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Impact of Trade Liberalization on Returns from Land

A Regional Study of Indian Agriculture

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Abstract

Trade liberalization, by aligning domestic prices with world prices, is envisaged to bring welfare gains to a country. In the case of Indian agriculture, owing to the vastness and diversity of the sector, the impact is likely to be profoundly unequal across regions especially when liberalization is double-edged, acting on both output and input sides. This paper views returns from land resource as a primary determinant of farmers' economic well-being and production incentive and considers paddy both as the dominant support for the rural population and as a product with comparative advantage, as most studies have demonstrated. Working with state and sub-state level data and taking account of the differences in technologies, productivities and transport costs, the paper finds that the gains vary regionally and may not be positive in all cases when both output and input prices are globally aligned.

Keywords: rice, state-trading, cost of cultivation, India, agriculture, globalization

JEL classification: Q17, Q18

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1 Introduction

The new international economic order established by the WTO hinges on fair competition among nations bringing out efficient production patterns. While a clear cut definition of the term competitiveness is not available, from a less developed country's point of view, the more relevant one is the ability to generate rapid growth in output in a manner that leads to rising employment and income for large numbers (Becker *et al*. 2002). The factors that explain the competitive advantage of a nation are even less clear. Comparative advantage based on resource endowment has become largely inconsistent with empirical tendencies, the reasons being technological advancement, innovation and global sourcing of factors and the exceptions being natural resource based production activities (Porter 1990) such as agriculture. Agricultural production is conditioned principally by the availability and qualitative nature of immobile or internationally non-tradable resources like land, climate, irrigation and even unskilled labour. To that extent factor endowments can be a source of competitive strength of agriculture. However, agriculture is not excluded from the reach of technological change and certain tradable and mobile factors like improved or hybrid seeds, fertilizers and farm and irrigation equipment can apparently confer a change in the qualitative nature of the immobile factors to improve the competitiveness of the sector. Besides, in a large country the issue of competitiveness is more complex with varied comparative advantages of regions, unequal transport cost over inland and overland distances and different local demand conditions where the rules of international trade even work within the nation's territory.

The WTO proposes to free the world market by four broad instruments termed as market access, domestic support, export subsidies and sanitary and phyto-sanitary measures. For a developing country like India with rich natural resource endowments the agreement promises to open up more doors than the constraints it creates, by increasing access into foreign markets for agri-products. But to make use of the opportunity the country has to put its house in order. In India the market has to come out of the shackles that have been binding it through decades of state control and domination. India signed the Agreement on Agriculture of the WTO in 1994 when she was already into a vigorous structural adjustment programmes launched in response to a balance of payment crisis in 1991. The measures undertaken were often consistent, complementary and overlapping with the WTO compatibility rules and it is not easy to delineate the effect of one from the other. What can be agreed on, is that despite an approach justifiably cautioned by food security of the poor and expectedly distracted by political tensions, India did take a departure towards a more globalized regime directed to giving greater freedom to private incentives and market forces.

In Indian agriculture rice holds a special place, being suited to the soil and climate of the country and cultivated extensively and by all classes of farmers. More importantly, being a labour intensive crop, rice absorbs a large section of the rural labour force and in that sense is a dominant source of employment in the country. This role becomes all the more significant since the domination of crop pattern by rice is found to be positively associated with the level of poverty, poor income and weak infrastructure within the country (Ghosh 2002). Above all, several studies have demonstrated India's comparative advantage in rice and under the given conditions the prospect of rice export has a potential to deal a frontal blow on rural poverty. True to the hypothesis, the

product emerged as a prominent export item with the initiation of economic reforms. The Government of India has been supporting this prospect by procuring grains at given minimum support prices and selling to exporters at concessional rates in recent years among other measures with the additional aim of clearing its own stocks and lowering the carrying cost. However, the market remains distorted and controlled and the question raised in this study is: Would farmers in the country gain from the exports when free market forces are allowed to operate?

The gain from export that reaches the farmer goes through an elaborate process comparable to the 'iceberg' (Bhagwati *et al*. 1998) in a reverse order in which, of any unit value of export, a fraction wears off in the marketing process. The marketing system therefore becomes important in this context. Answering the question taken up here a number of complexities are encountered. First, there is no unique, systematic and clear cut method of marketing the product from farm to ship. Even if one ignores the public-private duality, the marketing methods of private traders are unique to the situation as also to their strategies and objectives. There is thus no set method for cost calculation and researchers have resorted to empirical approximations or firm specific surveys. Second, the private traders in any case do not provide or publish any systematic record of operation and cost. Third, the dominance of the public sector in the market and the distortions induced by public policy would make such cost figures, even if available, unrepresentative of the free trade situation. Fourth, there is no clear definition of the export or border price concept to assess the competitiveness or gain in a free trade situation. Prices in international markets overseas are considered often but they are found to be at variance with prices actually realized. Fifth, international demand and supply often depend on which part of the country they are viewed from and any one border price could have little relevance for the farmer at the other end of the country. Sixth, prices in international market are volatile and would certainly be sensitive to the trading decisions of the home country. Finally, the prevailing situation is a complex backdrop under a flux as policies undergo continual changes. Not only is output market distorted by policy mixes, the input market is shrouded in an even more complex regime of protection shared non-transparently by farmers and manufacturers.

In this paper certain simplified methods consistent to the extent permitted by availability of information is adopted to portray a system characterized by randomness. In the absence of set patterns and recorded information from the private trader information provided by the public sector operator Food Corporation of India (FCI) is made use of although FCI enjoys economies of scale that private traders do not. Cost of transport has been based on the cheaper mode railways rather than alternative ones often taken by private traders. For export prices actual FOB prices at the ports of economic relevance are considered. If India enters freely into export market for rice, its price will certainly go down and similarly if India imports fertilizers in a big way its price will go up. This paper avoids this uncertainty through a small country assumption. All these simplifications have a bearing on the results but on the whole, the direction is such as to underestimate the cost and overestimate the return consistently from free trade.

The prevailing trade scenario under reform is crucially pertinent to the computation of the returns and for an understanding of the limitations. The policy that is evolving is essentially double edged with both input and output markets impacting on farmer's gains in converse ways. The two aspects of the policy, being peripherally important to the study, are taken up in Appendices 3 and 4 in detail while discussing the modes of price calculation. The regional dimension of the study brings into the picture the role of

ports in the country and the subject is explored in Appendix 1. Cost of cultivation data used for estimation of input coefficients in the technology of farming is discussed in Appendix 2. Section 2 follows this introduction with an overview of the rice economy. The methodology of analysis is described in Section 3 and results discussed in Section 4 followed by conclusions in Section 5.

2 The rice market in India at cross-roads

The rice market comes under the purview of the GOI's (Government of India) foodgrain policy which originated in a time of shortage in the 1940s. The infamous Bengal famine and the second World War were events that transpired against the background of a low productivity agriculture and abysmal market integration in India. The crisis brought the State in to intervene in the market but only sporadically with no long term vision. It was in the 1960s that certain developments strengthened the will of the independent country's government for a long term policy. These were (1) poor crop performance and resulting food shortage, (2) shortage of foreign exchange for imports, (3) two successive wars and the political unacceptability of food aid from USA, (4) availability of a new technology for agrarian development at hand and (5) the new optimism that farmers in a traditional agriculture are capable of responding to economic incentive (Schultz 1964, Raj Krishna 1963). All this laid the foundation of the Food Corporation of India (FCI) in the public sector in 1965 that went in tune with the socialistic spirit of the time. A price policy promulgated soon after and that to follow in subsequent decades, designed to be executed by the FCI, integrated several and conflicting objectives (Tyagi 1990; Mellor and Ahmed 1986). It aimed to provide incentive to the farmer, prevent distress selling and usher in self-sufficiency in grains. It also aimed to protect consumer interest through low food prices, stabilize prices, hold buffer stocks and serve the needs of the poor and the vulnerable.

The rice market remained a dual channel market through years (as elaborated in Appendix A4) with a mere residual private trade inhibited by not only the dominance of FCI but also a multitude of other controls. The private trader in grains, discouraged by unexpected policy changes of GOI, low priced open sales by FCI, excessive seasonal stability of price and coercive levies, is left with little incentive to operate and invest in stocking, processing and transporting. The trader is also denied in credit allocation and having low priority in allocation of railway wagons, resorts to bad and inadequate road transport, an unduly expensive and slow process. In addition, the State Governments impose control orders on movement and storage under the Essential Commodities Act (ECA). In short, the cost structure and profitability encountered by the private trader largely reflects the distortions of grain market tailored by the public policy.

