MTID DISCUSSION PAPER NO. 67

ACHIEVING FOOD SECURITY IN A COST EFFECTIVE WAY: IMPLICATIONS OF DOMESTIC DEREGULATION AND REFORM UNDER LIBERALIZED TRADE

Shikha Jha and P.V. Srinivasan

Markets, Trade, and Institutions Division

International Food Policy Research Institute
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EXECUTIVE SUMMARY

This study evaluates the domestic and international trade and marketing policies in India and analyzes the effects of deregulating domestic markets and liberalizing external trade on the food grain sector.

Historically, India's food policy has involved heavy government intervention in all aspects of the food grain market – pricing, procurement, stocking, transport and marketing. The Food Corporation of India (FCI) is the principal parastatal agency responsible for marketing food grains within the country and controls nearly 50 percent of the grain markets. An analysis of the performance of the FCI, however, reveals enormous and mounting costs of operations that present a huge financial burden for the Government of India (GOI). This study offers a comparison of the costs and functioning of the FCI with that of private traders, in order to suggest policy options for reform. The results show that private traders operate at costs lower than those incurred by the FCI in both storage and trade, despite several controls and restrictions imposed upon them. Therefore, the finding from this study is that there is a strong case for reform from the efficiency point of view.

In this regard, the government has already initiated steps to encourage private participation in grain markets. The role of the FCI is proposed to be restricted to timely sales and purchases in order to maintain stability in food prices and exports and imports of food grains, as and when required. The budgetary savings of the central government realized by limiting the role of FCI can be used to provide subsidy to the states for the specific purpose of procuring grains through their agencies, private or public. Given the cost factor, they can choose the most appropriate way to purchase grain. However, there is more that needs to be done. If price distortions are eliminated, farmers could shift away from rice and wheat and diversify to high value farming that offers higher market price such as fruits and vegetables, poultry and dairy. Subsidized loans could be offered to improve the restricted access to credit and to encourage private storage facilities that are

used co-operatively. In line with this, the National Policy on Handling and Storage of Food grains envisages greater private sector participation in building storage capacities for rental use by government agencies and also in the development of infrastructure for integrated bulk handling, storage and transportation of food grains.

Another major contribution of this study is to analyze and quantify the impacts of relaxation of restrictions on private domestic trade of rice and wheat based on a spatial equilibrium model of inter-state trade that takes place under arbitrage opportunities. A unique feature in the analysis of Indian grain markets is that wholesale and retail traders are considered as a separate set of agents in addition to consumers, producers and the government. The analysis produces some interesting results.

Public sector agencies perceive private traders as competitors to the FCI. Based on this, the general perception is that private trade will mimic the behavior of FCI by, for example, transporting grains from Punjab in the north of the country to Kerala in the south. However, contrary to this perception, results from this study show that private trade does not necessarily take place only and directly between a surplus and a deficit state. The results show that it is possible for a deficit state to import grains from a neighboring deficit state, which in turn could import from another deficit or a surplus state or even from abroad depending on arbitrage benefits. With freer domestic trade, markets reveal all information needed to private profit maximizers who obviously choose the least cost options of trade.

As restrictions on domestic trade are relaxed, prices stabilize across states and there are welfare gains to producers, consumers and wholesale traders at the national level. The gains are much higher in the case of wheat compared to rice. This could be due to the fact that the rice market continues to be controlled through levy procurement. There is a steep reduction in government costs from deregulating domestic trade as costs of procurement and storage both fall, especially due to lower wheat procurement since traders prefer to sell wheat to other states rather than to the FCI, since it fetches them a better price than the Minimum Support Price (MSP). In a liberalized domestic and

foreign trade regime, it is also found that states make new trading partners domestically and may even prefer to trade with foreign partners in order to make the best of price differences.

The gains illustrated to accrue from liberalizing domestic and foreign trade are derived from small policy changes that reduce/ eliminate movement restrictions and also from reduced transportation cost. The problem of excess stock accumulation would however not be solved by these policy changes alone. Much higher gains in efficiency and economic welfare are possible if opening up the markets for both domestic and external trade is accompanied by investment in roads and other infrastructure, lower MSP for wheat (just sufficient to act as an insurance in low price years), abolition of the levy on rice procurement and decentralization of FCI's operations.

It is thus socially efficient to open up markets for trade in grains by encouraging private agents to participate in marketing and investment. This can be facilitated by a number of long-term policy changes to reduce transaction costs of private traders. These include encouraging investment and modernization through improved infrastructure (e.g., roads/ ports/ storage), a larger scale of operation (e.g., bulk handling/ transport) and innovations (e.g., fuel-efficient trucks). The government also needs to develop better institutions for improving market information, grading facilities etc.

As for external policy, the era of globalization has brought with it new opportunities as well as challenges to the food security system. Being a signatory to the WTO, the country is moving towards greater openness in agricultural trade. The challenges are in terms of developing appropriate marketing infrastructure and institutions to deal with trade in agricultural commodities and formulate appropriate policies to deal with price risk. The opportunities include reduced dependence on buffer stocks and a greater dependence on trade for price stabilization. As India becomes a major force in the global rice and wheat markets, new strategies are required to sustain its position. To achieve this end, the government plans to promote exports through providing long-term credit, removing export restrictions, establishing Agricultural Export Zones

and providing transport subsidies to export rice and wheat from government warehouses. However, there is a need to improve facilities for grading, improve measuring standards, and address quality problems. Exporters also face problems of storage and distribution. In order to take full advantage of growing export opportunities, they would need to have reliable port and domestic infrastructure facilities, which are currently lacking, rather than transport subsidies. The ports are highly congested, with obsolete equipment, and are managed by government-controlled port trusts that are plagued by bureaucracy. Improving these essential facilities through critical investments and institutional changes away from government dominated controls and towards greater private sector participation, would go a long way in reducing the high handling costs and margins of exporters, thereby making India more competitive in the world grain markets.

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ACHIEVING FOOD SECURITY IN A COST EFFECTIVE WAY IMPLICATIONS OF DOMESTIC DEREGULATION AND REFORM UNDER LIBERALIZED TRADE

Shikha Jha and P.V. Srinivasan[1]

1. INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

Two implicit but important components of the Indian food policy have been to stabilize food grain supplies and prices *over time* through stock policies and *across regions* by procuring grains from surplus areas and supplying in deficit areas. Policies that supported price incentives, food distribution, subsidy and investment in research, irrigation, and other forms helped to expand wheat and rice output substantially. The food grain market in the country has been characterized by a significant government presence in pricing, procurement, stocking, marketing and distribution and transport which began in the days of food shortages, when dependence on food grain imports was high and imports were canalized, as a result of which restrictions were imposed on domestic and foreign trade and storage of grains through policies such as the Essential Commodities Act (ECA) and *zoning* that regulates or prohibits private trade in food grains across broad zones. The government's control through active participation in storage and trading activities was based on the belief that "speculative" activities by private operators can be destabilizing and that legal restrictions to counteract their collusive and manipulative practices may not succeed. Such controls in grain markets led to significant regional price variations as well as high costs of operations. The government also imposes Selective Credit Controls that specify minimum margins & commodity specific interest rates. In addition to these, private agents face problems due to inordinate delay at check posts, bad roads and infrastructure.

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[1] Professors, Indira Gandhi Institute of Development Research (IGIDR) General A. Vaidya Marg, Goregaon (East)Mumbai – 400 065, India.

In recent years, the situation has become one of excess supply as government procurement especially for wheat turned out to be more in the nature of providing price support to farmers. In 2002 stocks in government warehouses exceeded 60 million tonnes, half of which had to be kept in the open ground due to lack of any proper storage facilities. Simultaneously, at least one fourth of India's population – about 250 million – remained underfed. Thus while on the one hand the domestic policy environment contributed significantly to long-term grain production; it also led to the current situation of large market surpluses alongside persistent food access problems. While India has long been food secure at the national level, it has become increasingly clear in recent years that it has a long way to go in attaining household level food security.

Taking stock of the unsustainable situation, the government began to revamp its grain distribution programs since the mid-1990s by focusing specifically on poor consumers. Policies to offload stocks such as subsidized grains for new schemes and for exports along with higher allocations for existing food and nutrition programs did bring down the stocks but they still remain close to 50 million tones in 2003, several times the amount sufficient to tide over unforeseen circumstances. But the changing domestic and international scene means that the surpluses may not be a long-term phenomenon. Among the various steps being taken by the government of India towards deregulation of both domestic and international trade of agricultural commodities is a new policy to remove restrictions on interstate movement of commodities. The Tenth Plan has proposed to do away with the ECA and repeal and replace it with an emergency act that can be applied by notification for a limited period of time to a specified commodity in a specified region. With a recent initiative taken by the central government, the state governments are expected to introduce appropriate laws to remove restrictions to enable farmers and companies to jointly promote both domestic and foreign trade. With the changing external economic scenario, the country now will have to implement agricultural economic reforms to meet WTO obligations and to take advantage of the opportunities thrown up by a more liberalized world market.

However, there is still a great deal of reluctance on the part of policy makers to open imports (and sometimes even exports), and allow private sector to operate freely in

the grain markets, for fear of jeopardizing food security. In the existing situation, freeing of domestic trade would in fact imply a reduced need for protecting farmers' prices, as regional exports out of surplus areas would raise the local prices there and reduce them in deficit regions. Centralized procurement may not be needed any more and decentralized procurement is likely to be more effective. Moreover, traders in bordering states such as West Bengal and the North-East may find it easier to export to Bhutan, Bangladesh or other neighboring countries. Similarly during periods of shortage they could import from other countries rather than depending on central government stocks. In short, domestic market efficiency could be greatly increased and social welfare enhanced by encouraging larger private sector participation and withdrawal of public operations in areas where it is no longer desirable. The latter in turn may lead to higher marketing efficiency and lower transactions costs.

In this Report we address several issues associated with these concerns and the changing policy scenario. For example, what would happen if all domestic controls on grain marketing go, especially movement restrictions, centralized procurement including levy on rice millers, and stocking limits on traders? Will the private sector come in a big way? Will food security be assured? Would division of FCI into smaller corporations solve the current problems? These questions become important in the current context of fast track reforms such as diversification of agriculture and removal of control (on storage, movement and marketing of agricultural produce), which are identified by the Tenth Five Year Plan as the two important areas for employment creation. The Plan also emphasizes adjustment of Minimum Support Price for food grains and other commodities so as to promote diversification of agriculture both in terms of geographical coverage and crop diversification. Shifting of cropping pattern in their favour of new areas like pulses and oilseeds that are more labour-intensive will boost employment generation per unit of output. A higher output of these crops is also necessary to increase the weight of these items in the average food consumption basket, necessary for meeting the nutritional requirements.

1.2 METHODOLOGY

We begin with an overview of trade and marketing policy perspective and consider issues such as how government marketing and trade policies in the past have impacted food security. Given the changing global economic environment under the WTO, and domestic acceptance to economic reforms, what should be the policy agenda with respect to marketing and trade policies for India's most important staple crops, rice and wheat, which dovetails the food security concerns with domestic and external trade liberalization? This discussion is followed by an evaluation of the parastatal Food Corporation of India vis-à-vis the private sector operators in trading and marketing based on data, government policies, literature on the role of the private sector and the policy obstacles it has faced. We examine the relative efficiency of functioning of private traders within the current system and what potential gains can be obtained through reform measures.

Having described the policy scene and effectiveness of the public sector agency, we evaluate the effects on regional food security of removing restrictions on domestic private trade of food grains. In doing so, we address some important questions such as: Have zonal restrictions on trade of food grains served the purpose of effectively transferring grains from surplus to deficit areas? Has the control on free private movement enhanced price stability across regions? Are such controls desirable? What would happen if the restrictions were removed? This part of the study maps potential gains through a spatial modeling of 18 regions in India. The results indicate that gains could be significantly large if the government is bold enough to take this step. And, these gains could be realized without compromising on the food security front.

Decentralized procurement is another major policy objective that the current government in India is pursuing to fulfill the requirements of PDS, which has been adding to spiraling costs to the exchequer. The main question we try to answer in this context is: What would happen if India decentralized procurement of rice and wheat to serve the PDS and restricted central procurement to cover only buffer stock requirements? For this purpose, we extend our spatial equilibrium model by including

additional features such as regional procurement prices, lower minimum support price for the central government and calculation of costs of central and state governments separately. Our calculations show that there are potential gains in welfare to consumers and producers.

1.3 ORGANIZATION OF THE REPORT

Our objective of the study is to obtain cost effectiveness and potential efficiency gains from various reforms. In Chapter 2, we provide an overview of trade and marketing policy perspective and analyze how government marketing and trade policies have influenced food security. In the next Chapter we compare and contrast the role, efficiency and effectiveness of FCI in relation to the private traders and agents. We present the spatial equilibrium model framework in Chapter 4. We follow this up in Chapter 5 by evaluating the effects on food security of relaxing restrictions on private trade of food grains in India. Finally, we conclude the Report in Chapter 6 providing some policy recommendations based on the analysis. It is hoped that this study would help policy makers by bridging some information gap with in-depth research and analysis of the data and past policies.

2. GRAIN MARKETING AND TRADE POLICY PERSPECTIVE

2.1 INTRODUCTION

The major underlying objective of the Indian government’s food policy is to protect both consumers and producers. With agricultural output continuing to depend heavily on monsoons, the government places great importance on stabilizing grain prices and income to farmers through price support policies. In order to protect consumers' interests it attempts to prevent prices from reaching exorbitant levels through buffer stock operations and distribution of grains at subsidized prices. Given these objectives, grain storage forms an integral part of the government's food policy. While a part of public

stocks are used for the operations of various food-based welfare programs, the rest act as a buffer to counter fluctuations in output and are used for market intervention operations to stabilize open market prices.

This Chapter evaluates the government's domestic and international trade and marketing policies and their effects on the food grain sector. It reviews the nature, degree and impact of the government policies, particularly, distortions in marketing and trade policies related to wheat and rice, on food security at the national and household levels with a special focus on the 1990s and early 2000s. The Chapter analyses the historical evolution of policies and their effectiveness in meeting objectives such as protecting consumers and providing incentives to producers. It also examines issues that arise from liberalizing external trade and the role that private storage and foreign trade can play in containing the rising costs of government intervention.

While trade liberalization has emerged as an important element of agricultural economic reform in India, it has not been accompanied by commensurate reforms in the domestic grain markets. Lack of domestic reforms adversely affects domestic production and consumption by distorting consumer and producer prices, impacting private trade and in turn stifling growth of the agricultural sector in general, which cannot take advantage of liberalized trade or cope with external competition.

In Section 2.2 we describe the evolution of domestic policies pertaining to pricing and distribution controls in food markets. In the next Section we review external food policy, followed in Section 2.4 by a discussion of the emerging role of the private sector. Finally, in Section 2.5 we present a summary of recent policy initiatives and conclude the Chapter.

