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Agricultural Market Integration and Trade Competitiveness of Indian Agriculture

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Indian Agriculture is characterized by small holdings, limited off-farm employment opportunities, and inadequate institutional and infrastructure support. Therefore, farmers are unable to withstand major structural shifts if required. Any adverse impact on their income and/or increase in risk will have a significant impact on their livelihood. Farmers do respond to market prices and adjust to market requirements by changing cropping patterns and input use. However, this is all right as long as these crops are remunerative in each region. If all crops suitable in an area are not competitive in the international market, then the very livelihood of the farmers will be adversely affected. Even if there is a remunerative crop, farmers may not be able to take advantage of the crop if they are exposed completely to the volatility of the international market, as their risk-bearing ability is poor. In the absence of efficient futures and options market which are prevalent in developed countries and some newly emerging economies, our farmers/agribusiness are at a disadvantage in managing volatility in world market prices. Therefore it is essential that the Agreement on Agriculture (AoA) implications in terms of both profitability and volatility are not too drastic for farmers to cope up with.

In the early 1990s, India had emphasized the need for exports. Till then there was no consistent policy towards exports. The country's export basket in the past was heavily dependent on items such as tea, mates and coffee, which only recently has widened to include other commodities like rice, marine products, fruits and vegetables, etc. However, dedicated systems to cater to the export market are yet to develop. Exporters have to take special care in maintaining the quality at all stages of exports. Still, our current information flow along the value chain is very weak. These often lead to additional costs. Therefore, there are asymmetric trade opportunities for Indian exporters which constraining our exports. In addition, the importers in other countries are also putting additional restrictions or raise quality issue to prevent imports from certain countries. There are likely to affect Indian exports to a large extent.

Although India enjoys advantage in exporting some commodities, in the period post the General Agreement on Tariffs and Trade (GATT) international trade has become highly competitive and the competitive advantages of some of these commodities would be lost due to the infrastructural advantages prevalent in the competing countries. Therefore, infrastructure development for efficient movement, handling, grading, packing, processing, trade network, and information dissemination systems is needs to be developed on a priority basis. So, building of these backward/forward linkages is also important to improve production efficiency.

However, past studies conducted by some researchers on the impact of globalization and liberalization on Indian agriculture concluded that agriculture sector witnessed sharp improvement in terms of trade (ToT) during initial years of reforms. In the post-World Trade Organization (WTO) period though ToT remained favourable compared to the period before reforms but there is decline in them. Growth rate in GDP of the agriculture sector showed almost no change during the pre-reform decade and post-reform period. But, the advantage India has in production of labour-intensive crops such as fruits and vegetables, and other crops such as basmati rice may not be adequate to compensate for the likely imports of other commodities and larger fluctuations in prices.

Nevertheless, the demands and trends in world markets will increasingly influence both the patterns of production and price expectations. On the other hand, the price could be the best incentive to give a strong boost to investment in agriculture as well as adoption of modern technologies and thereby to the raising of agricultural production and productivity. Similarly, the rise in domestic prices could put pressure on the public distribution system and accentuate the problem of food subsidy. The nature and character of state intervention and state support will have to undergo qualitative changes in order to not only realize the opportunities for exports, but also to cope with the implications of our agriculture coming into increasing alignment with the international marketplace.

With this background, the chapter attempts to highlight the following researchable issues:

1. How to widen India's trade base in international markets? (India has remained a marginal player in world agricultural trade despite being a big country and a major producer of several agricultural commodities.)
2. Is India able to influence the world market in terms of price, quantity, and quality?
3. Whether Indian farmers and exports benefit out of any rise in international prices or able to cope up the price shocks/volatility?
4. How to improve the farmers' knowledge and organizational capabilities to benefit from trade opportunities?

To address the above issues in the context of growing global competition, it is crucial to assess the trade competitiveness of Indian agricultural commodities in terms of price, quantity, and quality in comparison with major global players; and understanding the market integration and price transmission between markets so as to build the capacity of Indian farmers who lack knowledge and technology, financial and organization capacity in order to gain from trade opportunities.

