so to compare prices of domestic and global suppliers, the average prices for the months of October-January were used.

In order to understand the policy interventions for Indian shelled groundnut, prices of the commodity are compared with prices of an international supplier. The World Bank Pink Sheets give the prices of U.S. shelled groundnut at the Rotterdam Port, i.e., cif Rotterdam. The cif prices had to be traced back to get the U.S. (Gulf) fob prices. This was done by subtracting freight charges from the U.S. ports to Rotterdam from the cif price series.

The domestic wholesale price series for shelled groundnut was taken from Agmarknet. This wholesale price series was for groundnut pods and so using the conversion factor of 0.7, the shelled groundnut wholesale price series were estimated for the two states of Gujarat and Andhra Pradesh. Utilizing the production weights, the two price series were synthesized to get one average wholesale price series for shelled groundnut (Figure 28).

Figure 28 International Reference Prices vs. Indian WH Price and Export Quantity



Authors' estimation based on Data from: World Bank Pink Sheets, Agmarknet and DGCIS.

Note: Ref Price Mable refers to the reference price under importable hypothesis and Ref Price Xable refers to the reference price under the exportable hypothesis.

Lower domestic prices compared to international reference prices (adjusted for quality, freight, and domestic transportation and marketing costs and margins) explain the trajectory of exports during the studied years. With three-quarters of the area under groundnut rain-fed, fluctuations in Indian rains (mainly monsoons) influence annual groundnut production. The years 2004 and

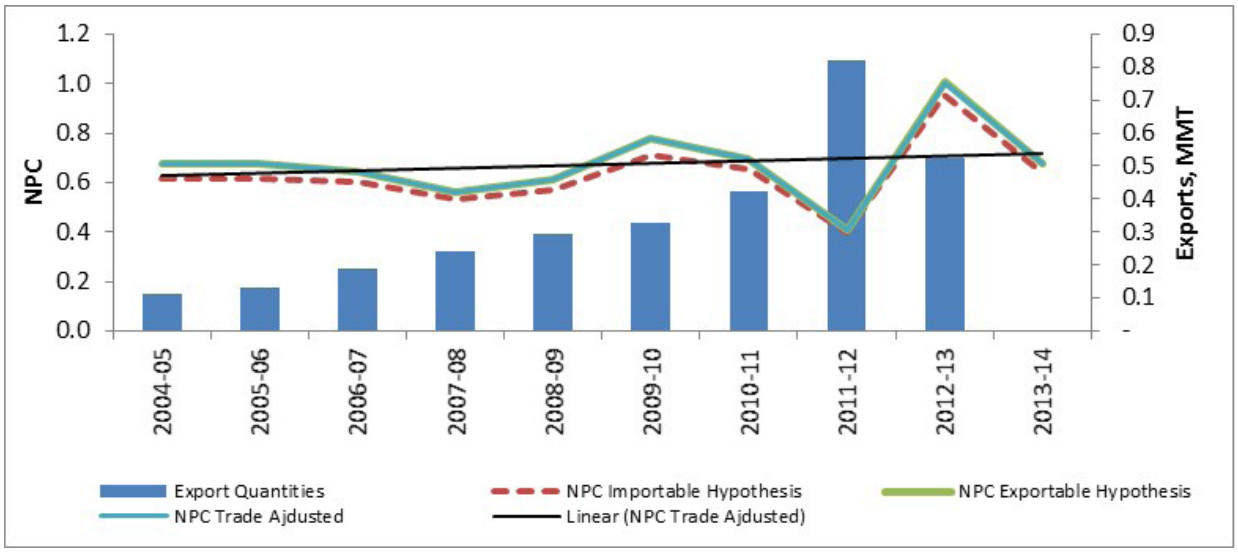
2009, and to some extent 2012, were drought years that explain the fluctuations in production and wholesale prices in the year. Despite that, Indian groundnut exports have grown over the years. Complaints about quality from importers, however, have made the Government adopt strict export norms, as stated earlier.

Next the NPCs for shelled groundnut between the United States and the Indian markets were estimated. Following the methodology, the following key variables for soybean domestic trade were estimated:

- Domestic transportation in Gujarat and Andhra Pradesh markets:
  - Transportation between the wholesale market and the ICDs by railway and truck
  - Transportation between the ICD and the port by rail
- Traders' margin and marketing costs: assumed to be 10 percent of the domestic price, WH in this case (based on interactions with traders)
- Port handling charges at Mundra Port of Gujarat and Vishakhapatnam Port of Andhra Pradesh
- International freight charges between U.S. (Gulf) and Rotterdam and between U.S. (Gulf) and the Mundra Port/Vishakhapatnam Port are included when groundnut is an importable, but not when it is an exportable.

Utilizing the estimates, the NPCs for groundnut at the wholesale level were estimated. Three NPC estimations were done: one under the exportable hypothesis, the second under the importable hypothesis, and the third where the two NPCs were combined with the endogenously determined trade status, and the result is called the trade-adjusted NPC. The graphical representation of the NPCs for the exportable and the importable hypothesis is shown in Figure 29.

Figure 29 Estimates of NPCs for Groundnut at Wholesale Level



Data Source: DGCIS

During the 10 studied years, Indian groundnut was exportable in 9 of them and nontradable in 1 (2012–13). Rising global groundnut prices between 2009–10 and 2011–12 provided export

opportunities for purveyors of Indian groundnut. When global groundnut production fell in 2011–12, the global prices rose, giving export opportunities to Indian processors. However, a good harvest globally followed in the subsequent year of 2012, leading to a drop in global groundnut prices. The year 2012, however, was a bad-monsoon year for India, thus domestic yields and production levels of groundnut dropped. Therefore, while the international prices fell, the domestic prices rose, bringing the NPC closer to 1 in 2012–13.

Rapeseed and Mustard Seed

The world produced about 69.2 MMT of rapeseed and mustard (R&M) seed in triennium ending 2014–15, 90 percent of which was produced in five countries or areas: European Union (31 percent), Canada (24 percent), China (21 percent), India (10 percent), and Australia (5 percent). Little more than 20 percent of global production in 2014–15 was exported. Canada is the largest exporter of R&M seeds with a share of 61 percent in exports for triennium ending 2014–15. Australia ranks second with a share of 21 percent. Ukraine follows third with a 13 percent share in world exports. India has been a marginal exporter of this oilseed.

Canola, a registered trademark of the Canadian Oil Association, represents a superior quality R&M seed (Kumar et al. 2009). Lower erucic acid in its oil (less than 2 percent) and lower glucosinolates in its deoiled meals (less than 30 micro-moles), makes canola preferred internationally for human and animal consumption over the traditionally cultivated R&M variety of India. The latter not only has high erucic acid (about 50 percent) but also extremely high levels of glucosinolates (greater than 100 micro-moles per gram of defatted seed meal) making it less (to canola) fit for human and animal consumption.

India's R&M Production and Trade

In 1950–51, R&M was sown in a little more than two Mha of land, producing about 0.8 MMT. In 2013–14, R&M was grown on close to seven Mha of land, which produced about eight MMT of the crop. Yields have gone up from 0.4 tn/ha to 1.2 tn/ha.

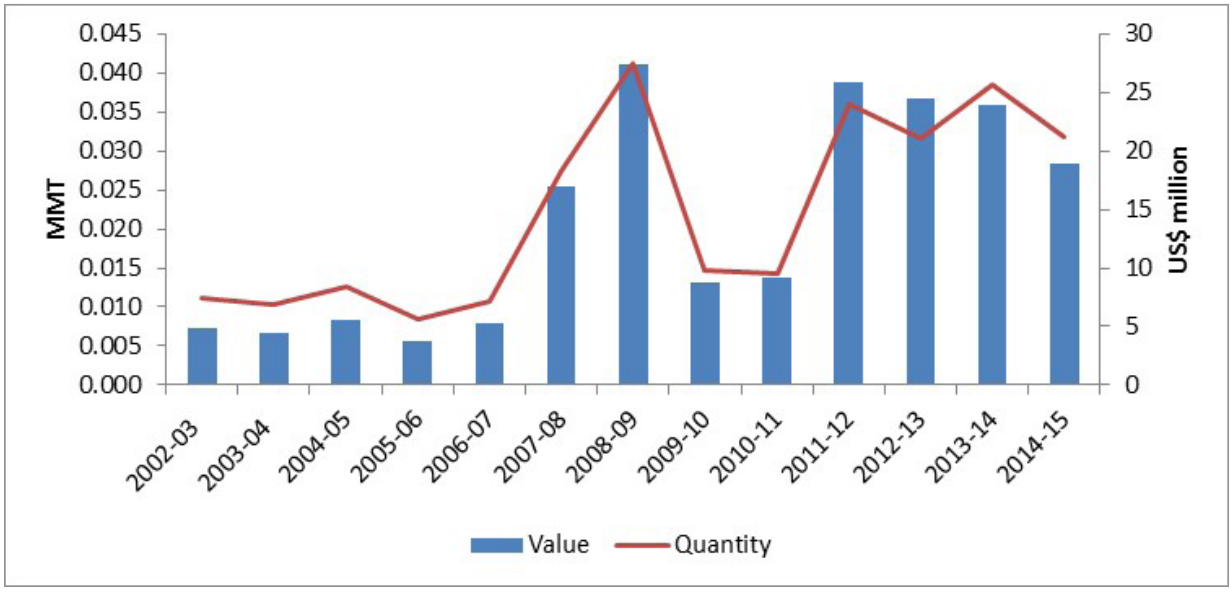
Rajasthan, which produces 48 percent of the country's R&M, with 46 percent of India's area under the crop, is the number one state for the crop. Other states include Madhya Pradesh, Haryana, and Uttar Pradesh. About 73.2 percent of the area under the crop is under assured irrigation. The crop is a *rabi* crop and its harvesting starts in late February.

The current research focuses on the two states of Rajasthan and Uttar Pradesh.

Trade Performance

With very low export volumes, India still is a net exporter of R&M seeds as it does not import these seeds. In 2013–14, India earned about US$24 million from about 0.04 MMT of R&M seed exports (Figure 30).

Figure 30 Value and Volume of Indian R&M Seed Exports



Data Source: DGCIS

Between 2002 and 2014, India's R&M exports fluctuated between 8.4 thousand tonnes (2005–06) and 41.3 thousand tonnes (2008–09). The exports have been highly price sensitive. The gap between the domestic prices and the international prices was high in favor of Indian prices during 2006–07 and 2008–09, resulting in higher Indian R&M exports. With global prices moderating in 2009–10 and 2010–11, Indian exports lost ground only to pick up the momentum again with rising global prices in the following years. More recently, global prices have been receding, closing the price gap with Indian R&M prices which contributes to the diminishing exports.

The Value-Chain for R&M Exports

As in the case of other oilseeds, there are two types of marketing channels for the oilseed farmers: private and institutional. Under the private channel, the farmer sells the produce to the aggregator/village trader or directly to the miller/oil expeller, after which it reaches the wholesale market/trader/exporter who then supplies it to the retail market or to the shipping agencies. Primary modes of transportation are tractor trolleys, back loaders, trucks, and railways. Exports are generally via ships. Under the institutional channel, institutions like NAFED (National Agricultural Cooperative Marketing Federation) procure the seeds from the farmers.

Indian R&M Trade Policies

While the R&M seed imports are under OGL with a stable import duty of 30 percent, its exports are free. The exports for the seeds are very small as most of the production meets domestic consumption and processing needs.

Trade Distortions in Indian R&M Seed

In the absence of an international price time series, the unit value of India's exports was used as a proxy measure for the fob price.

For domestic prices, Agmarknet provided the wholesale prices for the months of April–January (as R&M are *rabi* crops) which were used for the two studied states, Uttar Pradesh and Rajasthan. The series was combined using the production weights.

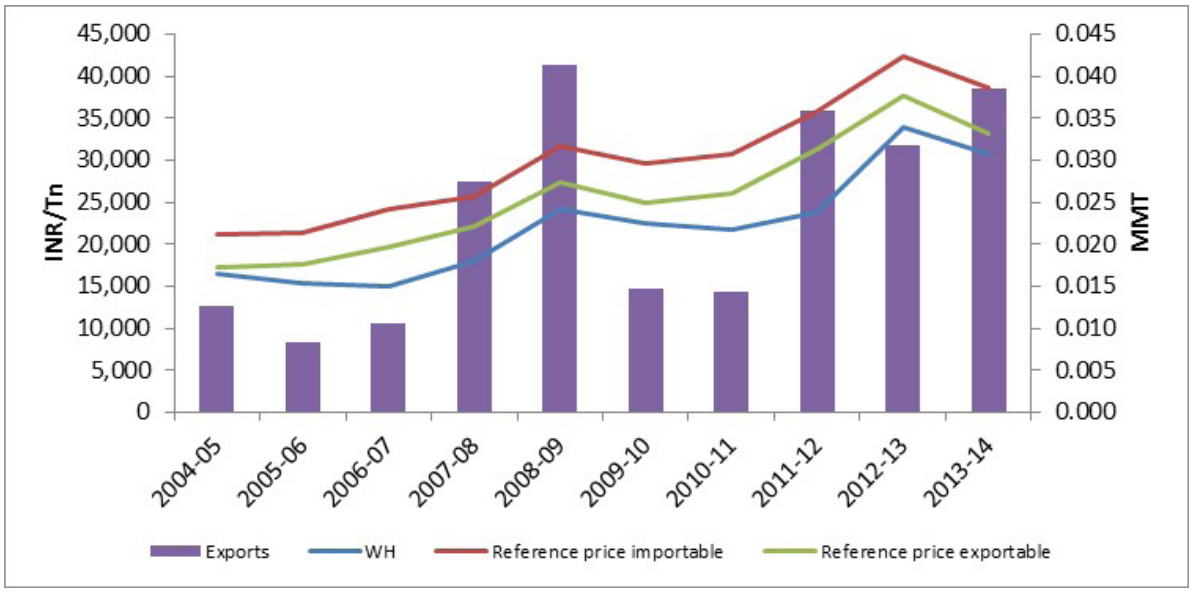
We estimated the NPCs for the rapeseeds and the mustard seeds between the unit value of exports (taken as a proxy of the fob value) and the Indian markets.

Following the methodology, the following key variables for R&M domestic trade were estimated:

- Domestic transportation in the Rajasthan and Uttar Pradesh:
  - Transportation between the wholesale market and the ICDs by railway and truck
  - Transportation between the ICD and the port by railway
- Traders' margin and marketing costs: assumed to be 6 percent of the domestic price, WH in this case
- Port handling charges at Nava Sheva Port (JNPT)
- International freight charges between Vancouver (Canada) Port and the JNPT port of Maharashtra are included when R&M seed is an importable, but not when it is an exportable.

Upon comparing the Indian wholesale market prices for R&M with the international reference price series (adjusted for freight, domestic transportation and marketing costs, and margins) the wholesale prices were found to be about 27 percent below the international reference price under the importable hypothesis and about 14 percent below the international reference price under the exportable hypothesis.

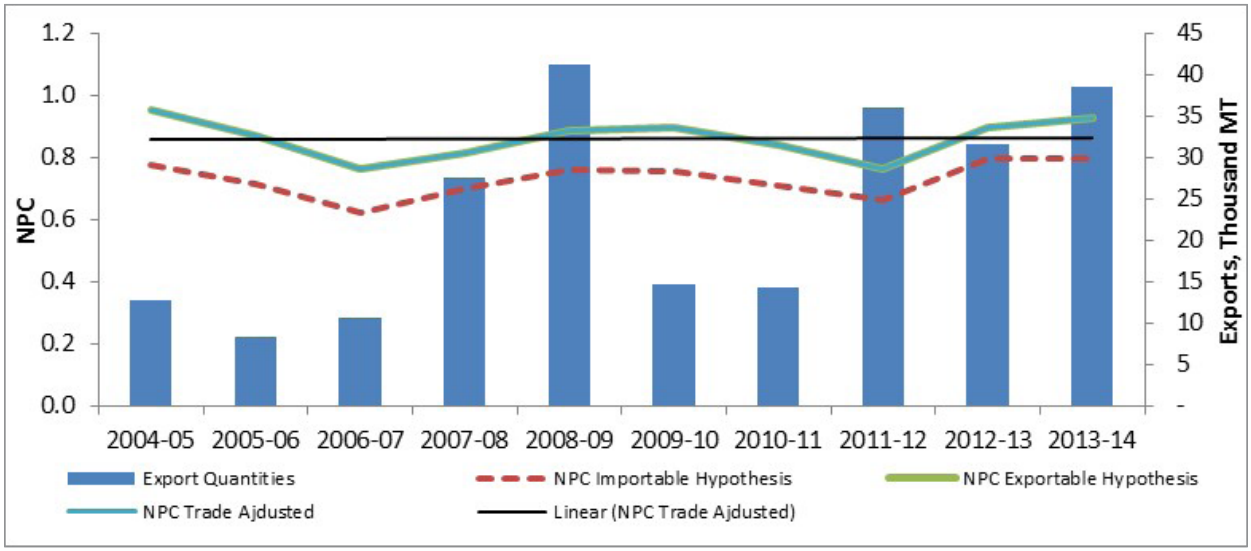
Figure 31 Comparing R&M Prices and Exports



Source: DGCIS

Utilizing the estimates, the NPCs for R&M seed at the wholesale level were determined (Figure 31).The three NPC curves were estimated: NPC exportable hypothesis, NPC under the importable hypothesis, and NPC trade-adjusted.

Figure 32 Estimates of NPCs for R&M Seeds at Wholesale Level



Data Source: DGCIS

For all the studied 10 years, Indian R&M is an exportable and thus the endogenously determined trade-adjusted NPC line (blue line in Figure 61) overlaps the NPC Exportable Hypothesis line (green line in Figure 32). Given free export policy, domestic prices have followed international prices. Due to qualitative differences, despite lower prices, the Indian R&M seed trade has not flourished.

Overall, it is clear that it is the high customs duty and lower trading volumes in the Indian oilseed market that feed into the consistent gap between the global and domestic price series. Additionally, maintaining an inverted duty structure—where while the oilseeds have a customs duty of 30 percent, the crude and refined oils have a duty of 7.5 percent and 15 percent, respectively—has also made the system highly inefficient. Not only is there a need for a more uniform duty structure, but also for duties to moderate over time.

Dairy: Skimmed Milk Powder (SMP)

India is home to 31.2 percent of the global bovine population, including 56.7 percent of the worldwide buffalo population. India produced close to 138 MMT of milk in 2013–14. Driven by aggressive domestic policy initiatives, India's milk production has grown by a CAGR of 3.4 percent between 1950–51, when it produced 17.0 MMT, and 2013–14, when it produced 137.7 MMT (19th Livestock Census (2012) and FAO). The triennium ending 2014[8] production figures from the USDA show India emerging as the largest liquid milk producer in the world, with a share of 24.2 percent (USDA). Incidentally, India produces this amount with yields that are among the lowest in the world. The average cow yield in India in 2013 was 1.4 metric tonne per animal MT/An) against 1.0 MT/An in 2000. This is in sharp contrast to the United States and the EU, where average cow yields are 9.9 MT/An and 6.5 MT/An respectively (FAO).

India's dairy industry produces and exports many products including fresh butter, buttermilk, butter oil, fresh cheese, milk, and cream in powder, milk for babies, other fat, other milk powder,

[8] Year 2014 refers to the market year (MY), with MY for nonfat dry dairy milk being January to December 2014.

ghee, whole milk powder, and skimmed milk powder (SMP). This study evaluates price distortions in the Indian SMP market.

The largest global exporter of SMP is the EU, with exports from the region comprising 30.4 percent of the total world exports in triennium ending 2014. Within the EU, the top milk producers are Germany, France, United Kingdom, Netherlands, and Poland (Eurostat). The major destinations for SMP exports from the EU are the Middle East and North Africa and the United States. (U.S. Dairy Export Council).

India, with 4.4 percent share of world exports, ranks fifth. Indian SMP exports were 6.9 thousand MT in triennium ending 2001–02 and have grown at a CAGR of 20.0 percent to average 73.7 thousand MT in triennium ending 2014–15 (DGCIS). As a percent of the total dairy exports, Indian SMP exports have increased from 39.2 percent in triennium ending 2001–02 to about 69 percent in triennium ending 2013–14 (Table 16).

Table 16 Percentage of Skimmed Milk Powder in India's Total Dairy Exports

Year	Total dairy exports (value in US$ million)	Total SMP exports (value in US$ million)	SMP exports as % of total dairy exports (value)
1999–00	11.3	3.7	32.8
2000–01	22.3	6.2	27.9
2001–02	39.8	22.6	56.8
2002–03	26.3	16.2	61.6
2003–04	20.3	7.1	35.0
2004–05	86.8	45.7	52.6
2005–06	152.8	80.4	52.6
2006–07	97.1	59.9	61.7
2007–08	217.9	113.8	52.2
2008–09	223.0	86.2	38.7
2009–10	85.8	29.3	34.1
2010–11	120.4	33.9	28.1
2011–12	60.2	0.0	0.0
2012–13	259.8	199.7	76.9
2013–14	547.4	429.2	78.4
2014–15	198.0	101.2	51.1

Data Source: DGCIS

China is the largest importer of dairy products, including SMP. According to the USDA, Chinese imports have increased from 20.0 thousand MT in triennium ending 2001 to 218.7 thousand MT in triennium ending 2014, a CAGR of 18.6 percent.

Domestic Trends in SMP Production

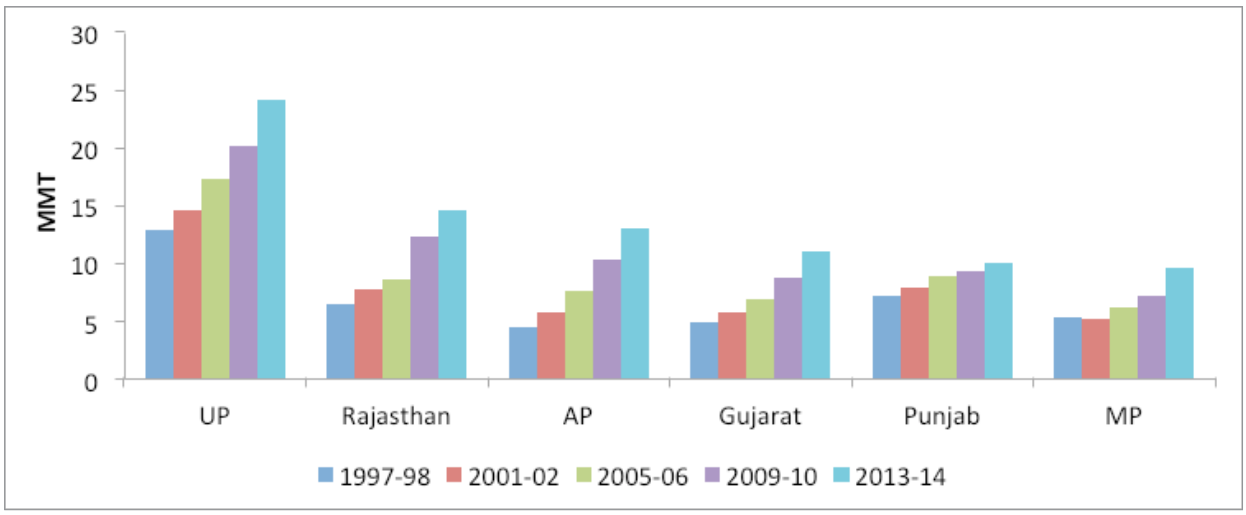
Indian milk yields are among the lowest in the world. The chief causes for this are low genetic potential, poor nutrition, inferior feed and farm management practices, ineffective veterinary services, and inefficient implementation of breed improvement programs (Kapoor 2014)

To increase milk yields, the Government has introduced a number of policies and programs. The

National Project for Cattle and Buffalo Breeding, run by the Department of Animal Husbandry, Dairy, and Fisheries, envisions genetic improvement with a focus on development and conservation of indigenous breeds. The Ration Balancing Program of the National Dairy Development Board (NDDB), educates farmers on providing a balanced feed for their dairy animals. The Fodder Development Program of the Ministry of Agriculture, aims to hedge farmers against supply variations caused by climatic changes.