2.2 DOMESTIC MARKETING: PRICING AND DISTRIBUTION CONTROLS

The Government of India (GOI) and various state governments are involved in several food-based interventions. Table 2.1 presents the salient features of various food-based programs run by the governments. These can be broadly classified into price

subsidy schemes, food for employment schemes and nutrition based programs. A major element of GOI's food intervention comprises procurement of food grains at minimum support prices (MSP), maintenance of buffer stocks and distribution of grains at subsidized rates through the Targeted Public Distribution System (TPDS), which is India's most expensive food security program. TPDS aims to ensure access by the poor and other vulnerable groups to essential food commodities at subsidized prices below GOI's economic costs. The program supplies rice, wheat, and sugar nationally, and other commodities such as edible oils and coarse grains in some states. It follows a 2-tiered pricing structure for people below and above the poverty line. Antyodaya Anna Yojana (AAY) is a new scheme to serve the poorest of the poor through a price subsidy that is much higher than that the TPDS subsidy for those below the poverty line.

Apart from distribution of grains at subsidized rates, another component of GOI's food intervention comprises procurement of food grains, i.e., wheat, rice and coarse grains, which serves the purposes of food-based programs, providing remunerative prices to farmers, building buffer stock of food grains to counter fluctuations in prices and meeting any emergencies like drought/ failures of crop. The buffer stocks are vital to the food management policy of the Government. Grains are procured by the Food Corporation of India (FCI, a GOI agency) in association with State procuring agencies under the price support scheme. For wheat, the government offers to buy all grain that comes forth for sale at its MSP. In the case of rice part of the procurement is in the form of paddy at its MSP, which is custom milled and the rest, which is the major part, is procured as rice in the form of a statutory levy imposed by some States/ Union Territories (UTs) on rice millers/ dealers.[2] The levy percentage varies from 10% in Pondicherry to 75% in Haryana, Punjab, Orissa, etc. Rice millers are paid levy rice prices fixed by the Government.

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[2] In this report, we interchangeably refer to States/ Union Territories as states.

Table 2.1—Safety Net Programs–Interventions, Financing Arrangements and Coverage

Program/Scheme	Volume of Food-Based Transfer	Program Interventions
A. Targeted Public Distribution System	BPL/ APL: 35 kg rice and wheat/ family/ month	Price subsidies on rice wheat, sugar, edible oils.
1. Antyodaya Anna Yojna	35 kg of rice and wheat per family classified as poorest of the poor	A higher price subsidy on rice and wheat than BPL rates
2. Annapurna Scheme	10 kg/ month/indigent senior citizen	Free grain to indigent senior citizens
B. Food grain Price Stabilization		Food grain procurement and price support, rice and wheat buffer stocks and open market sales at below market prices; Controls on private storage, movement, access to credit, rice milling, external trade
C. Food for Work 1.Jawahar Gram Samriddhi Yojana	1 kg of rice or wheat/workday	Employment in lean agricultural season for rural workers below poverty line
2. Employment Assurance Scheme	1 kg of rice or wheat/workday	100 days employment during lean agricultural season up to 2 members/family
3. Swarnjayanti Gram Swarozgar Yojana	Up to 5 kg grains per person per day	Employment at minimum wage, partly paid in kind
4. Food-for-Work	Food grains up to 5 kg per man-day	Employment in natural calamity areas
D. Mid-Day Meals Scheme	3 kg rice or wheat/child/month for 10 mos. Or cooked meal (100gm/day) for 200 days	Cooked meal or distribution of food grains to primary schools
E. Nutrition Schemes with Food Supplementation 1. Integrated Child Development Services Scheme/ Tamil Nadu Integrated Nutrition Program	*0 to 6 yrs*: 300 calories (ready to eat food) + 8-10 gm protein for 300 days *Malnourished Children:* 600 calories + 20 gm protein for 300 days *Adolescent girls*: 500 calories + 20-25 gm protein for 300 days *Pregnant & nursing mothers*: 500 calories + 20-25 gm protein for 300 days	Supplementary feeding, growth monitoring and promotion, nutrition and health education to adult women and adolescent girls, pre-school education to 3-6 years old, immunization, health check-ups and referrals, income generating programs
2. Pradhan Mantri Gramodaya Yojana	300 calories and 8-10 gms of protein for Grade I and II children, double the amount for Grade III and IV children.	Supplementary feeding
3. Balwadi Nutrition Program	300 calories + 12 –15 gm protein for 270 days	Supplementary feeding to children 3-5 yrs, promote child's social and emotional development
4. Day Care Centers	300 calories + 12 –15 gm protein for 270 days	Day care services to children below 5 yrs to low income families, supplementary nutrition, health care, medical check up and immunization

Source: Adapted from World Bank (2001).

The operations of the entire program are carried out by FCI, which is reimbursed its 'economic cost' net of sales realization in the form of 'food subsidy' by GOI. The food subsidy includes subsidy for rice, wheat and sugar and for buffer stock management. In 1990-91, total grain price subsidy plus buffer stock subsidy was 2.33% of total central government expenditure (Rs.24.50 billion). By 2001-02, it multiplied more than six times and became 4.41% of central government expenditure (Rs.160.68 billion). See Table 2.2. The budget estimate of food subsidy (including for sugar) at Rs.212 billion or $4.3 billion during 2002-03 constitutes 5.17% of central government expenditure. This translates to per capita subsidy of merely Rs.17 per head per month.

Table 2.2—Food Subsidy of GOI

Year	Total price plus buffer stock subsidy (Rs. Billion)	Of which: Subsidy on buffer stocks (Rs. Billion)	Buffer stock subsidy as % of total food subsidy	Share in Total GOI Expenditure (%)	Share in GDP (%)
1990-91	24.50	0.00		2.33	0.48
1992-92	28.50	0.00		2.56	0.48
1992-93	28.00	4.51	16.11	2.27	0.41
1993-94	52.00	12.46	23.96	3.90	0.70
1994-95	45.34	18.53	40.87	2.80	0.49
1995-96	50.78	14.19	27.94	2.78	0.46
1996-97	51.66	7.63	14.77	2.46	0.42
1997-98	75.00	9.37	12.49	3.23	0.54
1998-99	87.00	15.96	18.34	3.11	0.53
1999-00	92.00	18.94	20.59	3.03	0.51
2000-01	102.32	42.33	41.37	2.88	0.53
2001-02	160.68	56.80	35.35	4.41	0.77

Source: Jha and Umali Deininger (2003).

For strengthening the operational machinery of PDS, GOI gives financial assistance to states/UTs for construction of godowns, purchase of mobile vans/trucks and for training, research and monitoring. While food subsidy provision is made in the non-Plan budget of GOI, the Planning Commission provides funds for such PDS Plan Schemes. Despite reports that a large number of godowns for which GOI provided funds were not constructed, many were not put to intended use and many state governments did

not purchase mobile vans for which funds were released, GOI continues to fund the operation.

2.2.1 Support Price Policy

GOI follows a Minimum Support Price (MSP) Policy for 24 major crops. Since early 1990s, the concept of MSP was adopted for paddy, wheat and various other crops. The policy is effective for rice and wheat in five major surplus states. The Commission for Agricultural Costs and Prices (CACP) recommends levels at which MSP should be fixed based on several considerations. These include the cost of cultivation, the overall shortage of grains as reflected by the trend in wholesale prices and the need to keep in check the rate of inflation in the consumers' interest. These recommendations take into account the variations in these costs across regions while explicitly incorporating cost estimates provided by states. Although the MSP is supposed to be based on a set of economic criteria that includes cost, its fixation by the government is influenced by various non-economic factors such as demands from chief ministers of grain-surplus states and rising expectations of rich farmers represented by politically strong farm lobbies [see, e.g., Rao (2001)]. These pressures have resulted in ever-rising MSP. In recent years, MSP was raised so much that it reached the level of market price, especially for wheat.[3] According to the Economic Survey (2001), the annual average increase in MSP of rice and wheat was higher than average inflation during 1992-93 to 1999-00. Chand (2003) reports that in 2001-02 harvest season, presence of official procurement machinery did not allow the market price of wheat and common paddy to fall below the level of MSP in the major surplus states of Punjab and Haryana. This situation forced the government to buy and accumulate stocks. For wheat the support prices have been fixed at such high levels over

[3] High procurement prices paid to farmers have encouraged planting of wheat production, which increased by 37% between 1990 and 2000. Relatively higher MSP for rice and wheat increased the profitability of these crops and motivated the farmers to divert their areas to these crops from coarse cereals, pulses and even oilseeds as in the case of Punjab.

the years that the CACP refrained from making any recommendation for this price for the 2000-01 season.

According to the Economic Survey (2002), the government agreed that the high MSP "applied to wheat and rice and near monopoly procurement by FCI have led to an unsustainable situation where food stocks with FCI have risen to levels that have little probability of being used." FCI's actual stocks exceeded several times its own norm of stocking, going beyond 60 million tonnes in July 2002, before falling to about 50 million tonnes by end of September 2002 due to release of stocks at subsidized prices to exporters and increased offtake through redesigned TPDS and other food-based programs that have been revived/ initiated.[4] The excessive rise in the MSP has not only led to accumulation of stocks and contributed to the rise in market prices of wheat and rice, the credit blocked in these stocks also puts pressure on interest rates and can crowd out more productive investment. Several committees and researchers have recommended that the MSP should be truly a "minimum" support price by including in it only the variable costs, namely the costs of inputs and wages (including family labour). See, among others, Expenditure Reforms Commission (2001), GOI (2001), GOI (2002a) and Parikh et al (2003). Box 2.1 summarizes the recommendations of GOI (2001).

[4] The buffer stock norms that ranged from 14.5 to 22.3 million tonnes in different months during 1992-98 were subsequently raised to 15.8 to 24.3 million tonnes [Chand (2003)]. Such a practice has also been followed in the past to cover up the rising discrepancy between actual stocks and buffer norms.

Box 2.1—Selected Recommendations of GOI (2001)

1) The central budget should make a provision for national food subsidy and distribute it among states according to a prescribed formula using updated poverty ratios. The state governments could supplement this with their own resources. Rice and wheat should be supplied to States/UTs at full economic cost.
2) Quantum of total food subsidy to be provided, issue prices and quotas of food grains, subsidy involved in food stamps etc. should be decided by the state governments.
3) There should be greater decentralization of operations; states should be free to procure cereals and maintain buffer stocks. Any rules and regulations obstructing states should be removed.
4) In the long run food subsidy should be confined to the population below the poverty line. In the short run, to offload stocks, cereals can be supplied under PDS to the APL population at a concessional rate.
5) Food subsidy should be restricted to rice and wheat. State specific schemes can be introduced for PDS distribution of coarse grains in states with decentralized system of procurement. Coarse cereals subsidy to States will however be covered under the overall subsidy allocation made as per recommendation 1.
6) It may be more efficient to supply subsidized grains through a system of food stamps or food credit cards (smart cards). To ensure minimization of any potential design problem a committee could examine the operational details and feasibility of experimental introduction of such systems.
7) MSP should not exceed the sum of variable cost and family wages.
8) The Essential Commodities Act and (State) Agricultural Produce Marketing Acts that hamper the growth of free trade in agricultural goods should be reviewed.
9) The food policy should continue to have stabilization of cereals prices as one of its objectives. This can be achieved through the operation of a buffer stock combined with timely intervention by the FCI in domestic markets and a liberal import-export policy for food grains.

2.2.2 Targeted Public Distribution System

TPDS, India's most expensive food security program with a price subsidy, was introduced in June 1997. The shift to TPDS was a significant milestone in the GOI's food security strategy as it targeted a larger food grain subsidy to the poor relative to the non-poor. Its predecessor, the Public Distribution System (PDS), by contrast was a general entitlement scheme and was widely criticized on several grounds for its failure to serve the population below the poverty line. See, among others, Comptroller and Auditor

General of India – CAG (2000), Drèze (2001), Dutta and Ramaswami (2001), Jha and Srinivasan (2001a), Umali Deininger and Deininger (2001) and Shariff et al (2002). It not only failed to reach the poor, but also provided meager income support and suffered from urban bias, leakage, diversion and deteriorating quality of grain supplied due to relaxed specification for procurement. Between 30%-40% of subsidy is estimated to be lost through leakage[5] and inefficiency of the procurement and distribution system both at central and state levels. PDS was also criticized for lack of transparent and accountable delivery systems, inadequate allocation and poor quality, negligible coverage and low offtake in states with high concentration of poor due to non-availability of stock, while the offtake contributed less than 10% of beneficiary requirement in most states.

In order to redirect more of the subsidy to the poor, in 1997 the GOI launched a re-designed program, the TPDS, which excluded the population above the poverty line (APL). It included a 2-tiered pricing structure for families based on their poverty levels. Special white cards were issued to families Below Poverty Line (BPL) with an entitlement of 10 kg of food grains per month per family at specially subsidized prices, set at half the FCI's economic costs. This was meant to benefit about 60 million poor families. APL families were issued yellow ration cards and supplied grains at a higher price set equal to the economic cost so that the entire consumer subsidy could be directed to the BPL population.

TPDS is operated under the joint responsibility of the Central and State Governments. The Central Government takes the responsibility for procurement, storage, transportation and bulk allocation of food grains, at subsidized prices. The GOI supplies grains to states at Central Issue Price (CIP) for distribution to consumers. The responsibility of distribution to consumers rests with State Governments. State governments are also responsible for identification of the BPL families as per the poverty estimates of the Planning Commission based on the methodology of the 'Expert Group'

[5] Grains issued (supplied) through PDS minus grains received by households from PDS.

on estimation of proportion and number of poor. State TPDS food grain allocations are sold at subsidized prices through a network of more than 4,60,000 *fair price shops* (FPSs). State Civil Supplies Corporations and State Marketing Federations draw the food grains from designated FCI depots located throughout the country for distribution and sale at FPSs. These shops are private retail outlets operating on commission basis (about 7%). The final size of the rations that households could purchase varies by State. TPDS subsidies are allocated to states according to their shares of the population living below the official poverty line based on 1993-94 poverty estimates.

GOI finances the TPDS price subsidy associated with the food grains that it allocates to each State. State governments finance the intra-state TPDS distribution costs (e.g., storage, transport, losses). By charging prices different from CIP for both APL and BPL categories, some states give additional price subsidy[6] to consumers while others impose a tax in terms of an average price higher than CIP. Data for 2000-01 shows that the state of Andhra Pradesh provided an additional TPDS subsidy of Rs.607 million, Haryana Rs.2.5 million and Maharashtra Rs.324 million while Madhya Pradesh imposed a tax of Rs.296 million. GOI has now allowed states to fix Retail Issue Price (RIP) according to their actual costs of transport, incidental charges and 'fair margin' to ration shop owners so as improve the viability of their operations and to rationalize retail-end prices.

Some state governments failed to establish an effective mechanism for identification of BPL families and issue ration cards to the identified households. By 1999, 18 states/ UTs had not completed the process of identification of the poor. This resulted in nationally 18% of the population, and in Nagaland, Manipur and Meghalaya respectively 88%, 64% and 50% of families not owning ration cards. The number of BPL households covered increased only marginally from 63.2 million in 1998 to only 65.2 million in 2001.

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[6] State PDS subsidy = Offtake * (Central Issue Price - State Issue Price).

There were other more serious problems in both design and implementation of TPDS. The entitlements were changed from a *per capita* norm to a *family* norm as each BPL household was entitled to a uniform 10 kg of grain irrespective of family size and need. For a five-member family, this amounted to 2 kg per person per month, which is merely 18% of the minimum cereal intake of 135 kg per person per year recommended by the Indian Council of Medical Research.[7] There is evidence of a significant reduction in 2000-01 in off-take relative to allocations and high leakage of food grains. In the light of continuing criticism, GOI increased the allocation to each BPL family from 10 kg to 20 kg per month at 50% of FCI's economic cost from April 1, 2000. However, no changes were made towards APL allocation. From December 1, 2000 the allocation of food grains under BPL quota is based on the population of states as in March 2000, average size of households in the state as in 1991 and the poverty ratio of the state as in 1993-94.