The background situation however changed from the days of inception of the policy. Food grain production reached comfortable levels and so did exchange reserves. Markets became more integrated (Kumar 1997; Sharma *et al*. 2001). The policy has now come under serious review especially with the general spirit now moving in favour of the free market. With India's participation in WTO and to exploit the advantage of the AOA it became necessary to loosen the government control on the market through domestic and external reforms. However, till now the government's role transcends its obligation towards the targeted public distribution system. The domestic policy of procuring grains at administered prices based on average cost of production, the input

subsidies and concessional sales even to exporters veil the true competitive advantages in the country to give distorted signals.[1]

Table 1
Policy transition in rice market in the 1990s

Year	Import	Export	Domestic
1991	Canalized through FCI	Negative list Licensed	Dual channel
1997	Canalized through FCI	Negative list Quantitative restriction Minimum export price	Dual channel
1999	Free	Free	Dual channel
2002	State trading	Free	Dual channel
	Solely on commercial consideration		
	Tariff		
	Other safety measures		

India is the world's largest rice producer after China with an output of 90 million tonnes. Unlike wheat the other main cereal in the country, rice cultivation spans across several states due to favourable soil and climate. Rice is a water intensive crop, raised both rainfed and irrigated. It is grown in multiple seasons or rotated with other crops and intensive cropping has in some cases as in Punjab been associated with ecological stresses. Rice is also a labour intensive product with labour constituting about 30 per cent of cost.

Food security and farmers' livelihood being vital issues in Indian polity, opening up of trade to world market is a contentious issue (Vyas 2001; Rao 2002). The competitiveness of India's food grain production is not borne out by empirical estimates except for rice (Vyas 2001). Studies by Gulati *et al*. (1994), Chand (1999) and Datta (1997) agreed on the comparative advantage of rice through the measures of nominal protection coefficients. The results of these studies are summarized in Table 2. Since internal distances act as a protection for imports and disprotection for exports (Nouroz 2001) handling and freight charges are of crucial importance to the result. In the absence of a well documented record on these aspects and consistent behaviour of traders, Gulati and Chand studies approximate these as 5 per cent of reference price where the reference price itself is different in the studies while Datta accessed information from industry sources. While excess demand in international market and

1 Even an agriculturally advanced state like Punjab faces the challenges of uncompetitiveness in wheat but for state protection (Sidhu 2002).

India's price advantage are accepted prospects, questions also revolve around India's capacity to generate the surplus.

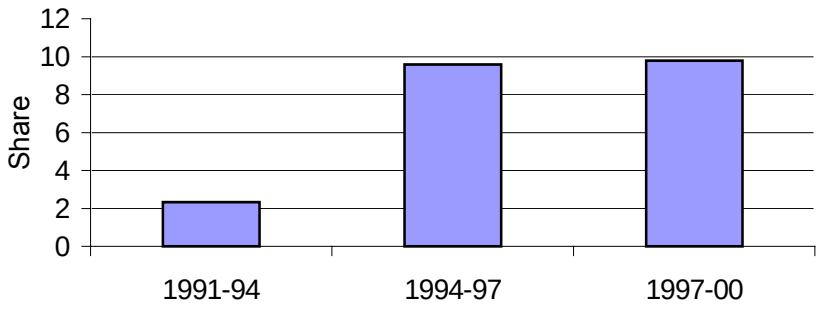
Table 2
Estimates of net protection coefficients of rice in India

Author	Gulati *et al*.	Chand	Datta
Ref. years	1980-81 to 1992-93	1988-89 to 1997-98	1994-95
Ref. port	Calcutta		Kandla
Ref. price domestic	Procurement price	Delhi market price transmission to producers	Price at Karnal, Haryana
Ref. price import	International price, Bangkok	FOB Price	FOB price at Kandla
Ref. centre	A.P., Punjab, India	India	India
Marketing charges	5% domestic ref. price	5% domestic ref. price	from industry sources
NPC	0.46 to 0.47	0.71 to 0.89	0.78 to 0.79
	Fair average quality	Non-parboiled	Different varieties

Source: Gulati *et al*. (1994), Chand (1999), Datta (1997).

With some degree of trade liberalization in India, however, rice, both basmati and non-basmati emerged as items of export during the 1990s. From an insignificant place in global export market, India reached eminent position in 1998-99 with a share of 16 per cent (FAO 1998). Within India's exports of agricultural goods rice has grown in importance through the 1990s as seen in Figure 1.

Figure 1: Share (%) of rice in India's agricultural exports, 1991-2000



3 Data and theoretical framework

Given that India enjoys a comparative advantage in rice, this paper attempts to examine if trade liberalization can bring gains in returns to farmers through export. The product considered in particular in non-basmati rice.[2] The focus is on the welfare of the ultimate producers that is, the farmers at the regional level. Trade liberalization is defined in a broad context of aligning domestic prices with international prices through both domestic and external reforms. The comparison is made between the prevailing price situation under existing levels of controls and regulations on the one hand and the hypothetical situations where external market prices are realized for output and traded inputs on the other. The regional dimension emanates from the diversity in technology, yield rate, local factors and location in relation to relevant ports all of which reflect on the domestic prices and the incidence of trade on prices.

Such a study has to be based on information on various aspects drawn from varied sources. While GOI official publications from different departments like Department of Economics and Statistics (DES), Comprehensive Scheme for Studying the Cost of Cultivation of Principal Crops (COC) and Bulletin on Food Statistics (BFS) under the Ministry of Agriculture and the Fertiliser Association of India (FAI) and the Directorate General of Commercial Intelligence and Statistics (DGCIS) come out with published data of crop, fertilizer and foreign trade statistics, there is no readily available published data on many other aspects, especially those related to internal trade. In the total absence of published and systematic record of private trade operations, this paper relies to a large extent on information provided by GOI, which also operates in a dual channel foodgrain market and a partially decontrolled fertilizer market. Discussions with officials of FAI, FCI and Agricultural and Processed Food Export Development Authority (APEDA) and information supplied by these organizations have proved greatly useful in this study.

The gains to farmers will be viewed through the returns or surplus (R) per hectare of land, measured by the following equation:

$$R = P\,Y - P_x\,X - P_Z\,Z \qquad (1)$$

where P and Y are producer price and yield rate of crop, X is a composite tradable input and Z is the composite non tradable input and the subscript denote the input to which the price refers. The quantity variables are expressed at per hectare basis and prices are in Rupees (Rs) per kilogram (Kg). On grounds of data limitation on cost of cultivation to be discussed, the equation is expressed in the following form for analysis:

$$R = PY\,(1 - p_x\,a_x - p_Z\,a_Z) \qquad (2)$$

where p is input price relative to product price (relative price) and a is the ratio of input to output (input coefficient) at the region level. Thus, underlying equation 2 is an input output relation of the form as indicated by the production practice of the region:

$$X = a_x\,Y \qquad (3)$$

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2 India's comparative advantage in basmati rice is well documented. This variety constitutes only 1 per cent of total rice produced in the country and grows only in limited areas in north west India.

In the prevailing scenario domestic demand and supply factors combined with the government's regulatory regimes both on the domestic and external front determine the prices faced by farmers (farmgate prices). A case of trade liberalization can be considered coming through the price effects on the product and the traded input and reflecting on the relative prices, assuming that under a hypothetical free trade regime the world market price would prevail. In the case of an exportable crop, the farmer's reference export price would be the FOB price at the port less handling and transport charge from the production centre concerned. This means that farmers in an interior state or a remote centre would find themselves at a disadvantage compared to those in a location near a port. The farmer would gain from the export only if the external price exceeds the prevailing domestic price fetched. For traded input the farmer's price would analogously be the CIF price at port plus the handling and transport charges.

The above propositions emphasize the change in the relative price that trade liberalization can bring but assumes that the crop yield rate is unaffected by the change. In reality however trade can impact on returns in at least the following three ways: (1) direct effect of product price change on revenue and thereby returns, (2) direct effect of a fall or rise in fertilizer price on cost and thereby returns and (3) indirect effect of a change in relative price of input on returns through a change in input use and thereby the yield rate.

The third effect can be captured through an estimated response function of input use. The COC data offers data on input use and prices over a number of years in the 1990s between 1990-91 and 1997-98 and across major states that can be pooled for a regression analysis of the following equation showing region specific effects:

$$X_{st} = b_0 + b_1\, p_{xst} + b_2\, D_s + b_3\, t \qquad (4)$$

where X is use of tradable input per hectare, p is relative price of the same input, D is region dummy, s is state, t is year and b_i are parameters of which b_1 is the response. The response parameter is then applied to adjust the given yield rates (Y) by the following equations:

$$Yadj = Y + \Delta Y \qquad (5)$$

where $\Delta Y = (1/a_x)\, b_1\, \Delta p_x$

The yield adjustment is made subject to the supposition that non-traded inputs will adjust automatically giving primacy to price changes of fertilizer. There are three estimates of returns per hectare (1) R1 under reported yield rates and valued at prevailing domestic prices, (2) R2 valued at external price of output and prevailing price of inputs and reported yield rates and (3) R3 valued at external prices of both output and tradable input and reported yield rate and finally (4) R4 valued at prices as in (3) but yield rates adjusted to price regime. A comparison of free hypothetical trade returns R2, R3 and R4 with the restricted prevailing regime returns R1 indicates the possibility of benefit of trade reaching the farmers and its relative incidence on farmers in various locations according to distance from port and agricultural prosperity.