Uttar Pradesh is the largest producer of liquid milk with the state producing 23.4 MMT of milk in the triennium ending 2013–14 (Basic Animal Husbandry and Fisheries Statistics (BAHS)). This accounted for 17.6 percent of the total milk production in the country. Rajasthan and Andhra Pradesh, with 10.6 percent and 9.5 percent of the total Indian output, rank second and third, respectively. Gujarat has been one of the chief success stories of the milk revolution in India, with the state witnessing a CAGR of 5.2 percent since 1997–98 and ranking fourth, with a total production of 10.4 MMT (Figure 33). Gujarat Co-operative Milk Marketing Federation Ltd. (GCMMF) or AMUL is the largest food brand in India and has the country's highest dairy exports.

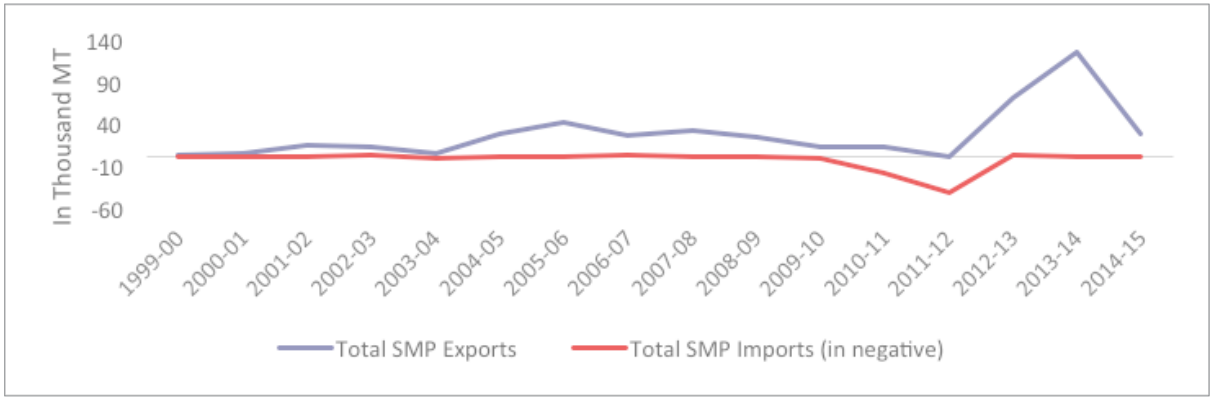
Figure 33 Production of Liquid Milk by States



Data Source: NDDB

India has been a net exporter of SMP in all the years since 1999–2000, except for 2010–11 and 2011–12 (Figure 34).

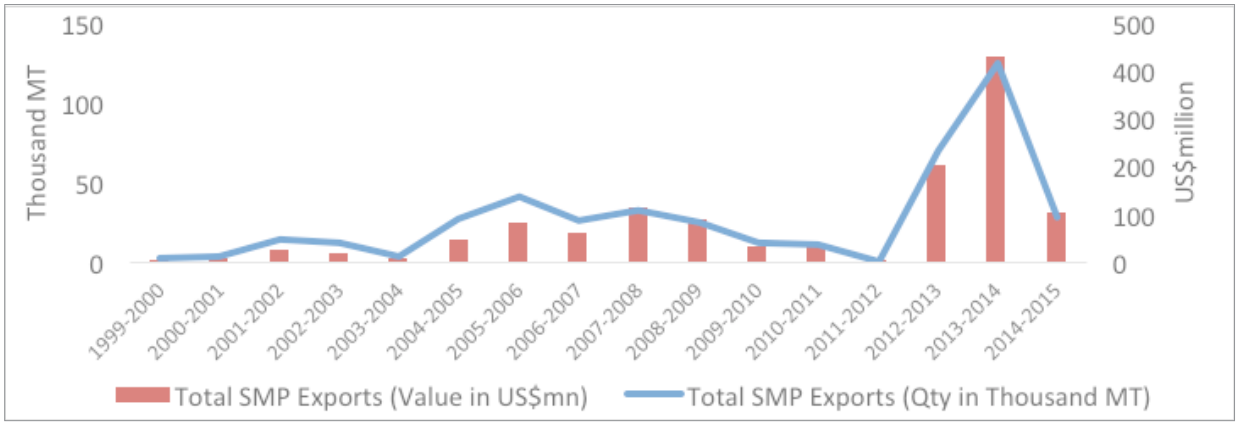
Figure 34 Quantity of SMP Exports and Imports



Data Source: DGCIS

In the triennium ending 2014–15, India exported 73.7 thousand MT, equaling a value US$243.3 million. This is in stark contrast to 6.9 thousand MT in triennium ending 2001–02, valued at US$10.8 million, showing the remarkable growth of the Indian Dairy industry (DGCIS) (Figure 36).

Figure 36 Value and Quantity of SMP Exports



Data Source: DGCIS

The majority of SMP exports from India are to neighboring countries, with Bangladesh and Pakistan receiving 26.2 percent and 9.6 percent of the total exports, respectively, in triennium ending 2014–15.

India's Trade Policy for SMP

As with many other agri-commodities, the Indian Government's dairy import policy is ad hoc and unpredictable: it varies with market conditions and local political scenarios. In the case of SMP imports, the Government applies tariff rate quota (TRQ) and customs duties depending on market situations.

Starting from 2000–01, the total import duty on SMP imports was 60 percent. However, SMP imports up to an aggregate of 10,000 MT in a financial year were to be charged a 15 percent duty. This remained the case until 2006–07, when SMP imports were charged an import duty of 67.7 percent, with imports up to an aggregate of 10,000 MT being charged at 19.9 percent. The rates were further increased in 2007–08 to 68.3 percent, owing to an additional 1.0 percent of education cess (a form of a tax), with the initial 10,000 MT being charged at 20.1 percent.

Dairy exports were banned on February 18, 2011 in response to the Government's concerns over domestic food price inflation pressures. Therefore, during the fiscal year 2011–12, India permitted imports up to 50,000 MT under the TRQ at zero duty, with imports beyond that charged at 68.3 percent. The export ban was lifted on June 8, 2012, as domestic milk producers faced a liquidity crunch because of falling profits. This was due to a steep fall in domestic SMP prices caused by surplus supplies. Given the excess SMP stocks, the Government again set the SMP TRQ in 2012–13 at 15.0 percent duty (up to 10,000 MT). As per the 2015–16 policy document (Goyal 2015–16), the SMP import duty currently is at 68.3 percent, with basic duty of 60.0 percent and a special countervailing duty of 4.0 percent.

In June 2012, the Government included SMP under the VKGUY or Vishesh Krishi and Gram Udyog Yojana (i.e a special agriculture and village industry scheme) that aimed to compensate the high transport costs of an exporter from the village to port/airport and to counterbalance other disadvantages, the purpose being to promote exports. VKGUY was withdrawn in July 2014 due to the possibility of deficient monsoons that would affect milk production due to shortage of fodder (DGFT). In addition, following the 2008 Melamine scandal (where Chinese dairy products were found to be adulterated with melamine), the Government prohibited the import of milk and milk products from China on September 24, 2008, and the ban is still in place today.

Trade Distortions in Indian SMP

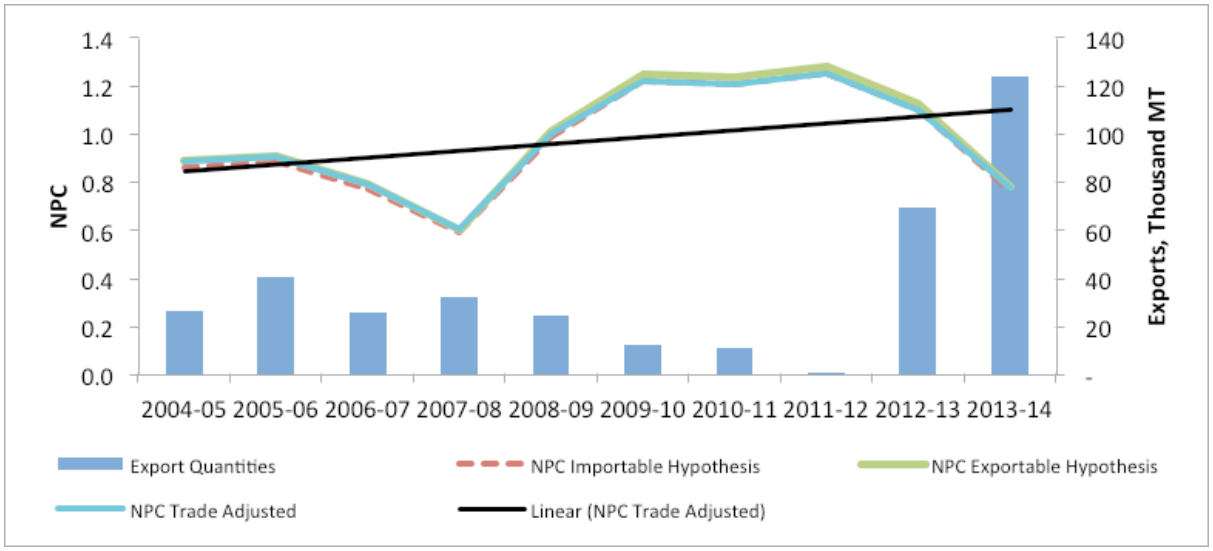
The international prices of SMP at Western Europe fob (at Rotterdam Port) were taken from USDA, and the domestic wholesale milk price series for UP was taken from DES. The domestic liquid milk price series was converted into SMP prices using 0.15 as the conversion factor.

Following the methodology stated earlier, the following key variables were estimated for SMP domestic trade:

- Domestic transportation in Moradabad, UP:
  - Transportation between processor/trader and ICDs by railway and truck
  - Transportation between ICDs and port by railway
- Traders' margin and marketing costs: assumed to be 5 percent of the domestic price, WH in this case
- Port handling charges at Mundra Port of Gujarat
- International freight charges between Rotterdam and Mundra Port are included when SMP is an importable, but not when it is an exportable.

Utilizing these data, the NPCs for SMP were estimated at the wholesale level. The graphical representation of the three NPC curves reveals the changing trade status of Indian SMP.

Figure 37 NPCs of SMP at Wholesale Level



Data Source: DGCIS

Of the ten studied years, Indian SMP was exportable in five years, import-competing in four years, and non-tradable in one year. Indian SMP was import-competing in the export ban year of 2011–12, and the policy of banning was correctly complemented domestically by policy makers freeing up imports. Overall, as per the trade-adjusted NPCs, Indian SMP prices in the studied 10 years have been on average close to or equal to the global reference prices.

Notwithstanding, Indian SMP exports have continued, particularly during 2008–09 to 2010–11 and more recently in 2012–13 and 2013–14. This is explained by the freight advantage that India has over, say, the EU in supplying to neighboring export destinations like Bangladesh and Pakistan or East Asian economies (APEDA). Rising global prices in 2013–14 reduced the trade-adjusted NPC for the year to 0.8, thus generating greater export opportunities.

The global SMP markets are very sensitive to production in large exporters such as the EU and New Zealand, as well as to demand by big importers like China. Domestically, not just the market but also the trade policy governing the market is driven by domestic supply and demand situation. Owing to an ad hoc and unstable policy environment, just as in the case of many other agri-commodities, SMP exporters suffer.

Livestock: Buffalo Meat

India has the largest bovine inventory in the world, at around 300 million head, or an estimated 31.2 percent of the total world bovine population. This includes 108.7 million buffalo, which comprise 56.7 percent of buffalo worldwide (19th Livestock Census 2012).

With subsistence farming prevalent in India, most farmers raise these herds as draught animals or for milk. However, when they reach an unproductive age, buffalo are typically sold to livestock traders for meat production. Also noteworthy, the recent population census of India (2011) puts the number of Hindus at 80 percent of the 1.2 billion total population. The Hindu reverence for cattle and abstinence from eating bovine meat (whether from cattle or buffaloes), contribute to India's export surplus in buffalo meat.

In the triennium ending 2015, total global production of bovine meat, which includes meat of cow, calves, oxen, bulls, bullocks, and buffaloes, was 59.2 MMT carcass weight equivalent (CWE), with the United States the largest producer with a 20 percent share, followed by Brazil at 16.2 percent. India ranks fifth, behind the EU and China, with a share of 6.8 percent. This contrasts sharply with its share of 2.9 percent in 2000, reflecting India's emergence as a major buffalo meat producer (USDA).

India's global trade in buffalo meat presents a phenomenal growth story. In triennium ending 2015, India was the largest exporter of bovine meat, accounting for 20.4 percent of world exports, followed by Brazil and Australia, with shares of 18.7 percent and 18.3 percent, respectively. Back in 2000, India lagged behind all the current major exporters with a share of 5.8 percent of world exports. However, over the subsequent decade and a half, Indian buffalo meat exports witnessed a compound annual growth rate (CAGR) of 12.5 percent, making it a leader in the global bovine meat market.

The United States is the largest importer of bovine meat, with a share of 17.1 percent of total

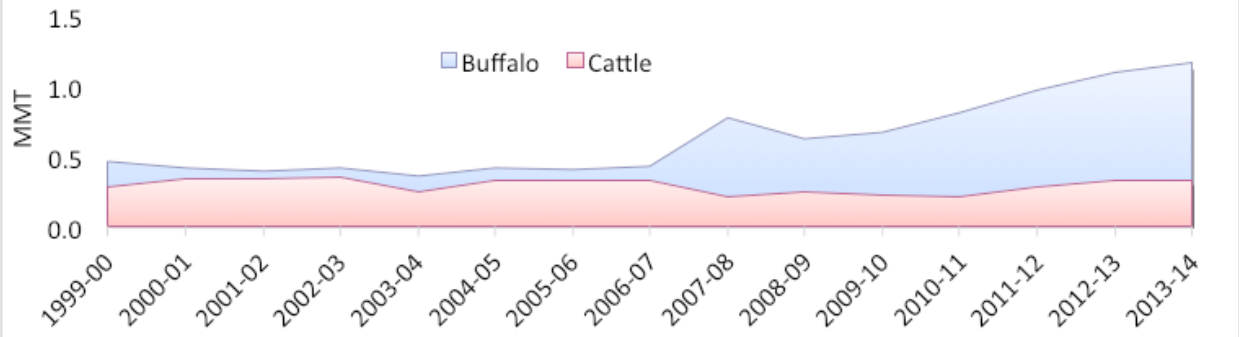
world imports. Russia ranks second with 11.6 percent, followed by Japan at 9.8 percent. The United States specializes in raising high-value grain-fed cattle, and it imports lower-value grass-fed lean product that is processed into ground meat (USDA FAS).

Domestic Trends: Production

Buffalo meat has been gaining importance in India's livestock sector. In 2012–13, as a share of the total value of output of the livestock sector, buffalo meat contributed 2.4 percent, poultry meat 7.8 percent, and the milk group more than 65 percent. (Basic Animal Husbandry and Fisheries Statistics (BAHS) and NDDB).

Data from BAHS show that production of meat from bovine animals increased from 0.7 MMT in triennium ending 2001–02 to 1.5 MMT in triennium ending 2013–14. A major proportion of this production, at 77.4 percent, is buffalo meat (Figure 38), which has witnessed a growth of 155.6 percent (CAGR 8.1 percent) since triennium ending 2001–02, compared to a 1.9 percent fall in cow meat production in the same period. The ratio between meat production from buffalo and cattle increased from 2.3:1 in triennium ending 2001–02, to 3.4:1 in triennium ending 2013–14.

Figure 38 Production of Buffalo Meat vs. Cow Meat in India since 1999–2000



Data Source: Basic Animal Husbandry and Fisheries Statistics. *Note:* Figures for 2006–07 are estimated.

In terms of the performance of Indian states, UP emerges as a leader in buffalo meat production with 495,800 MT of meat in triennium ending 2013–14, which accounts for 45.9 percent of India's total Buffalo meat. Andhra Pradesh (AP) and Punjab follow with shares of 10.9 and 10.4 percent, respectively.

In cattle meat, the top producer in triennium ending 2013–14 was Kerala. Combining state shares for both buffalo and cattle meat, UP emerges as a top player, with 35.5 percent of the total share in bovine meat; Kerala ranks second with a share of 15.9 percent. UP has emerged as a top player for three reasons: First, UP is home to 28.2 percent of the total buffalo inventory (19th Livestock Census 2012). Second, as of March 31, 2014, India had 1,623 registered slaughterhouses; UP, with 285 slaughterhouses, ranks second behind Maharashtra, which has 316 (Maharashtra State Data Bank, Uttar Pradesh Department of Animal Husbandry). Moreover, there are 24 export-oriented units for buffalo meat in the state, which facilitate increasing production and exports (APEDA). The third reason is that many operational units in UP procure buffalo from Bihar, Rajasthan, Chhattisgarh, Jharkhand, Madhya Pradesh, Haryana, and Punjab owing to the fact that the business of buffalo meat processing is well established and accepted in the state (FICCI 2013).

Indian Domestic Policy on Cow Slaughter

Cattle slaughter in India is historically a controversial subject, given the cow's status in Hinduism. The "Preservation, protection and improvement of stock and prevention of animal diseases, veterinary training and practice" (Entry 15 of the State List of the Seventh Schedule of the Constitution), grants state legislatures exclusive power to legislate the prevention of slaughter and preservation of cattle. In addition, prohibition of cow slaughter is a Directive Principle of State Policy contained in Article 48 of the Constitution.

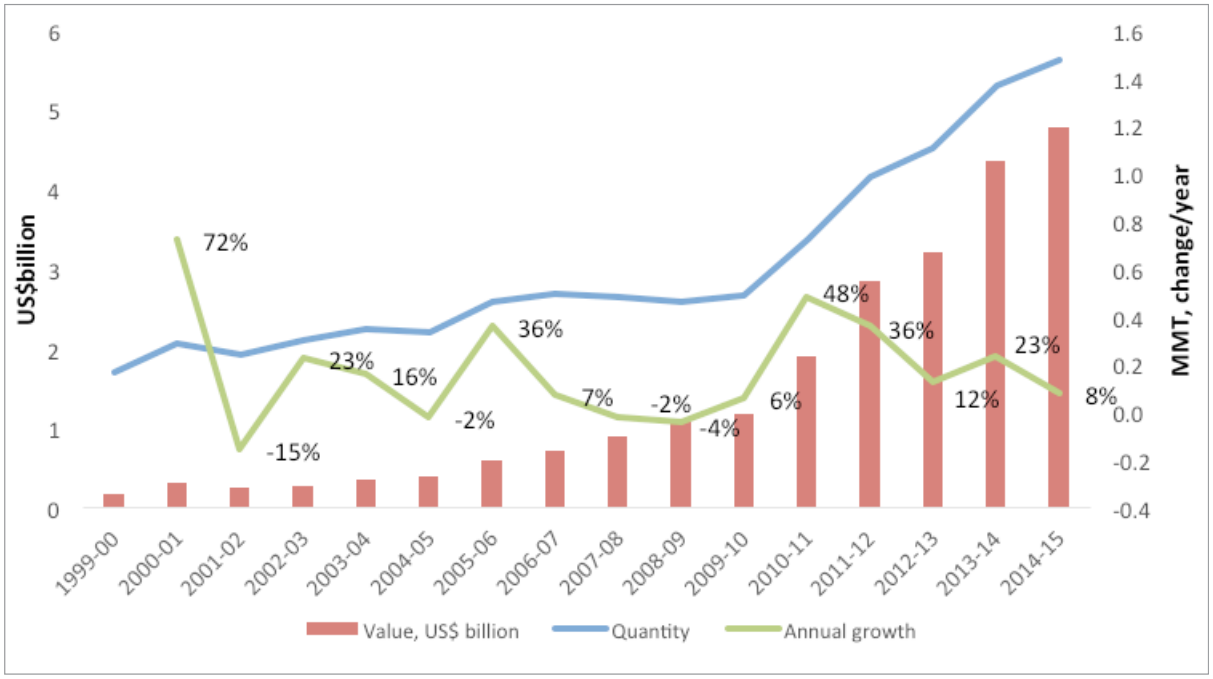
Twenty-four states in India ban cow slaughter, with only Kerala, West Bengal, Arunachal Pradesh, Mizoram, Meghalaya, Nagaland, Tripura, and Sikkim having no restrictions. In Assam, Goa, and Daman and Diu, cow slaughter is allowed if a "fit-for-slaughter" certificate is obtained, which is provided if a cow is over 14 years of age or has become permanently incapacitated for work or breeding due to injury, deformity, or incurable disease. On the other hand, the laws are not uniform and vary from state to state. Haryana, Himachal Pradesh, and Jammu and Kashmir do not permit the slaughter of any bovine animal. Uttar Pradesh, the largest buffalo meat producer, does not permit the slaughter of cows (DAHD).

India's Trade Policy for Buffalo Meat

India's export policy prohibits trade of meat of cows, oxen, and calves. Only boneless meat and offal of buffalo are allowed to be exported (DGFT). Thus, Indian exports are composed entirely of carabeef (water buffalo meat).