As the redesigned TPDS continued to perform poorly, coupled with excess stocks adding to the rising share of storage cost in food subsidy (Table 2.2), GOI introduced further changes. GOI (2002a) recommended that the quota for BPL families depend on the number of family members with each such family allowed to purchase up to 5 kg per person per month at the announced BPL price or an allocation of 20 kg per family whichever is higher. Any additional requirement may be provided at the APL price. See Box 2.2 for a summary of relevant recommendations of GOI (2002a). From July 2001, BPL allocation of food grains was increased from 20 kg to 25 kg per family per month with CIP at 48% of economic cost. Furthermore, to offload some more of the stocks, GOI started selling grain from FCI stocks at BPL prices for export purposes. Grains offloaded for exports rose from a negligible amount in 1997/98 to 4.69 million tonnes in 2001/02. GOI also introduced a discounted rate of 70% of the economic cost for allocation of food grains to APL families. From April 1, 2002, the allocation of food grains was increased to

[7] GOI (2002a) estimate the monthly family requirement to be 73 kg.

35 kg per family per month for AAY, BPL and APL families for a period of one year. At the same time, the government also reduced the issue price for APL rice and wheat by Rs. 100 per quintal for a period of three months. The offtake under TPDS between April 2002 and June 2002 rose to 2.35 million tonnes for rice and 1.61 million tonnes for wheat against 1.85 million tonnes and 0.99 million tonnes respectively for the corresponding period in 2001. Increased offtake resulted in reduced stocks, which in turn reduced cost of storage.

While TPDS showed a poor performance at the national level, state level data showed a better reach to the poor. World Bank (2002) reports that the policy changes resulted in significantly higher shares of food grains reaching the poorer states. Analysis of the National Sample Survey (NSS) 50th round (1993/94) and the 55th round (1999/00) too indicates some improvement in targeting of the benefits of the public distribution system [Jha and Umali Deininger (2003)].

Box 2.2—Selected Recommendations of GOI (2002a) on Public Distribution System

1) Reintroduce universal PDS with uniform Central Issue Prices (with no distinction between varieties) one each for rice and wheat respectively, for all consumers in all parts of the country.

   Fix the CIP at FCI's all-India average acquisition cost based on MSP. Allocate grain to states based on population and a monthly per capita quota to be specified from time to time.

2) Set up an independent central watchdog body, comprising officials, experts and others, to monitor use of cash grants and grants under the food for welfare schemes.

3) In the long run, introduce a food coupon system outside PDS outlets to allow wider choice to consumers. Index the value of the coupon to food inflation.

4) For decentralized procurement, give states in cash the difference between the full state-specific economic cost and the CIP on their entire PDS distribution.

2.3 EXTERNAL TRADE POLICY

The design of external trade policies in India has been influenced by the prevailing domestic and international economic situation over time. The Export and Import (EXIM) Policy for food grains is decided by the Ministry of Commerce in consultation with the Ministries of Agriculture and Consumer Affairs & Public Distribution. The policy regarding export and import of food grains is as follows.

With a view to discourage import of wheat into the country, in 2000-01 the Government introduced 50% tariff on imports of wheat and 80% on import of rice without any exemption even to official agencies.

As noted earlier, India continues to be plagued by mounting stocks due to rising production and attractive procurement prices that encourage farmers to sell their crops to the government. The excess stocks have led the government to subsidize exports. For instance, in 2002-03 the government sold wheat to exporters for less than the procurement price and covered transport, storage, and other handling costs. A side effect of this policy has been that stocks sold for export at a subsidized price are diverted to domestic market fetching the traders a higher price. For example, in 2000-01 as against the release of 1.6 million tonnes of wheat for export, actual export was 0.682 million tonnes only [Chand (2003)].

In the post WTO period international prices of rice and wheat plunged to lowest levels during the last twenty years while the domestic prices in India rose upward largely due to continued hike in support price. This made it profitable to import wheat but adversely affected rice exports. Chand (2003) argues that as a consequence of this, private traders imported 1.33 million tonnes of wheat during 1999-00 despite record level of buffer stock in the country. The government in turn had to impose high tariff and even resort to canalization to control imports. Moreover, decline in international prices and rise in domestic prices made it difficult to dispose of large public stocks of rice and wheat for export at acquisition cost to the government, which was thus forced to subsidize for

export even though it charged a much higher price to domestic consumers. From April 2002, government started releasing rice from its stock for export.

Table 2.3—Export and Import Policy (as on **26th October, 1999)**

Item	Import	Export
Paddy	Canalized. Import through FCI.	Restricted. Export permitted under license.
Rice-Basmati	50% or more broken-import freely allowed.	Free. Export allowed subject to registration of contracts with APEDA.
	Other basmati rice import canalized through FCI.	
Rice-Non-Basmati	40% or more broken and common and coarse varieties-import freely allowed. Other rice-import canalized through FCI.	Free. Export allowed subject to registration of contracts with APEDA.
Wheat	Canalized. Import through FCI. However, import by Roller Flour Mills either directly or through STC/MMTC/PEC for milling purposes allowed freely.	Export permitted against license subject to quantitative ceilings as may be notified by Ministry of Commerce (DGFT) from time to time and registration of contracts with APEDA. For 1999-2000 a ceiling of 1.00 million tonnes has been fixed.
Wheat products	Restricted – Consumer goods – Not permitted to be imported except against license or in accordance with Public Notice.	Free
Coarse grains (barley, Maize, Bajra, Ragi & Jowar)	Canalized. Import through FCI.	Export permitted subject to an annual quantitative ceiling of 1.00 lakh tonnes. However, export of Hybrid Jowar produced ad Kharif crop is free.
Pulses	Free	All types including flour made there under except those in consumer packs up to 5.00 kg. Restricted, export permitted under license. Export of pulses in consumer packs up to 5.00 kg is free.

Source: http://fcamin.nic.in/pol_ind.htm

2.3.1 WTO and Trade Liberalization

Gulati and Narayanan (2003) argue that trade liberalization by developing countries helps alleviate their poverty provided domestic policies (market access, domestic support and food aid) of developed countries such as the US do not pass on the

"burden of adjustment" of world prices on to competitive developing countries such as Thailand, Vietnam and India. This problem could be sorted out through multilateral trade negotiations. Hoda and Gulati (2002) list several directions that India can take in future negotiations relating to AOA.

In recent years high-price support to wheat farmers and levy procurement of rice led to a large grain stockholding by GOI causing a drain on the government's resources as carrying cost of buffer stocks grew at about 15% per annum in late 1990s. But in spite of the high costs, the government in the past has shown a general preference for domestic buffer stocks over external trade to stabilize domestic prices. This is due to the apprehension that foreign markets can be unreliable sources of supply and demand and the higher price variability in these markets may induce greater instability in domestic prices. For instance, by simulating the effects of free trade in rice in five Asian countries, Islam and Thomas (1996) show that free trade increases domestic price variability to levels several times higher than historically observed. Since world prices are much more volatile than domestic prices, by linking the latter to the former through liberalization of trade, there is a perceived potential risk of exposing domestic producers and consumers to greater price instability. Note that in general, domestic and world market prices differ from each other due to trade margins, cost of transportation to the port, port charges and other handling charges. In addition to this, if government imposes any trade tax/subsidy, this would also contribute to the difference between domestic and world prices. If trade margins were reduced through better port and infrastructure facilities, it would increase the possibility for greater volumes of trade and lead to a greater exposure of the domestic economy to world prices and their instability.

Ever since India became a signatory to the WTO Agreement on Agriculture (AOA) in 1995, a concern that has been raised repeatedly is whether agricultural trade liberalization would destroy India's food security. This is a critical issue since a large section of the population is dependent on agriculture for their livelihood, and the poor consumers already spend an overwhelming share of their income on food. See Box 2.3

for concerns arising from WTO. Some of the fears from external trade liberalization have been that removal of quantitative restrictions (QRs) would flood the country with imports and bring in greater domestic price instability.

Although AOA has been perceived to be a threat to the country, the government has implemented several reforming policies. Notable among them are: market access (QRs were abolished in 2001 and tariffs bound at ceiling levels), domestic support (product and non-product specific below *de-minimis*) and no export subsidies except grain exports since 2000-01. Contrary to fears, despite the abolition of QRs imports have not flooded the country since existing tariff levels are sufficient to check imports. The actual tariffs are far below bound rates for most tariff lines. Also, Srinivasan and Jha (2001) show through counterfactual simulations that when world prices are stable, domestic price variability is reduced due to liberalized trade by India. The extent of reduction in price fluctuations depends on the level of exposure to trade. Moreover, AOA does not restrict some of the main elements of Indian food policy, namely, buffer stocks, PDS, MSP (within *de-minimis* limits) and input subsidies (to low-income and resource-poor farmers but within *de-minimis* limits). All this means that food security options can be pursued by reforming FCI and PDS and by removing restrictions (storage limits, levies, and other marketing controls) on domestic private marketing.

Box 2.3—AOA and WTO Concerns

There is a fear that with trade liberalization, cheap imports would threaten food security, wipe out production base, create unemployment and deepen poverty while exports would reduce domestic availability of cheap food. There is also a feeling that the Uruguay Round Agreement on Agriculture (AOA) is an 'unequal treaty' unduly favouring the rich countries.

The AOA is built on three pillars: market access, domestic support and export competition. Reduction commitments were drawn up for different countries, with several exemptions to developing countries. The permissible limit (*de-minimis*) on distortionary domestic support – both product-specific and non-product specific – was 10% of the value of production for developing countries and 5% for developed countries. India has no reduction commitments, either with respect to *domestic support* or *export competition*. It has additional exemptions under the Special and Differential Treatment Clause. Subsidies for market promotion, international freight and internal transport of export consignments are exempt from reduction. India has commitments only in the area of market access. It bound its tariffs at ceiling levels, i.e., tariffs should not exceed this limit. Even after the WTO Agreement India continued with quantitative restrictions (QRs) for balance-of payments reasons (exempt from tariffication requirements). But after dispute settlement proceedings initiated by the US, it agreed to abolish QRs with effect from April 1, 2001.

AOA has had little role to play in shaping agricultural policies in India since 1995. **Domestic support**: product-specific support is negative for most products and below the *de minimis* for others. Non-product-specific support is also below the *de minimis* limit even without taking into account input subsidy exemptions. India does not provide **export subsidies** except for wheat exports since 2000-01. **Market access**: after renegotiations India has revised rice tariff bound upwards from the level during the Uruguay Round, which was among the highest in the world. But the applied rate of customs tariff is far below the ceiling bindings.

Agricultural trade liberalization has not had detrimental effects on India's food security. AOA does not threaten the food security since rice and wheat in India have been both efficient import substitutes and export competitive for several years in the past 3 decades. Removal of QRs and import liberalization has not led to any surge in imports. AOA does not prohibit Green Box measures for food security such as public stockholding and domestic food aid. Demand for a "food security box" or a "development box" could be losing propositions, since it would only reinforce demands from highly protected developed countries (in Europe and East Asia) to include their *multifunctionality* concerns as exempt support.

Domestic marketing reforms should be undertaken so that there is one integrated market for food within India and restrictions do not prevent inter-regional flows in a timely and efficient manner. In the context, apart from price reform, a crucial link is institutional reform in both procuring and distribution, which must be undertaken to ensure better household food security. Proper targeting of food subsidies and eventually moving on to a food stamp system should also be pursued.

Source: Hoda and Gulati (2002).

2.4 ROLE OF THE PRIVATE SECTOR

Control of the private sector in grain markets takes various forms such as regulation of trade and stocks and price controls. There are formal and informal restrictions on trading, storage and inter-state movement of agricultural produce. In addition there are other ills of controls including harassment by officials, corruption and bribery. The consequence of such conditions is to slow down the movement of grains from surplus to deficit regions, increase price variation across regions and add to the costs of marketing/ trading, making domestic prices internationally uncompetitive. Physical storage of grain by government agencies too can lead to inefficiencies. By stabilising prices, buffer stock policies reduce the incentives for private storage.

But the government has been procuring substantial parts of marketed surplus from food surplus states. Chand (2003) notes that the share of official agencies in market arrivals of rice steadily increased at the cost of the private sector. It increased from about 1/3rd to 2/3rd between 1995-96 and 2001-02. Similarly, for wheat, the government's share increased from less than ½ to more than ¾ during the same period. Several factors caused the downtrend in private share: lower rate of increase in retail than procurement and wholesale prices, expectation of low future prices due to a large build-up of public stocks and subsidized sale from stocks for exports and for open market sales. All these made it more attractive for private trade to buy from the government agencies than from the market.

Since government agencies usually have a soft budget constraint they do not have incentives to carry out cost saving measures. Grain losses are reported to be large during transit as well as under storage. There is shortage of good quality storage facilities resulting in the rotting of grains in godowns. Even the available facilities are not utilised optimally due to a lack of backward and forward linkages resulting from a weak system

of grain handling, storage and transportation [Singh (1999)].[8] On the other hand, price stabilisation can be achieved at lower costs by schemes that do not require physical handling of the commodity, e.g., international trade, subsidy to private storage, use of variable levies and interest subsidy.[9] In the Indian context, Pursell and Gulati (1993), e.g., recommended deregulating domestic wheat market and abolishing compulsory acquisition at below-market prices of rice.

The government policy had all along failed to recognize the complementary role that private storage can play in stabilizing prices. It considered private storage to be destabilizing and imposed several restrictions on their operations. In spite of these drawbacks, private traders manage to operate at lower costs. Unfortunately, despite evidence of lower trading margins and storage costs for private traders as opposed to public agencies the government continues with several restrictions. Regulations such as Essential Commodities Act (1956) were meant to tackle scarcity situation by curbing/ controlling the activities of private traders/ *speculators*/ *hoarders*. But stringent rules and declining credibility of regulated markets have resulted in falling share of produce sold through these markets [Chand (2003)]. Sale through informal markets also allows traders to avoid various kinds of market charges and taxes – mandatory in regulated markets, which vary across states and are perceived to be excessive. Moreover inefficiency of parastatal organizations involved in procurement and marketing, such as FCI, has been a matter of debate in economic reforms.

While the public sector does have a role to play in facilitating appropriate economic environment and building infrastructure, an expanding role for the private sector can promote competition, stabilize prices and encourage production patterns

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[8] To strengthen transport infrastructure to reach PDS to rural, hilly, remote and other geographically inaccessible areas that lacked regular ration shops, the central government provided financial assistance to states for procuring delivery vans/ trucks. But despite such funds, many states did not buy the recommended mobile vans nor construct the required godowns.

[9] See, for example, Bigman and Reutlinger (1979), Jha and Srinivasan (1997), Knudsen and Nash (1990) and Srinivasan and Jha (2001).

commensurate with non-distortionary prices. The underlying objective of reforms in the food sector should therefore be to promote/ provide a level playing field to private operators and traders. According to the Expenditure Reforms Commission (2001) induction of the private sector in procurement operations will indirectly lead to a reduction in the cost of procurement to FCI. The report points out that some costs due to statutory and non-statutory charges (e.g., *mandi* charges and purchase tax) paid to agencies in Punjab and Haryana, adding up to more than 9% of MSP for wheat, could be avoided. A similar suggestion is made by GOI (2002a) to bring such charges outside the purview of the system and arrange to cover them through government budgets.