The input coefficients are parameters that are determined by the technologies practised in the agro-climatically varied regions. Fertilizer is the dominant traded input in agriculture and information on the same by crops is available only in survey data, notably COC, reported only with incomplete coverage of states and uneven frequency

but nevertheless providing a glimpse of the technology prevailing in the 1990s. Limited by this vital information source six states figuring as dominant rice producers are selected for study to begin with. These are Andhra Pradesh (AP), Haryana (HRY), Orissa (ORS), Punjab (PJB), Uttar Pradesh (UP), Madhya Pradesh (MP) and West Bengal (WB). The survey data is also not updated, and though the final analysis is done for a more recent year 1998-99 based on availability of all other information, the parameters are anchored on the last triennium based on stability of the input coefficients and availability of data. Thus the input coefficients are obtained by averaging the same over the years 1994-95, 1995-96 and 1996-97 except for UP and HRY for which anchor years are 1991, 1992 and 1996. The parameters thus obtained by states are assumed to hold for the year under study.[3]

The COC reports all categories of cost (Appendix A2) faced by the farmers on inputs supplied from own resources or purchased from market. Returns representing differences between value of product and cost would however vary with the cost concept employed. COC provides several definitions of cost and although cost based on only purchased inputs (A2) are often a relevant consideration for farmers in subsistence economies, on grounds of economic logic cost of all inputs (C2) valued at actual and imputed market prices is more justified in the present context. In that sense the returns per hectare considered here are a measure of profit from the main product with farmer's own labour and resources included as cost although this may turn out negative in cases. For this paper the cost items are categorized in two groups, traded input consisting only of chemical fertilizers and all others clubbed up as non-traded inputs.

Fertilizer is the prominent input in agriculture, which changes the productivity of land, complements other inputs like irrigation, is a focus of attention from policy makers and politicians and has been going through to path breaking reforms. As a background to the main paper, the policy scene in the fertilizer sector is described in Appendix A3 to help understand the computation of fertilizer price. In the absence of disaggregate and region wise cost data of fertilizer trading, average figures of prices and cost provided by FAI are used along with regional weights in nutrient consumption to bring in a regional dimension. The non-traded inputs have been subject to far less policy changes though prices of certain constituents like irrigation are under review. These prices are assumed to adjust to product prices so that p_z is considered as same as in the anchor triennium.[4]

The price of the main product is subject to policy changes under pressure from domestic reforms and globalization. The external product price differs from trading port to farmgate as the product goes through an extensive and complex marketing process as discussed in Appendix A4 which further goes on to explain how the hypothetical free trade farmgate prices are calculated. Farm harvest prices (FHP) reported by Ministry of Agriculture (MOA) as time series provide the domestic prevailing prices for the reference year. Table A4 gives a comparison of the FHP with the external reference prices to give a measure of the protection received by farmers. Likewise, the prevailing

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3 For UP this is the last triennium reported by COC whereas for HRY the coefficient of fertilizer use for the year 1994-95 turns out inordinately high relative to other years. In an all cases the coefficients show stability over the years in 1990s.

4 With further decontrol and greater market orientation, the presently rigid prices of non-traded inputs may even over adjust so that the free trade relative price is likely to increase implying a negative effect on returns.

and external prices of tradable input fertilizer are obtained for the year under consideration using FAI information.

4 Gains at external prices

Supporting numerous studies that noted India's advantage in exporting rice, actual experience in the 1990s found improvement in India's position when trade liberalization and domestic decontrols began to open up the market. The development however occurred in a market still distorted by controls and FCI's dominance. This paper examines if the actual producers benefit from exports while market opens up, given the heterogeneous conditions they operate in. This is done by evaluating returns at prevailing domestic and external reference prices for the reference year and comparing them. The gains would come from liberalizations in both output and input markets.

As a starting point the regional picture in the base scenario of prevailing price (R1) conditions is considered. Of the seven states under consideration HRY and WB are the only two states where export prices work out to be lower than domestic prices and there is a degree of positive protection indicated in Table A4. Further probe reveal that both states report[5] excessively high FHP relative to others and for West Bengal, the input coefficients are also high, turning out negative returns at cost C2 in both prevailing and free trade scenes (see Table A2). These findings suggest that HRY and WB cannot be considered as exporters of rice. Table 3 presents the returns per hectare valued at prevailing and external reference prices for different trade regimes. The largest returns at Rs 3500 per hectare is reaped by the northern state Punjab, followed by Uttar Pradesh (UP) with a moderate return of Rs 925. Andhra Pradesh (AP), Orissa (OR) and Madhya Pradesh (MP) show lower positive profits. The spatial variation of returns is large given by the coefficient of variation (CV) of 150 per cent.

In the second case of free trade in output market obviously improves returns (R2) so long as the farmers can fetch higher prices than possible under controlled conditions. Calculations done in Appendix A4 (Table A4) suggest that FOB prices at relevant ports adjusted for processing, handling and transport cost still turn out higher than the regional farm harvest prices in all states except Haryana and West Bengal. The other states, especially AP and UP would gain from export.

A simultaneous freeing of trade in input fertilizer displays a different picture. Appendix A3 finds that the complex pricing and trade policies with respect to fertilizer confer an element of protection to farmers[6] and exposing them to free trade prices raises input cost bringing down returns (R3) significantly in all states as compared to free trade in

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5 The FHP reported by MOA is inordinately high for HRY. The price used in this study is therefore projected on the basis of COC-reported post harvest price for 1997-98 using the growth in wholesale price of paddy in the state during the period 1997-98 to 1998-99, also reported by COC. Even this modified price is high and indicates protection.

6 The Retention price system also confers protection to the domestic fertilizer industry so that the producer price in domestic market is actually higher than the import price which is itself found to be higher than what the farmer pays.

output only situation. However, the relevant comparison is with the prevailing situation and on this count two states AP and UP make some gains while others lose.

If impact of price changes on yield rates via input use is also taken in account, the result could be further modified. Based on the estimated regression equation (Table A5.3) which incorporates a trend and region specific effects, an yield adjustment following equation 5 is made over the prevailing level given the change in relative price from prevailing to free trade regimes. Since the protection from fertilizer pricing outweighs the disprotection from product pricing, the relative price becomes adverse leading to lower input use, which translates to a fall in yield rates. Taking yield rate adjustment into account free trade in output and input brings additional gains only to AP. The modest returns of MP and ORS are further truncated. The situation in UP is not altered greatly and even Punjab sheds returns revealing its true high cost structure and dependence on imported technology input. Figures 2 and 3 show the relative gains to the states varying in extent from 13 per cent in PJB to nearly 300 per cent in AP while that in input with yield adjustment improve gains in the range of –39 per cent in ORS to +12 per cent in AP. Agriculturally lagging states Madhya Pradesh and Orissa gain more due to opening of product market but also lose more from the same in input market relative to forward states Punjab and Uttar Pradesh.

Table 3
Returns from paddy cultivation valued at prevailing and external prices (Rs/hectares)

State	Prevailing prices of output and input	External output price		
		Prevailing input price	External input price yield unadjusted	External input price yield adjusted
AP	194.92	765.83	219.76	217.81
ORS	202.93	321.14	176.10	123.90
PJB	3575.48	4071.04	3468.11	3119.90
UP	924.93	1314.68	1020.23	905.76
MP	53.16	155.21	23.98	19.81
CV	149.93	120.64	147.01	148.25

Source: Computed.

Note: Reference year is 1998-99.