The import duty on bovine meat imports has been extremely high ever since the start of the millennium. Starting in 2000–01, the import duty on fresh or chilled meat of bovine animals, and frozen meat of bovine animals was 44.0 percent. A similar rate was charged for "edible offal" (both "frozen" and "fresh or chilled") of bovine animals. This was reduced to 35.2 percent in 2002–03 for all bovine meat categories. A further reduction took place in 2003–04, with a rate of 30.6 percent for all meat and offal from bovine animals, and it continued until 2006. Thereafter, rates were increased to 35.9 percent for all categories, except for fresh or chilled offal of bovine animals, which remained at 30.6 percent, as there was no "special countervailing duty" (SVD) on the same. With an additional 1.0 percent of education cess in 2007–08, the rates increased marginally to 36.1 percent and 30.9 percent respectively. In 2012–13, the SVD on fresh or chilled meat of bovine animals was also removed, leading to a rate of 30.9 percent for both fresh and chilled meat and fresh and chilled offal. This import policy has continued and the rates in the year 2015 are 36.1 percent for frozen meat and frozen offal and 30.9 percent for both fresh and chilled meat and fresh and chilled offal (Source: Goyal, various issues). Combined with eating habits influenced by cultural and religious factors, these high import duties together push domestic consumers toward protein sources like milk and poultry.

Figure 39 Value, Quantity, and Annual Growth of Exports



Data Source: DGCIS

The export quantity has increased from 0.2 MMT in triennium ending 2001–02 to 1.3 MMT in triennium ending 2014–15, with a corresponding increase in value from US$0.2 billion to US$4.1 billion. Exports have increased substantially from 2009–10 onward, after growing steadily from 1999 to 2009 (Figure 39). The CAGR has been 19.4 percent since 2010–11, mainly due to plans and programs implemented by the Government.

In 2010–11, the Government introduced a scheme for "salvaging and rearing of male buffalo calves", to be implemented by the Department of Animal Husbandry. This was to countervail the observation that livestock farmers did not regard raising male animals to be remunerative and they removed 8 million male buffalo calves from the buffalo production system by killing them to save on mother's milk and other feed resources. The scheme aims at salvaging male buffalo calves for meat production and recovery of hide, thereby providing quality meat for the export market, enlarging the material base for the leather industry, improving the availability of byproducts, and improving the economic condition of farmers (NABARD).

Additionally, in 2012–13, the Government announced a scheme for "setting up of new/modernization of existing abattoirs" that involved establishing 25 new abattoirs and modernizing 25 existing abattoirs, at an estimated expenditure of INR 330.8 crore or about US$ 60.8 million (Ministry of Food Processing Industries 2013).

India's main export destinations for buffalo meat are Southeast Asia and the Middle East, where there is a growing demand for inexpensive protein. Moreover, all of India's buffalo meat is halal slaughtered meat based on Islamic Shari'ah law, which gives Indian exports a competitive advantage in the Middle East. However, India cannot export to countries like Japan, the United States, and Korea because of its foot and mouth disease endemic status with the World Organization for Animal Health (Australian Bureau of Agricultural and Resource Economics and Sciences 2014).

Another reason for increasing exports from India is the growing demand for bovine meat in China. Chinese imports have increased exponentially over the last 15 years, from 22,000 MT CWE in triennium ending 2002 to 476, 000 MT CWE in 2015, which represents a growth of 2,032.8 percent (CAGR of 26.5 percent). Surprisingly, India does not export to China directly. However, reports suggest that Vietnam, which is the largest importer of Indian buffalo meat, re-exports a majority of it to China. The Chinese and Indian governments have recently signed a memorandum of understanding for direct trade in buffalo meat from India to China, though official shipments have not yet commenced (Ministry of Commerce and Industry 2014).

Finally, Indian buffalo meat is considered inferior to cow meat, as it is tougher; therefore, it is used extensively in preparing processed foods, rather than direct household consumption. Hence, it is discounted in comparison to regular bovine meat in the world market.

Trade Distortions in Indian Buffalo Meat

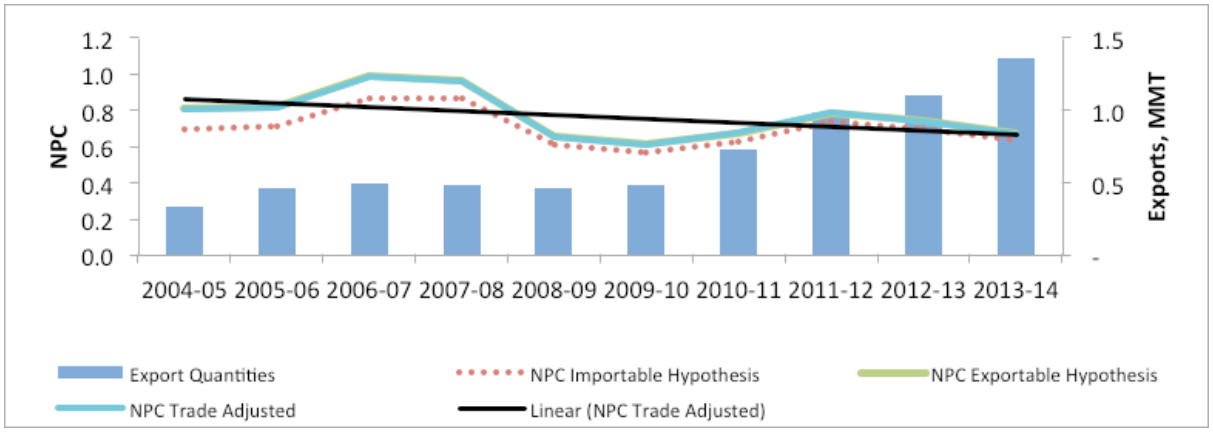
Due to absence of any international price series, the unit value of exports was utilized as a proxy for the international fob price. The data for value and volume of exports was taken from DGCIS. The domestic wholesale price series was taken from DES, which provides the wholesale price for buffalo meat in Chennai, Tamil Nadu, for each month, and the same was averaged for the financial year.

Key variables estimated were:

- Domestic transportation in the states of Tamil Nadu:
  - Transportation between the wholesale market and the ICDs by railway and truck
  - Transportation between the ICDs and the port by railway
- Traders' margin and marketing costs: assumed to be 5 percent of the domestic price
- Port handling charges at the JNPT Port
- International freight charges between the Brazil Port and the JNPT are included when bovine meat is an importable, but not when it is an exportable.

Utilizing the above data, NPCs under the exportable and the importable hypothesis were estimated. Using the endogenously determined trade-status, the combined trade-adjusted NPC was also estimated.

Figure 40 NPCs of Buffalo Meat at Wholesale Level



Data Source: DGCIS

The trade-adjusted NPC curve completely maps the NPC curve under the exportable hypothesis, indicating that buffalo meat was an exportable commodity in all the studied years. In the studied 10 years, Indian buffalo meat prices were about 78 percent on average of the international reference prices; this percent fell to about 70 percent after the global price hike in 2008–09.

The price of bovine meat in international markets has been systematically higher than that of India, and the gap has only increased over the years. Therefore, there is a huge potential for Indian buffalo meat exports to grow if countries like the United States and Japan—that account for 27 percent of global bovine meat imports and currently do not allow imports from India due to its status as a foot and mouth disease endemic nation—also start demanding Indian buffalo meat. The huge disparity between international prices and wholesale prices, skewed in favor of India, will help Indian buffalo meat to remain exportable despite the freight costs. The only note of caution should be depreciation of the Brazilian Real, which has fallen by more than 33 percent against the U.S. dollar since the start of the year 2015. Given that Brazil is India's nearest competitor, a depreciated Real would make bovine meat exports from Brazil cheaper, which could hamper Indian growth of buffalo meat exports.

Cash Crop: Sugarcane (Refined Sugar)

In terms of the number of processing facilities and the number of workers and farmers directly or indirectly associated, sugar emerges as the second largest agro-based industry in India (cotton textiles is the largest). In 2014–15, 5.3 million hectares were under sugarcane cultivation that produced 367 million tonnes of cane and 538 factories processing it. (ISMA 2014, CACP 2015).

Global sugarcane production in the triennium ending 2013 (crop year) was 1.85 billion tonnes (FAO). Brazil is the highest producer of sugarcane with a share of 40.5 percent, followed by India at 18.3 percent, China at 6 percent, and Thailand at 4.9 percent. In triennium ending 2014–15 (marketing year), Brazil was the largest producer of sugar (raw value), with a share of 30 percent, followed by India at 25 percent, the EU at 14 percent, and China and Thailand at 9 percent each.

Sugar is a highly traded commodity. The largest exporter of sugar in triennium ending 2014–15 was Brazil, with an export share of 45 percent, followed by Thailand, Australia, Mexico, and India (in that order). While sugar exporters are few and the supply is more concentrated, its imports are diversified, with China being the largest sugar importer, followed by the United States, the EU, and Indonesia (USDA).

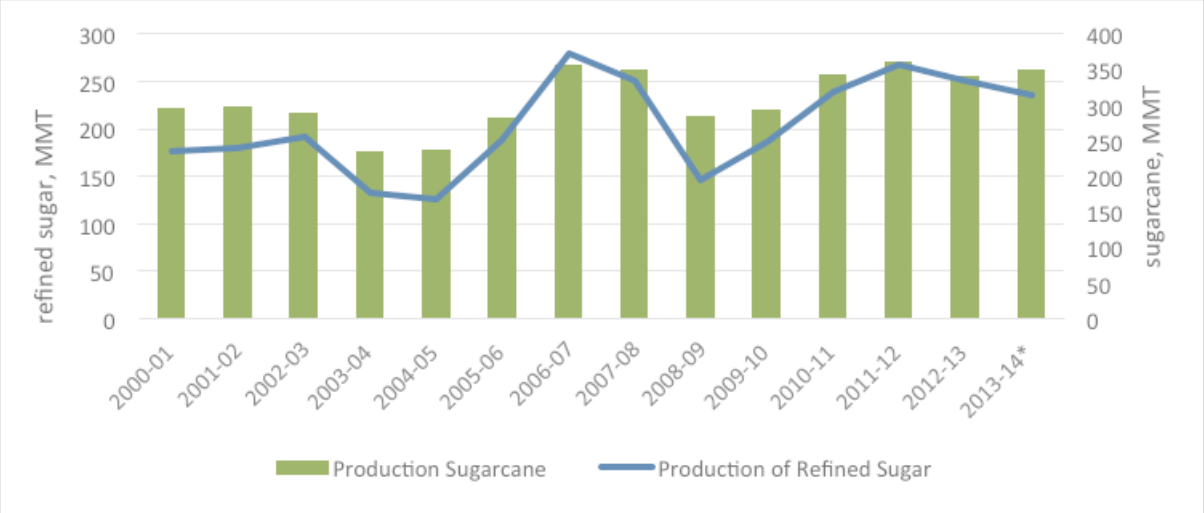
India exports and imports sugar in various years depending on its domestic sugarcane production and the domestic supply and demand situation. India's major export destinations are neighboring countries like Bangladesh, Sri Lanka, United Arab Emirates, Yemen, Saudi Arabia, Sudan, and Somalia, among others.

Domestic Production and Trade Scenario

The share of sugarcane in India's total value of agricultural output and gross cropped area was 6 and 2.5 percent, respectively, in 2013–14. Sugar is a very sensitive agri-commodity for India, and the Government supports its cane farmers by supporting the sugar millers. To do this the Government uses two instruments: providing support prices for sugarcane and export subsidies to millers. As in the case of other agri-commodities, the interplay between production and consumption determines the sugar trade policy of the country.

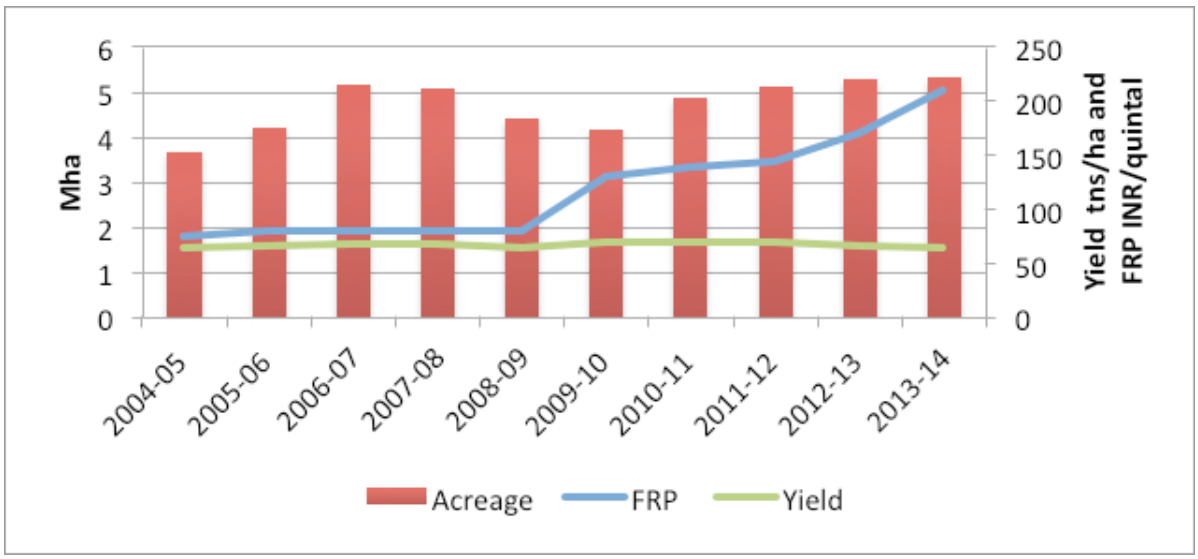
With constant yields for all the years of the study, production of sugarcane in India has followed its acreage (Figure 41 and 42), and both the sugarcane area and production appear as a clear function of three factors: sugarcane and sugar prices in the previous season, procurement prices (MSPs) of irrigated-land-competing crops like rice and wheat, and trade policies for sugar.

Figure 41 Production of Cane and Refined Sugar



Data Sources: DES and ISMA

Figure 42 Area and Fair and Remunerative Price of Sugarcane



Data Sources: DES and ISMA

The fair and remunerative price (FRP) is the price paid to sugarcane farmers by the Government. Prior to 2009–10 the Government fixed a statutory minimum price (SMP) for sugarcane, and farmers were entitled to share the profits of sugar mills equally, with farmers getting half of the sugar mill profits. This sharing, however, remained unimplemented (CACP 2015). In 2009–10, the Government started a new scheme for sugarcane pricing that abolished the unimplemented profit-sharing system. They came up with fair and remunerative prices (FRPs) (Figure 42), which were higher than SMPs. In 2009–10, the set FRP was 60 percent higher than the previously set SMP. Many state governments offer a markup on the centrally announced sugarcane prices and announce their own state advised price (SAP). The strength of the sugarcane growers' lobby of any state determines the markup (Jugale 2000). Of late, SAPs have risen relative to the FRPs.

Indian farmers are very responsive to relative price incentives (Gulati, Saini and Jain 2013) and sugarcane farmers are no exception. A sugarcane crop stays in the field for three years and, once planted, its area and production continue to adjust to evolving price incentives. Increases in real cane SAPs result in increased acreage, and any fall in acreage is preceded by a drop in real SAPs. For example, higher real SAPs in 2004–05 and 2005–06 were followed by increased acreage in 2005–06 and 2006–07, and a fall in real SAPs in 2003–04 and 2004–05 showed up in lower acreage and production in the 2004–05. This refers to a cyclical pattern in the Indian sugarcane (and sugar) industry. Increase in SAPs in one period increase the sugarcane area under production and its tonnage. Improved cane supplies mean larger sugar supplies to market. Due to inadequate storage facilities and absent buffer stocking opportunities, this leads to moderation and/or decline in sugar market prices. Lower sugar prices reduce millers' profits and their ability to pay cane farmers, thereby escalating the arrears due to the latter (Javalagi and Bhushi 2007). Reduced profitability in sugarcane cultivation drive farmers to reduce their areas under the crop. With the reduced area, cane supplies decline in subsequent seasons. Lower cane supplies and plummeting sugar stocks (which are already limited in quantity) raise sugar prices thus driving the opposite cycle where these higher sugar prices drive up farmer profitability and thus his incentive to increase crop acreage. Then the cycle continues.

Interestingly, increases in MSPs of crops like rice and wheat also have an impact on sugar cane area. As discussed in previous sections, the Government increased rice and wheat MSPs under NFSM 2007 during 2008–2012. These crops compete with sugarcane for irrigated land. Unusually steep increases in MSPs led some farmers away from sugarcane to these crops (Landes 2010). To mitigate volatility in cane acreage and production, CACP has recommended adoption of a more economically sustainable pricing mechanism, where the price of sugar is determined by the price of cane.[9]

Fluctuating domestic supplies affect India's global sugar trade policy. In any given year, India both exports and imports sugar.[10] In 2014–15, India was a net sugar exporter (Figure 43).

[9] To produce sustainability, a revenue sharing formula (RSF) approach has been recommended by CACP. Under this formula, the price of sugarcane should be fixed based on the price of sugar, the recovery rate, and the share to the farmer, keeping in mind the costs incurred by the farmer. CACP's study showed this share to be approximately 75 percent of the sugar price.

Price of cane = Price of sugar X Recovery rate X Share to farmer

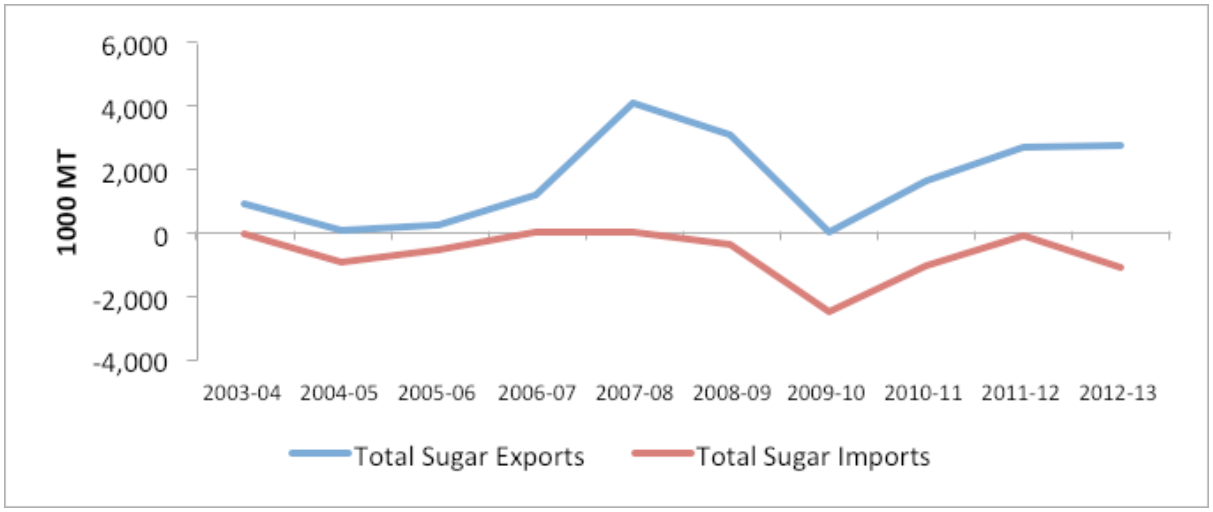
Clearly, the price of cane will incorporate the fluctuations that the price of sugar will undergo. Thus the CACP recommends that the price of cane should be the one set by the Government or by the recommended formula, whichever is higher.

Price of cane = Max {FRP, RSF}

For this purpose, a sugar stabilization fund (SSF) should be created in order to source subsidy to the sugarcane farmers in the times when sugar prices are falling. This fund can be financed though a cess on sugar exports when the prices are in the upswing.

[10] Simultaneous export and import of sugar is explained by the underlying quality differences of the traded sugar and to the process called "sugar tolling," which means that India re-exports refined sugar that is processed from imported raw sugar.

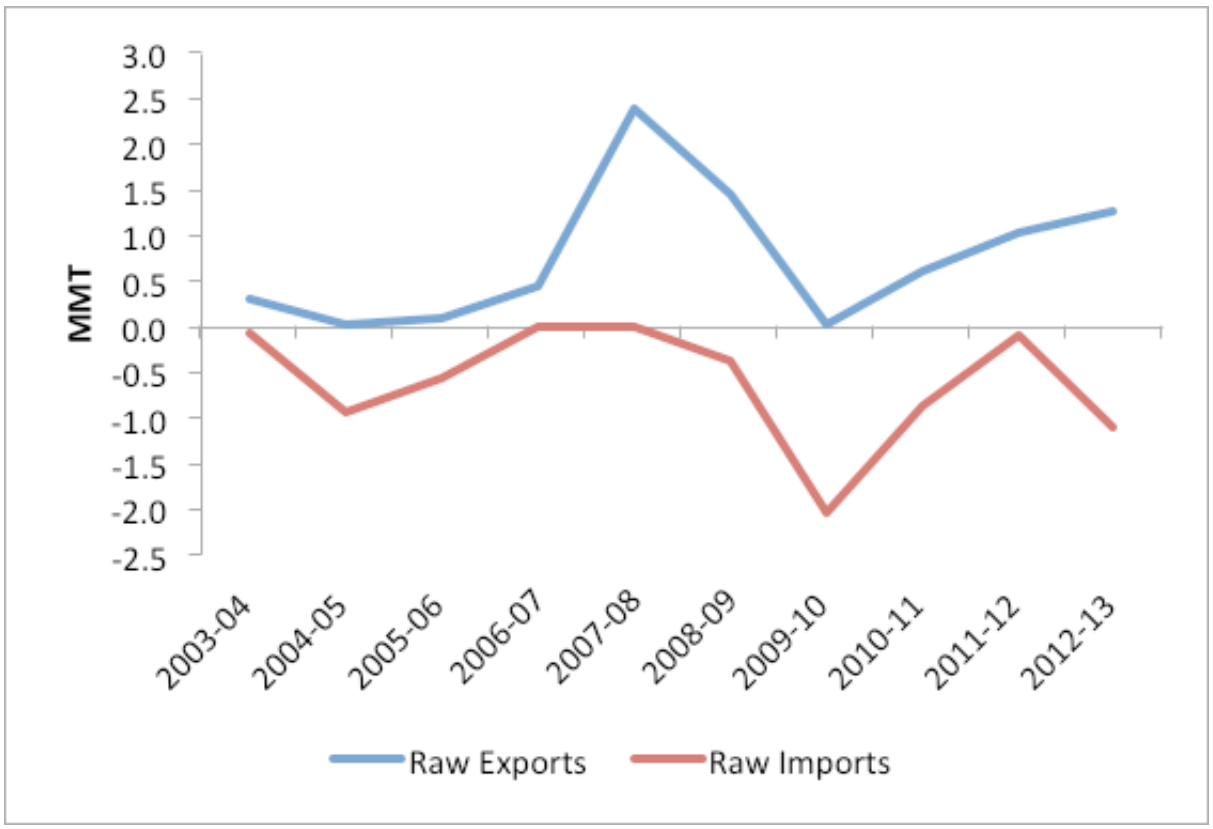
Figure 43 Export-Import of Total Sugar in India