2.5 RECENT POLICY INITIATIVES AND THE STEP FORWARD

In terms of domestic food policy, the government is supporting some of the largest food distribution and nutrition programs in the world that aim to have a direct, positive and immediate impact of alleviating household food insecurity. But pervasive inefficiencies in implementation and lower allocations than requirements observed in several food-based programs seriously undermine their ability to achieve the intended goals. Studies have shown that when its not possible to identify the poor in a cost-effective manner, then programs designed with a self-selection or self-targeting mechanism can limit the subsidy to the poor or the target group [e.g., Chander (2001), Coady et al (2002), Jha and Srinivasan (2003a) and van de Walle (1998)]. The government is making attempts to improve the effectiveness of public spending on its programs by rationalizing expenditure, adopting better targeting methods such as through income-based identification and social and demographic characteristics etc. Such reforms, if followed through properly, could help make public food spending much more worthwhile. An important challenge in the future therefore is increasing the effectiveness of these expenditures so that it will reach the most food insecure and nutritionally vulnerable people of the country.

The government is also initiating steps to encourage private participation in grain markets. The role of FCI is proposed to be restricted to timely sales and purchases to maintain stability in food prices and resort to exports and imports of food grains, when required. But more needs to be done. If price distortions are eliminated, then based on the relative prices, farmers could take advantage by shifting to crops that offer higher market price than rice and wheat. There are various options to support farmers that do not require direct market intervention by the government. They include subsidy to private storage, loans for private storage, crop insurance, futures contracts and commodity options, commodity programs designed to assist producers in orderly marketing by taking off the pressure to sell at harvest time, interest subsidy etc. In various countries, commodity programs provide support to producers through deficiency-payment, loans and acreage-reduction programs. Policy options other than holding public buffer stocks, which could improve the restricted access to storage and credit include government loans or subsidies that may be offered to encourage private storage facilities that are used co-operatively. In this line, the *National Policy on Handling and Storage of Foodgrains* envisages encouragement of private sector for building storage capacities for rental use by government agencies and also development of infrastructure for integrated bulk handling, storage and transportation of food grains.

As for external food policy, foreign trade in food grain has not been effectively used as a policy measure due to fears of destabilizing domestic prices. Import of food grains had been canalized through FCI. Exports were subject to quotas and were required to fetch a specified minimum export price. Some of these restrictions have, however, been relaxed in recent years due to the mounting stocks of food grains with the government and also due to market access requirement under the WTO agreement.

As India becomes a major force in the global wheat and rice export markets, new strategies are required to sustain its position. As part of a new strategy, the government plans to promote exports through long-term credit, removal of export restrictions, establishment of Agricultural Export Zones and transport subsidies for exports of wheat

and rice from government warehouses. But it also needs to improve facilities for grading and measuring standards, and address quality problems. In order to take full advantage of growing exports, the exporters would need to have better port and domestic infrastructure facilities, which are currently very meager. The ports are highly congested, have obsolete equipment, are managed by government controlled port trusts and thus marred by bureaucracy. The exporters in general also face distribution and storage problems. Loading a ship takes enormous time and is extremely slow compared to international standards. Improving these facilities would go a long way in reducing the high handling costs and margins of exporters.

Undertaking reforms in these areas could make India competitive with competitors such as Vietnam and Pakistan for rice and the United States for wheat, especially in Southeast Asian and Middle Eastern regions. For example, Indian wheat has captured about 40% of the market share in Bangladesh, largely from the US by exporting wheat at significant discounts. A similar observation can be made from Philippines, Vietnam, South Korea, Indonesia, Sri Lanka and Malaysia too. One of the reasons for the Indian wheat capturing major shares in these markets is that despite its low quality compared to U.S. and other origin wheat, Indian wheat is being used in the production of flour rather than feed.

3. ROLE OF FCI VERSUS THE PRIVATE SECTOR

3.1 INTRODUCTION

Government intervention in grain markets of India is well entrenched. Different ministries and departments of Government of India (GOI) carry out operations relating to price support policies, buffer stocking and price stabilization, and subsidized distribution of grains under various welfare programs, often with help from state governments and part funding from donor agencies and international organizations. The main functions of the Department of Public Distribution in the Ministry of Consumer Affairs and Public Distribution are: formulation and implementation of national policies on procurement, import and export, movement, storage, distribution of food grains (rice, wheat and coarse-grains) to consumers, administration of subsidies including implementation of Targeted Public Distribution System with special focus on poor, buffer stocking, provision of storage facilities for the maintenance of Central Reserves of food grains and promotion of scientific storage, quality control and specifications of food grains. In carrying out its functions, the Department is assisted by its two Public Sector Undertakings viz. the Food Corporation of India (FCI) and the Central Warehousing Corporation (CWC) and the subordinate offices, namely Save Grain Campaign Offices, Indian Grain Management Research Institute and its 5 Field Stations.

FCI is a central government agency involved in procurement, storage, transport, and allocation to states and distribution of food grains within the country on behalf of GOI. It is reimbursed its 'economic cost' net of sales realization in the form of 'food subsidy' by GOI. The food subsidy includes subsidy for rice, wheat and sugar and for buffer stock management. The operation of FCI has been an integral element of the Indian food policy. This Chapter evaluates the role of FCI based on data, government policies, the literature on the role of the private sector, the policy obstacles it has faced and the (in)efficiency of public sector performance. It critically assesses the present

situation with respect to provision of food security by the government programs and policies. In particular, this Chapter examines the relative efficiency of functioning of private traders within the current system and what potential gains can be obtained through reform measures. Some of the suggestions made are substantiated by quantitative results obtained from simulation analyses presented in Chapters 4 and 5.

3.2 ORGANIZATION AND MAJOR FUNCTIONS OF FCI

FCI was set up under the Food Corporations Act 1964 in order to provide effective price support to farmers, cater to the Public Distribution System (PDS) and maintain operational buffer stocks to ensure National Food Security (http://fciweb.nic.in/fcitod_ind.htm). It operates through a country-wide network of about 60,000 employees with its Corporate Office in New Delhi, 5 Zonal Offices, 22 Regional Offices practically in all the State capitals, 1 Port Operation Office, 173 District Offices and over 2178 depots (as on 31.03.2002). A Board of Directors provides general superintendence, direction and management of the affairs and business of the Corporation.

There are three agencies in the public sector which are engaged in building large scale storage/ warehousing capacity namely, FCI, Central warehousing Corporation (CWC) and 16 State Warehousing Corporation (SWCs). FCI has a network of storage depots located all over India. These depots include silos, godowns and an indigenous method developed by FCI, called Cover and Plinth (CAP), which refers to storage of food grains in the open with covering of stacks with specially fabricated polythene covers (http://fcamin.nic.in/civil_ind.htm). It has over 23 million tonnes (owned & hired) of storage capacity in over 1700 godowns all over India. As on 1.11.2002 the total capacity available with FCI for storage of food grains including the capacity hired from Central Warehousing Corporation and State Warehousing Corporation was about 36 million tonnes of which more than 20 million tonnes was hired. The average utilization of the warehousing capacity of FCI between April, 2000 to November 2000 was about 75%.

In the words of GOI (2002a), "If the dimensions and the nation-wide character of the FCI's operations are taken into account, the independent powers enjoyed by the management of the FCI are indeed impressive." The Corporation has autonomy in several functions. It can decide on the break-up of storage as between godowns, under plinth and cover, on the methods for preservation of food grains and on intra-country movement of grains from procurement centres to storage points to consuming areas. Moreover, it is also up to the FCI to choose the quantity of procurement that is transported by rail and by road. FCI also enjoys a significant degree of autonomy in field operations such as decisions pertaining to procurement agencies, the agency-wise percentage of procurement, the *mandis* to be attached to each of the agencies, estimation of its credit requirement and negotiations with RBI.

The operations of FCI helped to give impetus to sustain higher yields in the post-green revolution era and ensured stability in food supplies. To nurture the green revolution, GOI introduced the scheme of minimum assured price, announced before the crop season and based on cost of production, inter-crop price parity, market prices and other relevant factors. At present, in the immediate post-harvest season, FCI and state government agencies establish about 8,000 centers for wheat and 4,000 centers for paddy to facilitate purchase of food grains at assured prices. The centers are selected so that the farmers do not have to travel more than 10 kms. The price support operations have sustained farmers' income and provided impetus for higher investment in agriculture.

Through FCI, GOI purports to make available a steady availability of food grains to consumers at a fixed price, which is lower than the actual costs due to a consumer subsidy that absorbs a part of the overhead costs. FCI's operations relating to sale of state food grain allocations at subsidized prices are carried out through a network of more than 460,000 *fair price shops* (FPSs) spread throughout the country, making coverage almost universal. State Civil Supplies Corporations and State Marketing Federations draw the grains from designated FCI depots located throughout the country for distribution and sale at FPSs. These shops are private retail outlets operating on commission basis (about

7%). However, as this is insufficient to generate reasonable profits, corruption and leakage is said to be rampant.[10]

3.3 CAPITAL, COST STRUCTURE AND SUBSIDY

While FCI purchases food grains for the central pool at the procurement prices, it issues the same through programs such as TPDS at the Central Issue Prices (CIP) fixed by GOI. The issue price does not cover the full cost incurred by the Corporation in the procurement, movement, storage and distribution of food grains. The difference constitutes consumer subsidy for the Public Distribution System and other welfare schemes, and is paid to the Corporation by GOI (Table 3.1). FCI also maintains Central Pool buffer stock of food grains on behalf of the government, which reimburses its carrying costs. The stocks are maintained by FCI and state governments and their agencies in different states. The total stock in the central pool as on December 1 2002 was 51.54 million tonnes.

Traditionally, FCI purchased about 15-20% of India's wheat production and 12-15% of its rice production for price stabilisation, public distribution and other works. In the last two decades, procurement has increased from 4 million tonnes to over 25 million tonnes per annum (http://fcamin.nic.in/pol_ind.htm). But sale (or 'offtake) through its distribution have not been commensurate. At present, the amount paid to the farmers/ millers during wheat/ rice procurement season totals to about Rs.41 billion for paddy and Rs.43 billion for wheat in Punjab and Rs.45 billion for levy rice in Andhra Pradesh.

[10] For instance, in her study on Bihar, Mooij (1999) found that it is difficult for the PDS dealers to make profits without being corrupt.

Table 3.1—Food Subsidy Released to FCI

Years	Rs. Crores
1994-95	5100.00
1995-96	5325.75
1996-97	6016.73
1997-98	7900.00
1998-99	8700.00
1999-00	8856.78
2000-01	11462.00
2001-02	16724.00
2002-03 up to (Jan)	19414.71

1 crore = 10 millions

GOI also provides funds to FCI to meet the cost of fixed assets like offices, godowns, silos, railway sidings and weighbridges. For financing food grains and sugar operations entrusted to the Corporation, the working capital is provided by a consortium of 44 banks. As on March 31 2001, the authorized capital of FCI was Rs.2500 crores and paid-up capital Rs.2300 crores. Recent trends in the components of FCI's costs indicate that procurement incidentals, distribution, administrative and carrying costs all put together form a high percentage of the actual purchase cost of grain. The high operating costs of FCI give rise to a high cost-benefit ratio for the public distribution system (PDS) [Jha and Srinivasan (2001a)]. Also, as Gulati et al (2000) note, "the gap between the cost and revenues of the FCI has been sharply widening over the years leading to spiralling government subsidies. ... Per unit costs of its operations have been substantially higher than that of private traders. The lack of accountability within the FCI and the knowledge that the government will cover the costs, if necessary, have made the inefficient operations possible". These observations suggest that by encouraging private trade FCI could reduce its costs of operation.

3.4 RELATIVE COSTS AND PERFORMANCE OF FCI VIS-À-VIS PRIVATE TRADERS

The functioning of the FCI has been specifically analyzed over the years in great detail by, among others, Government of India (1991), Gulati et al (2000), ASCI (2001) and more recently by GOI (2002a). The main focus of these studies has been particularly on its cost aspects, with some suggestions for how to streamline these. A general recommendation has been that along with its other activities, the FCI continue its role of stabilizing the food grains market.

As a result, the FCI is overburdened with mounting food stocks without adequate capacity to store and the accompanying mounting costs. Large stockholding, in turn, has added to rising storage costs. In late 1990s, the carrying cost of buffer stock grew at the rate of 15% per annum. One of the most significant observations from various studies is that the hike in procurement prices/ MSP of wheat and paddy since 1989-90 apparently to support the PDS and buffer stock policy but often under strong farm and political lobby m surplus states has contributed substantially to the increasing costs of the system. Recently these increases have exceeded the inflation rate [GOI (2001)]. Moreover, during the 1990's the quantities procured through price support operations for jowar, maize and bajra too have grown larger year after year leading to heavy storage losses because of their limited shelf life and difficulty in selling these coarse grains through the PDS. Much of the procurement has even been sold at heavy loss as cattle feed [GOI (2002a)].

While the rising cost of FCI can be partly attributed to the government's support price policy, part of its high cost is also due to inefficiencies in its operations [see, among others, Government of India (1991) and Gulati et al (2000)]. That is, the costs incurred by the Corporation can be classified into two categories: those that are policy induced and costs related to its operational efficiency. The former, comprising costs arising from operations at MSP, CIP, specification of grain quality, buffer stock norms, railway freight, procurement incidentals etc., make up close to 70% of the economic cost of FCI. This component can be reduced by reforms to correct market distortions created by

policies such as MSP and levy. But, apart from this FCI also needs to become more efficient by concentrating only on a subset of its current work areas, leaving the rest to the private sector.

It is well established that private traders move grain from surplus to deficit areas and store grain from peak to lean season take advantage of arbitrage benefits arising from price differences. In consequence, they stabilize prices across regions and over time. A number of studies have argued that creating an environment for private traders to operate on level playing field would bring about overall social welfare gains to the economy [see, among others, Chand (2002), GOI (1991, 2001, 2002b), Gulati et al (2000), Jha and Srinivasan (1999), Umali Deininger and Deininger (2001) and World Bank (1999)]. Simulations carried out for this Report and presented in Chapter 5 also point in the same direction.

Nair (2000, pp.326) observes that private trade is now emerging as an important source of supply of food grains. For instance, despite the formation of the Southern Food Zone in early 1960s, private trade in Kerala supplied an amount (17% of total cereal consumption) that exceeded the PDS supply and it is now "likely to be of a higher order". Due to zonal restrictions, such private trade takes place through illegal channels as the variety of rice preferred in Kerala and produced in Andhra Pradesh and Tamil Nadu has a market only in Kerala and the FCI does not take this factor into account. Interestingly, farmers in these two supplying states have so far required permits from their governments for direct sales outside the state [GOI (2000)]. Moreover, with rising production in other states, rice is also smuggled into Kerala from states as distant as Maharashtra, Punjab, Haryana, Madhya Pradesh and Uttar Pradesh. The traders have been arguing for freeing of domestic trade in food grains so that open market supply could be increased, prices reduced and supply *equalised* among deficit states.