OBJECTIVES

Broadly, the present study has been planned to cover four major objectives:

1. Understanding the structure of India's major agricultural exports and imports compared with major global players
2. Assessing trade competitiveness of selected agricultural commodities in terms of price, quantity, and quality
3. Examining the price realization of farmers and assessing the influence of price changes on domestic and international markets
4. Understanding the existing institutional support and suggestions for building the capacity of farmers for better price realization and improving competitiveness

DATA AND METHODOLOGY

The issue of price linkages in product markets both at local and international levels has been studied in the literature extensively either under the notion of the law of one price (Ardeni 1989; Protopapadakis and Stoll 1983, 1986) or under the notion of market integration (Baulch 1997; Gardner and Brooks 1994; Ravallion 1986). Integration between markets, either national or international, is one of the important phenomena which needs to be checked through co-integration tests. Price transmission is expected to take place between integrated markets (domestic–domestic or international–domestic) over short- and long-term basis. Transmission of changes in world prices into various domestic prices of agricultural commodities can be estimated through a Vector Error Correction Model (VECM) framework and estimation of long-run as well as short-run impacts on prices are also possible. To accomplish this, various prices, namely, international prices (reference market prices), country's export and import prices, wholesale prices, and producer prices were collected from major regulated markets in the country and various other sources.

Vector Error Correction Model

On the basis of the properties, the test for unit roots was also applied to the residuals of the static regression between each pair of prices, in order to test for

co-integration following the Engle and Granger (1987) procedure. Where co-integration arose, a set of Auto Regressive Distributed Lag (ARDL) models were specified and estimated as follows:

$$pd_t = a + \tau T + \sum_{j=1}^{J} \beta_j pd_{t-j} + \sum_{k=0}^{K} \gamma_k pw_{t-k} + e_t \quad \text{Equation 1}$$

where, *pd* are the countries' (logarithm of the) import unit values in time *t*, *pw* is the (log) world reference price, *a* is an intercept, *T* is a time trend, *e* is the error term, and *t* is the period index. Where the null of absence of co-integration is rejected in the Engle and Granger (1987) procedure, the adjustment taking place around the long-run equilibrium can be modelled through an Error Correction (ECM) specification, such as:

$$\Delta pd_t = a + \delta T + \rho[pd_{t-1} - \lambda_1 pw_{t-1}] + \sum_{j=1}^{J} \beta_j^{*} \Delta pd_{t-j} + \sum_{k=0}^{K} \gamma_j^{*} \Delta pw_{t-k} + h_t \quad \text{Equation 2}$$

in which the coefficient = $(1 - \Sigma)\ j\ \rho\ \beta$ usually named 'ECM coefficient', indicates the short-run adjustment of prices toward the long-run equilibrium, and λ_1 is the same as the one calculated from the ARDL model in Equation 1.

Results reported here include for each commodity the parameters and the *t* statistics for the long-run equilibrium, together with the results of the estimation of the corresponding ECM specifications. In order to test for Granger non-causality between the pairs of prices, Equation 1 and its reverse form have been estimated by dropping the contemporaneous coefficients, according to:

$$pd_t = a + \tau T + \sum_{j=1}^{J} \beta_j pd_{t-j} + \sum_{k=1}^{K} \gamma_k pw_{t-k} + e_t$$

$$pw_t = a + \tau T + \sum_{j=1}^{J} \beta_j' pd_{t-j} + \sum_{k=1}^{K} \gamma_k' pw_{t-k} + z_t \quad \text{Equation 3}$$

Both equations were tested for $\gamma_k \beta_j\ \gamma_k'\ \beta_j'$ significantly different from zero for any *j*, *k*. Acceptance of the null implies that past values of the series on the right hand side are not adding information on the actual values of the series on the left hand side, on top of what is provided by its own past values. If this happens in both equations, then neither of the two series is Granger-causing the other, while if the null can be rejected in one of them, the price appearing on the left hand side will be Granger-causing the other. Given that a co-integrating relation must exist between the two series involved if Granger non-causality is rejected in at least one of the two equations, this test has been used here first, as a confirmation of the test for the long-run equilibrium; second, to understand which of the two prices acts as a source of information for the other; and third, to gain qualitative elements to understand the results, in terms of the causality direction. Rejection of the null in both the equations is to be considered as indicating a model misspecification or incompleteness, as it implies that both series are being Granger-caused by some third unknown variable. This test was performed, on monthly data, for those pairs of prices showing the presence of long-run equilibrium.