Figure 2
Gains from free trade in output (R2-R1)

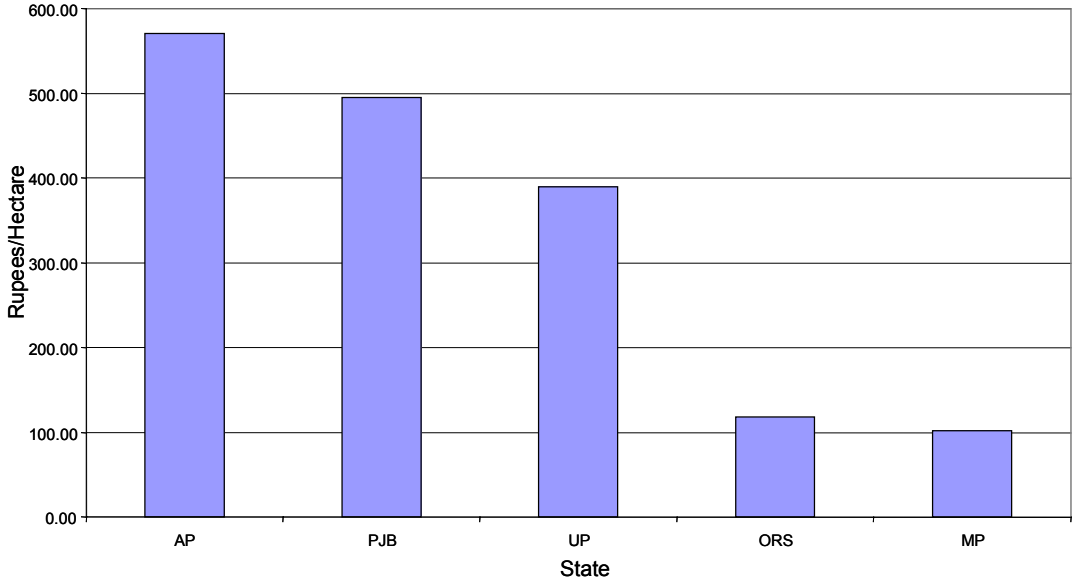
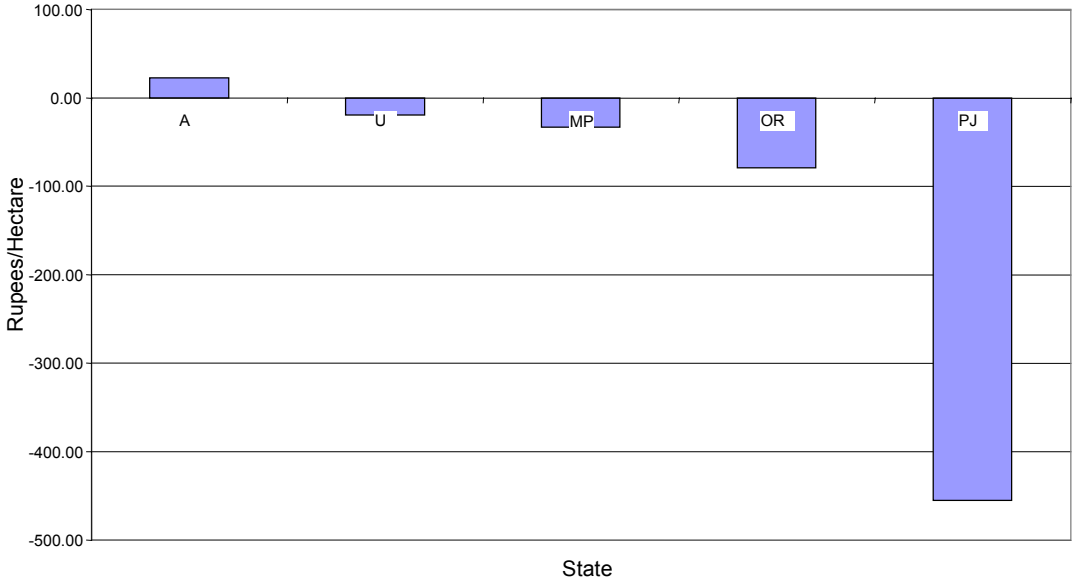


Figure 3
Gains from free trade in output and input with yield adjustment (R4-R1)



The regional imbalance in Indian agriculture has been a matter of concern since the launch of the green revolution technology. The yield variation in the sample is measured by the coefficient of variation (CV) which is large to start with. Trade however brings the CV down significantly in the first scenario and marginally in the final case of free trade in output and input with yield adjustment.

To get a more in depth view of the regional character of gains, a sub-state level analysis for ten select districts in each of two states AP and UP is conducted limited by the availability of data at that level. The limitation of information compelled a restrictive assumption that the technological practices are the same within a state and the input coefficients at state level derived from COC data is applied in this micro-analysis. The regional dimension is captured through three aspects. First and most important, the yield

level varies within a state and the DES provides district level data of paddy yield rate. The selected states fall into high yield rate and low yield rate categories relative to that state. Second, the differences in fertilizer prices facing the farmers are reflected through the varying weights on nutrient use in the differing soil conditions. Third, farmers in various regions receive somewhat different prices that can be more than or less than the state average depending on local supply-demand conditions and transport costs from other market centres. Farm harvest prices are reported at district levels with extremely limited coverage and delayed updating. For the selected districts the spatial dispersion is approximated by proportionality with the state level average for the year 1996-97, for which the FHP data is reported, and the proportions are applied to the year 1998-99 in respect of domestic prevailing and external reference price for the state. This analysis throws up further variation in results, in both UP and AP where some districts are found to gain from free trade and some lose. Export possibilities arise in both high yield and low yield districts due to varying technology and the actual impact on trade and prices on districts showing negative gains from exports would depend on the elasticities of demand and supply in various districts.

6 Conclusions

Agricultural development in India is accorded high priority on account of its contribution to national income and its linkage to other sectors. Above all, a high rate of agricultural growth was considered to be a pre-condition for faster employment growth (Planning Commission 1979) in the country and a regionally disaggregated strategy of agricultural growth was seen as a way to higher employment outcomes as compared to regionally concentrated performance (Alagh 1991). Rice is the leading product in Indian agriculture, being cultivated in many states in both commercial and peasant holdings covering a large section of poor. The presence of comparative advantage in rice as demonstrated by various studies and the existence of demand in the global market raises the prospect of rice export which has been amply utilized by the Government of India in the 1990s through its FCI executed price policy with a longer term aim as exporter. Such comparative advantage based exports could thus ensure not only India's eminence in the international market and help stabilizing the balance of payment but also more importantly, might imply an attack on rural poverty. This possibility is explored in this paper with a regional perspective recognizing that free trade would call for reforms in both external and domestic sectors and opening up both output and input markets.

The study finds that some moderate gain can come from free trade only in output though not in all states, possibly coming from resource advantages specific to rice. Farmers in Andhra Pradesh, Punjab, Uttar Pradesh, Orissa and Madhya Pradesh faced higher export price possibilities than what they got in the prevailing regime of controls and would possibly turn out as exporters if the market were fully decontrolled. However, when the farmer is also exposed to the free market in tradable input this gain is eliminated except in one of the seven states considered. The Government has been protecting the farmers from global price movements in the input market and those in the exchange rate through import controls and complex domestic pricing mechanisms to support domestic production. The tradable and technology-based input fertilizer is not only more expensive to the farmer under free trade, also, its significance in changing the quality of the immobile resource, land takes its toll.

The estimation conducted under restrictive conditions and an assumption of a non-flexible technology suggests that farmers in most parts of the country are unlikely to gain from rice export in the absence of state protection and the impact on rice exports may not mean much for poverty alleviation. The sub-state studies however expose some heterogeneity of prospects. The analysis highlights the technology factor in competitiveness even in agriculture in a less developed country. While five of the states considered may earn higher returns at external prices of the natural resource intensive product, the mobility and tradability of technology input can wipe out the gain when farmers have to buy this from international market at higher prices once protection is removed. When free internal grain movements are taken into account, there may however be a price rise in some of the non-exporting states or even districts of a state induced by deficiency (these areas would have to compete with the foreign market) rather than market expansion.[7] Such price rise is of great political and economic concern and may also induce rice cultivation in less suitable areas. However, going by the results of this study such possibility becomes minimal when output and input markets open up. In any case the government would have to continue transfer and public distribution of grains in areas of higher prices for the benefit of the poor.

The present FCI operations leading to exports and directed to a longer term export policy are a way of subsidizing farmers (and also exporters) which could be done more transparently so as not to distort signals and misguide the beneficiary farmers in the longer run. Much of the malaise responsible for the poor return going back to farmers in a free market arises from technology and cost involved in cultivation and the government can serve better in preparing and incentivizing the farmers by exploring other exportable crops,[8] other forms of fertilizer to soil, investing on food security stocks and above all promoting non-crop based activities in rice dominated areas which can also structurally improve profitability of rice.

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7 States are often categorized as 'surplus' or 'deficit' in terms of their normative grain needs and a reasonable level of price and with private grain movements inhibited, these are identified by movements in the public sector channel. Among the seven dominant rice producing states taken up, public procurements fall short of distributions in the eastern states Orissa and West Bengal, the largest producer.

8 Incentivizing rice production and export need also to take account of other costs such as water since rice is extremely intensive in use of water which is required for other crops and uses and is becoming either scarce in some regions or a conduit to land degradation in others.

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Appendix A1

Ports in India's external trade

The competitive advantages enjoyed by a country and thereby the direction and nature of trade will influence and be influenced by the size, location and efficient distribution among the ports. As a result, a competitive relation is also expected to grow up among the ports of a country. The advantage of a port with respect to a given product of trade would depend on the hinterland served (Weigend 1958) by it and the internal transport cost as also on the overseas regions/markets served and the associated shipping or freight rates. But the port's own internal advantages in terms of access, handling equipment, labour availability and quality of service are no less important and there is a significant overlapping of both hinterland or overland.