Data Source: DGFT

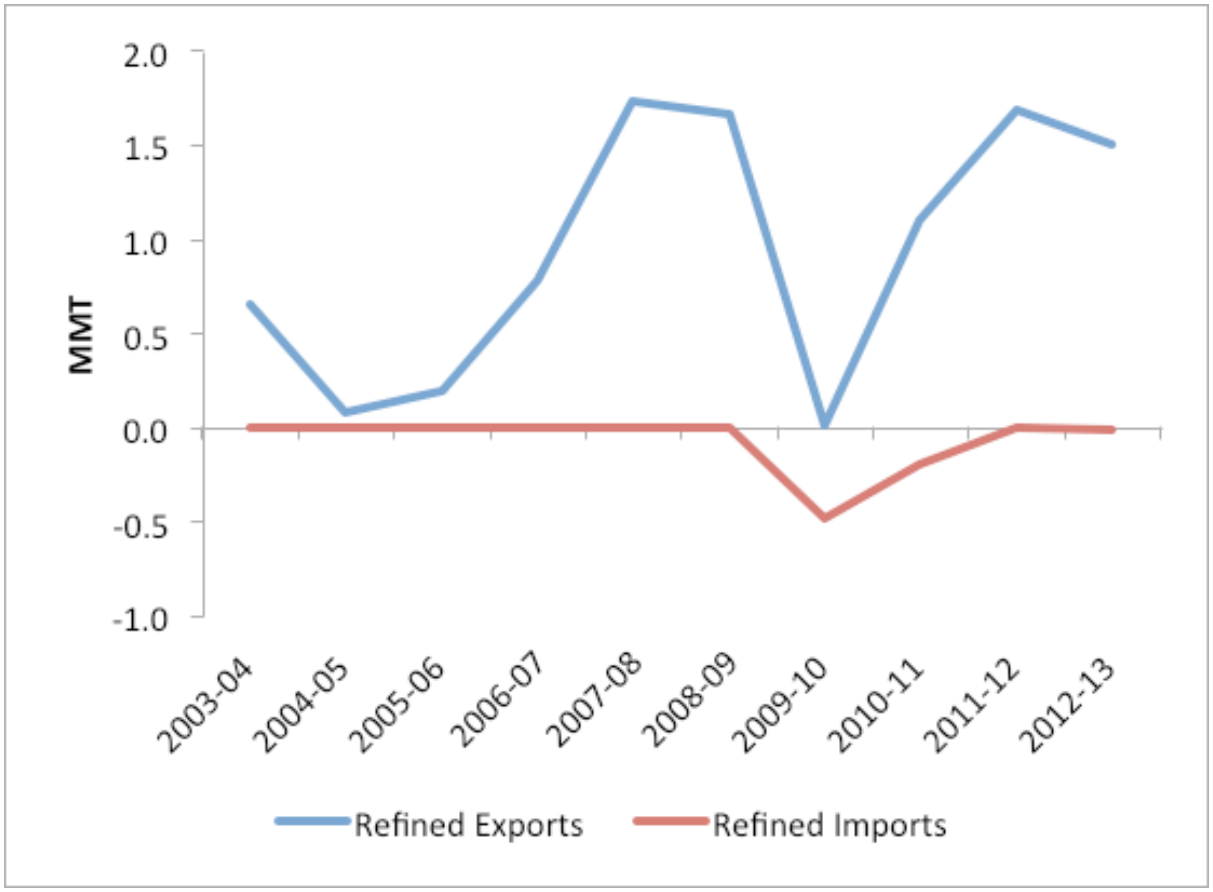
Comparing the export and import curves of total sugar with that of raw and refined sugar (Figure 43, 44, and 45), reveals that most of the fluctuations in total sugar emanated from fluctuations in raw sugar rather than refined sugar. The current study is on refined sugar.

Figure 43 Export-Import of Sugar in India (Raw Sugar)



Data Source: DGFT

Figure 44 Export-Import of Sugar in India (Refined Sugar)



Data Source: DGFT

In terms of trade policy, until January 1997 India exported sugar only through two notified agencies: Indian Sugar and General Industry Export Import Corporation and the State Trading Corporation of India (STC). The system was decentralized, after which exports of sugar needed just a "registration-cum-allocation certificate" from APEDA. This system continued for a little more than four years before it was replaced in April 2001. Now any exports of sugar need an export release order from the Directorate of Sugar.

Table 17 Import Duty on Sugar

Time Period	Import Duty on Sugar (%)
February 2000 onward	60+
June–September 2006	0
October 2006 onward	60+
April 2009 onward	0
July 2012 onward	10
July 2013 onward	15
July 2014 onward	25
April 2015 onward	40

Source: ISMA

There are wide fluctuations in sugar supply, with supply mostly exceeding demand. To smooth supplies, the Government uses trade policy, making import duties moderate during normal times and lower in times of lower domestic cane and sugar production (Figure 34 and Table 17). Exports are encouraged through various types of export subsidies during excess domestic supplies and are restricted (or even banned) in a supply-constrained domestic market. It is important that the Government ensure that the sugar prices do not fall in the market as that will impede the millers' ability to pay the cane farmers, who in turn will determine the cane supplies in subsequent seasons.

The Government of India has been encouraging sugar exports through various interventions. For example, in 2002–03, sugar exporting factories were allowed a reimbursement of internal transport and freight charges at INR 1,000/tn or approximately US$ 20.7/tn , neutralization of ocean freight disadvantage at INR 350/tn or approximately US$ 7.2/tn, and handling and marketing charge support at INR 500/tn or approximately US$ 10.3/tn. These incentives, however, were withdrawn in June 2004 because of falling domestic sugar production in 2003–04. Rising sugar prices domestically in that year triggered the cyclicality in the cane acreage and production, as mentioned earlier. Thus within two years, production matched and exceeded the old levels, thus exports and export subsidies were resumed. As per the latest "Trade Policy Review" submitted by India to WTO (2015), the government approved a cumulative export subsidy at the rate of INR 3,300/tn (or approximately US$ 54) toward the marketing and promotion services for raw sugar.

One more aspect of the sugar market should be considered: sugar tolling. In order to tap the unused production capacity of sugar refineries (in times of lower domestic production) the Government allows duty-free imports of raw sugar, which the refineries are required to refine and re-export within a period of 18 months. The process of importing raw sugar in order to re-export refined sugar is sugar tolling. It has been found that this sugar leaks into domestic markets and thus puts downward pressure on prices. Lobbies are at work to get the Government to discourage such spillover of sugar meant for re-export from entering domestic markets.

In terms of statewise spread of sugarcane production, Indian sugarcane grows in tropical and subtropical agro climatic zones. Tropical regions cover states like Andhra Pradesh, Gujarat, Maharashtra, and Tamil Nadu, while subtropical states include Bihar, Haryana, Punjab, Uttar Pradesh, and Uttarakhand. In triennium ending 2013–14, tropical areas accounted for 42 percent of the total area under cultivation and 51 percent of total production of sugarcane, while subtropical areas accounted for about 55 and 47 percent for the same, respectively (CACP 2015). Further, tropical areas accounted for 63 percent of total sugar production, of which 32 percent was from Maharashtra alone. Despite UP having the largest share in sugarcane production, due to lower sucrose content in its cane its sugar production share in India is second to that of Maharashtra (CACP 2015).

Trade Distortions in Indian Refined Sugar

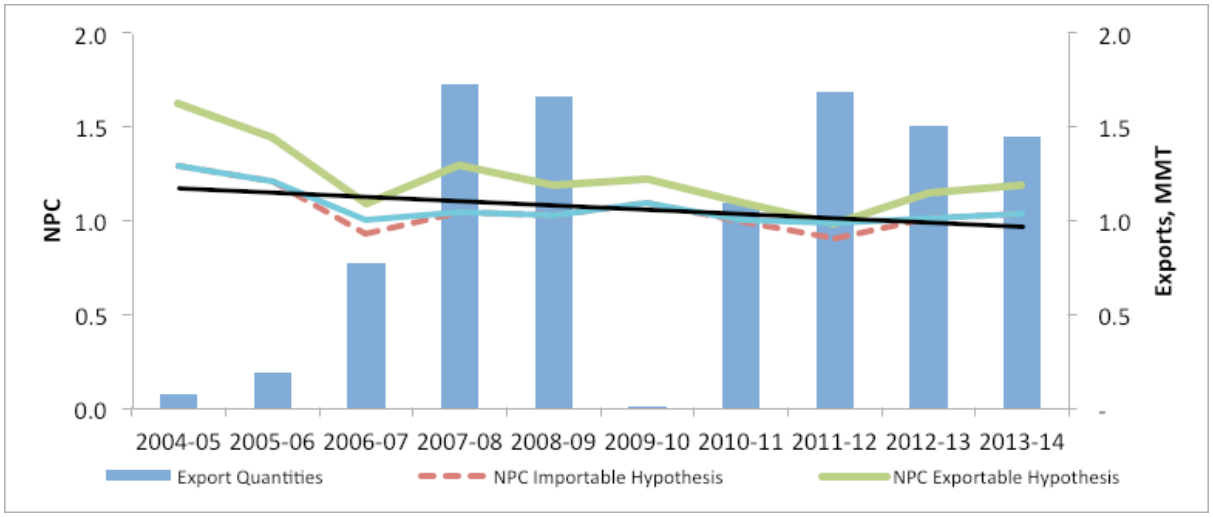
The international price series for refined sugar (fob EU Ports) was taken from USDA. The domestic wholesale refined sugar prices were taken for Mumbai from DES. The series was calculated for financial years.

Key variables estimated were:

- Domestic transportation in the state of Maharashtra:
  - Transportation between the wholesale markets at Mumbai to the JNPT Port
- Traders' margin and marketing costs: assumed to be 5 percent of the domestic price
- Port handling charges at JNPT Port of Maharashtra
- International freight charges between Rotterdam Port and the JNPT Port are included when sugar is an importable, but not when it is an exportable.

Utilizing the collected information, NPCs were estimated under the exportable hypothesis, importable hypothesis, and trade-adjusted NPCs, combining the two hypotheses and adjusting for the respective year's trade status.

Figure 45 NPC and Export Values of Refined Sugar



Data Source: DGFT

Indian refined sugar has been import-competing in seven of the studied 10 years, exportable in only one year, i.e., 2011–12, and non-tradable in two years, 2006–07 and 2010–11. Between 2004–05 and 2013–14, the domestic refined sugar price has been on average equal to or higher than the international reference price. Clearly if it were not for the export incentives, the exports would have been unviable.

By continuing import restrictions and export subsidies (supporting domestic sugar lobbies), the gap between the higher domestic and lower international prices will only increase, to the detriment of consumers. Escalating arrears to cane farmers complicates the whole situation, where, except for the mills, both the farmer and the consumer of sugar are possibly suffering from the existing system.

Cash Crop: Cotton

Cotton is a *kharif* crop in India, planted in June–July and harvested between October and February. The ginning outturn (lint weight as a percentage of cotton crop) ranges from 28 to 44 percent. Lint is used for making yarn to be woven into textile fabrics, alone or in combination with other plant, animal or synthetic fibers. Globally, 26.36 MMT or 155 million bales of 170 kg of cotton lint[11] were produced in triennium ending 2014–15. China is a leading producer of cotton, with a world share of 27 percent, followed by India at 25 percent and the United States at 13 percent (USDA).

Cotton is a heavily traded commodity. The largest exporter of cotton in triennium ending 2014–15 was the United States with a world share of 28 percent, followed by India at 17 percent and Australia at 11 percent (USDA). On the import side, China is both the largest producer and the

[11] From here on, cotton lint will be referred to as cotton. Any other form of cotton will be explicitly mentioned.

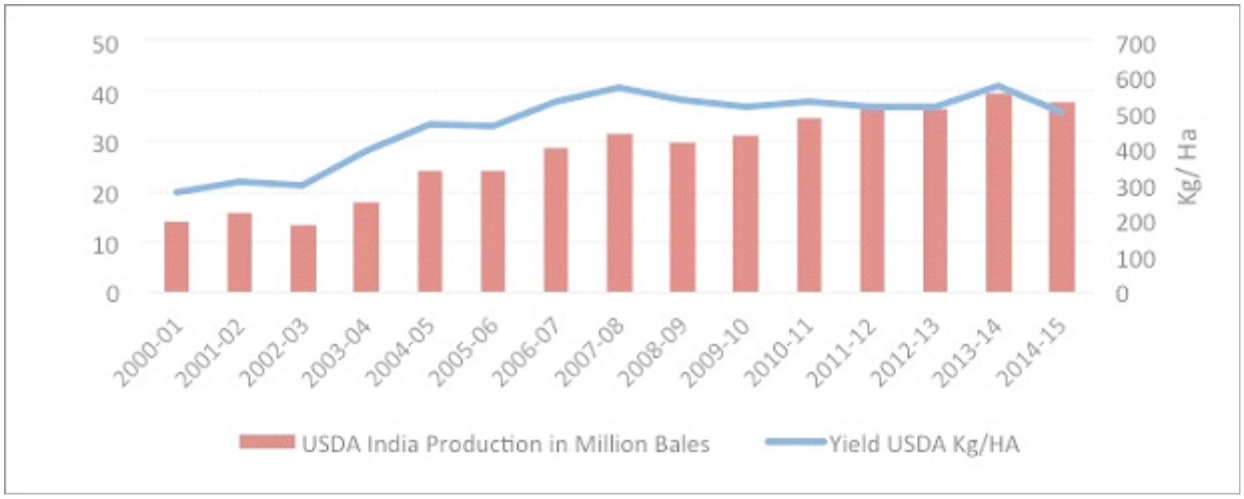
largest importer of cotton with a world import share of 34 percent in triennium ending 2014–15. Bangladesh follows way behind with only 12.5 percent of cotton imported, followed by Turkey at 9 and Vietnam at 8 percent (USDA).

Within a span of 14–15 years, India, which had been the third largest producer after China and the United States in 2000–01 marketing year (MY[12]), is predicted to become the world's largest cotton producer in the 2015–16 MY, with a production of 36 million bales, exceeding the 32 million bales' production estimate for China (USDA). In terms of export, from being the 10th largest exporter in the 2003–04 MY, India became the second highest cotton exporter, just after the United States in the 2014–15 MY.

India's Cotton Trade and Domestic Production

Cotton production in India has increased from 14 million bales in MY 2000–01 to 37.78 million bales in 2014–15 (USDA). Both the area under cotton and the yields have contributed to this growth. While the area increased from 8.5 million hectares to 11.8 million hectares, yields increased from 278 to 506 kg per hectare in the same period. Despite the growth in production, Indian yields are much lower than the world average of 758 kg per hectare in 2014–15 (Figure 46).

Figure 46 India's Production vs. Yield of Cotton



Data Source: USDA

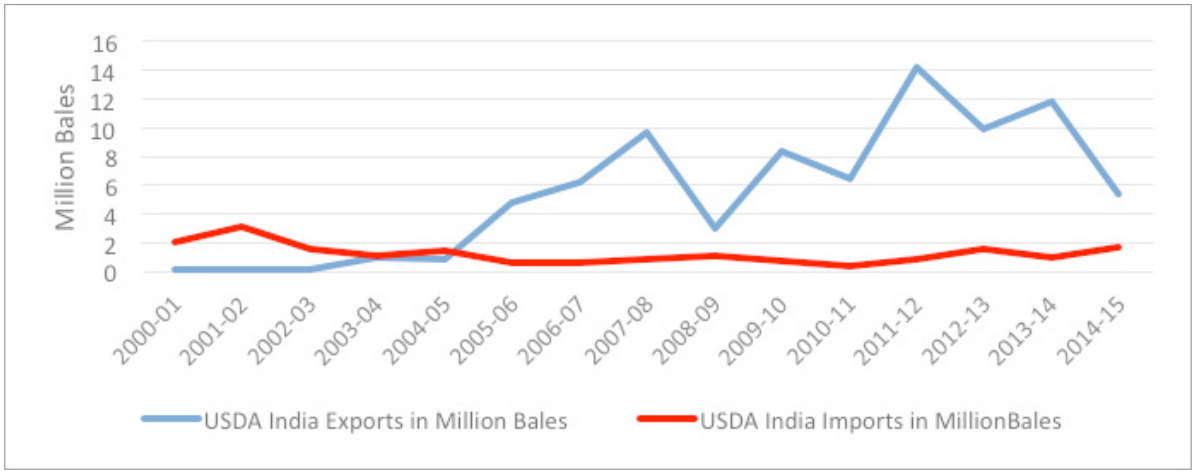
Note that cotton production as a percentage of the total value of agricultural production has grown from 1.74 percent in 2000–01 calendar year to 4.28 percent in 2013–14, which is a tremendous increase (FAO).

India is now a consistent net-exporter of cotton. Data shows that Indian exports have risen from 0.12 million bales in MY 2000–01 to 5.62 million bales in 2014–15, while imports have decreased from 2 million to 1.27 million bales in the same duration (these import-export figures include all the staples of cotton bales)[13] (USDA) (Figure 47).

[12] USDA estimates are for the cotton-marketing year (MY) August 1 to July 31.

[13] According to DGFT, there have been zero imports of cotton staples ranging 24.5–28 mm (HS 52010014) and 28.5 to 34 mm (HS 52010015) and our study focuses on 27.5–28.5 mm H-4 that lies in both.

Figure 47 India's Cotton Import and Export Trends



Data Source: USDA

China is India's biggest export destination. The fall in cotton exports in the last few years is due largely to the decline in import demand by China as a result of its domestic over-accumulation of stocks. China's import of cotton started falling rapidly in the 2013–14 MY and is continuing (USDA).

Domestically, in terms of Indian states' shares in total cotton production, Gujarat (31 percent) emerges as the leading cotton producer, followed by Maharashtra (22 percent) and Andhra Pradesh (19 percent) in the triennium ending 2013–14. In terms of area sown, however, Maharashtra takes the lead, followed by Gujarat and Andhra Pradesh (CCI). Differences in respective yields explain this gap. While Gujarat produced 7.3 quintals/ha[14], MP produced 5.2 quintals/ha, and Maharashtra produced about 3.6 quintals/ha in 2013–14.

Domestic Policy for Cotton

India has achieved a substantial increase in cotton production since the 1970s; before which it had imported massive quantities of cotton. The Government in the mid-1970s introduced special schemes through successive five-year plans aimed at increasing the area under cultivation and sowing hybrid varieties (CCI). Since then, India has been self-sufficient in cotton production except for a few years in the late 1990s and early 2000s when hefty quantities of cotton had to be imported following a reduction in crop production due to pest attacks and the ever-increasing demand of the domestic textile industry (CCI).

Table 18 Adoption of Bt Cotton in India

Time Period	Area under Bt Cotton (Mha)	Total Area Under Cotton (Mha)	% Bt Cotton Area
2002–03	0.05	7.7	0.65
2003–04	0.1	7.6	1.32
2004–05	0.5	8.9	5.62
2005–06	1.3	8.9	14.61
2006–07	3.8	9.2	41.30
2007–08	6.2	9.4	65.96
2008–09	7.6	9.4	80.85
2009–10	8.4	10.3	81.55
2010–11	9.4	11.0	85.45
2011–12	10.6	12.2	86.89
2012–13	10.8	11.6	93.10
2013–14	11.6	12.25	94.69

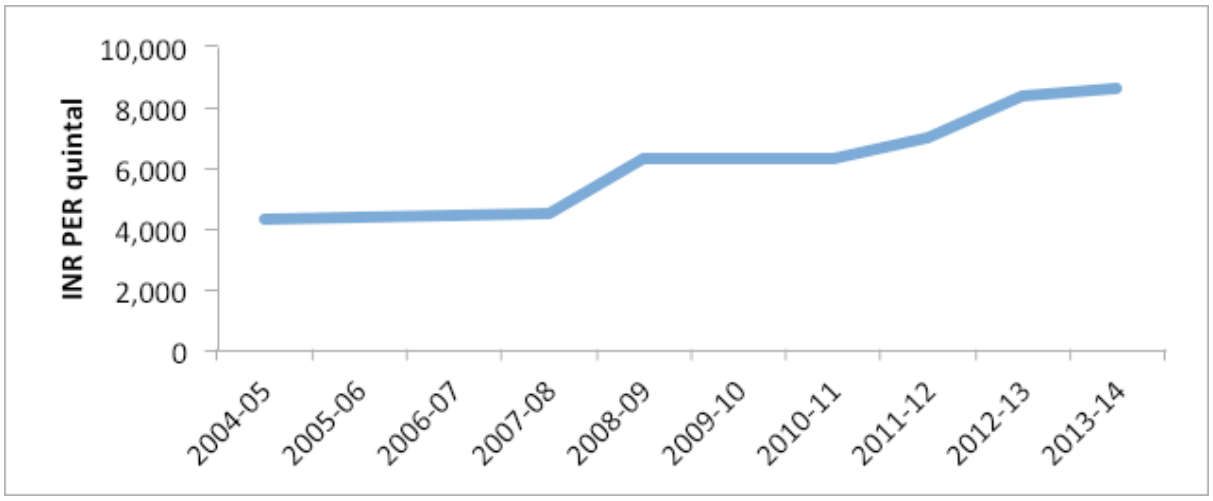
Data Source: ISAAA 2014.

[14] One bale is equal to 170 kilograms

Since India adopted the use of Bt cotton genes (i.e. genetically modified (GM) crop technologies) in 2002, the production of cotton, which was 13 million bales in 2002–03, tripled to 39 million bales in 2013–14 (CCI).

The Government undertakes MSP operations in cotton. As with major cereals, MSP of cotton has also shown an upward trend. Particularly, a steep rise in MSP is visible post 2007–08, when the global market was hit by the global financial crisis.

Figure 48 MSP for Cotton



Data Source: CCI
Note: Calculation uses price conversion of 2.2 on MSP kapas (cotton with seed) H-4

Despite a global tendency toward a glut, the MSP of cotton in India was raised by around 40 percent between 2007–08 and 2008–09, mainly to incentivize farmers to maintain production (Figure 48).

Over the last few years, China has encouraged domestic production of cotton as well as imports of cotton, resulting in around 45 million bales of Chinese cotton stocks, equivalent to one-third of the world's cotton production in 2014 (Choudhary & Gaur 2010). To reduce stockpiling, China subsequently reduced its area under production and reduced imports (USDA). This had an adverse impact on India's exports and consequently led to stockpiling in India which crashed domestic market prices, adversely affecting cotton farmers.