Government policy in the past assumed that private storage is destabilizing and failed to recognize the complementary role that it can play in stabilizing prices over time. According to Gulati et al (2000), government interventions in the food grains market

were designed to curb "speculative activities" of private "profiteers" in the belief that they operated in inefficient and disintegrated markets although it was established as early as 1973 that the Indian grain markets were efficient and integrated and that in the given market conditions, these traders could not earn above-normal profits. But the government continues to treat them as speculative agents. They are not permitted to hold more than a certain amount of stocks under the Essential Commodities Act (ECA) so that they cannot reap economies of scale. Their cost of stockholding is further increased by imposing Selective Credit Controls (SCC), which require minimum margins and commodity specific interest rates thereby restricting the availability of credit to private storage agents.

The above observations lead one to ask whether private sector operators function with lower or higher margins than the FCI and whether they can be relied upon for fulfilling certain objectives such as market price stabilisation and transit of goods from surplus to deficit regions. While this has been a major point of controversy in the debate on the changing role of FCI, in the past adequate evidence on private trade margins and storage costs for private agents was not available to make a conclusive comparison of FCI costs with those of private operators. However, some new documentation of such as comparison demonstrates that in spite of various physical and financial constraints private traders operate at lower costs [see, e.g., Tyagi (1990), World Bank (1999), Gulati et al (2000) and Jha and Srinivasan (2001a)]. Box 3.1 presents a description of the marketing channels in wheat and rice markets.

Box 3.2 shows that private sector does not enjoy a level-playing field. However, in spite of such drawbacks, private traders incur lower costs of trading and storage and operate with thinner margins. Tyagi (1990), who analysed data for the period 1970-71 to 1988-89, brought out very clearly that retail margins of private traders were much lower than the post-procurement costs incurred by FCI. From a comparison of margins he found that private trade distributed both rice and wheat with a margin that was far lower than that required for distributing PDS grains through the public channel. In a more recent

study, World Bank (1999) also noted that both procurement/ processing margins and total margins for private trade in rice and wheat are lower than the FCI (Table 3.2).

Chand (2002) provides one of the latest estimates of private marketing costs and margins, which comprise different elements for paddy and wheat markets. Tables 3.3 and 3.4 present the items of cost. Using data for wheat from Khanna market in Punjab during April-June, 2000 he finds that after purchase of wheat the seller pays purchase tax (4%), surcharge (1%), market fee and rural development fund (4%) and commission (2.5%) as percent of its farm harvest price. These are the statutory charges that make up 11.5% of the price paid by wholesalers to producers in the assembly market.

Box 3.1—Private Marketing Chain for Wheat and Rice

Wheat

After purchasing wheat from producers in assembly market, the wholesaler pays the statutory charges comprising purchase tax, surcharge, market fee, and rural development fund and commission. Wheat is then filled in bags of about 95 kg weight[11], which are then stitched, weighed and transported either to godowns for storage and sale in subsequent months or despatched directly to secondary markets mainly in deficit states. Wholesaler bears labour charges for filling, stitching, weighing and loading and unloading and charges for transporting produce to godown. Wholesaler also pays for packaging material, which is generally used twice. Adding all these costs to farm harvest price yields wholesale price in the surplus state. Output stored for sale in subsequent months incurs storage charges and interest on working capital, which is financed by private (18% annual interest) and institutional sources. At the time of sale in the lean period, wholesaler incurs costs of loading and forwarding charges. Wholesalers in Khanna mandi charge a margin of Rs. 20 per bag as profit. The actual margin of wholesalers in wheat trade is reported to be Rs. 25.10 per quintal. Wheat sold to other states also costs transportation charges particularly by road (truck). The price variation between wholesale and retail level differs across states due to differences in their tax structure. These estimates show that retail wheat price in different states would range between 30%-105% higher than farm harvest price in Punjab, being at the lower end in surplus states. The margin increases with the distance of deficit states from surplus states and time difference after harvest season.

Paddy/ Rice

One major difference between rice and wheat marketing is that the former involves processing/milling of paddy to convert it into rice. Farmers sell paddy to rice millers/ wholesalers who pay 11.5% per cent of the purchase price (farm harvest price) of paddy as statutory charges. They also pay for cost of gunny bag (can be used thrice and then sold for Rs. 2), bag filling and stitching, weighing, loading and transport to rice mill. Rice millers sell rice husk and rice bran to recover a large part of the cost of processing paddy into rice. They charge FCI Rs. 13 per quintal of paddy to process paddy to rice under custom milling arrangement. This generates a margin to the millers. After milling, rice is stacked/stored, which involves cost of labour, capital and gunny bag. As one quintal of rice is extracted from 1.5 quintals of paddy, all these costs and cost of one-quintal paddy are multiplied by a factor of 1.5 to get cost of one-quintal rice to wholesaler. Sale of rice by wholesalers to retailers in surplus states or to wholesalers in deficit states involves wholesaler's margin and transport costs. Given this cost structure, retail price of rice increases to 2.25 times the farm harvest price of paddy by month of September in following year. During the peak time, retail prices of rice by private trade in most of the deficit states would be close to 3 times the paddy price during October to December.

Source: Chand (2002).

[11] Size of bag is now being changed to 50 kg.

Box 3.2—Comparing FCI and Private Traders

Special treatment to FCI

- Commercial borrowing rates 3-6% lower than private traders: In 1997
  - FCI: 14.6%
  - Private traders: 18%
- Exemption from Selective Credit Controls (SCC)
- Subsidised rail freight

Restrictions on private agents

- Curb on "speculative activities" of private "profiteers" who operate in "inefficient and disintegrated markets"
- Limit on stockholding under the Essential Commodities Act (ECA) – restricts reaping of economies of scale
- Imposition of SCC that require minimum margins and commodity specific interest rates – restricts availability of credit and increases cost of stockholding
- Zonal restrictions on movement of grains
- Prices prevented from becoming excessively high by resorting to imports –speculative expectations of private traders remain stable

Factors behind FCI's poor performance

- Lack of explicit price stabilisation policy (politically determined procurement price also acts as support price)
- Diseconomies of scale despite its large scale of operation
- Low capacity utilisation of warehouses
- Storage cost of owned godowns 70% higher than hired godowns
- Movement of its stocks multiple times between its warehouses
- Unscientific, inadequate storage – quality deterioration, ageing of grain, health risk
- FCI wholesale marketing cost 10-15% higher than private marketers
- Prescribed narrow marketing margin insufficient to cover costs
- Departmental wages 4-5 times and contract wages 2 times the market wages

Factors behind private traders' better performance

- Avoidance of mandi charges by buying directly from farmers
- Re-use of gunny bags several times (unlike FCI)
- Movement of grains by trucks, which are more easily available (than railway wagons) and have lower transit losses.

Source: Jha and Srinivasan (2001a).

Table 3.2—Wholesale Marketing of Rice/ Wheat: Public *vs* Private Costs (Punjab 1997-98)

Rice Marketing				
Private	**Rs./ q**	**Public**	**Rs./ q**	**Ratio of private to public costs (%)**
Procurement & processing	157	FCI-procurement agency & processing	179	88 %
Distribution & wholesaling	20	State distribution agency	13	160 %
Total	177	Total	191	93 %
Wheat Marketing				
Wholesale in assembly market	60	FCI-procurement agency & processing	119	51 %
Wholesale in secondary market	63	State distribution agency	26	247 %
Total	123	Total	145	85 %

Source: World Bank (1999), Annex Table 2.21a.

Table 3.3—Wheat trade from surplus to deficit area: Private marketing costs and margins

Type of State	**Harvest season**	**Subsequent season**
	April – June	**July - next March**
Surplus	1.Statutory marketing charges 2.Cost of labour and bag	1. Statutory marketing charges 2. Cost of labour and bag 3. Storage cost for 45 days (half) of harvest season 4. Storage charges for lapsed months 5. Interest cost for 45 days (half) of harvest season 6. Interest cost for lapsed month 7. Wholesaler's margin
Deficit	1. (1) and (2) as above 2. Wholesaler's margin 3. Forwarding charges 4. Transport cost	1. (1) to (7) as above 2. Wholesaler's margin 3. Forwarding charges 4. Transport cost

Source: Chand (2002), Table 5.1.

Table 3.4—Paddy to Rice trade: Private marketing costs and margins

Type of State	Harvest season	Subsequent season
	October - December	Next January – September
Surplus	1. Statutory marketing charges 2. Cost of labour and bag used for paddy 3. Carriage to rice mill 4. Processing cost 5. Cost of bag for rice 6. Handling/ stacking charges 7. Rice miller's margin	1. Statutory marketing charges 2. Cost of labour and bag used for paddy 3. Carriage to rice mill 4. Processing cost 5. Cost of bag for rice 6. Handling/ stacking charges 7. Rice miller's margin 8. Storage charges for 45 days (half) of harvest season 9. Storage charges for lapsed months 10.Interest cost for 45 days (half) of harvest season 11. Interest cost for lapsed months 12. Wholesaler's margin
Deficit	1. (1) to (7) as above 2. Wholesaler's margin 3. Forwarding charges 4. Transport cost	1. (1) to (12) as above 2. Wholesaler's margin 3. Forwarding charges 4. Transport cost

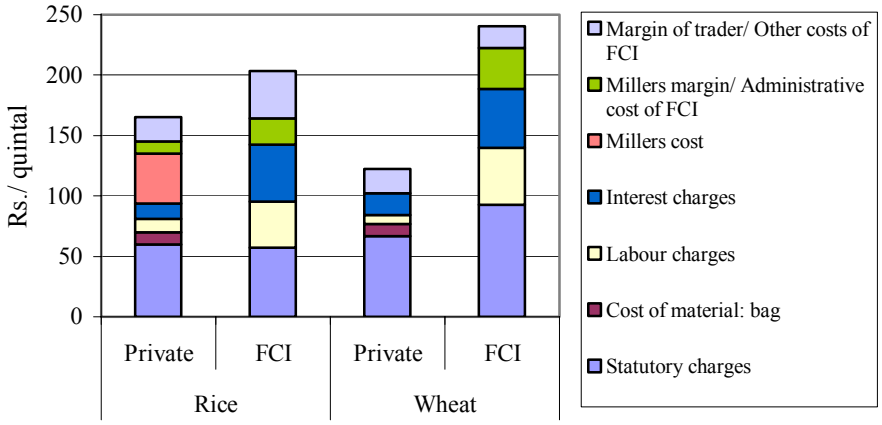
Source: Chand (2002), Table 5.2.

Figure 3.1 shows a break-up of private costs and marketing margins vis-à-vis those of FCI. Clearly labour, interest and administrative costs comprise a significant component of FCI costs. Interestingly, FCI also shows diseconomies of scale despite its large scale of operation and moves its stocks several times between its warehouses. There are several reasons for lower private operating costs. They avoid *mandi* charges by buying directly from farmers; re-use gunny bags several times (unlike FCI); move grains by trucks which are more easily available (than railway wagons) and have lower transit losses. Note that it is perfectly legal for private traders to buy directly from farmers thereby *avoiding* but NOT *evading* mandi charges.[12] In addition, in order to cover their loss due to levy sales to FCI, the rice millers apparently sell low-quality grains to FCI and

[12] FCI is unable to do so as it is apparently required to pay mandi charges on <u>all</u> its purchases. This adds to its costs.

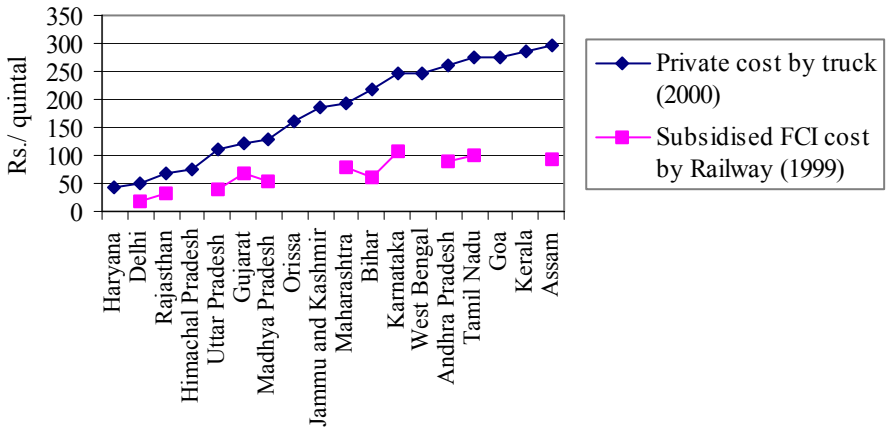
good-quality in the open market. In contrast to this FCI, which receives subsidised rail freight and credit rates and is not restricted by Selective Credit Controls (SCC), ECA and zones, incurs much higher operational costs. As private traders rely to larger extent on road transport and do not enjoy rail subsidy, their transport costs are higher than FCI (Figure 3.2).

Figure 3.1—Trading Costs and Wholesale Marketing Margins of Private Traders and FCI: 2000-01



Sources: Chand (2002) and GOI (2002a).

Figure 3.2—Transport Cost – Ex-Punjab



Sources: FCI, Directorate of Economics and Statistics and Chand (2002).

In comparing FCI margins with those of private traders it is to be noted that while the relatively higher administrative and other costs of FCI (partially due to excess staffing) are signs of inefficiency, this may not be the case with respect to some other cost items. For example, the higher marketing costs of the FCI are partly due to the transportation of grain over longer distances to meet its procurement obligations and the PDS requirements in distant consuming areas. Part of the economic cost of FCI is also due to statutory and non-statutory charges paid to state governments and their agencies, which include *mandi* charges, purchase tax and infrastructure cess (amounting to around 14% of procurement price in 2000-01 in case of wheat). One would, however, expect the private sector to be more efficient in handling and marketing operations minimizing loss and theft of food grains, since it operates within a hard budget constraint.

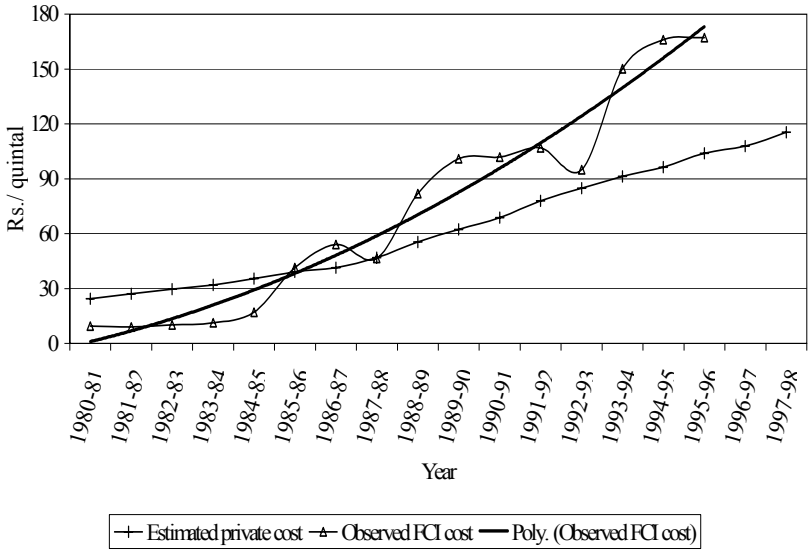
Using an estimated relationship between public storage costs and capacity utilisation, assuming that private agents operate at a higher capacity utilisation but with lower labour and establishment costs, Jha and Srinivasan (2001a) inferred private storage cost to be 70% of FCI storage cost in 1999-2000. In Figure 3.3 we present the private

cost thus estimated and the actual FCI costs. Note that the slope of actual cost curve of FCI is much steeper in the 1990s than in the early 1980s and it is also steeper than the private cost curve. That is, its annual average actual costs are rising faster than they were in the past and faster than the current private costs. This observation also favours promotion of private stockholding. However, it must be emphasized that although private storage plays a complementary role, one cannot rely solely on it. Jha and Srinivasan (1997), using a dynamic stochastic simulation model, find that private storage leads to price stabilization but only to a limited extent. Thus a judicious combination of public and unhindered private storage would be better.