India has an extensive coastline along nine coastal states supporting 11 major and 149 minor ports in India managed respectively by the Port Trusts under the Central Government and the State Governments (Economic Survey 2002). Corporatization and privatization of ports are also under way in India. The major ports Kandla and Mumbai in the west and Madras (Chennai), Vishakapattanam, Calcutta and Haldia in the east are the most dominant port. Part of the rice trade is also conducted via land port Petrapol in West Bengal since close neighbour Bangladesh has appeared as a major importer in recent years. Sourcing has however not often been from the state due to restrictions on the movement (source data is not available). The trade is affected by economic as well as non-economic consideration of bilateral relations.

The choice of a port for trading is determined to a large extent by the distance from the production point and from the overseas market where demand/supply exists as this would influence the cost of insurance and freight. Existence of demand for non-basmati rice in Asian countries like Indonesia would seem attractive from eastern ports and import of chemical fertilizers from gulf countries or USA might settle the choice in favour of the western port. However a comparative study of marine transport around the Indian coastline with internal cross country transportation is needed to decide the port. Moreover the capacity and efficiency of the port are also decisive factors.

Indian ports are constrained by congestion due to poor capacity, outdated and ill-maintained handling equipment and labour problem (Datta 1997). In particular rice exporters face problems related to storage and fumigation facilities, lack of security as also complex bureaucratic formalities, all leading to losses and delays. There is an overwhelming concentration on the western port Kandla. Although distances should be a major factor for trade, Table A1.1 shows that significant amounts of fertilizer imports are made from eastern ports like Madras and Vishakapattanam even though fertilizer is procured dominantly from nations in the west (Figure A3) and non-basmati rice is exported both from eastern and western ports like Kakinada (22 per cent) and Kandla (28 per cent) respectively. Differential prices are fetched or paid across the ports.

The six ports Mumbai, Kandla, Calcutta and Haldia, Kakinada, Madras and Vishakapattanam together accounted for 69 per cent of exports in the 1990s but with a high dispersion rate of 116 per cent (going up to 206 per cent) in 1994-95. The year 1995-96 which witnessed the highest export of 4.5 million tonnes also saw a more even distribution among the ports with a lower coefficient of variation. Each port has been

Table A1.1(a)
Fertilizer import statistics by ports 1998-99

Port	Quantity (tonnes)	Value (Rs lakh)	Unit value (Rs/kg)	Share % (quantity)
Kandla – ftz	297204	19406.3	6.53	5.97
Bhavnagar	275360	20692.91	7.51	5.53
Kandla – sea	522359	43012.84	8.23	10.49
Vishakapattanam	1564925	119372.43	7.63	31.42
Madras	655922	36271.34	5.53	13.17
Bombay	5351	364.77	6.82	0.11
Calcutta	40214	1830.93	4.55	0.81
Others	1619646	100428.17	6.20	32.52
Total	4980981	341379.69	6.85	67.48

Table A1.1(b)
Rice (non-basmati) export statistics by ports 1998-99

Port	Quantity (tonnes)	Value (Rs lakh)	Unit value (Rs/kg)	Share % (auantity)
Bombay	237231	26500.77	11.17	6.02
Calcutta	18845	1865.61	9.90	0.42
Haldia	29138	2867.18	9.84	0.65
Kakinada	948429	95516.11	10.07	21.69
Kandla – sea	1162626	122543.96	10.54	27.83
Nhava Shiva	5201	559.51	10.76	0.13
Vishakhapattanam	31947	3246.88	10.16	0.74
Madras	21081	2657.08	12.60	0.60
Others	1911390	184627.43	9.66	41.92
Total	4365888	440384.53	10.09	100.00

Source: DGCIS.

subject to volatility across time as seen from the CV computed over time. However, Kandla which handles the highest volume also experiences least volatility. Calcutta-Haldia followed by Channai has the lowest record of export which falls short of 0.1 million tonnes.

Table A1.2
Export of (non-basmati) rice from select ports in India (tonnes)

Port Year	Bombay Sea	Kandla FTZ and Sea	Calcutta Haldia Sea	Kakinada Sea	Madras Sea	Visha-khapatta-nam Sea	Others ports	Total export all ports	CV % ports
1991-92	15451	356474	103	28250	1862	--	9795	411935	193.73
1992-93	48348	172099	60	29985	1515	--	3612	255619	145.06
1993-94	7924	499268	581	34441	574	--	22399	565187	202.53
1994-95	7553	323464	8960	1289	1233	3008	102988	448495	206.55
1995-96	528237	1503521	31503	700738	101525	285437	1389738	4540699	94.21
1996-97	306258	935652	7145	165905	60315	85652	428113	1989040	121.73
1997-98	172935	827604	9386	209370	48982	83445	370076	1721798	123.38
1998-99	237231	1162626	18845	948429	21081	31947	1945729	4365888	116.86
1999-00	115199	426841	2405	239246	27496	16404	430202	1257793	110.58
2000-01	85784	184292	3866	--	27707	85	381460	683194	133.22
Decade 1991-01									
Average	152492	639184.1	8285.4	235765.3	29229	50597.8	508411.2	1623965	116.91
CV %	103.65	66.63	114.60	131.84	106.98	167.08	121.16	93.45	
Share %	9.39	39.36	0.51	14.52	1.80	3.12	31.31	100.00	

Source: DGCIS, computed.

Note: Coefficients of variation (CV) across time and across the six sea ports or port groups.

Appendix A2

Cost of cultivation data in India

The 'Comprehensive Scheme for Studying the Cost of Cultivation of Principal Crops in India' (COC) is implemented by the Ministry of Agriculture, GOI with the basic aim of facilitating the formulation of the agricultural price policy of the Government. The data is brought out by states and by crops as a publication since 1991 for possible use by researchers and other institutions. The latest issue brought out in February 2000 covers the years 1990-91 through 1997-98 though not uniformly.

The scheme, designed as a three stage stratified random sample presents a number of concepts of cost terms of coverage of paid out and imputed components. When the opportunity cost of owned set of resources is zero, it can make sense to cultivate even for zero or negative levels of economic profit going by cost C2 and A2 may then be the indicator of cost in farmer's perception. Further, the Government has added two more concepts C2* and C3 which are rather inflated. The concepts of cost considered for a study would primarily depend on the purpose (Rajaraman and Ghosh 2002).

In Table A2 a comparison of the value of the main product[9] with cost C2 suggests that barring northern states of HRY, PJB and UP much of the cultivation of rice or paddy in India is economically unprofitable but that with cost A2 explains why it nevertheless is practiced widely. While PJB and HRY have a low labour component in cost, the share of labour is high in WB and AP.

Table A2
Cost of cultivation of rice

State	Years	Value of main product (Rs)	Yield (100kg/ ha)	Fertilizer (kg./ha)	Cost of fertilizer (Rs)	Cost of family labour (Rs)	Cost labour (Rs)	Cost C2 (Rs)	Cost A2 (Rs)
AP	1996	20166	47.04	186.0	2080	2492	7134	20937	11318
AP	Average	18539	46.63	176.7	1917	2049	6376	18874	10415
HRY	1996	19873	43.44	185.0	1738	2828	4840	18622	8665
HRY	Average	17987	40.69	177.0	1269	1772	3719	13306	7045
ORS	1996	9738	24.18	57.0	613	1905	3894	10310	5242
ORS	Average	9939	27.56	61.3	647	1657	3503	9823	5197
PJB	1996	20961	51.64	183.0	1725	1102	3408	17967	9875
PJB	Average	19054	49.84	187.0	1545	1216	3165	16247	8888
UP	1996	13557	34.02	104.4	939	2244	3652	11301	5126
UP	Average	9937	30.87	89.1	671	1543	2695	9081	5721
WB	1996	15897	37.20	95.0	1070	3091	6248	16930	8301
WB	Average	13387	33.02	70.0	773	2511	5296	13963	6837
MP	1996	9936	22.61	66.6	649	1649	2873	9989	4818
MP	Average	8773	22.01	61.1	593	1321	2389	8742	4346

Source: Government of India (COC) 2000.
Note: Average is over 1991, 1992, 1996 for HRY and UP and 1994, 1995, 1996 for other states.

9 The total revenue to farmer also includes value of by-products which is not considered here. The by-products too have various potential in uses such generation of power for local use, bran oil and furfural.

Appendix A3

Fertilizer pricing in India and calculation of fertilizer prices

A review of the fertilizer sector in India

The success of the HYV seed depended on the superior response of crops to chemical fertilizers and the success came at a tremendous cost in terms of budgetary subsidies. With the urge for self-sufficiency and import substitution, the government not only pursued an active food policy but also sought to control the fertilizer sector to make fertilizers affordable to farmers and promote technology adoption. Since India was deficient in production facility for essential fertilizers, imports were necessary but following the oil shock of 1974 the government went a step beyond canalization of imports to protect and build up a strong domestic industry by a complex scheme known as the Retention Price and Subsidy Scheme (RPS).