Trade Distortions in Indian Cotton

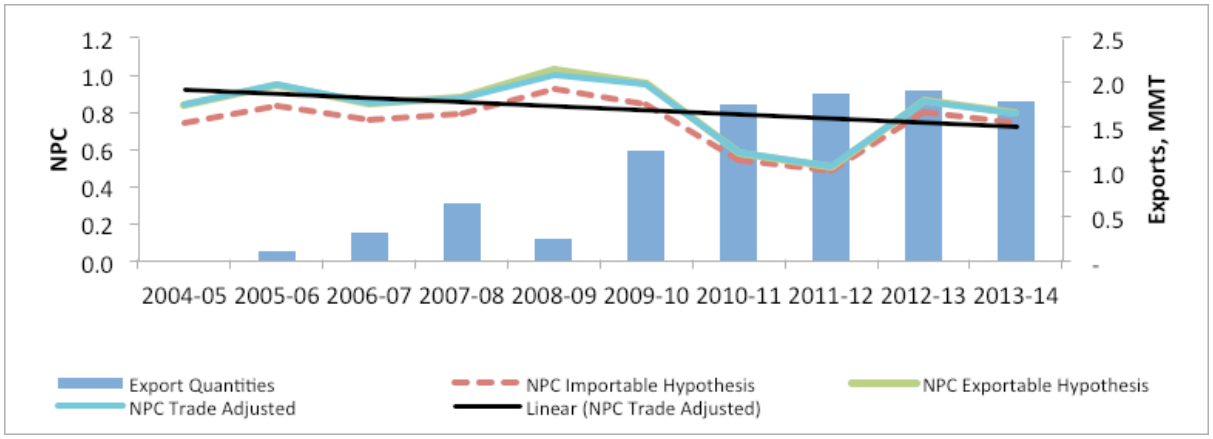
For this study, the international price series for cotton lint (CNF Far East) was taken from UNCTAD (United Nations Conference on Trade and Development) which are Cotlook 'A' Index prices. The cotton lint prices given by Cotlook A are for the variety of staple length 27.78 mm. By adjusting for freight between the Far East and United States, the price series of cotton lint at fob U.S. Gulf was estimated. The domestic price series used was the MSP series of raw cotton (converted into lint through a factor of 2.2); the series was taken from the Cotton Corporation of India (CCI). The domestic cotton variety considered was Gujarat H-4, which has a staple length in the range 27.7–28.5mm (to match the international cotton variety). The series was calculated for the financial years i.e. April to March.

Key variables estimated were:

- Domestic transportation in the state of Gujarat:
  - Transportation between the wholesale markets at Jamnagar to the Mundra Port
- Traders' margin and marketing costs: assumed to be 5 percent of the domestic price
- Port handling charges at Mundra Port of Gujarat
- International freight charges between Gulf Port and the Mundra Port are included when cotton is an importable, but not when it is an exportable.

Using the estimates, the three NPC series were calculated (Figure 49).

Figure 49 NPCs of Cotton at Wholesale Level



Data Source: DGFT

Note: Here, export volumes are a sum of HS 52010014 (24.5–28 mm) and 52010015 (28.5–34 mm), as both these ranges capture H-4, which is the international cotton equivalent of staple length (27.5–28.5) used in the study.

NPCs of both importable as well as exportable hypotheses are consistently below 1 except for FY 2008–09 when the exportable NPC is 1.03.

The Government in July 2001 removed quantity restrictions on cotton export and placed cotton under open general license (OGL). Exports of raw cotton were kept free, except that they needed to be registered with the Textile Commissioner, Ministry of Textiles, Government of India, prior to shipment (DGFT 2008). In 2008–09, long staple cotton (including H-4, which is the focus of the cotton type in this study analysis) saw an enormous MSP growth (see Figure 24). These increased domestic prices made Indian cotton less competitive in the world market (Gulati and Jain 2011). Exports plummeted by 30 percent compared to the previous year (2007–08). That could explain the NPC number in 2008–09 reaching close to 1. Because of the recession, world cotton prices were depressed, but the high growth in MSP kept domestic cotton prices on the higher side.

Following the hike in MSP and rising trends in the domestic market, the Government imposed an export duty of INR 2500 per tonne on raw cotton in April 2010 to avoid disruption in the supply chain for cotton in the country. However, in August 2012 India's exports were allowed at zero export duty, with the restriction that contracts for export be registered with the DGFT prior to shipment (CACP 2015). On March 5, 2012 India implemented a ban on cotton exports in order to keep the domestic supply of cotton robust and to prevent a price hike in the domestic textile industry. However, the ban was lifted within a week and 2011–12 saw large values of cotton being exported. Since 2012–13 onward exports of cotton have remained under OGL.

Table 15 outlines the overall import duties on cotton variety H-4. High import duties on cotton during the period 2004–09 suggest that the Government did not want substitution of Indian cotton by foreign staples. When the international price started exceeding the price of Indian cotton (H-4) by large margins (from 2010 onward), the duty was reduced (Table 19).

Table 19 Import Duty on Cotton H-4

Year	2000–01	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2012–13	2013–14
% Duties	5.5	5	10	10.2	10.2	14.6	14.7	14.7	0	0

Data Source: DGFT

Therefore, to neutralize the adverse impact of the fluctuation in the international price of cotton on domestic production/consumption, the Government stepped in promptly to take policy action though imposition of export-import duties whenever required.

Throughout the period of this study, Indian cotton exports were exportable 90 percent of the time and trade-neutral 10 percent. Indian prices averaged at about 80 percent of world reference prices, except for the two years 2010–11 and 2011–12 when the domestic prices were a little more than half of the world prices. However, not having a stable and a predictable trade policy does influence India's global standing.

Vegetable: Onion

In 2013–14, India exported 1.5 MMT of onion, close to 8 percent of its annual production of 19.3 MMT. India is a global player in onions. With more than 27 percent of the global area under onions, the country has a share of 21 percent of global production. China is the largest producer of onions with about 26 percent of global production. In terms of productivity, in 2013, the world on an average produced about 19.3 tn/ha, while India produced about 16 tn/ha. By contrast, the United States produced a little less than three times this amount, or 54.5 tn/ha; China, 21.8 tn/ha (FAOstat).

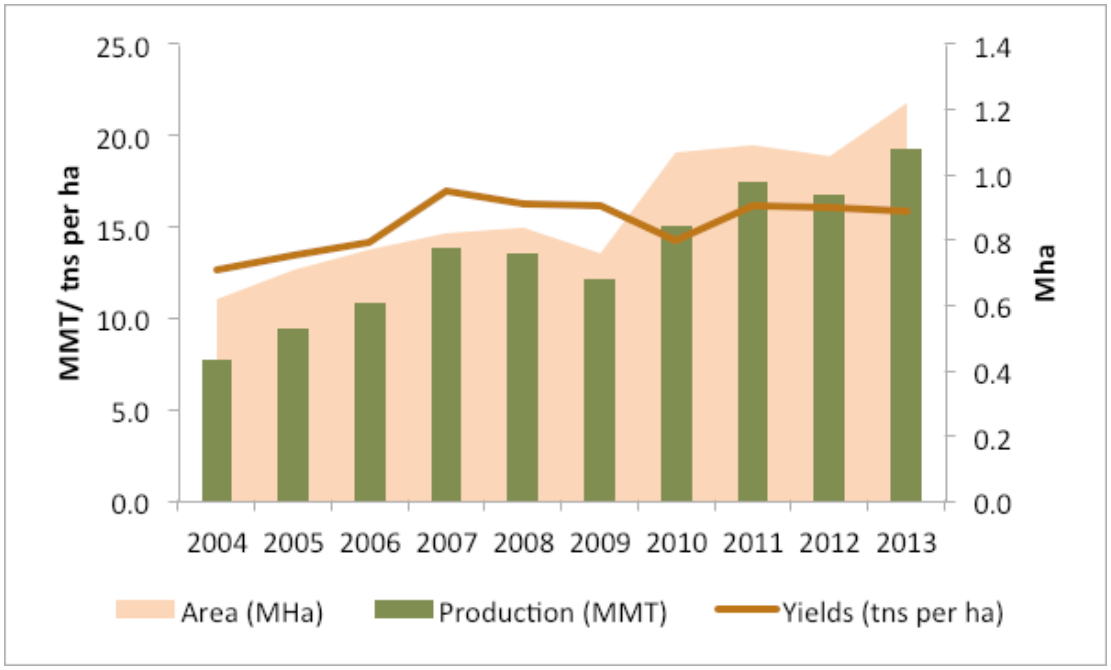
Although only a small share of India's production is exported, India has emerged as a major onion supplier. Major global exporters of onion and their shares in world exports in triennium ending 2012 are led by India, with a share of 20 percent, followed by the Netherlands (19 percent), China (10 percent), Egypt (6 percent), and Mexico and United States (around 5 percent each). Onions are globally imported by countries like Malaysia, Russia, United States, Bangladesh, United Kingdom, and Japan, among others.

Domestic Onion Trade and Production

Onions have three cropping seasons in India: *kharif/early kharif* , *late kharif* and *rabi*. Rabi is the main cropping season that produces about 60 percent of the country's annual onion production, while each of the two kharif seasons produces about 20 percent. India produces three main varieties of onions: red, yellow, and white.

There has been a sizeable increase in the acreage and production of onions in India during the studied years. The area doubled from 0.6 Mha in 2004 to 1.2 Mha in 2013, while production increased by close to 150 percent, from 7.8 MMT in 2004 to 19.3 MMT in 2013 (Figure 50) mainly on account of yields that grew from 13 tn/ha in 2004 to about 16 tn/ha in 2013.

Figure 50 India's Onion Area, Production, and Yields

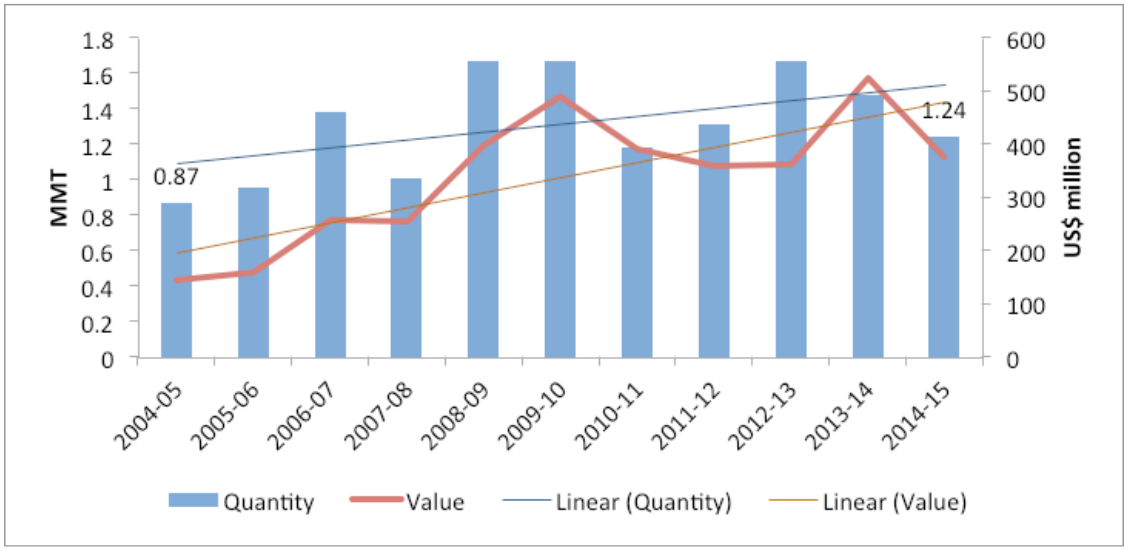


Data Source: FAOstat

Maharashtra is the main onion producing state in the country, with about a 30 percent share (2013–14), followed by Madhya Pradesh with about 15 percent, Karnataka about 11 percent, and Gujarat with about 10 percent. In terms of yields for triennium ending 2011–12, while India produced about 16 MT/ha, both Maharashtra and Karnataka produced a little more than 14 tn/ha. Five states that had a higher yield than these two traditional onion growing states were Gujarat (24.3 tn/ha), Bihar (19.9 tn/ha), MP (16.5 tn/ha), and Andhra Pradesh (14.7 tn/ha). Maharashtra's Lasalgaon (in Nashik district) onion market is Asia's biggest onion wholesale market, and was used in this research.

Indian onion exports, both in terms of value and volume, have grown rapidly over the study period (see trend lines in Figure 51). In terms of quantity, exports have increased at an annual average rate of 10 percent, between 2004–05 and 2013–14, and in terms of value (in INR), they have grown at a rate of 24 percent

Figure 51 India's Onion Exports: Value and Volume

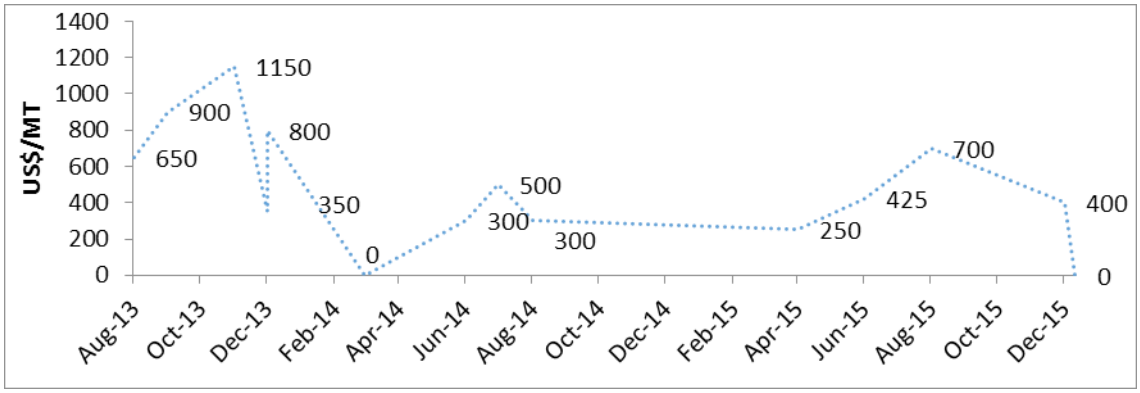


Data Source: APEDA Exchange

Bangladesh, Malaysia, Sri Lanka, United Arab Emirates, and Nepal are major export destinations for Indian onions. There is a 30 percent import duty on onions.

Onion is a highly sensitive commodity for India. Domestic onion wholesale and retail prices are monitored on a fortnightly, weekly, and even on a daily basis as part of the "list of 22 sensitive commodities," by the Indian Government's Ministry of Consumer Affairs. Depending on the domestic supply and price situation, the Government maneuvers its onion trade policy. From reducing import duties to zero to banning/freeing exports of onions, the onion trade policy of India is ad hoc and unpredictable. However, there is a pattern to these policy changes. As mentioned, India has three onion seasons and the most crop is harvested during the *rabi* season; thus any prediction of disruptions to this crop is likely to induce policymakers to ban exports completely or impose or increase minimum export prices (MEP) and/or reduce the onion import duty to zero. Additionally, the demand for onion is spread throughout the year, but the majority of onion crop is harvested in only a few months. This means that during the lean periods, i.e mainly in the months of June–December the country survives on the incoming small *kharif* crops and the stored *rabi* crops. Lack of storage and changing humidity levels affect the shelf life of the stored onions and thus the ability of the supplies to meet demand in the upcoming months. These are the most crucial months when the policy makers maneuver onion trade in order to manage domestic supplies. Figure 52 shows the fluctuations in applicable MEPs of onions for two years—2014 and 2015.

Figure 52 MEP of Onions for 2013–14 and 2014–15



Source: APEDA

Within one year, the MEP on onions increased from US$250/MT in April 2015 to US$700/MT in August 2015, to return to being free by late December 2015. During excessive volatility in domestic supply and prices, onion exports may even be banned completely, like they were in September 2011 and December 2010. In collaboration with DGFT (Directorate General of Foreign Trade), the NAFED (National Agricultural Cooperative Marketing Federation of India Ltd.) determines onion MEPs.

Depending on the costs of production, NAFED also determines the procurement price of onions each season. NAFED undertakes its procurement operations to smooth intra-year onion supplies by buying during glut periods to prevent prices from crashing, and supplying during bad crop years to prevent prices from soaring. However, the scale of procurement operations is inadequate and lacks depth.

Another set of domestic policies— that is, the Agricultural Produce Market Committee (APMC) and the Essential Commodities Act (ECA)—affect onion markets in India. Under these policies, the role of private traders in stocking and trading onions is restricted: stocking limits are assigned to them and the farmers/producers are forced to sell their produce only to authorized wholesale markets, in which layers of middlemen increase the gap between the farmer price and that paid by the final consumer. Such policies discourage private participation and their investments in cold storage or processing units, thereby leaving the responsibility of price stabilization on the Government's inefficient procurement machinery. Consequently, a typical Indian onion farmer suffers in both a good harvest (when prices crash due to a glut) and a bad harvest (as Governments cap wholesale and retail prices). The systemic inefficiencies are widely acknowledged and there are talks about repealing the APMCs. Apart from these losses inflicted upon the onion farmers, export bans and arbitrary practice of fixing exorbitantly high MEPs have also subjected onion exporters to the loss of many export opportunities.

Despite the policy arbitrariness and fluctuations in onion supply, Indian onions have a niche global market where, due to its typically pungent taste, color and texture, they are preferred over onions supplied by many competitors.

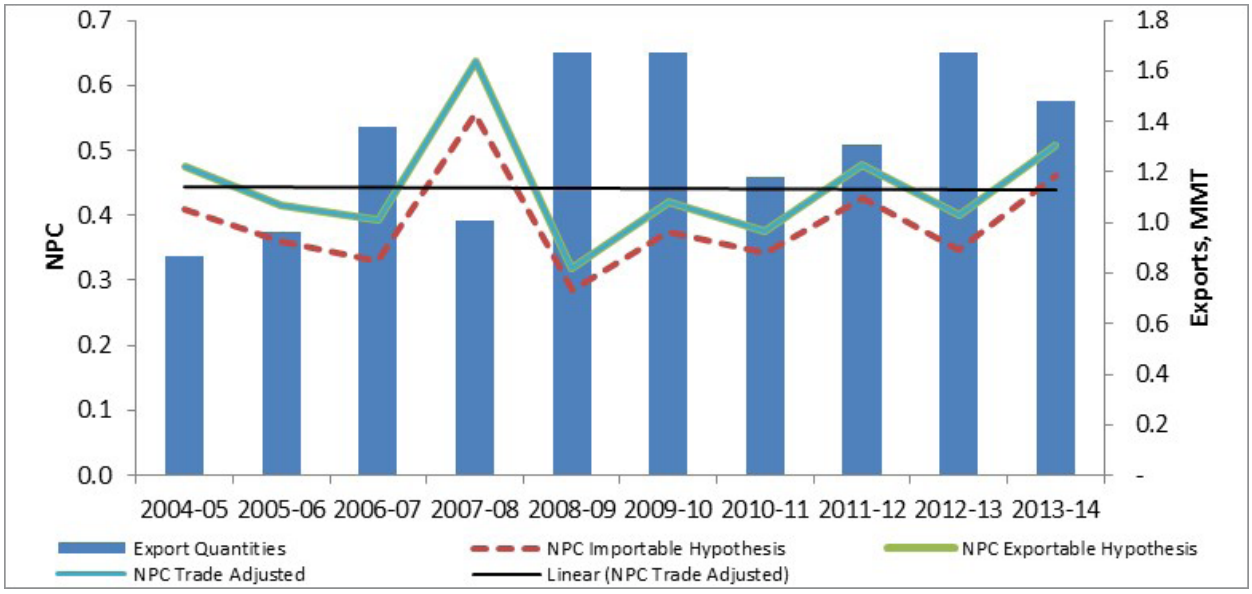
Trade Distortions in Indian Onion

To better understand the price distortions in the Indian onion market, the NPCs must be calculated. Two price series are used, as with other commodities—a domestic wholesale price and an international fob price series. The domestic wholesale price series is estimated for the Nashik onion market taken from Agmarknet/DES for the *rabi* months of April–June. As a proxy to the international fob price series, the unit value of exports is used. The international competition is taken as Pakistan due to the varietal similarities.

Adjusting the prices for international freight charges (Karachi, Pakistan to JNPT, Maharashtra), domestic transportation between the wholesale markets and the ICDs/Ports (Nashik Mandi to JNPT), marketing margins (10 percent), and port handling charges (JNPT), the international reference price under both exportable and importable hypotheses were estimated. Ratios of these reference prices to the domestic wholesale price yields the NPC estimates under importable and exportable hypotheses. Next the yearly trade status of Indian onions using these price series is determined. If the domestic wholesale price is greater than the import reference price, then the onion in that year is taken to be import-competing; if the domestic wholesale price is lower

than the export reference price, then onion are seen as exportable in that year; and when the domestic price is between the two external reference prices,onions are taken to be non-tradable in that year. Combining the determined annual trade status with the two estimated NPCs, gives the trade-adjusted NPC curve.

Figure 53 NPCs of Onions at Wholesale Market Level



Data Source: APEDA

Indian onions were exportable in all 10 years studied, which is also shown by all estimated NPCs being lower than 1. NPCs consistently lower than 1 or consistently negative NRPs (i.e. NPC-1) indicate presence of a consumer bias in the system and the existence of barriers to exports. The ad hoc trade policy and lack of infrastructure facilities and technology, as discussed earlier, clearly explain this.

Sensitivity to onion supplies and prices guide onion trade policy. Any time the Government foresees rising onion prices, it bans onion exports or institutes high MEP requirements, or reduces import taxes—or even procures onions from nearby countries and dumps them in the domestic market—to tame rising prices, indicating consumer bias. Lack of a stable onion-trade policy is a disincentive to private investors, who are unable to benefit from rising global export opportunities due to restrictive policies put in place by the Government.

Infrastructure inadequacy is another problem faced by onion farmers. When a crop harvest is concentrated in a few months, but its consumption is spread throughout the year, then someone has to store the crop to smooth supplies in the dry times. But in cases where storage facilities are inadequate, as with onions where the gap between actual and needed storage capacity is high, the farmer is left high and dry in times of harvest—when the glut forces the prices down in the wake of a missing trader buying and storing the crop. Restrictive Government policies like the ECA also restrict the role that the private trader can play in the markets of some staple essential food items like onion, rice, and wheat. This also discourages further private investment in the market. Farmers' inadequate knowledge of the pre- and the post-harvest technology also results in massive waste along the value-chain. Thus despite having the potential, as endogenously deduced, the country is unable to tap global market opportunities.

Vegetable: Potato

In terms of share in the area under the crop and the production levels, potato is the most important vegetable in India. Globally, it is the fourth most consumed food crop after rice, wheat, and maize. More than 19 million hectares of land were under potato in 2013 globally, and half of this was in three countries alone: China (29 percent), Russia (10.8 percent), and India (10.3 percent). Countries like Ukraine, Bangladesh, the United States, Poland, and Peru also grow potato.