3.5 FUTURE DIRECTIONS

The analysis of the previous Section suggests that, there is substantial scope for improving efficiency in the operations of the FCI. In a decade-old report, GOI (1991) made several suggestions to reduce FCI's costs of operation such as by improving its storage capacity utilization and downsizing its staff strength. It also recommended staggered procurement with decentralized storage. Since procurement operations are normally completed within a couple of months of harvesting, they add substantially to procurement cost, transportation and storage cost, physical damage and loss of grains. The Report suggested a financial (loan) package to farmers to hold on to their stocks by designing an appropriate instrument/ contract to provide them liquidity. Different procurement prices over the cropping cycle could be used to carry out staggered procurement. For example, following Hotelling's Rule of Intertemporal Arbitrage, procurement price could be increased through the harvesting season by adding to it the cost of storage.

Figure 3.3—Unit Public and Private Storage Cost



Source: Jha and Srinivasan (2001a).

Moreover, to begin with, price support should be at reasonable levels according to scientific criteria to both bring in efficiency and to prevent high costs to FCI. GOI (2002a) suggests adhering to quality norms for procurement as well. As procurement, and in turn stocks with FCI, decline, private sector would more readily come to the market since the fear of future flooding of market with offloading of public stocks would subside. Higher private sector purchases would lift up market prices and in turn reduce the requirement of price support. Consequently government costs would fall. The costs of operation of FCI can be further reduced by decentralizing procurement and storage and avoiding cross hauling of grain that takes place in the current centralized system. Decentralization would help to ensure market efficiency and reduce the economic costs of running the PDS. It would also put an end to the trading of blame by the state and central governments for the poor functioning of the system. In the current system "State governments, for instance, complain of inadequate food allotments from the Centre. The

Centre, for its part, blames State governments for failing to make full use of their existing allotments." [Drèze (2001)].

Such a major change therefore has to be brought in with careful analysis. ASCI (2001) recommend breaking up of FCI into state-level food corporations to encourage states' participation and involvement. But given the past records of the working of FCI, this recommendation might amount to dividing a larger problem into several smaller problems that may add up to more than the whole. This calls, in particular, for analyzing the center-state relations in the light of the states' sovereign powers, their interests and priorities that may differ from those of the central government and the fact that the PDS and procurement policy was originally a central government initiative. For example, the criteria for central allocation to states are not explicitly stated and there is a wide discrepancy between what states demand from the center and what is allocated to them [Radhakrishna and Subbarao (1997)].

While the government has announced its intention to decentralise the system, for such a system to take shape, the centre would require support and co-operation from state governments. It should ensure that over time the states take over the procurement operations and the food subsidy bill of the central government does not rise as in the past. To better serve the poor through the PDS, its targeting should be improved and its requirements purchased from free market in the nearest and cheapest local markets.

Apart from decentralization three are several other suggestions that have been made by various expert committees. Recommendations for FCI made by GOI (2002a) are presented in Box 3.3. GOI (2001) recommends that FCI maintain a minimum level of buffer stock and then undertake open market operations within a prescribed price band by releasing stocks in the open market when shortages are prevalent and prices are high and purchase grains from the open market when there is excess supply and prices are depressed. The FCI should thus limit its role of providing too high a price support since a high level of buffer stock can itself contribute to inflation. Moreover, the present level of

food credit, exceeding Rs.400 billion, also has significant macro economic implications and impact on money supply.

Box 3.3—Observations and Recommendations of GOI (2002a) regarding FCI

- There is "clear need for FCI to change" to "enable faster, commercially oriented decision making"; it would help "FCI to operate autonomously, accountably and cost-effectively".
- No basic change in structure: FCI should maintain Central Pool, carry out long-distance movement and make direct market intervention for price stabilization but handle only major cereals not coarse cereals.
- It should tackle the "serious diseconomies" arising from "abnormal stock levels" by full utilization of silo capacity, increasing the height of stacks, redesign of plinth and specification for LDPE sheets.
- Measures are needed to control the quality of grains in storage beginning from installation of mechanical cleaners at farm-level, tighter inspection and ban on relaxation of procurement standards.
- FCI should follow the principle of "first-in, first-out" for stock disposal and introduce modern computerized systems of inventory control and management.
- The uneconomic procurement centres should be entrusted to state government agencies rather than FCI, especially in Punjab and Haryana.
- Losses occur at *mandis*, during transport, storage, loading/ unloading, stacking/destacking and issue for PDS. FCI has a "poor record of fixing responsibility for storage losses and effecting recovery. There is a need for corrective action."
- Introduce a Memorandum of Understanding between FCI and GOI to commercialize FCI's operations through greater operational flexibility in procurement, storage, buffer stocking, distribution, open market sales and exports and by providing subsidies to cover all activities entrusted to FCI.
- While private operators, including foreign bulk grain traders get accurate and timely market information without any nation-wide network, FCI's market intelligence does not. It should go for a national computerized information network.
- Food credit to FCI at 11.65% rate of interest is "in the nature of a running account and there is no deadline for repayment". It is "not based on commercial principles" and "bulk of the outstanding credit is on stocks. There should be clear credit limits related to … higher buffer stock norm".
- The internal audit division, staffing 600 people, should shift emphasis from establishment audit to more core issues such as subsidy, budgetary control, external trade, open market operations, procurement incidentals etc.

The restriction on private grain trade must be lifted and competitive forces allowed playing a larger role in reducing intermediation costs. In particular the constraints and restrictions on entry of modern food procurement, transport, processing and distribution companies must be removed so that the benefits of modern management

practices like silo storage, logistics and large scale processing can flourish. This will benefit both farmers and consumers. According to GOI (2001), the government should also make efforts to evolve a standardized grain grading system which would benefit farmers, traders and consumers by lowering transaction costs, providing growers with rewards for delivering quality output and incentives to use quality enhancing technologies and practices and facilitate integration of domestic markets with world markets. FCI should transfer more and more of its marketing functions under concession arrangements and management contracts to the private sector and encourage it to invest in more modern grain handling systems.

The size of the current surplus stock has exposed GOI to particularly large physical and financial losses, and provided a stronger rationale to push exports apart from seeking outlets through domestic distribution programs. Several avenues have been suggested for reducing the large buffer stocks. GOI has set up a Technical Group on Buffer Stocking Policy to suggest maximum and minimum stocking norms. GOI (2002b) suggests lowering of issue price and encouraging exports in the short run and reformulation of price support policy in the longer run. The scope of anti-poverty programs would have to be expanded if food stocks have to be reduced substantially. Given the excess food stocks, from an economic point of view, the opportunity cost of releasing these stocks is probably zero. As an even more drastic step, if the cost of procurement plus procurement incidentals is treated as sunk cost, then some rough calculations show that the government would save by giving grains away for free, since it has already incurred costs of procurement. Consider for example, the data for 2001-02. With carrying cost of about Rs.240/ quintal[13] and distribution cost (freight, handling, etc. plus carrying charges to state agencies) about Rs.140/q, a net saving of approximately Rs.100/q would occur by giving away grains for free distribution rather than stocking. Incidentally, this is almost equal to the unit transportation cost of FCI from Punjab to

[13] This is the average cost with total carrying cost of Rs. 13,915 crores and buffer stock of about 58 million tonnes.

Kerala – perhaps the longest distance covered by FCI in the country. This means that GOI can use these savings to even pay for transporting the grains to deficit areas.

While excess stocks can be used for schemes such as food-for-work and other anti-poverty programs in the short run, however, the government has to contend with several constraints in doing this. Drèze (2001) points out that the poor financial condition of the states makes it difficult for them to bear the cash costs or the non-wage component of food-for-work schemes. This partly accounts for the low off-take of PDS food grains by the states from what is allocated to them by the Center. The governments are not in a position to bear the administrative and other associated costs entailed in operating such schemes. Another problem in disposing of the large stocks is that the total absorption of grains by various anti-poverty programs currently run in the country is limited. The quantity that can possibly be exported, even at lower than domestic market prices, is in the range of only 3-4 million tonnes.

The opportunity cost of releasing the buffer stocks is perhaps negative, considering that the government will also save on the carrying cost of excessive stocks provided it maintains a minimum to buffer against the possibility of a few years of consecutively poor monsoons. There is a related problem though of higher (subsidized) supply leading to a drop in the market price, necessitating further procurement by the government to provide the minimum price support to farmers. The only way this can be tackled in the short run is to lower or at least freeze the MSP. In the long run, such stock build up should be avoided by providing support to farmers aimed at boosting food grain demand (through income generation programs) rather than raising support prices. This could be done through alternative income-support measures to replace MSP, such as deficiency payment to farmers in poor crop years.

With the pressure to streamline FCI mounting, in 2001, of the 55,000 FCI staff who handle wheat and rice procurement and distribution operations, the FCI management dismissed more than 100 employees and charge-sheeted 10,000 more for transit and

storage losses of grain. It also issued a circular to the effect that employees responsible for shortage/transit losses beyond 0.5 per cent will be penalized and recovery of such losses will be made from them. Such a drastic step has been taken for the first time since the creation of the agency in 1965. Employees who have taken to agitation to press for withdrawal of the circular have obviously opposed it. The employees union has in turn pointed to the senior staff and to unrecorded losses in railway transit for over past 30 years, diversion of funds in purchase of gunny bags, wooden racks and polythene covers etc. [reported in Daily Excelsior (2001)]. In a similar instance of diversion of grain reported from Andhra Pradesh, food aid provided by GOI was reportedly resold to FCI as locally grown grain. As a consequence, not only did GOI apparently stop the aid to the state but the state government itself suspended more than 350 government officials and elected village representatives for misappropriating rice [BBC (2002)].

3.6 CONCLUSIONS

Being a signatory to the WTO, the country is moving towards more open trade in agriculture. The era of globalization has brought with it new opportunities as well as challenges to the food security system. The challenges are in terms of developing appropriate marketing infrastructure and institutions to deal with trade in agricultural commodities. The opportunities under liberalized external trade are in terms of reduced dependence on buffer stocks for price stabilization, suggesting a reduced role for FCI. Efficiency considerations too suggest that the role of FCI should be restricted to price stabilisation. Simultaneously, under a deregulated domestic market, private traders are expected to play a greater role in the distribution of food grains. Unfortunately, despite evidence of lower trading costs and margins for private operators as opposed to public agencies, the government so far seems to be wary of private trade and continues with policies such as SCC to impose a credit squeeze and limit stock holdings of traders.

Efficient functioning of private agents would require the removal of restrictions introduced under the Essential Commodities Act such as limits on stock holdings and

controls on movement of grain outside state boundaries and sometimes even district boundaries. Such controls curtail growth and result in the development of secluded states. For instance, with its continually declining food grain production, Orissa depends more on its neighboring states such as Madhya Pradesh and Andhra Pradesh for its food grain supplies, which are not easy to procure through the normal market route. In Tamil Nadu, the zoning policy promotes smuggling out of a particular variety of rice (red boiled – *matta*) that is produced, but not locally preferred for consumption. An immediate solution to such problems lies in removing the interstate restriction on the movement of food grains and in making this policy initiative credible, as there are fears that such restrictions would be imposed again.

In India traditionally the government fixed prices for both producers and consumers, it decided how much to distribute where, how much of stocks to release or accumulate for price stabilisation and so on. But private agents operate at costs lower than public costs in both storage and trade and their operations will not be excessively speculative in the presence of public intervention for price stabilisation. In this context it is important to note that the traders' storage decisions are based on their anticipation of future scarcity. Public interventions to manage price risks should be designed such that they do not unduly restrict the normal flow of commodities in the economy but allow for smooth functioning of private trade and market prices to determine resource allocation. What is required now is a complete overhaul of the food policy. Safety nets to consumers such as the PDS should be delinked and designed separately from price support or procurement policies.

Support price should not be fixed at unduly high levels. The government can set a price band of minimum (floor) and maximum (ceiling) prices so that markets can freely determine equilibrium prices so long as they are within this band and the government can step in only when prices tend to go out of this band. Such price interventions should provide a protection against distress sales during surplus situations or price spikes under periods of shortage. Complete elimination of price volatility by the government through

inter-regional or inter-seasonal policies is neither desirable nor feasible. There should be enough scope for traders to undertake the arbitrage transactions that are worthwhile, and not be hindered by restrictions on storage, movement and access to trade and credit. Such restrictions would need to be either permanently eliminated or significantly reduced.

That is, private sector should be allowed to operate more freely in the market and to trade and store stocks based on its expectations from the market. Current reforms are proposing to use the new economic environment by allowing a larger role for the private sector and restricting the role of FCI to timely sales and purchases to maintain stability in food prices and resort to exports and imports of food grains, when required. Such reforms, if followed through properly, would help make public food spending much more worthwhile. The high costs of maintaining public stocks can be reduced through encouraging private storage, which plays a complementary role to public storage. These costs can also be reduced through liberalisation of private external trade and the government is already moving in this direction. Agricultural trade liberalisation has a favourable impact on resource use efficiency in agriculture and it has been shown that domestic price stability need not increase with liberalisation. To sum up, removal of restrictions on private storage and trading activities would go a long way in promoting food security in the country.

The budgetary savings of the central government realized by limiting the role of FCI can be used to provide subsidy to the states for the specific purpose of procuring grains through their agencies, private or public, in order to serve the PDS through their network of fair price shops. Given the cost factor, they can choose the most appropriate way to purchase grain. PDS would serve the poor better if, in addition to improving targeting performance, purchases are made from the free market in the nearest and cheapest surplus zone. Jha and Srinivasan (2001a) show that if PDS purchases were made at market prices, the benefit cost ratio would, in fact, be higher than the historically observed ratios. The amount saved from food subsidy could be given to states in the form of food stamps or vouchers, which would be distributed to the households by the local

governments/ panchayati raj institutions [Radhakrishna and Subbarao (1997)].[14] The storage activity can also be decentralized to avoid cross hauling of grain by transferring procurement operations to states to control the food subsidy bill of the central government.

4. MULTI-COMMODITY SPATIAL EQUILIBRIUM MODEL

4.1 INTRODUCTION

Welfare impacts of domestic reforms in the form of market deregulation and freeing of interstate trade from controls can best be analyzed using a spatial equilibrium model. We therefore build a multi regional and multi commodity model and analyze the impact of domestic trade liberalization in the case of rice and wheat markets in India in a partial equilibrium framework. In the spatial trade equilibrium model for rice and wheat, we divide the country into 18 large/ major states (synonymously called regions) that account for 99% of total production of these grains. Demand and supply functions for rice and wheat are specified for each state based on elasticity estimates available from the existing literature. These functions are calibrated for the base year 2000-01 using data for that year on all exogenous and endogenous variables. In the model regional demands and supplies of rice and wheat interact with each other through their substitution possibilities both in consumption and in production. Equilibrium prices and other variables are obtained as a solution to the commodity balance equations subject to the constraints imposed due to government interventions. The set of equations that clear the markets and the set of inequalities that represent price interventions by the government are solved as a Mixed Complementarity Problem (MCP) using PATH Solver in GAMS.