The RPS and fertilizer subsidy

The RPS was first adopted in November 1977 for urea following the suggestions of the High Power Fertilizer Pricing (Marathe) Committee. It aimed to make fertilizer available to farmers at favourable prices on the one hand and to provide adequate incentive to the domestic fertilizer industry on the other. The RPS which was later extended to other categories of fertilizer assures a retention price to the producer to cover their normative cost[10] and at the same time notifies a statutory sale price or farmgate price uniformly throughout the country. The difference adjusted for freight rate and dealer's margin is paid as subsidy. With this policy fertilizer use improved and import dependence came down in nitrogenous fertilizer (N) and phosphatic fertilizer (P).[11]

The RPS has come under increasing attack because of the subsidy burden imposed on the budget and its complex and non-transparent nature. The subsidy has been increasing over the years mainly because the farmgate price of fertilizer has not adjusted to the feedstock prices. This is an extremely sensitive issue in India since such a price rise is likely to have serious impact on food production and the plight of the farmers, especially the small and marginal farmers. Of particular concern are the small and marginal farmers who also benefit from the scheme. On the other hand it is contended that only a part of the subsidy bill shown in the annual budget reaches the farmer and rest, about 40 per cent (as of the 1980s) goes to protect the fertilizer industry as also to feedstock importing agencies as these prices are also administered (Gulati 1989, 2000). Since these agencies are state owned, their surplus represents intra-economy transfers.

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10 This is cost plus a 12 per cent post tax return at an output level of 85 to 90 per cent of rated capacity.

11 Potassic fertilizers (K) however continue to be imported as domestic production is not commercially viable on account of lack of raw materials and low demand. Though urea manufacture relies on indigenous naptha and fuel oil, these products being essentially petro-products, imports are still important. Rock phosphate for P is a domestically scarce resource.

Reforms

The decontrol of P and K fertilizers is a landmark reform in the sector. Urea the most important nitrogenous fertilizer is still controlled and the industry spanning public, private and cooperative sectors is protected by canalized imports and the RPS. The partial reforms created nutrient imbalance in soil when prices of decontrolled fertilizer shot up and the government reacted by introducing ad hoc concession to P and K fertilizers that continue. The steps taken to free the fertilizer market of state controls and integrate it with the global market were accompanied with vigorous political resistance and political indecision as borne out by the Box below.

Box: Some Policy steps taken with the launch of Reforms
1. On 25 July 1991 some of the nitrogenous fertilizers excluding urea (CAN, AS, AC)[1] were decontrolled and prices of other fertilizers were increased by 40%. 2. In three weeks times the price hike was revised to 30% and small and marginal farmers were exempted. 3. The dual pricing method was again abandoned as not more than 5% of farmers were said to have benefited. 4. 25 August 1992 government decontrolled P and K and abolished RPS for P. But the nitrogenous fertilizers were brought back under control. 5. Sale price of urea was again reduced by 10%. RPS was retained. 6. To moderate the price increase of decontrolled fertilizers, concessions were introduced. Other advantages relating to freight, exchange rate and customs duty were extended. 7. 1994 again the same N fertilizers were decontrolled and urea price was raised by 20%. Further increases occurred in1997, 1999 and 2000-01.

Note: 1 Calcium Ammonium Nitrate, Ammonium Sulphate and Ammonium Chloride.

The state of affairs can be summarized by the status of the most commonly used fertilizers in India as given Table A3.1

Table A3.1
Nutrient content, share in nutrient supply in country and policy scene for fertilizers

Fertilizer (nutrient)	Nutrient content %	Nutrient supply %	Policy
Urea (N)	46 (N)	63 (N)	RPS State Trading
DAP (N,P)	(18,46)	53 (P)	Decontrolled Concessions
MOP (K)	(60)	65 (K)	Decontrolled Concessions

Note: DAP = Diammonium phosphate, MOP = Muriate of Potash.

Source: FAI.

Fertilizer import policy

India depends on imports in varying degrees for all three major fertilizers and with further reforms and progress of WTO implementation the dependence is likely to go up. At present variable but nominal custom duties are levied and longer term reforms and tarriffication are under way before the sector becomes free. As matters stand, while DAP and MOP are freely imported, urea the most important material is imported by state owned agents like and distributed by different agencies to farmers' access points. The distributors however include private sector companies apart from state owned and cooperative agencies. The urea under RPS faces a uniform maximum price fixed by the national polity. On the other hand DAP and MOP although imported and distributed privately also face a nationally uniform sale price rather than market determined prices at regional levels depending on distances and local conditions. The latter also enjoy concessions with a bias in favour of domestic producers.

Import price calculation

Imports are subject to variable duties and the ultimate farmgate price for imported fertilizer would depend not only on the CIF prices and handling and transport charges but such policies as concessions, duties and taxes as applicable at a particular time.

In order to obtain the farmgate price of fertilizer in a free trade scenario one has to take account of all the complexities of policy. Also the problem is compounded by lack of published data on costs such as port charges, transportation and handling. Even nutrient-wise (N, P, K) data on imports is not reported by DGCIS. However, the Fertilizer Association of India (FAI), Government of India provided actual import prices of urea, DAP and MOP and the average pool handling charges from port to hinterland which include freight and handling (port and stevedoring). Taking actual consumption of nutrients as weights it is possible to arrive at external reference price of fertilizer nutrients in addition to those of disaggregated nutrients. The calculation at the national level is demonstrated in Table A3.2. The varying consumption patterns across agriculturally diverse regions provide a regional dimension to the price and state wise domestic and import prices, as used in the main analysis are provided in Appendix Table A5.1.

Estimates of domestic farmgate price also derived by taking weighted average of nutrient prices is compared with the farmgate import price to have an idea of protection to the farmer. The ratios of import price to domestic price is here taken to measure protection to farmers who are consumers of fertilizer and the values exceeding unity even at the state levels suggest that farmers indeed receive a share of protection from higher world prices.

Figure A3

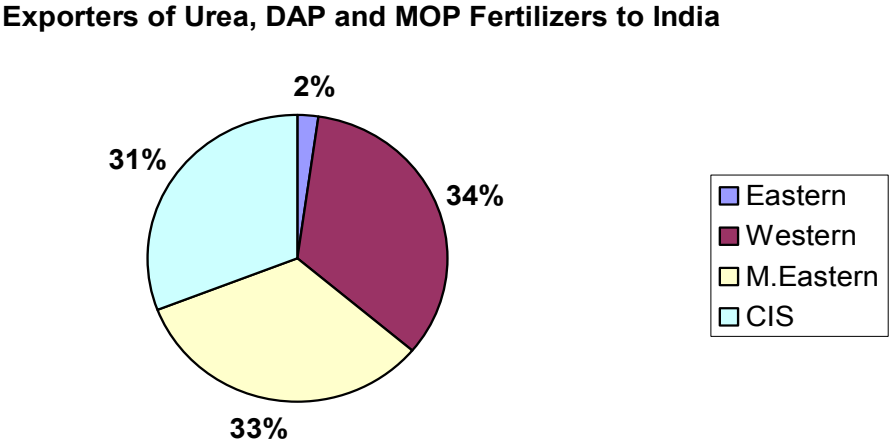


Table A3.3
Calculation of fertilizer import price (all India) and an estimate of protection

(Rupees per tonne)				
Fertilizer/nutrient				
Fertilizer	Urea	DAP	MOP	
Import price ($)	100.41	219.88	122.00	
Import price (Rs)	4224.25	9250.35	5132.54	
Farmgate import price (Rs)	5316.25	10342.35	6224.54	
Domestic sale price (Rs)	3660.00	8300.00	3700.00	
Nutrient	N	P	K	NPK
Import price (Rs)	11557.06	17961.04	10374.23	13030.91
Domestic price (Rs)	7956.52	14930.06	6166.67	9521.65
Import price/domestic price	1.45	1.20	1.68	1.37

Source: Computation based on FAI.

Notes: (i) Average exchange rate was Rs 42.07. (ii) Farmgate price includes handling charge inclusive of freight at Rs 1092. No import duty was levied in this year. (iii) Sale price is statutory maximum price of urea under RPS and uniform sale price of DAP and MOP. (iv) Fertilizer prices are converted to nutrient prices (see Table A3.1 for conversion). (v) Domestic price is sale price which includes concessions (Rs 4400 for DAP and Rs 3000 for MOP). (vi) Import price divided by Domestic price is a measure of protection to farmers. (vii) For weights see Table A5.1. (viii) Reference year is 1998-88. The import price for the year is representative, the average of triennium 1997-00 being Rs 13.36, somewhat higher than Rs 13.03 for the year as above.

Appendix A4

Rice marketing in India and calculation of product prices

Market channels and institutions

Food marketing takes place in a dual channel market in India. Farmers retain a major portion of the output themselves for their own consumption, seeds and animal feed and only about 30–40 per cent of paddy is marketed (World Bank 1999). Of this about 50 per cent enter the public sector dominated and centrally administered market via Food Corporation of India (FCI) and other State agencies. The remaining grain goes by the private channel, which is the so called open market, although regulated and impacted by various State rules and activities. The FCI freely procures from the market and also coerces levies from millers.