Assessment of the change in trade pattern was analysed using the time series data on quantity and value of exports and imports of various principal agricultural commodities. Secondary data was obtained from *Agricultural Statistics at a Glance*, web data sources like Food and Agriculture Organization of the United Nations (FAO), Centre for Monitoring Indian Economy (CMIE), and *IndiaTrade* for the periods between 1985–86 and 2008–09. Secondary data was also collected to examine the trend/pattern of trade during the above mentioned years and calculated the annual growth rates. Commodity-wise comparison between India and the major global players was done using the strengths, weaknesses, opportunities, and threats (SWOT) framework.

Overall, the study broadly covered eight commodities under six categorical groups. They are paddy (foodgrains), groundnut and castor (oilseeds), sugarcane (sugar crops), cumin (spices), cashew nut and tea (plantation crops), and mango and its pulp (fruits). For the selected agricultural commodities, data on cost of production and output prices was collected for the selected region/state from different sources which could supplement primary data collected from farmers and traders in the respective domestic markets. Value of tradable and non-tradable inputs and outputs was used to assess the trade competitiveness of selected commodities using the Domestic Resource Cost Ratio (DRCR) methodology. Further, the Extended DRCR framework was also adopted to address environmental issues. Secondary data on quantity and quality were collected for the selected commodities to assess the robustness of trade and quality competitiveness.

RESULTS AND DISCUSSION

The broad commodity-wise results of the study have been summarized in Table 39.1.

Despite the degree of competitiveness, export and import of rice is largely influenced by policy (export ban on non-basmati rice) and participation of large export firms. Fluctuations in world prices, especially export price is found to influence the producer price and vice-versa. Both producer and export prices were influencing each other; the

Table 39.1 Trade Competitiveness of Different Agricultural Commodities (Under Exportable Hypothesis)

Commodity	NPC	EPC	ESC	DRCR
Basmati rice	0.91	0.89	0.90	0.32
Groundnut	1.00	1.01	1.07	0.03
Castor	1.11	1.19	1.21	0.09
Sugar*	1.28	–	–	0.807
Cumin	0.80	0.70	0.71	−0.08
Cashewnut	1.21	1.35	1.39	−0.13
Tea	N.A	N.A	N.A	N.A
Mango	N.A	N.A	N.A	N.A

* 1995 estimates.
Note: NPC = nominal protection coefficient; EPC = effective protection coefficient; and ESC = effective subsidy coefficient.
Source: Authors' computation.

significance of influence of producer price on export price was found high (see Table 39.2). Even though the measures of nominal protection coefficient (NPC), effective protection coefficient (EPC), and effective subsidy coefficient (ESC) are close to one, the estimated DRCR is as low as 0.32; which indicates that export of Indian basmati rice is much more competitive. Export firms aim to bring quality produce (organic or untraceable level of chemicals) and they promote such activities by providing technical and input support to farmers. Linking rice farmers with these firms would benefit both the parties. Basmati rice is a special product and its export is not affected by price advantage or quality.

India is the second largest producer groundnut in the world, which is the most produced oilseed in India. The trade competitiveness of groundnut has been declining over the past six-year period. But, it is still competitive in the international market. The export prices are influencing the producer prices and the opposite was not significant (see Table 39.3). International prices are slightly influenced by our major wholesale markets in the country. All

Table 39.2 Granger-Causality Wald Test for Rice Long-term Price Integration

Dependent	Independent	Chi-Square	Pr > ChiSq
Producer Price	Export Price	6.65	0.0360
Export Price	Producer Price	26.03	<0.0001
Producer Price	Import Price	5.73	0.0570
Import Price	Producer Price	2.96	0.2281
Export Price	Import Price	3.96	0.1380
Import Price	Export Price	0.92	0.6301

Source: Authors' computation.