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[14] However, operation of food stamps has faced several difficulties in different countries, as described by Jha and Srinivasan (2001a).

4.2 DEMAND AND SUPPLY FUNCTIONS

We consider linear demand functions, which incorporate the effects of own price, cross price and income. For each region i, the open market demand function is specified as follows:

$$D(i) = \alpha(i) + \beta(i)\, pr(i) + \gamma(i)\, qr(i) + \lambda(i)\, y(i) \quad (1)$$

where

pr(i) = Own retail price

qr(i) = Retail price of the other crop

y(i) = Per capita income

The supply function is also assumed linear. It depends on the weighted average of market and procurement prices received by the farmers[15]:

$$S(i) = a(i) + b(i)\ wap(i) + c(i)\, qf(i) \quad (2)$$

where

S(i) = Production

wap (i)= $\{\lambda\, pf(i) + (1 - \lambda)\, lvp(i)\}$ = weighted average of procurement and market prices

pf(i) = Own farm harvest price

lvp= Levy price (MSP in case of wheat and levy procurement price in case of rice)

qf(i) = Weighted average farm harvest price of the other crop

[15] Depending on the production patterns in different states, rice and wheat can be substituted for each other in production only in some states. But from the available literature we could not get any significant cross-price elasticity estimates and had to drop this variable from the supply equations for all states.

4.3 INTERSTATE TRADE

In order to model scenarios with different degrees of domestic movement restrictions we assume that these restrictions that arise due to policies, infrastructure bottlenecks and other trade obstacles manifest themselves in the form of an implicit tariff on interstate trade. In the base case this implicit tariff is obtained endogenously from the model by imposing a constraint that total interstate trade generated in equilibrium does not exceed the amount observed in the base year. Given the base year total interstate trade, the implicit tariff variable 'ita' adjusts to keep the sum of all regional imports (*tm*, which is also equal to the sum of all exports) generated endogenously in the model from exceeding this level. This is specified in the model as the following complementarity condition.

$$tm \geq \Sigma_j \Sigma_i T(i,j) \perp ita \geq 0 \quad (3a)$$

T(i,j) denotes the amount exported by region i to j or equivalently the amount imported by region j from i.

This complementarity condition implies that if total trade ($\Sigma_j \Sigma_i T(i,j)$) is < tm, the total observed interstate trade in base year, then ita =0. Alternatively if ita > 0 then it implies that ($\Sigma_j \Sigma_i T(i,j)$) = tm.

Trade from Region i to Region j is determined by the following complementarity condition

$$T(i,j) \geq 0 \quad \perp \quad [p(i) + tc(i,j) + \text{traders' margins}] (1 + ita) \geq p(j) \quad (3b)$$

where

T(i,j) = Trade from region i to region j
tc(i,j) is the transportation cost from state i to j
p(i) is wholesale price.

The above complementarity condition says that trade will not take place (T(i,j)=0) so long as the sum of purchase cost in state i and cost of transporting grains to state j inflated by the implicit tariff exceeds the returns, the open market price in state j ([p(i) + tc(i,j)] (1 + ita) > p(j)). Trade takes place so long as the reverse inequality holds. Perfectly competitive markets imply that trade will continue from state i to j until all the arbitrage benefits are exhausted and total cost equals the open market price in the destination state. Thus, T(i,j) > 0 implies that [p(i) + tc(i,j)] (1 + ita) = p(j).

Explicit use of transport cost is not followed according to the current modeling practice. However, it can effectively capture product differentiation between different regions and is also useful when this cost comprises a large component of price due to underdeveloped transport infrastructure. For these interpretations and modeling of transport costs explicitly see, e.g., Löfgren and Robinson (1999) and Piet (2002).

4.4 FOREIGN TRADE

External trade is modeled by treating the rest of the world as another region with which individual states can directly trade by incurring the additional costs of transport from the nearest/ cheapest port. Given the large size that Indian trade can constitute in world trade, we make the large country assumption so that higher imports into India cost more while higher exports fetch lower prices. Thus, we express export (import) price as a function of exports (imports).

Export price = border price – ec * total exports - port clearance charges

Import price = border price + ic * total imports + port clearance charges

where border price is expressed in domestic currency, *ic* is the import coefficient and *ec* the export coefficient. These are obtained from their respective price elasticities of exports (imports) with respect to exports (imports), evaluated at the base year values.

Exports take place so long as the price received remains higher than the cost of purchasing the grains plus transport cost from the state center to the port. Imports take

place if it is cheaper to import than to buy in the domestic local market. Exports/imports are therefore obtained from the following complementarity conditions:

$$EX(i,\text{"ROW"}) \geq 0 \quad \perp \quad [p(i) + tc(i,\text{"ROW"}) + \text{traders' margins}] \geq XP \qquad (4a)$$

$$IM(i,\text{"ROW"}) \geq 0 \quad \perp \quad [MP + tc(i,\text{"ROW)} + \text{traders' margins}] \geq p(i) \qquad (4b)$$

Where EX, IM denote exports and imports and XP, MP denote their respective prices.

4.5 PRICE RELATIONSHIPS

Equilibrium prices computed in our model refer to the wholesale level prices. Retail price which enters the demand equation is given as:

$$pr(i) = p(i) * (1 + \text{retail margin}) \qquad (5)$$

Since we do not have data on retail profit margins, we assume it to be the same percentage as the wholesale margin applied on farm harvest prices to derive wholesale prices.

Farm harvest price which enters the supply equation is given as:

$$pf(i) = p(i) / (1 + \text{wholesale margin} + \text{marketing cost}) \qquad (6)$$

Prices

PDS Price in state i for both rice and wheat is expressed as a fixed percentage lower than the market price: $PDSP(i) = \nu_i\, p(i)$

Procurement Price (same for all states, exogenous):

Rice: Fixed Levy Price

Wheat: Fixed Minimum Support Price (MSP)

4.6 PUBLIC INTERVENTION

Quantities distributed through the Public Distribution System are fixed exogenously for each state.

PDS: Fixed quantity for each state (exogenous)

Procurement

Since procurement is in the form of levy for rice it is fixed exogenously as a percentage of production.

Rice procurement(i): $proc\_R(i) = \mu_i S(i)$

However, in case of wheat it is procurement is determined endogenously based on the Minimum Support Price policy.

Wheat procurement (i): Endogenous determined by the complementarity condition:

$$proc\_W(i) \geq 0 \quad \perp \quad p(i) \geq MSP \quad (7)$$

where

proc(i) = Government procurement of wheat

μ_i = levy fraction of output in state i

MSP = Minimum Support Price

The above complementarity condition implies that wheat procurement will be zero so long as the open market is higher than MSP. And positive procurement of wheat implies open market price is equal to MSP.

4.7 WELFARE GAINS

Change in Producer Surplus

$$PS = S(i)\ (wap_1 - wap_0) + \tfrac{1}{2}\ (spe)\ S(i)\ (wap_1 - wap_0)^2\ /wap_0$$

where

wap_0 = base year weighted average of farm and market prices,

wap_1 = current year weighted average of farm and market prices.

spe = price elasticity of supply.

Change in Consumer Surplus

$$CS = -\ D(i)\ (pr_1 - pr_0) - \tfrac{1}{2}\ (dpe)\ D(i)\ (pr_1 - pr_0)^2\ /pr_0$$

where

pr_0 = own retail base year price,

pr_1 = own retail current year price.

Dpe = price elasticity of demand.

Gains to Traders

Apart from consumers and producers, other agents in the economy also experience welfare changes. They include traders who earn profit margins by trading within state from farm to wholesale market (*wholesale traders*) and from wholesale to retail market (*retail traders*) and *inter-state traders*. The surplus of these traders arises from different sources. 1) If production goes up, more grain is brought from farm gate to wholesale market and hence increases their surplus. 2) If more grain is traded across states, inter-state traders gain. 3) If more grain is consumed then retailers' surplus goes up. The entire amount of difference between prices at the two points of trade does not constitute the income of traders as they incur some costs to provide services (e.g., finding

a buyer and arranging payments etc). Wholesalers help in the delivery of grain from farm gate to the wholesale markets (within state transaction) or between wholesale markets in different states.

Using data on profit margins in trading from farm to wholesale market and from wholesale to retail market, we can calculate the gains from trade accruing to traders in each state. The gains from trade are obtained by comparing the surpluses in different scenarios as compared to that in the base scenario.

Wholesale Traders' Surplus (from farm to wholesale markets)

To get this surplus, we multiply the margin with the wholesale price and local production net of procurement, net exports abroad and net exports to other states. This captures the margins of wholesalers both from within and without the state i.

$$WTS(i) = margin * p(i) * [S(i) - proc(i) - \{E(i) - M(i)\} - \{\Sigma_j T(i,j) - \Sigma_j T(j,i)\}]$$

Retail Traders' Surplus (from wholesale to retail markets)

The retail traders' surplus is obtained by applying the margin to the free market demand times the retail price.

$$RTS(i) = margin * pr(i) * D(i)$$

Savings in Government Costs

Total government cost = purchase cost + procurement incidental cost + storage cost + distribution cost

Where

Purchase cost = government procurement*MSP,

Procurement incidental cost = government procurement * incidental cost,

Storage cost = (procurement – PDS)*storage cost,

Distribution = PDS* distribution cost

Sale realization = PDS*central issue price

Net government cost = total government expenditure – sales realization

Under the scenario of movement restrictions, there is no change between reference and changed scenarios in PDS related variables.

4.8 MARKET EQUILIBRIUM

The market clearing condition equates net availability to demand in each state. Since PDS quantities are exogenously specified, the condition reduces to equating open market demand with net supply, which caters to the domestic open market demand. The net availability is obtained by subtracting from production the outflows from the state, which consist of net regional imports, government procurement and net foreign exports. Thus the equilibrium condition for state i is

$$S(i) + \{\Sigma_j T(i,j) - \Sigma_j T(j,i)\} - proc(i) - \{E(i) - M(i)\} = D(i) \quad (8)$$

Markets are cleared by p(i).

The MSP is fixed at such a level that the quantity procured is more than enough to cover the PDS requirements. The difference between the procurement quantity and PDS is taken to be the stocks held by the government.

5. REMOVAL OF RESTRICTIONS ON DOMESTIC MOVEMENT OF GRAINS

5.1 INTRODUCTION

Imposition of internal trade restrictions is a ubiquitous phenomenon in the developing world. This has been observed by, among others, Bhagwati and Chakravarty (1969), Krishna and Raychaudhuri (1980) and Jha (2002) for India; Ellis et al (1997) for Sri Lanka, Minot and Goletti (2000) for Vietnam, Kherallah et al (2000) for Egypt and Drèze and Sen (1993) for several countries in Africa (e.g., Kenya, Zimbabwe, Botswana) and Asia (e.g., India). It is often believed that speculative activities by private operators can be destabilising due to lack of knowledge about future prices and that the government can control such manipulative practices by actively participating in storage and trading activities to allay fears of future scarcity. Governments also fear that private traders follow collusive practices and legal restrictions to counteract them may not succeed.

In line with such arguments, food grain markets in India have faced several interventions including storage and movement controls through policies such as the Essential Commodities Act and *zoning* that prohibits private trade in food grains across broad zones (Table 5.1).[16] There is, however, no unanimity on this line of reasoning. Drèze (1990), e.g., argues "there is little evidence that food markets in India easily lend themselves to collusion and manipulation. If anything, zoning is likely to facilitate such (collusive) practices". Drèze and Sen (1993) cite the cases of Botswana, Cape Verde, Kenya, and Zimbabwe, which successfully averted famine by inducing private trade to supplement the efforts of the public sector in moving food towards vulnerable areas. Moreover, a comparison of Kenya and Botswana shows that presence of controls in Kenya and none in Botswana led to more stable prices in Botswana. It is not necessarily

[16] The Department of Consumer Affairs of the Ministry of Consumer Affairs, Food and Public Distribution, is entrusted with regulation of domestic and interstate trade and implementation of ECA and Prevention of Black Marketing & Maintenance of Supply of Essential Commodities Act (1980). The functions of this Department also include ensuring uniform standards of grades and measures across the country.

the case that private trade involves mostly exploitative traders. It has often been found that poor buyers and sellers who very long distances, on foot if necessary, in order to transact food at more advantageous prices. This is not to undermine the role of public sector in food supply management but that should be performed as a creative form of intervention rather than the imposition of negative restrictions on the operations of private trade.

There may be a case for government intervention under market failure. For example, under perfect competition, private operations would lead to efficiency but distributional considerations may require government intervention. There are other conditions that may warrant government intervention. For example, under conditions of famines limited private opportunities to exploit spatial arbitrage may result in localised scarcities and require public intervention [Ravallion (1987)]. Although private trade will iron out spatial price differentials in the course of time but under famines, markets may take much longer than usual to do so. Under normal circumstances, slow response of trade to local shortages could be attributed to constraints imposed by long-term contracts devised to avoid risk.

The main rationale for domestic movement restrictions in India was to help procurement of grain by government agencies. This was required when the procurement was in the form of a levy. It was felt that dependence on private trade would result in high prices for consumers. Hence the government procured grain at below market price (levy) and distributed it across the country through the public distribution system (PDS) at subsidized prices. But such zoning policies considerably and systematically increased (rather than reduce) interstate food price dispersion thereby worsening the situation of hardship for deficit households in deficit states. Due to this perverse effect and the associated costs to the government, complete elimination of price volatility by the government through inter-regional or inter-seasonal policies is neither desirable nor is it feasible. On the contrary, private agents operate at costs lower than public costs in both storage and trade. To take advantage of arbitrage benefits, they buy grains at low prices

in peak seasons or from surplus areas thereby lifting up the prices. They sell them when prices are high during lean season or in deficit areas thereby bringing down the high prices. They thus play a stabilizing role by pursuing their own goals of profit maximization. But, the government's price stabilization policy with narrow price bands or pan-seasonal and pan-territorial pricing reduces the incentives of private sector operators for inter-temporal storage and spatial arbitrage activities. As a result, there is lower private trade due to lower arbitrage benefits, which in turn leads to higher public storage and associated cost. Encouraging private trade can thus reduce high public carrying costs.

Table 5.1—Indian States: Prevalence of Storage & Trade Restrictions

Limits on Storage			
State	**Commodities**	**Agents**	**Limits: Stocks/ Time period**
Gujarat	Pulses	License holders Others	25 quintals 9 quintals
Andhra Pradesh	Pulses & oils Raw materials Finished goods		 1 month ½ month
Punjab	Rice		250 quintals
West Bengal	Rice Wheat	Wholesale dealers Wholesale dealers	750 quintals 400 quintals
Kerala	Sugar		250 bags
Uttar Pradesh		Wholesale dealers	1000 quintals
Maharashtra		Wholesale dealers	15 days
Assam		Wholesale dealers	10 quintals
Trade Restrictions			
State	**Agents**	**Restrictions**	
Andhra Pradesh	Farmers	Permit required for direct sales outside state	
Tamil Nadu Tanjore district	Farmers Farmers	Permit required for direct sales outside state Control on movement of paddy out of district	
Maharashtra		Control on movement of cotton	

Source: Government of India (2001).