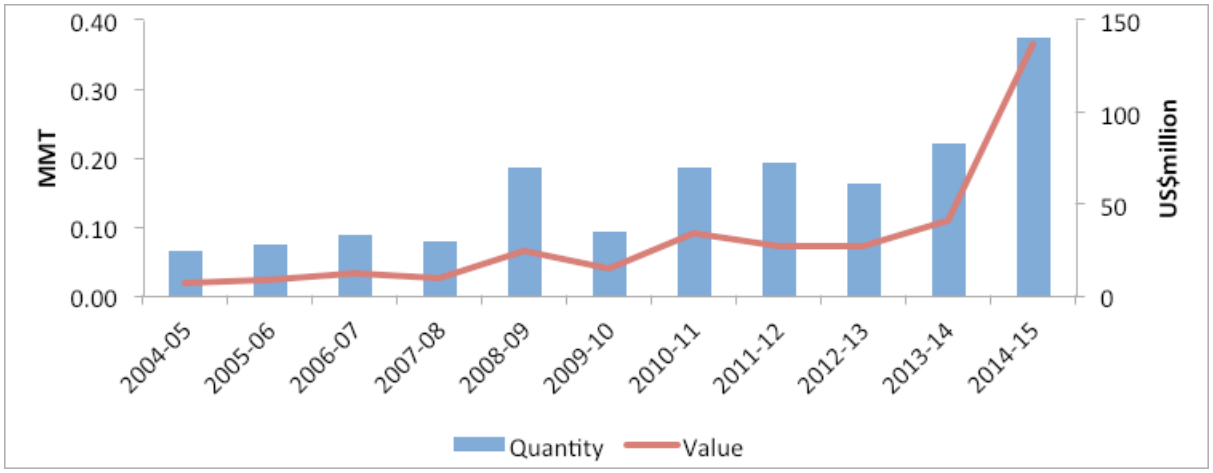
The world produced 376.5 MMT of potato in 2013; China produced one-quarter of this, and India produced little more than half of China's total. While the world on average produced 19.5 tns of potato per hectare, China produced 17.1 tn/ha and India produced close to 23 tn/ha in 2013. Countries like New Zealand, the United States, Belgium, Netherlands, France, Australia, El Salvador, United Kingdom, Denmark, and Germany all produced more than 40 tn/ha. Indian yields compared to the top ranked countries do not come out well because of the climate conditions during which the crop is planted. While the other countries grow their potato during temperate conditions, India grows them mainly during short-day conditions in the winter season, thus leading to short-cycle crops, which result in lower yields (Wustman et al. 2011).

European countries, France, Belgium, the Netherlands, and Germany, are the largest potato exporters in the world, together accounting for more than half of potato exports. Europe also imports large quantities of potatoes. According to triennium ending 2013 figures, close to half of the potato imports went to European countries like Belgium which imported 13 percent of global potato imports, Netherlands, 12 percent, Spain, Germany, and Italy, 6 percent each, and France, 4 percent.

Domestic Trade and Production

In 2013–14, India exported more than two lakh (200,000) tonnes of potato (Figure 54). More recent years have witnessed increased potato exports. Pakistan is one of the major export destinations for Indian potato. Short crop duration and cheap labor implies that Indian potato has a price advantage over their European counterparts. However, India remains a miniscule global player, one reason being that there is a 30 percent import duty on potato imports.

Figure 54 India's Potato Exports: Value and Volume

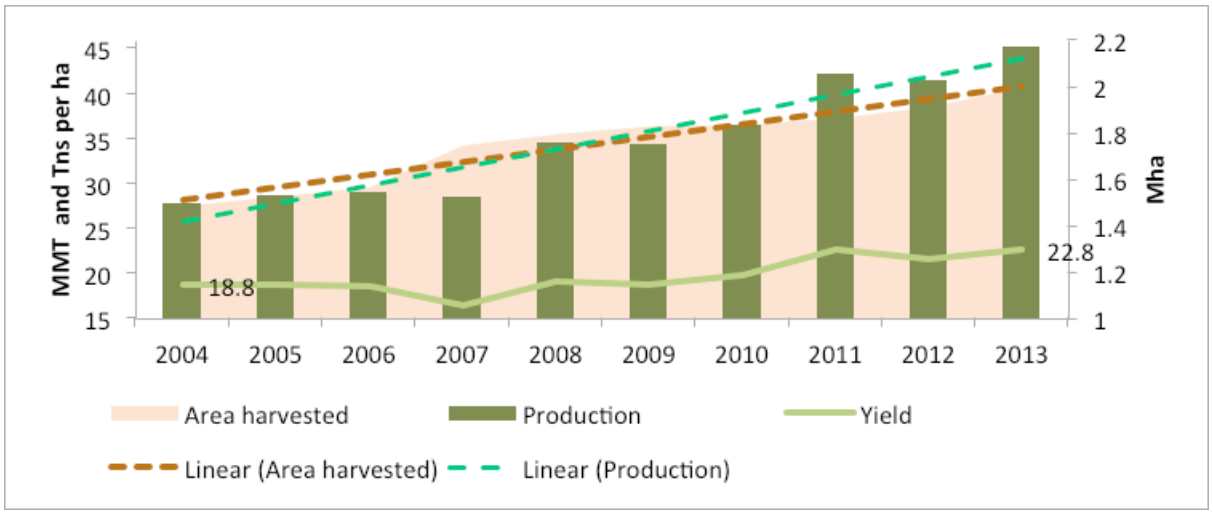


Data Source: APEDA Exchange

What explains the country's large share in world production but its minor role in global trade? This is explained by the domestic growth story of the crop.

As mentioned, India holds the third position in terms of area and second in terms of potato production. Worldwide, India has been in the top 10 producers for the last 20 years.

Figure 55 India's Potato Area, Production, and Yields 2013



Data Source: FAOstat

Since 2004, barring 2007, potato production and yields have grown. Over the 10 studied years, the production increased at an annual average rate of 5.8 percent, and the area under the crop increased by about half that rate, 3.4 percent. The yields in those 10 years went up by more than 21 percent (Figure 55). In 2007, the yield and production of potato were down substantially in the year 2007 due to abrupt weather conditions during the stage of tuber formation and untimely rains in the potato producing states.

Use of true potato seed (TPS) technology has transformed yields and production of potato around the world. Started in China in the 1960s, the TPS technology gained traction when the International Potato Centre in Peru led research and extension services of the TPS technology across world, concentrating more on the developing world. Now the TPS technology is in use around 20 countries, mainly in Southeast Asia, middle and south America, and Africa, including China, India, Vietnam, Bangladesh, Sri Lanka, Nepal, Bhutan, Indonesia, New Zealand, Chili, and Peru, among others.

Potato can be propagated vegetatively and generatively. While the former method entails usage of tubers and stem cuttings, it is the latter, referred to as TPS technology, where the botanical seeds found in berries are used for propagation. Benefits like high multiplication rates, low storage and transportation costs, and lower risks of disease transmission make the TPS technology highly adoptable worldwide.

Potatoes grow in almost all states of India, major states being UP, West Bengal, and Bihar. Seventy percent of the annual potato production in 2013–14 came from these three states, with UP contributing 33.2 percent, West Bengal 22 percent, and Bihar close to 16 percent.

UP is the most important potato state: it produced close to 14 MMT of potato in 2013–14 and has about 29 percent of India's area under the crop.

States like Himachal Pradesh, Gujarat, Maharashtra, Assam, and Karnataka are also important states for potato. Eighty to eighty-five percent of India's potato crop is sown in the *rabi* season, under irrigation, during the short days of October–March. Rainy season potato production takes place in states like Karnataka, Maharashtra, Jammu and Kashmir, Uttaranchal, and Himachal Pradesh.

For the current research, the states of West Bengal and UP were studied.

Price Distortions in Indian Potato

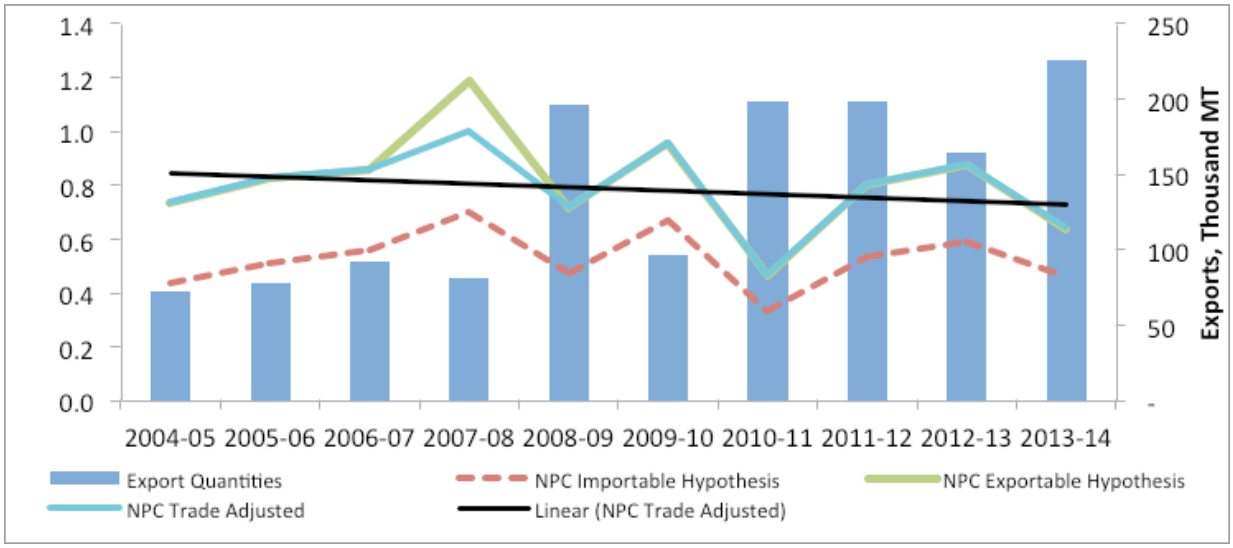
In the absence of an international price time series, the unit value of exports of potato were estimated and used as proxy for the fob price series. For the domestic market, the March and April average wholesale market prices were used for the two states under the study: West Bengal and Uttar Pradesh. The series for the two states is averaged using the production weights.

Key variables estimated were:

- Domestic transportation in the states of West Bengal and Uttar Pradesh:
  - Transportation between the wholesale markets at UP to Mundra and West Bengal to Haldia Sea Port
- Traders' margin and marketing costs: assumed to be 10 percent of the domestic price
- Port handling charges at Mundra Port of Gujarat
- International freight charges between Rotterdam Port and the Mundra Port and Rotterdam Port and Haldia Sea.

Utilizing the collected information, NPCs were estimated under the exportable hypothesis, importable hypothesis. The trade-adjusted NPCs were also estimated by combining the two hypotheses and adjusting for the respective year's trade status (that was endogenously determined using the price difference between the domestic and the international reference price).

Figure 56 NPCs of Potato at Wholesale Market Level



Data Source: APEDA

The NPCs for both the exportable and the importable hypothesis have generally been less than 1, indicating natural export competiveness for Indian potato farmers and suppliers. The fluctuating gap between the two NPC series is reflective of the fluctuating freight between Rotterdam port of Netherlands, and Mundra Port of Gujarat and Haldia Sea Port of West Bengal.

Indian potato exports are small and marginal because of quality, Government policies, and technology reasons, as briefly explained below.

Potato is one of the very crucial consumption items for the average Indian. Because of this, its exports, like that of onions, have been highly regulated by the Government. The fear of higher potato exports squeezing domestic supplies that will drive up domestic prices forces the Government to act sporadically by putting restrictively high MEPs on potato exports. The Government imposed a minimum export price (MEP) of US$450 per MT on potato exports in June 2014 that was removed in February 2015 because of smoother domestic potato supplies and prices. This clearly shows a consumer bias in the trade policy.

India restricted imports of potato seeds with the Central Potato Research Institute (CPRI) solely responsible for developing potato varieties. The varieties produced from the seeds developed by CPRI do not find much favor from potato processors. A study by the Dutch Government (Wustman et al. 2011) showed that in India 97 percent of the seeds used for planting by farmers were of degenerated (used) stock, and only 3 percent of the seeds came from CPRI. This led to lower yields and less acceptability from the processors. The Government lifted this ban on potato seed imports in October 2014 and there has been a surge in the imports; however, the results are only now beginning to show.

Although the Indian potato is free from major prohibitive diseases, they lose ground on sanitary and phytosanitary sanctions like post-harvest mishandling resulting in lower quality and shelf-life, bacterial rot diseases among others.

Lack of infrastructural facilities like the cold storage and limited alternative market outlets (like processing and exports) often result in a market glut leaving the potato farmers suffer huge economic losses.

Fruit: Banana

Banana is the second most important fruit crop in terms of area and most important in terms of production shares in India's fruit basket. Banana is a perennial crop that grows quickly under suitable conditions and can be harvested throughout the year. During the year 2012–13, 103.5 MMT of bananas were produced from a total of 5 Mha of land. With 26 percent of global production and 15.5 percent of world land under the crop, India is the largest producer of banana. In terms of yields, while the world on an average produces about 20.7 tn/ha, India produces about 34.2 tn/ha.

Little more than 17 percent of the bananas produced in the world are exported. As per triennium ending 2013 figures, the world exported 18.5 MMT of banana. Despite being the largest producer of banana, India is not a big player in its global trade. As per triennium ending 2013 the major banana exporters and their share in its exports were: Ecuador (29 percent), Philippines

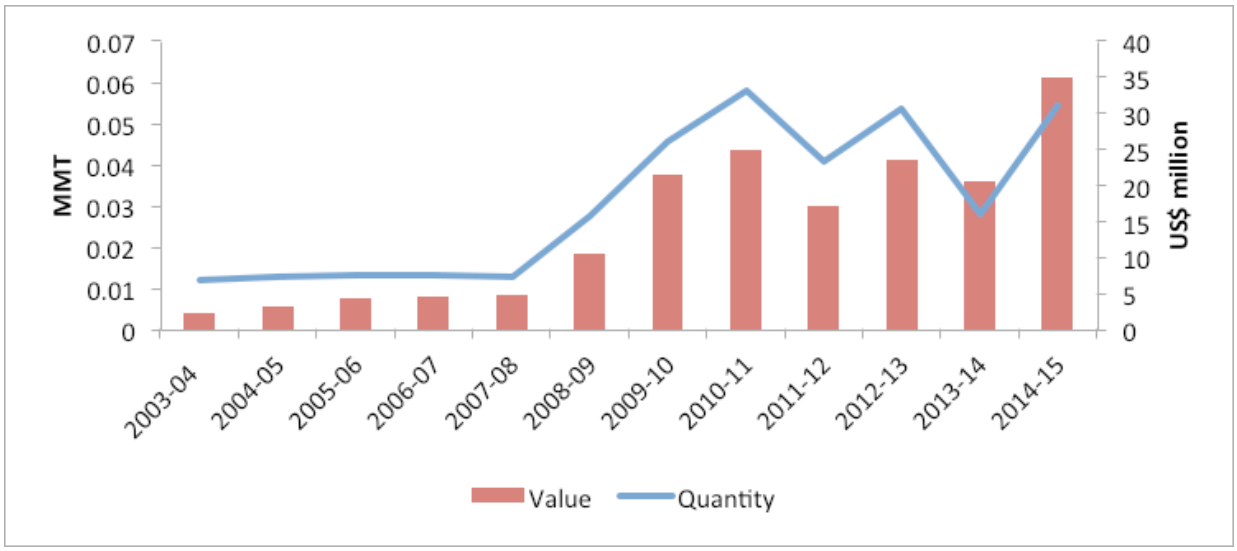
(11.3 percent), Costa Rica (10 percent), Colombia (9.5 percent), and Guatemala (8.5 percent). The United States, Belgium, Germany, Japan, Russia, UK and China are the biggest importers of banana.

Many varieties of bananas are grown commercially. The main commercial varieties in India are Grand Naine, Robusta, Dwarf Cavendish, Red Banana, and Nendran. However, the variety that is mainly exported is Grand Naine/Cavendish. In the current study, we determine trade distortions of this variety of bananas.

Domestic Banana Trade and Production

India is a growing player in banana exports. It exported about 55,000 MTs of banana in 2014–15, earning about US$35 million (Figure 57). But with 15.5 percent of the global area under banana, India, with about 26 percent of the global production, India has less than a 0.3 percent share in world exports as it exports only about 0.2 percent of its annual produce. Gulf countries are a major export destination for India's bananas, which mainly go to the United Arab Emirates, Bahrain, Saudi Arabia, Iran, and Kuwait.

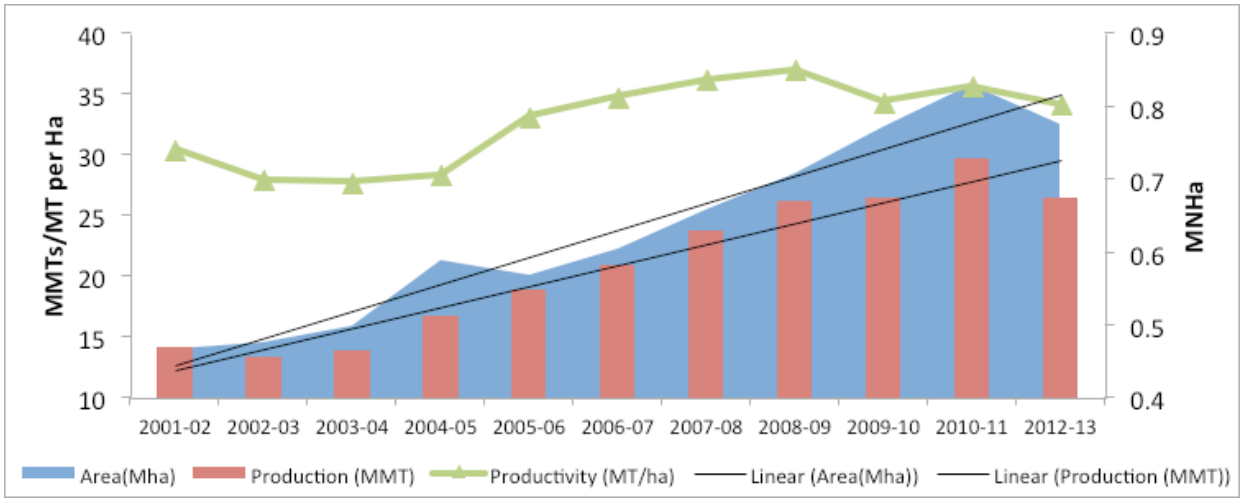
Figure 57 India's Banana Exports: Value and Volume



Data Source: US CommTrade

India's banana production levels and area under the crop have increased significantly in the last few years (Figure 46). A number of factors have contributed to improved yields, area and production levels. These factors have included: introduction of high yielding varieties like Grand Naine; increased use of disease-free planting and new irrigation techniques like drip irrigation; and adoption of integrated pest management (IPM) practices.

Figure 58 India's Banana Area, Production, and Yields



Data Source: NHB

Tamil Nadu, Maharashtra, Gujarat, Andhra Pradesh, Karnataka are the main banana producing states in India, with Tamil Nadu alone producing about 20 percent of India's bananas. During 2012–13, the all-Indian average yield of banana was 34.2 tn/ha. States with higher yields than this were Madhya Pradesh (66 tn/ha), Gujarat (64.1 tn/ha), Bihar (51.5 tn/ha), Tamil Nadu (46.1 tn/ha), Maharashtra (43.9 tn/ha), and Andhra Pradesh (35 tn/ha).

The grand Naine variety of banana, which is the most favored variety for exports, is cultivated in sizeable quantities in Maharashtra and Gujarat.

Banana Trade Policy

Banana exports are free and under the "Merchandise Exports from India Scheme" (MEIS) banana exporters get 5 percent of the fob value of their banana exports as an incentive. Apart from this, APEDA extends financial assistance to registered exporters of banana for creation of infrastructure for post-harvest handling; specialized cold storage creation; mechanized grading, sorting, and packaging; and for market promotion and quality development. Banana exporters are also given freight subsidization by APEDA. There is a 30 percent import duty on banana imports.

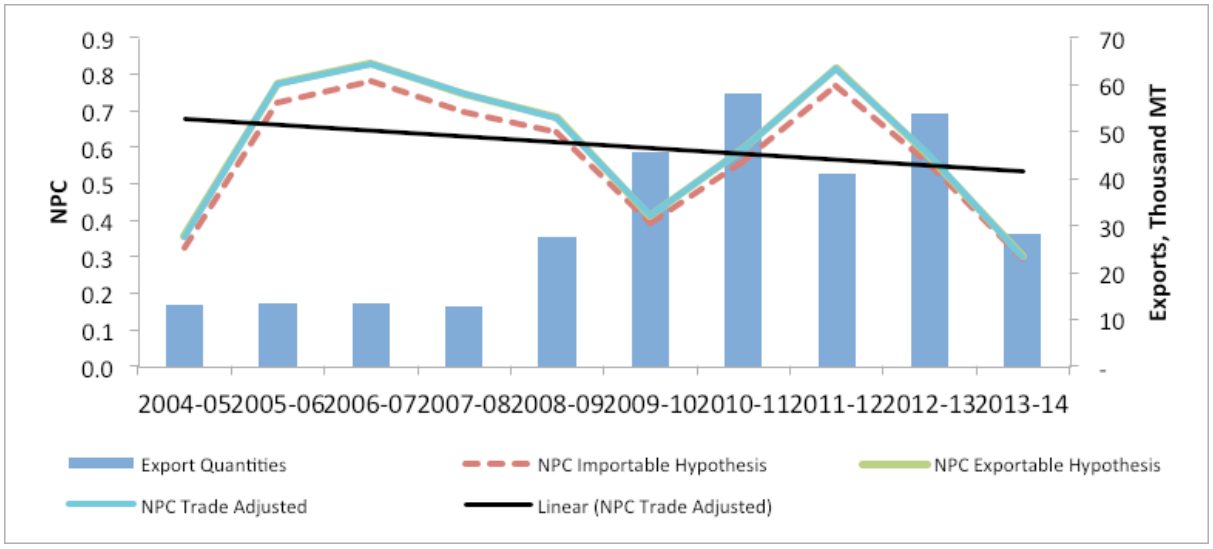
Trade Distortions in Indian Banana

The calculation of trade distortions requires two price series: an international supplier's fob price and domestic price. In the absence of an international fob price series for banana, the unit value of exports is used as its proxy.

The wholesale market prices were taken for the Maharashtra and Gujarat mandis. Even though banana crops are harvested throughout the year, the banana harvest starts increasing in April and peaks in October–November. Thus, the wholesale prices in the two mandis for the months of June-July and Oct–Nov were utilized. A wholesale price series that is representative of the two big markets supplying the exportable variety of banana was estimated by aggregating the two price series using production weights.

The NPCs were estimated by incorporating factors like freight, margins, and domestic transportation into the initial evaluation. The Philippines, India's competitor, was used to estimate the freight between Mundra/JNPT port of India and Davao Port of the Philippines. With 10 percent accounting for the traders' and marketing margin, the NPC estimates are shown in Figure 59.