Rice export is now freely allowed so that one can broadly trace the course taken by the marketed grain from one free market agent to another, namely the farmer to the exporter in two parallel channels as shown in Figure A4. The whole process can be divided roughly into three major phases: (a) farm to mill, (b) mill to port gate and (c) port gate to ship. Phase (a) further has two sequences, one from farm to market, operated by the farmer and the other from market to mill operated by farmer, trader or public agent. Phase (b) is operated by the trader or FCI and the final phase (c) is now in the hands of the exporter. Although various agents take part and gain or lose in the entire operation, the transaction at each point has an implication on the remuneration that percolates to the farmer.

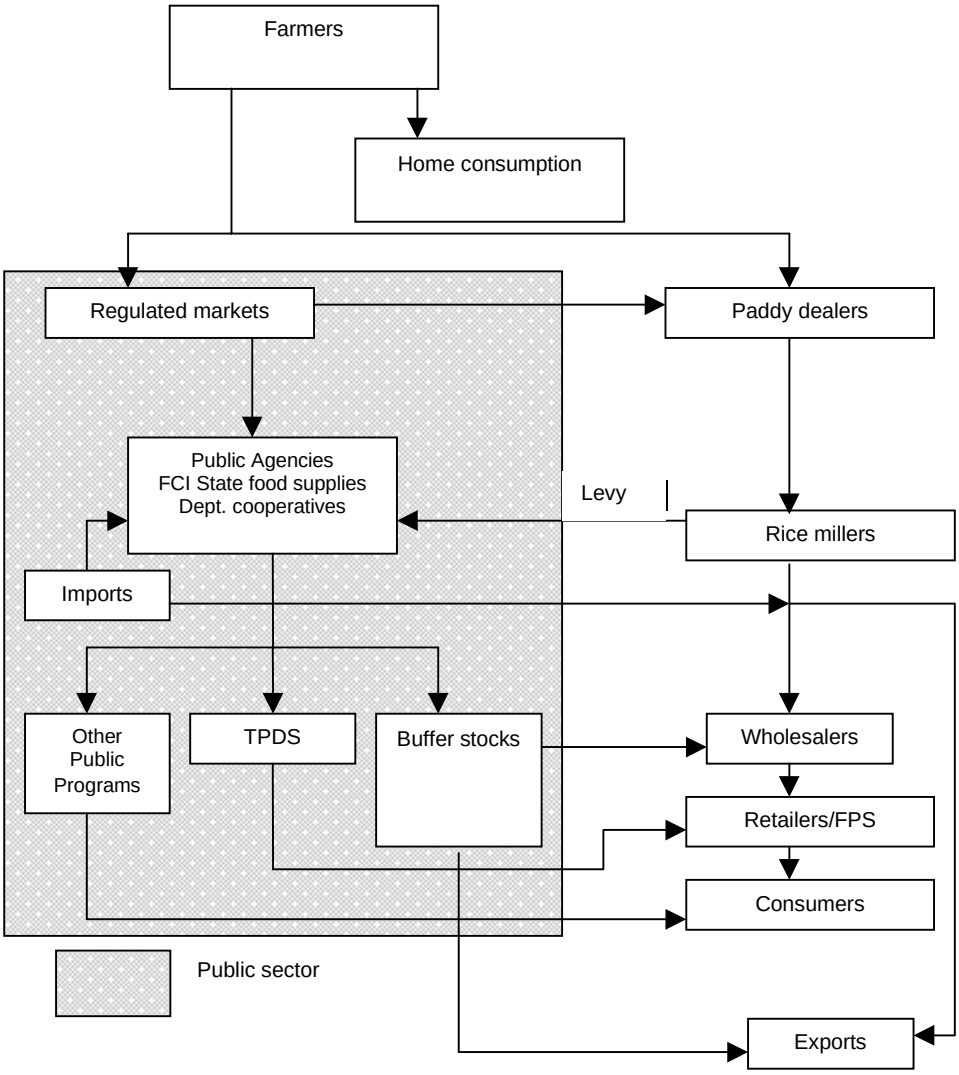
The cost structures thrown up by the two channels are different and difficult to compare although some studies in this direction (Sidhu 1998; Gulati *et al.* 1996) suggested a higher cost structure faced by the FCI as compared to the private trader. FCI's role as distributor in inaccessible and commercially unattractive sectors makes the comparison difficult in general. The scale economies and other privileges enjoyed by the FCI as opposed to the imposed constraints on the private trader further add to the problem. The following sections elaborate on the process of rice marketing in India and associated issues.

Phases of rice marketing

Farm to Mill: Market arrivals of paddy are staggered over a large part of the year, the crop being harvested two to three times a year in most of the states. Post-harvest processes are mostly manual and the paddy is brought to market by bullock carts while operations and transportation are more mechanized in Punjab and Haryana. Usually the market is within a short distance of the farm but in some states millers from distant locations buy directly from the farmers and transport the product in trucks. The wholesale market commonly called the mandi is a state owned wholesale market set up under the Agricultural Produce Markets Act, managed by a committee represented by farmers, traders, local government and the FCI. The markets are not always adequate, suffering from congestion, lack of electricity, leaky roofs and unpaved roads. Grain brought in bulk is unloaded, visually inspected and auctioned off mostly to private

traders and partly to FCI and other state agents who pay a pre-announced price. The collected grain is transported to the mill.

Figure A4
Dual channel market for rice



Procurement of paddy on voluntary basis at the mandi occurs only to a limited extent but FCI extracts a levy ranging more often between 50 and 75 per cent from millers in a coercive manner. The procured grain is also custom milled at given rates, which are also applicable to the private channel. Bulk of paddy is milled under inefficient technology in hullers and shellers rather than the modern mills. They suffer from lower recovery rates, greater mixing of bran and husk with grain, larger incidence of broken grains and greater power consumption.

Mill to Port: From the mill the private channel grain reaches the exporter or the consumer via the wholesale and/or retail markets. The FCI rice packed in gunnies is transported across the country and distributed through the vast network of privately owned but regulated 'fair price shops' at uniform prices or via employment and poverty linked programmes. Alternatively, FCI sells to the exporter and delivers the grain at the port gate. While FCI is able to use the cheaper railway wagon for transportation except in hilly areas, the private trader relies more on hired trucks.

Port to Ship: The exporters comprising of either private traders or State trading enterprises pick up the grain delivered at the port gate. The grain may undergo some more processing depending on the demands of the importer, especially to bring down broken grains, which is high in FCI sourced purchases. The shipping also involves loading and unloading, fumigation and official processing and all this often leads to delays and excessive expenses (see A1).

Food corporation of India and private trade

The FCI was established in 1965 in the public sector under the Food Corporation Act 1964 as a countervailing force to the speculative activities of the private trader and to execute the government's price policy. The FCI is known for its large overhead, outdated operational methods, inadequate storage space and inefficient supervision. This results in mounting subsidies and poor quality grains. On the defense side FCI has been shouldering increasing burdens in the last decades where the largely open-ended procurement system and frequent hikes in support prices have pulled up FCI's purchases too high relative to distributions and its stocks simply inordinate relative to the desired norms. The FCI also conducts the vital function of food distribution.

Apart from dominating the foodgrain market through the single largest operator FCI, the government also imposed several direct and indirect restrictions on private trade. The Orders linked to Essential Commodities Act 1955 as Government of limit a private trader's capacity to stock or move foodgrains are relaxed sporadically but the states have yet to come out of the restrictive practices and while India is moving towards a more globalized market, the country itself is yet fragmented by these market controls. Controls on credit and limited share of private trader as compared to FCI, the compulsory to use jute bags for retail trade, compulsory channeling via regulated markets have all discouraged and inhibited private trade and had implications on private cost. While the FCI's existence in the market still has significance in the light of food security concerns of the poor in particular, there is now a consensus to reduce its dominance and allow private players in this large grain market. However, the issue is politically and economically sensitive and debates hovers around the new role the FCI – whether as a price stabilizing force or a support against distress sales or a guide to resource allocation in agriculture or simply a competing trader in the food grain market.

Calculation of farmgate free trade price

Under a hypothetical control free and free trade situation, the farmgate or the producer price would be determined by the actual FOB price received by the exporter at the trading port. This price may be at variance with the so called international price (Chand 1999) measured by the world average price or more often the price obtained in a competing country (Gulati 1994). In fact the FOB price also varies to an extent from port to port in the country (see Table A1.1(b)) depending on various factors including the transaction bargains between exporters from the port and the importing country or agency.

As there is considerable overlapping among hinterland (Appendix A1) the exporter has to make a conscious choice among alternative ports and this choice depends not only on the distances to be traversed within and without the country but also the choices of the importers/shippers and the facilities of the ports. Thus there is no clear one to one match

between the producing center and the port pair. However, to get a regional picture of the price implication on farmer and the returns the port of reference is important.