Table 39.3 Granger-Causality Wald Test for Cumin Long-term Price Integration

Dependant	Independent	Chi-Square	Pr > ChiSq
International price	Junagadh price	16.07	0.0003
Junagadh price	International price	4.35	0.1135
International price	Gondel price	28.76	<0.0001
Gondel price	International price	1.41	0.4951
International price	Rajkot price	19.93	<0.0001
Rajkot price	International price	0.36	0.8365
Junagadh price	Gondel price	24.06	<0.0001
Gondel price	Junagadh price	0.75	0.6884
Junagadh price	Rajkot price	30.27	<0.0001
Rajkot price	Junagadh price	21.59	<0.0001
Gondel price	Rajkot price	17.80	0.0001
Rajkot price	Gondel price	49.36	<0.0001

Source: Authors' computation.

the three major domestic markets (Junagadh, Rajkot, and Gondel) are well integrated.

India is the largest producer of castor in the world. India faces stiff competition from exporting countries, primarily from Brazil and China. At the moment the NPC value of castor was more than one. We are less competitive in the international market under exportable hypothesis. But, still India has a strong comparative advantage in the production of castor beans. Just like groundnut, export prices are influencing the producer prices and the opposite was not significant. Our domestic whole markets like Mumbai, Rajkot, and Unjha have a little influence on the international market prices. All major markets in Gujarat (Junagadh, Rajkot, Gondel, and Unjha) showed significant integration in price transmission between them.

Sugar is highly a controlled commodity and prices showed total disintegration among them. Policy support towards increasing the efficiency of the sugar mills is the immediate need and strategies of successful sugar mills (such as Warnanagar sugar mill) should be replicated. It is necessity for a dramatic change in sugar policy and efficiency promotion is the need of this hour.

India is the largest producer of cumin in the world and accounts for 70 per cent of world's production followed by Syria, Iran, and Turkey. India also consumes 66 per cent of the total world production. Production of cumin is highly competitive in the international market. The calculated NPC value was less than one under exportable hypothesis. Our major wholesale markets (Unjha, Rajkot, and Gondel) were able to slightly influence the international prices. But, the opposite was not significant (see Table 39.4). The price

Table 39.4 Granger-Causality Wald Test for Cumin Long-term Price Integration

Dependant	Independent	Chi-Square	Pr > ChiSq
International price	Mumbai price	7.83	0.0200
Mumbai price	International price	3.44	0.1794
International price	Unjha price	6.90	0.0317
Unjha price	International price	0.82	0.6622
International price	Rajkot price	9.77	0.0076
Rajkot price	International price	5.59	0.0611
International price	Gondel price	9.90	0.0071
Gondel price	International price	4.93	0.0849
International price	Junagadh price	5.71	0.0576
Junagadh price	International price	1.48	0.4771
Mumbai price	Unjha price	0.78	0.6781
Unjha price	Mumbai price	15.43	0.0004
Mumbai price	Rajkot price	2.27	0.3218
Rajkot price	Mumbai price	0.26	0.8789
Mumbai price	Gondel price	6.71	0.0349
Gondel price	Mumbai price	0.84	0.6574
Mumbai price	Junagadh price	0.56	0.7542
Junagadh price	Mumbai price	7.30	0.0260
Unjha price	Rajkot price	16.34	0.0003
Rajkot price	Unjha price	1.58	0.4546
Unjha price	Gondel price	26.48	<.0001
Gondel price	Unjha price	0.15	0.9300
Unjha price	Junagadh price	21.24	<.0001
Junagadh price	Unjha price	1.24	0.5392
Rajkot price	Gondel price	6.57	0.0375
Gondel price	Rajkot price	3.38	0.1849
Rajkot price	Junagadh price	3.03	0.2198
Junagadh price	Rajkot price	10.68	0.0048
Gondel price	Junagadh price	0.54	0.7627
Junagadh price	Gondel price	6.48	0.0392

Source: Authors' computation.

transmission mechanism is functioning well among the all domestic markets along with the Mumbai market.