Figure 59 NPCs of Banana at Wholesale Market Level



Data Source: DGCIS

Lower than 1 NPC consistently or negative NRP suggest a consumer bias in the policy and/or the existence of export restrictions. A look at trade status of Indian banana each year, shows them to be exportable 100 percent of the time. Most of the horticultural farmers are small-farm cultivators with low average yields as low as 15 tn/ha (FAO 2010)). About 20–25 percent of the produce is wasted due to poor post-harvest management and a dearth of cold-chain infrastructure facilities. Even the land policies discourage larger scale farming. In such situations, a typical Indian banana farmer is only able to export because of the financial, infrastructural, and other export related support from the Central and state governments.

Fruit: Mango

In 2013 the world produced about 41.2 MMT of mangoes, of which India produced about 40 percent. China (11 percent), Thailand (7 percent) and Indonesia (5 percent) are some of the other important mango producers. Mexico (20 percent), India (16 percent), Thailand (12 percent), and Brazil (9 percent) are mango exporters. The United States is the biggest importer, with a share of 33 percent of the world's mango imports in triennium ending 2013, followed by the Netherlands with a 14 percent share and Saudi Arabia with 6 percent share.

Domestic Mango Trade and Production

In terms of area under the crop, mango is the most important fruit for India. The country grows more than one thousand varieties of mango; however, only 30 are harvested commercially in various states. In 2013–14, India produced 18.7 MMT of mango from 2.5 million hectares, almost 50 percent of which was from the states of UP (23 percent), AP (15 percent), and Karnataka (9.5 percent).

India has a large advantage in the international mango market for three reasons. One, it is a leading producer and exporter of the internationally favored variety of mango called the Alphonso; second is the relatively longer period of availability of Indian mangoes (March–August); and third is the large number of mango varieties India has on offer. However, countries like Mexico, Brazil, and even Pakistan have a higher percent of production exported compared to India. There are many reasons for this. Just as with the overall Indian farming practices, mango farming is a small-farm activity: about 72 percent of the farms in 2013 were less than 3 ha. And due to lack of infrastructure facilities, more than 15 percent of the mango produced goes to waste (Agmarknet). Besides, the small farmer is unaware of the internationally required quarantine and phytosanitary requirements, because of which he is unable to capitalize on export opportunities.

India exports various forms and parts of mangoes: mango juice, pulp, fresh mangoes, sliced and dried, flour, kernel, and slices in brine. The current study is on fresh mango exports, specifically of the premium variety, alphonso.

Figure 60 India's Mango Exports: Value and Volume

Data Source: APEDA Exchange

India exported 42,998 MT of mango in 2014–15, earning about US$50 million or INR 302 crore (Figure 60). The United Kingdom, Kuwait, Malaysia, Netherlands, Bangladesh, and some Arab countries in the Persian Gulf are regular export destinations for Indian mango.

Mango Trade Policy

Mango exports are free, and under the "Merchandise Exports from Indian Scheme" (MEIS) mango exporters get 5 percent of the realized fob value of their mango exports as rewards. In addition, APEDA extends financial assistance to registered exporters of mango for creation of infrastructure for post-harvest handling; specialized cold storage creation; mechanized grading, sorting, and packaging; and for market promotion and quality development. Mango exporters are also given freight subsidization by APEDA. There is a 30 percent import duty on mango imports.

Not prices, but the high freight, varietal/grading issues, sanitation, and pests restrict India's mango exports. The high costs of certification (in the case of the United States), delays in finalization of protocols on phytosanitary measures and certification measures (in the case of China), and the presence of fruit flies and weevils (in the case of Australia and New Zealand) have been some of the non-tariff barriers restricting entry of Indian mango in some countries.

Trade Distortions in Indian Mango

The wholesale prices of Indian mango in the Maharashtra and Gujarat mandi were compared with an international fob price. In the absence of any relevant international price series, the unit value of exports was used as its proxy. To make a comparison of international competition, the study was also done for the Karachi market in Pakistan.

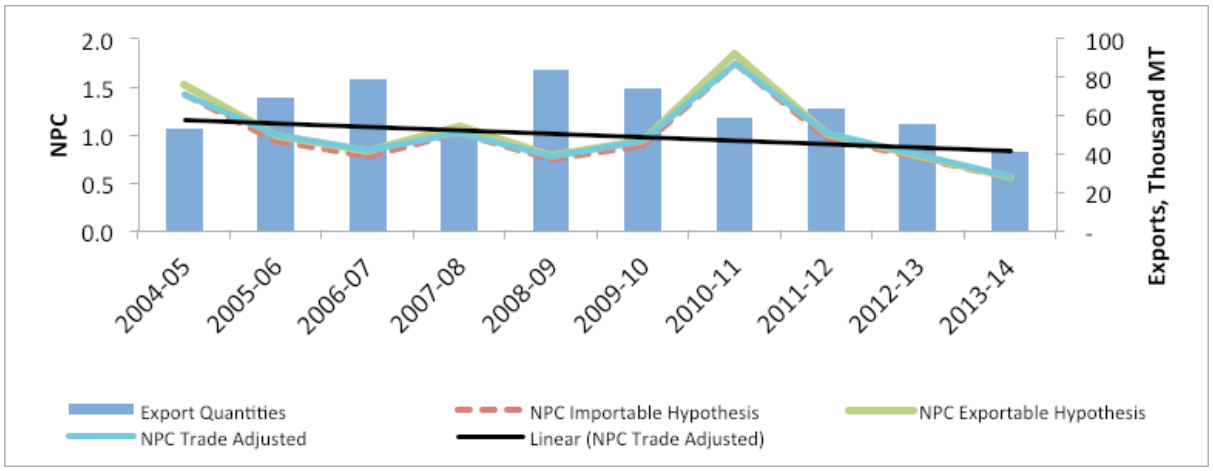
Districts in Gujarat and Maharashtra are focal producers of Alphonso mangoes in India. For the domestic price series, the wholesale price series was examined in Nashik and Junagarh districts of the two states, respectively. The wholesale price series is taken from Agmarknet and the two series are combined using production weights.

Next is the calculation of NPCs for Indian mangoes. By adjusting for international freight (Karachi, Pakistan to JNPT, Maharashtra, and Mundra, Gujarat), domestic transportation (average rate of transportation between Nashik (Maharashtra) to JNPT and between Junagarh (Gujarat) to Mundra), marketing costs and margins (10 percent) and port handling charges (average of charges for JNPT and Mundra) the international reference prices were estimated under the exportable and importable hypothesis.

The traders' and marketing margins, for all four horticulture crops in the study (mango, banana, onion, and potato), were taken as 10 percent of the domestic prices. Traders and experts told the study authors that, because of the perishability, bulkiness, and seasonality of these horticulture crops, their marketing becomes complex and risky and thus the traders/middle-men demand high shares of margin.

By combining the estimated NPC series under the exportable and the importable hypothesis with the endogenously determined annual trade-status of mangoes, trade-adjusted NPCs were determined (blue line in Figure 61).

Figure 61 NPCs of Mango at Wholesale Market Level



Data Source: DGCIS

Indian mangoes were exportable in 6 of the 10 studied years, import-competing in three (2004–05, 2007–08 and 2010–11), and non-tradable in one year (2011–12). Clearly, exports have followed relative price trends. Exports of perishable commodities like fruits and vegetables are highly sensitive to transportation and freight charges. Also as the Government subsidizes and rewards mango exporters, they were able to export even when domestic mango prices were high.

Section IV:
Analysis and Conclusions

It is important to bear in mind three things when considering the study's NPC estimates. One, the comparisons are adjusted, to the extent possible, for specification and quality differences so the price differences will provide estimates of the true economic distortions. Two, the NPC estimates for all commodities are at the wholesale level and the freight and domestic charges (port handling and transportation), that are used for calculating reference prices, are averages across studied states and ports Three, the studied period encompasses the 2007-08 global food crisis. Because of this, exports of some (restricted) commodities were lower than normal, while exports of commodities that benefitted during this time from an open trade policy and rising competitor prices were higher than normal. For importables, by contrast, higher world prices tended to reduce imports, while lower protection rates introduced as a consequence tended to increase imports.

Before summarizing the analysis of NPCs for the 15 commodities, we summarize below the endogenously determined trade status (that is already shared and analyzed under each commodity section separately) for each commodity (Table 20). This trade status, as already detailed in the Section on 'Study Methodology', is estimated using three price series for every commodity, namely the domestic price (D), the importable reference price (Mr) and the exportable reference price (Xr). The prices were analyzed as follows:

1. If D > Mr, then it shows that the domestic commodity is not competitive and has to face and compete with imports, which is denoted as import-competing or "M."
2. If D < Xr, then it shows that the domestic commodity is export-competitive, thus would be exportable and denoted as "X."
3. If D is between Xr and Mr, then the designation will be "N" or non-tradable.

The endogenously determined trade status results are used to estimate the trade-adjusted NPC curves referred to throughout in the last Section.

Table 20 Trade Status of the 15 Commodities, 2004–05 to 2013–14

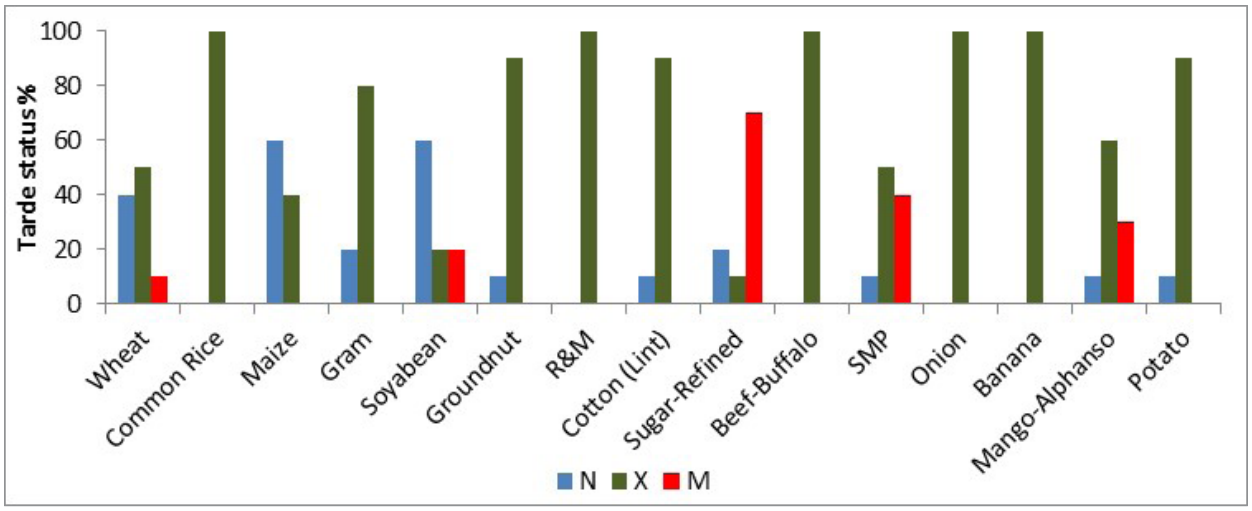
Years	Wheat	Common rice	Maize	Gram	Soybean	Groundnut	R&M
2004–05	N	X	N	N	N	X	X
2005–06	N	X	N	N	N	X	X
2006–07	X	X	N	X	N	X	X
2007–08	N	X	X	X	X	X	X
2008–09	X	X	N	X	N	X	X
2009–10	N	X	N	X	M	X	X
2010–11	M	X	X	X	X	X	X
2011–12	X	X	X	X	N	X	X
2012–13	X	X	X	X	N	N	X
2013–14	X	X	N	X	M	X	X

Years	Cotton (Lint)	Sugar-refined	Buffalo meat	SMP	Onion	Banana	Mango alphanso	Potato
2004–05	X	M	X	X	X	X	M	X
2005–06	X	M	X	X	X	X	X	X
2006–07	X	N	X	X	X	X	X	X
2007–08	X	M	X	X	X	X	M	N
2008–09	N	M	X	N	X	X	X	X
2009–10	X	M	X	M	X	X	X	X
2010–11	X	N	X	M	X	X	M	X
2011–12	X	X	X	M	X	X	N	X
2012–13	X	M	X	M	X	X	X	X
2013–14	X	M	X	X	X	X	X	X

Note: X = exportable; M = import-competing; N = non-tradable. R&M refers to rapeseed and mustard seed and SMP is skimmed milk powder.

Over the 10 year period of study (2004–05 to 2013–14), the studied 15 commodities were on average 72 percent of the time exportable, 11 percent of time import-competing, and leaving 17 percent of the time when they were in the non-tradable zone (Figure 62).

Figure 62 Trade Status of 15 Commodities (Percent in 10 years)



Note: N = non-tradable; X = exportable; M = import-competing

For commodities like common rice, shelled-groundnut, cotton-lint, buffalo meat, onion, banana, and potato the country was, on an average, 90 to 100 percent of the time exportable in the studied 10 years. Sugar and SMP trade are more import-competing. India's most important oilseed, soybean, is largely in the non-tradable zone. India's wheat is either trade-neutral or export-competitive, but falling global prices in 2010–11 made it import-competing in that year. Maize too has largely been in the non-tradable zone. Rising domestic mango prices in 3 of the 10 studied years made mangoes import-competing.

We next analyze estimated NPCs of the 15 commodities, under two broad headings:

1. NPCs under the exportable and importable hypothesis, and
2. Trade-adjusted NPCs based on the endogenously determined trade status.

The estimated nominal protection coefficients (NPCs) for the 15 commodities, separately under the exportable and importable hypothesis, are examined next (Table 22). (The appendix gives NRP estimates for these commodities.)

Except for a few cases, NPCs for all commodities are lower than or equal to 1, suggesting a tendency towards taxation of the agricultural sector. In particular, these estimated NPCs appear to fluctuate immensely around their trend lines (for all commodities, linear trend lines are added in the respective NPC figure). We summarize the observed trends below.

During the studied period, of the 15 commodities, the trend lines sloped negatively for 10 (rice, wheat, maize, gram, cotton, sugar, buffalo meat, banana, mango, and potato), positively for one (SMP) and parallel to the x-axis for four (onion, groundnut, R&M, and soybean). A negatively sloping trend line indicates falling NPCs over time, perhaps resulting from falling domestic prices and/or rising global prices. Trend lines parallel to the x-axis indicate to lesser fluctuations in the price ratio through the studied period. A positive sloping trend line refers to a situation of rising domestic prices vis-à-vis stable or moderating global prices. However, more than the direction of change, it is the average value of NPC for any commodity, which if is away from one in the longer run, role of trade and market-distorting policy becomes evident. Thus, we next look at average NPCs for all commodities

Table 21 Commodity-wise Estimates of NPCs (2004–05 to 2013–14)

Estimates for Nominal Rates of Protection (NPC)

Mable Hypothesis	Wheat	Common Rice	Maize	Gram	Soyabean	Groundnut	Rape/ Mustard	Buffalo Meat	SMP	Cotton	Sugar	Onion	Potato	Mango	Banana
2004–05	0.72	0.90	0.79	1.00	0.98	0.62	0.78	0.69	0.86	0.75	1.29	0.41	0.43	1.41	0.32
2005–06	0.88	0.87	0.82	0.97	0.90	0.61	0.72	0.71	0.89	0.84	1.20	0.36	0.51	0.93	0.72
2006–07	0.74	0.78	0.78	0.74	0.93	0.60	0.62	0.86	0.77	0.76	0.93	0.33	0.56	0.76	0.78
2007–08	0.97	0.83	0.69	0.76	0.85	0.53	0.70	0.86	0.59	0.79	1.05	0.56	0.70	1.01	0.69
2008–09	0.58	0.66	0.80	0.86	0.97	0.57	0.76	0.61	0.99	0.93	1.02	0.29	0.48	0.73	0.64
2009–10	0.78	0.65	0.82	0.76	1.00	0.71	0.75	0.56	1.22	0.85	1.09	0.37	0.67	0.87	0.39
2010–11	1.14	0.80	0.68	0.70	0.84	0.65	0.71	0.63	1.21	0.55	0.99	0.34	0.33	1.73	0.56
2011–12	0.64	0.63	0.68	0.79	0.89	0.40	0.66	0.74	1.25	0.49	0.90	0.43	0.54	0.96	0.77
2012–13	0.76	0.67	0.65	0.96	0.94	0.95	0.80	0.69	1.10	0.80	1.01	0.35	0.59	0.75	0.55
2013–14	0.69	0.95	0.93	0.74	1.01	0.64	0.80	0.63	0.77	0.75	1.04	0.46	0.46	0.54	0.29

Xable Hypothesis	Wheat	Common Rice	Maize	Gram	Soyabean	Groundnut	Rape/ Mustard	Buffalo Meat	SMP	Cotton	Sugar	Onion	Potato	Mango	Banana
2004–05	1.02	0.89	1.41	1.05	1.27	0.67	0.95	0.80	0.89	0.84	1.62	0.48	0.74	1.51	0.35
2005–06	1.33	0.94	1.43	1.04	1.17	0.68	0.87	0.81	0.91	0.95	1.44	0.42	0.83	0.99	0.77
2006–07	0.98	0.82	1.09	0.78	1.13	0.64	0.76	0.98	0.79	0.85	1.09	0.39	0.86	0.83	0.83
2007–08	1.22	0.86	0.94	0.81	0.97	0.56	0.81	0.96	0.60	0.88	1.30	0.64	1.19	1.07	0.74
2008–09	0.68	0.70	1.13	0.90	1.15	0.61	0.89	0.65	1.01	1.03	1.19	0.32	0.72	0.77	0.68
2009–10	1.04	0.70	1.25	0.81	1.21	0.78	0.90	0.61	1.25	0.95	1.23	0.42	0.96	0.93	0.41
2010–11	1.64	0.86	0.89	0.73	0.96	0.69	0.84	0.67	1.23	0.58	1.10	0.38	0.47	1.83	0.59
2011–12	0.76	0.67	0.86	0.82	1.02	0.41	0.76	0.79	1.27	0.51	0.99	0.48	0.80	1.00	0.81
2012–13	0.98	0.71	0.78	0.99	1.05	1.01	0.90	0.74	1.12	0.86	1.15	0.40	0.88	0.78	0.57
2013–14	0.80	0.90	1.21	0.77	1.12	0.68	0.93	0.67	0.78	0.80	1.19	0.51	0.64	0.55	0.30

Source: Authors' estimates

A look at the 10-year average NPCs in Table 22 shows that six out of the 15 studied commodities had NPCs closer to or greater than 1 under the exportable hypothesis. These were wheat, maize, SMP, soybean, sugar, and mango (The appendix gives category wise estimates of weighted average NPCs for exportable, importable, and total).

Table 22 Average NPCs

Three year average

Mable Hypothesis	Wheat	Common Rice	Maize	Gram	Soybean	Groundnut	R&M	Buffalo Meat	SMP	Cotton	Sugar	Onion	Potato	Mango	Banana
2004/05–2006/07	0.78	0.85	0.80	0.90	0.94	0.61	0.71	0.75	0.84	0.78	1.14	0.37	0.50	1.04	0.61
2007/08–2009/10	0.78	0.71	0.77	0.80	0.94	0.61	0.74	0.68	0.93	0.86	1.05	0.41	0.61	0.87	0.57
2010/11–2012/13	0.85	0.70	0.67	0.82	0.89	0.67	0.72	0.68	1.19	0.61	0.97	0.37	0.49	1.15	0.63
2013–14	0.69	0.95	0.93	0.74	1.01	0.64	0.80	0.63	0.77	0.75	1.04	0.46	0.46	0.54	0.29

Xable Hypothesis	Wheat	Common Rice	Maize	Gram	Soybean	Groundnut	R&M	Buffalo Meat	SMP	Cotton	Sugar	Onion	Potato	Mango	Banana
2004/05–2006/07	1.11	0.88	1.31	0.96	1.19	0.66	0.86	0.87	0.86	0.88	1.39	0.43	0.81	1.11	0.65
2007/08–2009/10	0.98	0.75	1.11	0.84	1.11	0.65	0.87	0.74	0.95	0.95	1.24	0.46	0.95	0.92	0.61
2010/11–2012/13	1.13	0.74	0.84	0.85	1.01	0.70	0.83	0.73	1.21	0.65	1.08	0.42	0.72	1.20	0.66
2013–14	0.80	0.90	1.21	0.77	1.12	0.68	0.93	0.67	0.78	0.80	1.19	0.51	0.64	0.55	0.30

Five year average

Mable Hypothesis	Wheat	Common Rice	Maize	Gram	Soybean	Groundnut	R&M	Buffalo Meat	SMP	Cotton	Sugar	Onion	Potato	Mango	Banana
2004/05–2008/09	0.78	0.81	0.77	0.87	0.92	0.59	0.72	0.75	0.82	0.81	1.10	0.39	0.54	0.97	0.63
2009/10–2013/14	0.80	0.74	0.75	0.79	0.94	0.67	0.74	0.65	1.11	0.69	1.01	0.39	0.52	0.97	0.51

Xable Hypothesis	Wheat	Common Rice	Maize	Gram	Soybean	Groundnut	R&M	Buffalo Meat	SMP	Cotton	Sugar	Onion	Potato	Mango	Banana
2004/05–2008/09	1.05	0.84	1.20	0.92	1.14	0.63	0.86	0.84	0.84	0.91	1.33	0.45	0.87	1.03	0.68
2009/10–2013/14	1.04	0.77	1.00	0.82	1.07	0.71	0.86	0.70	1.13	0.74	1.13	0.44	0.75	1.02	0.54

10 year average

	Wheat	Common Rice	Maize	Gram	Soybean	Groundnut	R&M	Buffalo Meat	SMP	Cotton	Sugar	Onion	Potato	Mango	Banana
Mable Hypothesis	0.79	0.77	0.76	0.83	0.93	0.63	0.73	0.70	0.97	0.75	1.05	0.39	0.53	0.97	0.57
Xable Hypothesis	1.05	0.80	1.10	0.87	1.10	0.67	0.86	0.77	0.99	0.82	1.23	0.44	0.81	1.02	0.61

Comparing between years, another observation about the impact of the global food crisis of 2007–08 is very clear. Rising global prices made many Indian products very export-competitive. In cases of commodities like rice, and wheat, the restrictive trade policy prohibited the exporters from fully exploiting the trade opportunity, but for other agri-commodities like buffalo meat, onion, and groundnut, the crisis translated into greater export opportunities.

We next combine the endogenously determined trade-status of each commodity for each year with the estimated NPCs under exportable and importable hypothesis to determine the trade adjusted NPCs (NPC TA). Summary of these are given in Table 23.