This paper deals with the issue in the following way. (1) For each state a main market city/town is taken as a reference called the producing center henceforth, (2) Trials are conducted for each center with multiple ports (as in Table A1.2) and the producing center-port duo which yields maximum returns is taken as the exporter's possible choice. (3) Due consideration is given to the FOB price at the port and other charges involved.

Since international prices are volatile and the rice marketing season is staggered beyond the agricultural year (April-March), the average FOB price of rice in Rupees for two years 1998-99 and 1999-00 is considered as the export price. The FOB price of rice in the non-basmati category is obtained from the value and quantity figures reported by DGCIS by port and by year.

The marketing of rice can be partitioned into three parts: (a) farm to mill (b) mill to outlet, that is, retailer/FPS/port gate and (c) port gate to ship and the process is conducted either by private traders or the FCI (or other state agencies) or both. It was seen that FCI operation has its often-criticized inefficiencies and the obvious economies of scale. Much of the former including large administrative charges and losses in transit could be avoided if FCI were to operate in a more competitive setting. While, FCI records and reports cost figures in a systematic way the private channel is much more heterogeneous with differing cost structures which are not reported and/or revealed on grounds of competitive advantages. Also the private channel has been proving to be 'uncompetitive' of late with FCI being the sole supplier to the exporter at the port gate although the validity of this advantage can no doubt be questioned in an environment still partial to the public sector.

Based on the availability and reliability of information the cost incurred in the farm to mill leg of the journey is taken from FCI sources. These are average figures of relevant items of cost approximating theoretically the cost if FCI were to compete freely in market with its scale economies and suitable efficiency measures. The other component of FCI cost involves feeding the huge distribution network and is not relevant in this context. In the mill to port journey gunny bag cost as reported by FCI and transport cost from producing center to the port is included with the latter derived from average railway freight rates of the regions reported by Indian Railways. This is less expensive of the two alternatives railway and roads and although private traders resort to roads more often this is only in an uncompetitive market. Finally the exporter may incur some cost too and allow a small margin of around 3 per cent to 5 per cent as reported by sources. The processing requirements usually depend on importers' demands. On the average the port charge is about RS 30.

Table A4 and the associated notes lay down the cost figures used, the reference ports and producing centres and the calculation procedure of the farmgate export price. The ratio of farm harvest price to the FOB price is less than unity in all cases except WB and HRY where some protection is indicated where the exportable hypothesis itself does not hold.

Table A4
Calculation of farmgate export price and an estimate of protection of rice
(reference year is 1998-99)

States	Reference producing centre	Reference port	FOB price port	Cost farm to mill	Cost mill to port	Cost port	Cost total	Farmgate export price	Prevailing FH price	Prevailing/ export farmgate
1	2	3	4	5	6	7	8	9	10	11
UP	Lucknow	Kandla	1147.30	174.57	101.53	77.55	353.65	793.65	645.00	0.81
HR	Karnal	Kandla	1147.30	174.57	94.89	87.00	356.45	790.85	841.00	1.06
PJB	Amritsar	Kandla	1147.30	174.57	99.32	81.34	355.23	792.07	723.00	0.91
AP	Vijayawada	Madras	1275.34	174.57	54.82	79.27	308.66	966.69	726.00	0.75
MP	Raipur	Bombay	1170.32	174.57	72.74	78.37	325.67	844.65	690.00	0.82
WB	Calcutta	Madras	1275.34	174.57	112.80	93.42	380.79	894.56	951.00	1.06
ORS	Cuttack	Visakapattanam	1054.40	174.57	58.12	74.11	306.80	747.61	619.50	0.83

Source: computed from DGCIS, FCI, Indian Railways, APEDA, mapsofindia.com.

Notes:

Farm harvest price/FOB price (Farmgate level) gives the measure of (dis)protection to farmer.

Definitions of Cost/Price (Rupees per 100 Kg):

Cost Farm to Mill = Mandi charges, purchase tax, custody and maintenance (fumigation, storage etc.), mandi labour, drying, internal movement, interest charge and bank guarantee, milling.

Cost Mill to Port = Gunny + Transport

Transport = Distance x Average railway freight rate of region (north, east, west, south).

Cost Port = Port charge + Processing and margin (5%)

FOB price Port = Unit value of export of non-basmati rice at given port (average of 1998-00).

Farmgate Export Price = FOB price Port – Cost total

Appendix 5: Tables

Table A5.1
Fertilizer nutrient consumption and prices by States

State	Consumption of fertilizer nutrients (000 tonnes)				Farmgate price NPK (rupees/tonne)		NPK
	N	P	K	NPK	Import	Domestic	Import price/ domestic price
AP	1284.26	560.47	163.19	2007.92	13248.47	9757.57	1.36
UP	2447.87	557.57	86.09	3091.53	12679.11	9164.38	1.38
MP	738.16	448.37	39.21	1225.74	13861.77	10450.15	1.33
HR	662.67	171.77	3.95	838.39	12863.54	9376.83	1.37
PJ	1081.06	275.47	18.74	1375.27	12823.68	9328.95	1.37
WB	579.69	305.77	192.48	1077.94	13162.42	9615.04	1.37
ORS	194.58	60.38	44.21	299.17	12674.75	9099.46	1.39
India	11353.78	4112.15	1331.53	16797.46	13031.04	9521.82	1.37

Source: FAI, Tables 3A.1, 3A.2.

Notes: (i) Import price includes average CIF price and handling charges (ii) Import price/domestic price is presented as a measure of protection to farmers.

Table A5.2
Parameters underlying calculation of returns

State	Input coefficient (fertilizer) a_x	Input coefficient (others) $p_{x^*} a_z$	Fertilizer price domestic (Rs/kg)	Fertilizer price imported (Rs/kg)	Paddy price domestic (Rs/kg)	Paddy price export (Rs/ kg)	Paddy yield (kg/ha)
AP	0.0379	0.9138	9.76	13.25	4.84	6.44	4128
HRY	0.0437	0.6591	9.38	12.86	5.60	5.27	3359
ORS	0.0223	0.9239	9.10	12.68	4.13	4.98	1818
PJB	0.0365	0.7724	9.33	12.82	4.82	5.28	4728
UP	0.0288	0.8646	9.16	12.68	4.30	5.29	2904
WB	0.0209	0.9848	9.62	13.16	6.34	5.96	3383
MP	0.0278	0.9286	10.45	13.86	4.60	5.63	1386

Source: Computed as in Tables A3.3 , A4; DES.

Notes: (i) a_x = input coefficient of traded input; (ii)$p_{x^*} a_z$ = input coefficient of non-traded input (value terms). (iii) Prices are farmgate level. (iv) Conversion rate (paddy to rice) is 0.67.

Table A5.3
Estimated regression equation for fertilizer use (for yield adjustment)

Dependent variable = FRT					
Variables	Constant	Time	P-f	Rsq	Obs.
Parameter	116.75	3.76	-35.25	0.72	36
	(2.73)	(1.42)	(1.80)		
Shifts					
East	28.11				
	(1.35)				
South	137.31				
	(5.79)				
North	105.54				
	(6.69)				

Note: Estimated linear regression equation. Data: COC.

Source: Estimated.

Table A5.4(a)
Gains in returns at external prices from paddy cultivation

Yield category	District	Yield rate 100kg/ha	Share in area %	R2-R1 Rs/ha	R4-R1 Rs/ha
High yield	West Godavari	5055	10.57	637.631	-16.1668
High yield	Karimnagar	4859	5.98	652.486	7.67603
High yield	Guntur	4818	7.59	699.318	77.3473
High yield	Prakasam	4817	3.38	689.615	68.1984
High yield	Krishna	4656	9.62	590.737	-9.34029
Low yield	Medak	3705	2.85	473.461	-17.0329
Low yield	Vizianagaram	3513	3.16	475.762	18.6099
Low yield	Srikakulam	3023	4.55	387.153	-1.97703
Low yield	Mahbubnagar	2982	3.40	400.398	10.628
Low yield	Visakhapatnam	2076	2.75	275.441	1.54937

Table A5.4(b)
Gains in returns from paddy cultivation

Yield category	District	Yield rate 100kg/ha	Share in area %	R2-R1 Rs/ha	R4-R1 Rs/ha
High yield	Pilibhit	3915	2.27	511.97	-13.30
High yield	Kheri	3342	3.21	439.34	-15.22
High yield	Maharajganj	3278	2.84	439.88	9.54
High yield	Bareilly	3131	2.92	463.25	8.50
High yield	Ghazipur	2972	2.27	388.59	-30.20
Low yield	Balliah	2751	1.94	360.70	-30.27
Low yield	Azamgarh	2675	3.40	321.54	-46.43
Low yield	Sitapur	2655	2.62	351.77	-13.24
Low yield	Gorakhpur	2061	2.48	302.86	-23.57