Cashewnut is the important plantation crop in India. India is the second largest producer of cashewnuts in the world after Vietnam. Brazil, Nigeria, Tanzania, Indonesia, and Mozambique are other major producers in the world. The degree of competitiveness in cashewnut was low under importable hypothesis for raw cashewnuts. India has strong competitive and comparative advantage in case of cashewnut kernel exports in the international market. Our producer prices are independent with import prices. The domestic wholesale market prices were not integrated with international prices. However, significant integration was observed among domestic markets (Kerala, Andhra Pradesh, Goa, and Karnataka).

Tea producers in the southern part of the country face problem of less price realization and a little share in the consumer rupee. Farmers' price realization is only 10–12 per cent of the market price. Various blends of tea may be introduced to win the consumers choice. Export of tea from India is declining over the years due to competitors like Sri Lanka. However, introduction of new blends, tea products (ice tea, lemon tea, etc.) and promotional measures are needed to increase/keep India's market share in the world market. Geographical indication like 'Darjeeling Tea' would help to boost the performance of the Indian tea sector. Encouraging domestic consumption of tea through tie-ups with Amul/other dairy outlets may also be attempted.

Supply of mango is largely influenced by the bearing habit of the (variety) trees and climatic fluctuations. Existing processing units provide a strong forward linkage to the mango growers and price fluctuations are also brought under control. The Gandevi Model may be replicated for establishing strong forward linkage to the mango producers in the state/country. The Kesar variety is highly preferable for export both as fruit and pulp, not only because of the price competitiveness but also due to its taste and consumers' preference. The Hazard Analysis Critical Control Point (HACCP) system may be advocated to the processing units in order to get premium prices and to have a significant share in European markets.

CONCLUSIONS AND POLICY IMPLICATIONS

Overall, the study brought out the following conclusions:

1. Growing internal demand due to increase in population and income. India will have to strive hard to meet its domestic consumption. Among the different commodities analysed, India has trade competitiveness only in the case of cumin followed by groundnut. All the eight commodities covered in the study exhibited huge domestic demands. Therefore, the Government of India (GoI) has to develop a comprehensive plan and strategy while dealing with the export of these commodities to international markets.
2. The price transmission analysis concluded that major wholesale markets influence international prices to a small extent. However, integration between the domestic markets was observed only in a few commodities. Modernization of the agricultural marketing

system and introduction of information and communications technology (ICT) will fill up these gaps and enhance the price transmission process.

3. The real impact of future markets/future trading needs to be analysed critically. Many traders, processors, and farmers opined high negative perceptions about that system.
4. Huge fluctuations in currency exchange between the rupee and dollar create a lot of impact on the export business. There should be some short-term stability mechanism for a certain period of transactions (at least a week) for smoothening of the agricultural trade.
5. Concerted efforts would be needed to increase the production through productivity enhancement technologies as well as post-harvest handling of commodities. All the commodities covered in the study showed that the productivity levels in India are far below when compared with key global players.
6. Protection or insulation in many developed markets remains high and allowable export subsidies and domestic support still threaten the stability of agricultural markets in the developing countries like India. This issue needs to be addressed well in forthcoming deliberations of the WTO.
7. High tariffs and other non-tariff barriers did not allow us to enter developed country markets. It has clear impacts on populations of developing countries whose dependency on agriculture is very high. These issues should be resolved in future negotiations.
8. Commodity-wise improved and safe package of practices, networking of processing facilities, creation of supply and value chains, and quality testing labs should be developed to boost the exports further in that specific region/state.
9. Capacity building of farmers in production and processing aspects, improved extension communication system, and well-integrated marketing system will play a key role in the promotion of agricultural exports.
10. Lack of proper transportation is an important market constraint that effects market integration. The existing infrastructure is highly inadequate, outdated, and inefficient. Therefore, there is a need to introduce an integrated system of bulk handling and transportation of agricultural commodities.
11. An important bottleneck is the lack sufficient storage and warehousing facilities, especially cold storage for perishable commodities. Reforms are needed in the functioning of Agricultural Produce and Marketing Committee (APMC) markets to hasten up the process of marketing and trading.
12. The flow of real time information across various markets that are interlinked throughout the country will create tremendous demand and efficiency in the system.

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