Table 23 Commodity wise NPC Trade-adjusted estimates

	Wheat	Common Rice	Maize	Gram	Soyabean Seed	GN–shelled	R&M Seed	Cotton (Lint)	Sugar–Refined	Buffalo Meat	SMP	Onion	Banana	Mango–Alphanso	Potato
2004–05	1.00	0.89	1.00	1.00	1.00	0.67	0.95	0.84	1.29	0.80	0.89	0.48	0.35	1.41	0.74
2005–06	1.00	0.94	1.00	1.00	1.00	0.68	0.87	0.95	1.20	0.81	0.91	0.42	0.77	0.99	0.83
2006–07	0.98	0.82	1.00	0.78	1.00	0.64	0.76	0.85	1.00	0.98	0.79	0.39	0.83	0.83	0.86
2007–08	1.00	0.86	0.94	0.81	0.97	0.56	0.81	0.88	1.05	0.96	0.60	0.64	0.74	1.01	1.00
2008–09	0.68	0.70	1.00	0.90	1.00	0.61	0.89	1.00	1.02	0.65	1.00	0.32	0.68	0.77	0.72
2009–10	1.00	0.70	1.00	0.81	1.00	0.78	0.90	0.95	1.09	0.61	1.22	0.42	0.41	0.93	0.96
2010–11	1.14	0.86	0.89	0.73	0.96	0.69	0.84	0.58	1.00	0.67	1.21	0.38	0.59	1.73	0.47
2011–12	0.76	0.67	0.86	0.82	1.00	0.41	0.76	0.51	0.99	0.79	1.25	0.48	0.81	1.00	0.80
2012–13	0.98	0.71	0.78	0.99	1.00	1.00	0.90	0.86	1.01	0.74	1.10	0.40	0.57	0.78	0.88
2013–14	0.80	0.90	1.00	0.77	1.01	0.68	0.93	0.80	1.04	0.67	0.78	0.51	0.30	0.55	0.64

Cross-referring to the diagrammatic representation of these curves given under each commodity section, we find these trade-adjusted (TA) NPCs to be overlapping NPCs under exportable hypothesis (EH)[15] for all years for six of the 15 commodities: common rice, groundnut, rape and mustard seed, onion, banana, and buffalo meat. Except for a few years, even the NPC TA curves of gram, cotton, and potato map NPC EH curve.

The NPC TA curve maps the NPC curve under importable hypothesis (MH)[16] for mango, and sugar. However, for commodities like wheat, maize, and soybean, the NPC TA curve lies mostly between the NPC EH and MH[17]. In case of SMP, the gap between the NPC under EH and MH is very small and all the three curves (EH, MH and TA) are very placed very closely. For 6 out of the 10 years, the TA curve overlaps the EH curve and for the remaining four years it overlaps the MH curve.

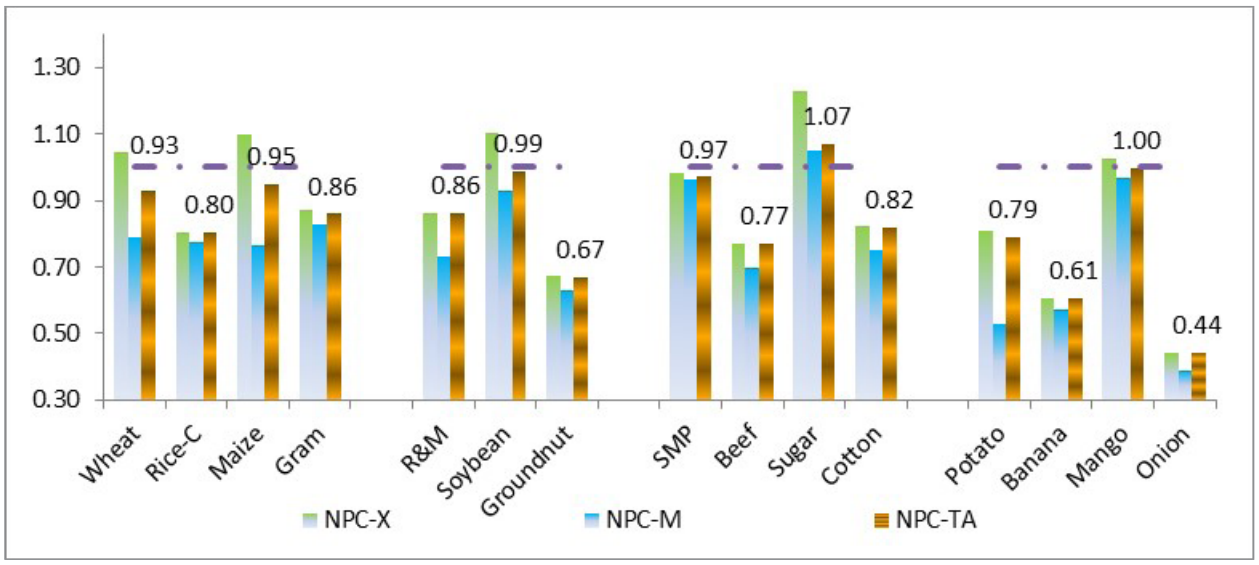
Looking at the average NPC figures for these commodities (Figure 63), we see that only one commodity (sugar) had an average NPC greater than one. Mangoes had an NPC exactly equal to one. For three more commodities, maize, soybean and SMP, the 10 year average NPC TA was quite close to one. Wheat, with an average NPC of 0.93 was only lightly taxed by trade policy. Of the other key staples, rice (common) was taxed by 20 percent and potatoes by 21 percent. Buffalo meat was taxed an average of 23 percent, while groundnuts were taxed by 33 percent. Bananas were taxed by 39 percent on average, and onions by a staggering 56 percent. These results, of general taxation of the agricultural sector, are much closer to the picture for developing countries found in Krueger, Schiff and Valdes (1988) than the picture of generally positive support found in Anderson (2008).

[15] When the TA curve overlaps the EH curve, the commodity is said to be exportable.

[16] When the TA curve overlaps the MH curve, the commodity is import-competing.

[17] In case, the TA curve is between the MH and EH curve, the commodity is treated as non-tradable for those years.

Figure 63 10-Year average Trade-adjusted NPCs



As was also highlighted in individual commodity sections, if one compared NPC estimates with the actual trade flow, one finds that for some years and some commodities, exports have grown despite NPC estimates being greater than 1(like maize and sugar) and for others, exports have not grown despite low NPC estimates (like common rice, potato, banana, and onion). The answer probably lies in two factors: the freight advantage that India has over global competitors in some products in supplying to neighboring countries and the impact of prevailing policies.

Overall, Indian policies governing trade mainly for crops like rice, wheat, onion and potato has oscillated between free trade and restrictions/bans. Because of this, these commodities are frequently not available for export. Then there are commodities like sugar that are exported despite high NPCs mainly because of the incentives and support that exporters receive from the government.

In case of some commodities, geographical location of an Indian port gives economic legitimacy to growing exports of a commodity with otherwise high NPCs. For example, in the case of fresh fruits and vegetables, and livestock such as buffalo meat, trade is highly sensitive to transport and handling costs, and increased export opportunities to neighboring countries have triggered Indian exports despite a positive market price differential. Even for food grains and bulk commodities, the players were found to be competing more on freight difference than on the inherent commodity price differential. Commodities like sugar competed due to the massive rates of export subsidization given by the Government to its sugar millers. Thus, despite NPCs of many studied agri-commodities being close to or greater than 1, exports of these commodities continued.

Additionally, the depreciating Indian rupee vis-à-vis the U.S. dollar during the studied period played an important role in making Indian exports competitive globally. From 48.4 INR/US$ in 2002–03, the Indian currency traded at 60.2 INR/US$ in 2013–14.

Conclusion

Indian agri-trade policy is observed to have fluctuated in the past. With a motivation to stall transmission of volatile global prices into domestic markets, Indian policy makers have been oscillating the policy between bans and restrictions on one side and free trade on the other. However, recent experience (during and post the 2007–08 global food crisis) and research (Saini and Gulati 2015) unveiled the fallacy in this line of thinking. Irrespective of trade bans/restrictions, the Indian domestic prices converged with their global counterparts in the medium to long run and the only purpose served by these bans and restrictions was to smooth this convergence process.

Government's excessive intervention within the domestic food and agricultural markets was also identified as inefficient and fiscally unsustainable. When the government encourages production and yields of commodities, it has also to ensure deep and wide markets for the final produce. If the exports are restricted and private participation is limited (due to restrictive policies like the ECA, APMC), the final burden of adjustment falls on the Government who then has to become the buyer-of-last-resort and incur huge costs of expanding stockholding in the country.

Even India's tariff policy was observed to be countercyclical across commodities and across time for same commodities. There are three examples in this regard. One is edible oil, which is a major import item in the overall agri-trade, and whose import duties are observed to be moving negatively with its global prices— i.e. duties are reduced when global prices rise and increased when global prices fall. This reflects the deep influence of domestic edible oil players on the policymakers. Two, is rice or any other highly exportable Indian commodity whose imports are subject to high duties. It is a rather confounding and a counter-intuitive policy to follow by India where imports of a highly export competitive commodity are restricted by high import duties. Sugar is the third case, where apart from being countercyclical, the trade policy is highly ad hoc and reactive. Import duties are reduced when mills need raw sugar to sustain, and duties are increased when global prices fall. The domestic suppliers are hugely protected much to the detriment of the scarce fiscal resources, which are spent on them for their survival.

Indian trade policy's intrinsic consumer-bias is another important aspect highlighted in this study. Such policies more than often harm the farmers' interests, whose scope of getting higher returns globally are curbed at the prospect of the trade translating into rising domestic prices.

The Way Forward

Indian agriculture's future intertwines with India's quest for its twin goals of food security and self-sufficiency. Not surprisingly, the policies governing the food and agriculture sector are also subservient to the twin goals.

India has come a long way since its days of famines and droughts (noted famines were the Bengal Famine of 1770, when close to 10 million people starved to death and Orissa famine of 1866, when more than 1 million people died of hunger (Sen 1981 and Mohanty 1993) and days when under food-aid programs it had to import food (the biggest food aid that India received was during the 1960s under the Public Law 480 (or PL480) from the US) to feed its people. Today, India is not only grain-surplus but also net grain exporting, especially during 2011–15. From

subsistence farming, the country's cultivation methods today are intensive and technology-led. The production base is reasonably strong and growing. The country exported 62 MMT of cereals in the three years since 2012–13. It is today globally the largest milk, cotton, banana, and chickpea producer and the largest groundnut, rice, and buffalo meat exporter.

Despite this success, the country holds indelible impressions of bitter experiences from its historical times. Inherent fears of a food crisis still influence many of country's policy designs and reforms and the perversely high levels of India's poverty and malnutrition deepen these fears and country's policy drive to address it. India is home to the world's largest number of poor and malnourished children. More than 21 percent of the country's 1.2 billion-plus population still lives below US$1.9/day/capita. About 68 percent of Indians still live in rural areas and 58 percent of these households are still agricultural. Almost 85 percent of Indian farms—cultivating around 44 percent of the country's area—are small and marginal (less than 2 ha). The food supplies are still highly vulnerable to weather and climatic conditions and the demand pattern is still largely cereal-centric.

Compelled by these factors, Indian government has always assumed a central role in the food and agricultural management in the country. However, recent global and domestic experiences and impact assessment of various government policies, interventions, and programs have highlighted inefficiencies in government systems and processes.

Indian policy makers have long been in pursuit of relative self-reliance in food and almost complete self-sufficiency in the basic staples, rice, and wheat. The reasons behind this were threefold: first, bitter experiences (as stated before) of the country from famines and food imports (under PL480). Second, perpetual shortage of foreign exchange, at least until 1991, that restricted country's ability to import food to feed its growing populations. Third, India being a populous country, it was felt by policymakers that its entry into the global food market as a big buyer will harden prices globally that will be transmitted eventually into domestic markets. Now, the Indian policy makers are increasingly acknowledging the futility and unattainability of aiming for complete self-sufficiency in food, and wherefore the debate is very rightly moving toward ways to attain self-reliance instead.

Indian policymaking is very sensitive to consumer sentiments, mainly with regard to food prices. Thus, no political party wants to allow any significant increase in food prices, least of all from global forces. The experience during the 2007–08 Global Food Crisis raised questions on this deep-rooted thinking of policymakers and about role played by trade restricting policies in insulating domestic markets from global price volatility. Today, the country understands that in the present global times, through multiple conduits, the global price trends are in fact, transmitted into domestic boundaries. Bans and restrictions can surely defer the transmission but there is no denial about the two prices—global and domestic—converging in the medium to longer run.

Evaluating reports of the Indian government's largest food-based welfare system, PDS that distributed highly subsidized rice and wheat to identified Indian vulnerable consumers (under NFSA, 81.3 crore individuals are distributed 62 MMT of rice and wheat annually) show the system to be marred by perverse inefficiencies. Research (Saini and Kozicka 2014 and Saini and Gulati 2015) identifies the system as highly ineffective, inefficient and unfeasibly expensive. Farmers in not more than five states benefit from this procurement system and 40–50 percent

of the grains meant for poor never reach the real poor (Gulati and Saini 2015 and HLC 2015). In light of the evaluation reports and the ongoing financial inclusion drive, the current debate is moving towards replacing PDS's or NFSA's physical distribution of grain with a direct cash transfer. However, it is a long way yet to this transition. In the short to medium run, greater Government involvement is to continue at least in the rice and wheat markets. This in fact is enough to lend a flavor of uncertainty to India's ongoing and future agricultural trade policy in general and to rice and wheat trade policies in particular.

India is one of the most populous, influential, and transformational economies in the world today. The IMF tags it as the world's fastest growing major economy and its agriculture is not far behind. However, it needs to take some actions to be able to tap its full potential. The Government needs to reorient its role in the agri-sector and foster an environment conducive for private players; invest in creating value-chains and storages; improve access to better technology and inputs; and most of all, create a seamless national market. There is also almost a concurrent need for the country to have a stable, predictable, and liberal agricultural trade policy. Notwithstanding the fact that protecting its poor and malnourished at all times from the fluctuating global prices will be an over-arching goal of the Indian policy makers, in summary, the research reveals that it will pay the policy makers if following set of policies is pursued:

» Phase out an in-built consumer bias (and anti-farmer) in agri-trade policies.

» Create business space for private players to have integrated markets across space and time, which would involve reforming the Agricultural Produce Market Committee Act (APMC) Act and pruning the Essential Commodities Act (ECA), and allowing futures markets to operate freely.

» Use the income policy approach to protect the poor consumers (and small farmers) through direct cash transfers.

» Create a predictable and stable agri-trade policy.

» Streamline high customs duties on some of India's highly export-competing products like rice.

Limitations of This Study

The current study estimates distortions at the wholesale market level rather than at the farm-gate level. Gaps in the available time-series and differences between commodity varieties and qualities were the two main reasons why price series at farm gate could not be used for the current purposes. The rationale has been detailed in Section II, "Methodology of the Study" section of this report. This approach makes this study consistent with the Pursell, Gulati and Gupta (2007) study.

In addition, this study looks at output prices and adjusts for freight, port-handling charges, domestic transportation, marketing, and trading margins, among others, to work out distortions in incentive structures. However, it neglects the story on input prices (subsidies) on fertilizers, power, irrigation, credit, and others. Thus, in order to complete the full story on India's agricultural price distortions, there is a need to estimate effective protection coefficients (EPCs) and effective subsidy coefficients (ESCs), as well as a need to move to producer support estimates to capture the full gamut of distorting policies.

Notwithstanding these limitations, the study does offer useful insights into India's complex set of policies and their impact on distortions in farm prices and thereby in incentives for farmers.

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Data Sources

19th Livestock Census, 2012

ADPI: American Dairy Products Institute

Agmarknet: Agricultural Marketing Information Network of the GoI

Agricoop, GoI

Agricultural Statistics at a Glance, Ministry of Agriculture, GoI

Agriculture and Horticulture Development Board. EU Milk Deliveries

APEDA: Agricultural and Processed Food Export Development Authority

APEDA Exchange

Arun Goyal's Big Easy Reference on Customs' Tariff, various issues

BAHS: Basic Animal Husbandry and Fisheries Statistics

CACP: Commission for Agricultural Costs and Prices

CACP Price Policy for Kharif Crops

CCI: Cotton Corporation of India

CGIAR: Consortium of International Agricultural Research Centers. Crop Fact Sheets. http://www.cgiar.org/our-strategy/crop-factsheets/groundnut/

DAHD: Department of Animal Husbandry and Dairying (AH&D)

Department of Agriculture, GoI

DES Directorate of Economics and Statistics

DES Agmarknet

DGCIS: Directorate General of Commercial Intelligence and Statistics

DGFT Directorate General of Foreign Trade

DGFT Circulars

DGFT Export Import Data Bank

DGFT Notification

Eurostat http://ec.europa.eu/eurostat

FAO: Food and Agriculture Organization statistics .

FAOstat: FAO Statistics

FCI: Food Corporation of India (FCI)

GoI Notifications

Government's Foodgrain Bulletin

ISGIEIC: Indian Sugar and General Industry Export Import Corporation

ISMA: Indian Sugar Mills Association

Maharashtra State Data Bank

Ministry of Commerce and Industry

Ministry of Food Processing Industries

NABARD: National Bank for Agriculture and Rural Development

NAFED: National Agricultural Cooperative Marketing Federation

NDDB: National Dairy Development Board

NHB: National Horticulture Board

NSSO: National Sample Survey Organiztaion

SSF Sugar Stabilization Fund (SSF)

Statistics, Dairy Companies Association of New Zealand

STC State Trading Corporation of India (STC).

the World Bank Commodities Price Data (Pink Sheets),

UN Comtrade United Nations Commodity Trade statistics database
UNCTAD United Nations Conference on Trade and Development (UNCTAD),
US CommTrade
US Dairy Export Council)
USDA United States Department of Agriculture
USDA Cotton: World Markets and Trade. 2015
USDA Production Supply and Distribution Online
USDA-ERS: USDA's Economic Research Services
USDA FAO: USDA's Food and Agriculture Organization
USDA FAS: USDA's Foreign Agricultural Sevice
Uttar Pradesh Department of Animal Husbandry
World Bank Commodities Price Data (Pink Sheets)
World Trade Organization (WTO)
WTO Trade Statistics

Appendix

Weighted Average NPCs for Exportables, Importables, and Total

Year	Importables	Exportables	Total
2004–05	1.1	1.2	1.1
2005–06	0.9	1.1	1.0
2006–07	n.a.	0.9	0.9
2007–08	0.7	1.0	0.9
2008–09	1.0	0.8	0.9
2009–10	1.1	0.8	0.9
2010–11	1.1	0.7	0.9
2011–12	0.9	0.7	0.8
2012–13	1.0	0.8	0.9
2013–14	0.9	0.9	0.9

We identified the exportables from importables by using Table 19. The trade status was used to identify the respective NPCs, and these were then combined as weighted averages for the two trading categories, namely exportable and importable. The share in the value of output of each of the commodity was used as weights.

Annexure Estimates for Nominal Rates of Protection (NRPs),2004–05 and 2013–14

Estimates for Nominal Rates of Protection (NRP)

Mable Hypothesis	Wheat	Common Rice	Maize	Gram	Soyabean	Groundnut	Rape/ Mustard	Buffalo Meat	SMP	Cotton	Sugar	Onion	Potato	Mango	Banana
2004–05	–0.28	–0.10	–0.21	–0.00	–0.02	–0.38	–0.22	–0.31	–0.14	–0.25	0.29	–0.59	–0.57	0.41	–0.68
2005–06	–0.12	–0.13	–0.18	–0.03	–0.10	–0.39	–0.28	–0.29	–0.11	–0.16	0.20	–0.64	–0.49	–0.07	–0.28
2006–07	–0.26	–0.22	–0.22	–0.26	–0.07	–0.40	–0.38	–0.14	–0.23	–0.24	–0.07	–0.67	–0.44	–0.24	–0.22
2007–08	–0.03	–0.17	–0.31	–0.24	–0.15	–0.47	–0.30	–0.14	–0.41	–0.21	0.05	–0.44	–0.30	0.01	–0.31
2008–09	–0.42	–0.34	–0.20	–0.14	–0.03	–0.43	–0.24	–0.39	–0.01	–0.07	0.02	–0.71	–0.52	–0.27	–0.36
2009–10	–0.22	–0.35	–0.18	–0.24	0.00	–0.29	–0.25	–0.44	0.22	–0.15	0.09	–0.63	–0.33	–0.13	–0.61
2010–11	0.14	–0.20	–0.32	–0.30	–0.16	–0.35	–0.29	–0.37	0.21	–0.45	–0.01	–0.66	–0.67	0.73	–0.44
2011–12	–0.36	–0.37	–0.32	–0.21	–0.11	–0.60	–0.34	–0.26	0.25	–0.51	–0.10	–0.57	–0.46	–0.04	–0.23
2012–13	–0.24	–0.33	–0.35	–0.04	–0.06	–0.05	–0.20	–0.31	0.10	–0.20	0.01	–0.65	–0.41	–0.25	–0.45
2013–14	–0.31	–0.05	–0.07	–0.26	0.01	–0.36	–0.20	–0.37	–0.23	–0.25	0.04	–0.54	–0.54	–0.46	–0.71

Xable Hypothesis	Wheat	Common Rice	Maize	Gram	Soyabean	Groundnut	Rape/ Mustard	Buffalo Meat	SMP	Cotton	Sugar	Onion	Potato	Mango	Banana
2004–05	0.02	–0.11	0.41	0.05	0.27	–0.33	–0.05	–0.20	–0.11	–0.16	0.62	–0.52	–0.26	0.51	–0.65
2005–06	0.33	–0.06	0.43	0.04	0.17	–0.32	–0.13	–0.19	–0.09	–0.05	0.44	–0.58	–0.17	–0.01	–0.23
2006–07	–0.02	–0.18	0.09	–0.22	0.13	–0.36	–0.24	–0.02	–0.21	–0.15	0.09	–0.61	–0.14	–0.17	–0.17
2007–08	0.22	–0.14	–0.06	–0.19	–0.03	–0.44	–0.19	–0.04	–0.40	–0.12	0.30	–0.36	0.19	0.07	–0.26
2008–09	–0.32	–0.30	0.13	–0.10	0.15	–0.39	–0.11	–0.35	0.01	0.03	0.19	–0.68	–0.28	–0.23	–0.32
2009–10	0.04	–0.30	0.25	–0.19	0.21	–0.22	–0.10	–0.39	0.25	–0.05	0.23	–0.58	–0.04	–0.07	–0.59
2010–11	0.64	–0.14	–0.11	–0.27	–0.04	–0.31	–0.16	–0.33	0.23	–0.42	0.10	–0.62	–0.53	0.83	–0.41
2011–12	–0.24	–0.33	–0.14	–0.18	0.02	–0.59	–0.24	–0.21	0.27	–0.49	–0.01	–0.52	–0.20	0.00	–0.19
2012–13	–0.02	–0.29	–0.22	–0.01	0.05	0.01	–0.10	–0.26	0.12	–0.14	0.15	–0.60	–0.12	–0.22	–0.43
2013–14	–0.20	–0.10	0.21	–0.23	0.12	–0.32	–0.07	–0.33	–0.22	–0.20	0.19	–0.49	–0.36	–0.45	–0.70


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