Production of rice and wheat in India is concentrated in some states. For wheat, UP, Punjab, Haryana, MP and Rajasthan contribute close to 90% of total production. For rice, the concentration is spread across WB, UP, AP, Punjab, Tamil Nadu and Bihar, contributing about 75%. Given this concentration and the large size of consuming areas outside of these states, there is a large mismatch between production and demand in both surplus and deficit states (Table 5.2). This disparity gives rise to a wide scope for private traders to move grains from surplus to deficit areas. However, many supporters of public intervention seem to ignore the very existence of private operators who can undertake spatial and temporal arbitrage transactions in storage and trade that are worthwhile and add to social welfare and improved economic efficiency, if not hindered by restrictions on storage, movement and access to trade and credit.

The Government of India (GOI) has recently taken steps towards deregulation of both domestic and international trade of agricultural commodities and removal of restrictions on interstate movement of commodities. The state governments are expected to introduce appropriate laws to remove restrictions to enable farmers and companies to jointly promote both domestic and foreign trade. Analyzing the implications of this initiative forms the core of this Chapter, which is based on the spatial equilibrium model built in Chapter 4. Apart from analyzing the policy implications of relaxing restrictions on interstate movement of food grains we also analyze implications of reduced transport costs to reflect better trading conditions. The specific features of the model include the use of demand and supply patterns of rice and wheat at a regionally disaggregated level. Traders' costs of transactions, transport and profit margins, price wedge between farm harvest, wholesale and retail prices, GOI's policies of PDS, procurement, stocks and external trade and its associated costs are all modeled so that welfare gains from reforms at various levels can be captured. The model is run for alternative scenarios. The focus of this Chapter is on calculating efficiency gains in terms of benefits to producers, consumers and traders and cost savings to government from deregulating domestic grain markets. In particular, it examines the effectiveness of this policy initiative in the presence of liberalized external trade.

Table 5.2—Surplus/ Deficit States in India

State	Wheat			Rice		
	Status	Per capita monthly surplus/deficit (Kg) 1996-97 to 1998-99	Total consumption (Kg per year)	Status	Per capita monthly surplus/deficit (Kg) 1996-97 to 1998-99	Total consumption (Kg per year)
Andhra Pradesh	Deficit	-0.21	0.22	Deficit	-0.88	10.84
Assam	Deficit	-0.32	0.62	Deficit	-3.17	11.92
Bihar	Deficit	-1.93	5.26	Deficit	-2.29	7.59
Gujarat	Deficit	-1.79	4.22	Deficit	-0.35	1.95
Jammu and Kashmir	Deficit	-3.95	7.06	Deficit	-0.41	4.69
Karnataka	Deficit	-0.48	0.74	Deficit	-0.63	5.55
Kerala	Deficit	-0.43	0.43	Deficit	-7.19	8.97
Maharashtra	Deficit	-2.00	2.83	Deficit	-0.82	2.91
Madhya Pradesh	Deficit	1.54	5.88	Deficit	-0.14	5.32
Orissa	Deficit	-0.45	0.46	Deficit	-2.91	14.14
Tamil Nadu	Deficit	-0.33	0.33	Deficit	-1.36	9.88
Goa	Deficit	-1.93	1.93	Surplus	2.00	6.64
West Bengal	Deficit	-0.74	1.49	Surplus	1.11	11.34
Himachal Pradesh	Surplus	1.55	5.96	Deficit	-2.16	3.64
Rajasthan	Surplus	0.35	9.19	Deficit	-0.03	0.3
Haryana	Surplus	20.22	9.76	Surplus	8.65	0.94
Punjab	Surplus	34.20	8.98	Surplus	24.37	0.79
Uttar Pradesh	Surplus	1.84	8.68	Surplus	1.86	3.63

Source: Chand (2002).
Note: Per capita monthly surplus is obtained as per capita production less per capita demand.

We describe various restrictive policies pertaining to domestic trade in grains in Section 5.2. In Section 5.3 we present a description of scenarios and simulations followed in Section 5.4 by the results on efficiency gains. Finally, we present a summary of findings in Section 5.5.

5.2 DOMESTIC TRADE AND MARKETING HURDLES

FCI undertakes the movement of food grains from surplus to deficit areas. It moves about 22 million tonnes of food grains over an average distance of 1500 kms. On a daily basis this amounts to an average of 4,00,000 bags of food grains transported by rail,

road and inland waterways (http://fciweb.nic.in/tran_ind.htm). The Department of Food and Public Distribution co-ordinates and monitors the movement taking note of availability, allocations, off-take and storage capacity. Movement Division in the Department of Public Distribution works in co-ordination with FCI and Railways to optimize movement and stocking of food grains. Table 5.3 presents amounts of food grains transported from major surplus states to deficit States and Table 5.4 the break-up between grains and sugar.

Table 5.3—Interstate movement by FCI – by Source (Million Tonnes)

Year	Ex-Punjab	Ex-Haryana	Total Ex-North	Ex-AP
2000-01	8.205	2.437	10.765	2.896
2001-02 (Upto July, 2001)	2.472	0.680	3.391	1.118

Source: http://fcamin.nic.in/civil_ind.htm

Table 5.4—Interstate movement by FCI – by Commodity (Million Tonnes)

Year	Food grains	Sugar	Total
1995-96	20.3	1.3	21.6
1996-97	23.6	1.2	24.8
1997-98	19.1	1.1	20.2
1998-99	19.1	1.1	20.2
1999-00	22.1	0.7	22.9
2000-01	16.2	0.3	16.5
2001-02(P) (as on Aug.2002)	20.5	0.3	20.8

Source: http://fcamin.nic.in/civil_ind.htm

Rice and wheat procured in the markets and purchase centers is first collected in the nearest depot and from there despatched to recipient States all over India from Imphal in Manipur to Kanyakumari in Tamnil Nadu and to the higher reaches of the Himalayas in the North. The stocks to Kashmir valley, Himachal Pradesh, North-East, Sikkim, Andaman & Nicobar Islands and Lakshadweep etc., which don't have rail link, are fed by road and other means.

In March 1993, the central government decided to treat the entire country as a single food zone for interstate and intra-state movement of food grains and advised the states/UTs to take action accordingly. However, currently while GOI treats the entire country as a single food zone for free movement of food grains, some states such as West Bengal and Jammu & Kashmir continue to restrict intra-state movement of paddy/rice in order to maximize procurement or to prevent smuggling across the international border areas (http://fcamin.nic.in/pol_ind.htm). Besides the statutory restrictions, some states impose informal restrictions on movement of food grains outside the state during particular periods of the year. There are also stock limits on rice in Andhra Pradesh, Tamil Nadu and Jammu and Kashmir in line with local requirements. But there is no such limit on wheat and its products in most of the states although they are directed by GOI to impose stock-limits on these items if the situation so warrants. Some of the restrictions imposed by states are written instructions while others are oral orders or word of mouth instructions whose documentation is difficult to obtain and traders associations or *Vyapar Mandals*, the sufferers of such restrictive and often illegal practices could be the only source for this kind of information. According to GOI (2001), "… the restrictions have continued even without adequate justifications because it hits the interests of certain class of renters who have had a parasitic existence on the restrictions imposed decades earlier".

GOI (2001) argued for strengthening the role of private trade in storage and distribution of food grains by removing the restrictions so as to give it an incentive to make significant investment in grain handling operations. Towards this end, it also recommended tax concessions to the private sector. In line with such recommendations, a recent directive by GOI aims to do away with such restrictions. The Department of Consumer Affairs has issued a Central Order titled 'Removal of (Licensing Requirements, Stock Limits and Movement Restrictions) on Specified Foodstuffs Order', 2002, under Section 3 of the Essential Commodities Act, vide GSR 104 (E), dated 15.2.2002. It is meant to facilitate free trade and movement of food grains, and to enable farmers to get best prices for their produce, achieve price stability and ensure availability of food grains in deficit areas. Under this order any dealer can freely buy, stock, sell, transport, distribute, dispose, acquire, use or consume any quantity of wheat, paddy/rice,

coarse grains, sugar, edible oilseeds and edible oils without any license or permit. This order overrides any order from state governments. Issue of any control order by the States under the delegated powers for regulating by licenses, permits or otherwise, the storage, transport, distribution, etc. of the specified commodities would now require the prior concurrence of the Central Government.

Apart from restrictions on trading across states, private trade has also been suffering from problems in marketing. For example, under ECA, they are required to obtain a large number of permits and licenses from the authorities, submit returns periodically and carry out inspections, all of which add to transaction costs. Moreover, there are poor facilities in terms of market infrastructure, cold storage facilities, mandi facilities and roads for which the private sector could make productive investment. The controls and restrictions, which include the persistent threat of arrest, act as disincentives to production and distribution of essential commodities by organized companies that can exploit economies of scale and modernize the food sector. See Box 5.1 for different types of barriers that exist in interstate trade. Das-Gupta (2003) analyses various fiscal barriers to trade and finds that while road check posts are necessary on revenue grounds in the short run, but costs of check posts can be reduced by suitable reform in the long run. The costs they impose include an administration cost burden on the exchequer, a fixed cost on traders irrespective of the size of transactions and risk costs on importers. Furthermore, check posts and mobile squads cannot ensure foolproof enforcement and revenue leakage occurs despite their existence. A useful alternative to generate revenue from cross-border trade is to develop better information technology and interstate information exchange system. For example, integrated, (multi-department) electronically equipped check-posts are planned in Karnataka and exist in AP and Gujarat. Das-Gupta (2003) also suggests "automatic green channel treatment" for selected large firms, which are known to maintain good records and accounts.

Box 5.1—Barriers to Interstate Trade and Commerce

Road infrastructure: National Highway networks are designed for long distance traffic shifting local traffic to side-roads. Carrying twice the permissible load in commercial vehicles in connivance with road transport authorities leads to annual corruption worth Rs.200 billion and reduces life of pavements by 30-60% in turn reducing average speeds by 20-30 km per hour amounting to a loss of Rs.200-300 billion per year.

Constitutional provision: Article 301 allows State legislature "throughout the territory of India" to "impose such reasonable restrictions on the freedom of trade, commerce or intercourse with or within the State as may be required in the public interest". Article 304 provides for a state to impose, by law, any tax on goods imported from other states that is also imposed on goods produced in the state concerned.

Detention of vehicles: This causes loss of time, high fuel consumption and idling of vehicles resulting in underutilization of capacity and lower operational viability. But the practice continues at *RTO (Regional Transport Offices) and Police Check-Posts* (for checking documents, driving and traffic safety etc.); *Good-Related Check-Posts* (for taxes – octroi, sales tax, entry permit, tolls etc.); and Others (checking by Flying Squads, Movement of Essential Commodities, and other checks by local authorities). Existence of check-posts does not contribute significantly to checking tax evasion. On the contrary, the more the number of check-posts, the higher is the wastage resulting from stoppage of traffic. For example, paper clearance/ check-posts etc. account for 12% of total trip time between Delhi and Mumbai.

Interstate and National Permits: For vehicles operating within a state: permit by paying the motor vehicle tax of the State. Two categories for operating in more than one state: (i) counter-signature permits and permits under reciprocal agreements – operator pays tax of both the home state and of the other state, and (ii) national permits introduced by GOI in 1975 for movement between the home State and three or more other States – operator pays tax for home State and a composite tax for each of the other States.

Other Barriers in Trucking Operation: Complex paperwork – 58 forms in Central Motor Vehicles Rules, 1989; Complex Practices – goods entering a state require Entry Permit – Form 32 to be filled in by the buyer with information on the consignment, e.g., nature of the commodity, name and address of the seller, total amount of goods in terms of quantity and value, name of the transporter, registration number of the truck, date of dispatch, etc. As these details are filled in at different stages of the transport chain from the seller – transporter – driver – booking agent – buyer, the Form is likely to remain incomplete leading to recourse of 'dispute resolution' at the buying state's border.

Source: Debroy and Kaushik (2002).

The government is adopting measures to improve agricultural marketing by establishing regulated markets, constructing warehouses, grading and standardizing produce, weights and measures, and providing information on agricultural prices. It also advised the state governments to enact marketing legislation to provide competitive and transparent transactional methods to protect interests of the farmers. Consequently, as on

31 March 2000, out of 7262 wholesale markets, 7169 have been covered under regulation.

Similarly, 15% of nearly 28000 rural periodical markets function under regulation. This has to some extent helped producers/sellers at the wholesale assembling level. However, despite these reforms, there is no scope under the existing law for direct marketing by farmers for procurement. Functionaries such as commission agents, traders, processors, weigh man, surveyors, brokers all have to obtain license to function in the market area. The lengthy procedures and documentation for licensing under the rules and byelaws add further to the marketing and trading costs.

5.3 SCENARIOS AND SIMULATIONS

It is normally observed that the public sector agencies visualize private trade as a competitor to FCI. Based on this, they assume that private traders will mimic the behavior of FCI (e.g., in transporting grains for PDS from Punjab to Kerala). Since the FCI serves several objectives simultaneously the optimization problem underlying its decisions regarding shipping of grain to different regions is unknown to us. The information requirements for a centralized decision making exercise may not be easily available. However, with competitive markets and free domestic trade, markets would reveal all the information needed by private profit maximizers who choose the least cost options of trade. Surplus states would then sell their excess produce either to deficit states or to foreign countries.[17] For instance, one can imagine that private trade will always occur between neighboring states and not directly from Punjab to Kerala as assumed by public agencies. As a number of states are located between a surplus and a deficit state, it is expected that they will buy from the former and sell to the latter to take advantage of

[17] In a simple prototype CGE model with two urban and two rural regions, where urban regions alone trade with the rest of the world or the border region, which is assumed adjacent to the urban regions, Löfgren and Robinson (1999) show from simulation results that gains can accrue from reduction in transport costs, investment in roads and infrastructure, trade liberalization and a larger role for foreign trade.

the arbitrage opportunities. This is what is likely to happen when markets are free from movement restrictions.

The ideal comparison of a reform scenario of reducing domestic trade restrictions with the reference scenario is one where the former is with and the latter without interstate trade possibilities. However, it is not realistic to assume a scenario of zero interstate trade, as there are non-producing states whose consumption would be zero in the absence of trade (PDS quantity alone may not be enough). We also don't have observations on the actual levels of state-wise inter-regional trade in the base year though we do have data on aggregate trade in the base period. We therefore model the scenario with movement restrictions as one in which an implicit tariff applies on interstate trade. Movement restrictions are induced due to policy restrictions such as physical controls on movement, octroi, *mandi* charges, etc. They could also be induced by infrastructural and institutional bottlenecks. Efficiency gains can therefore be obtained either through policy reform or through infrastructure and institutional investments. The policy hurdles act like implicit tariff on interstate trade raising the cost of transactions. One could imagine that it should be possible to reduce this cost in a short duration. Policy induced efficiency gains may work quickly in the short to medium run and have a large effect but may still be limited to a certain level. Higher levels of reduction may then be possible only through investments that help to cut down transport costs due to factors such as reduction in fuel costs and completion of road projects. Better roads would provide a much smoother ride to trucks reducing time taken, fuel consumed and hence costs. Fuel costs could also be reduced through technological innovations (e.g. more fuel-efficient trucks) or through reduction in fuel prices (say due to discovery of new oil wells). This changes can however be expected only in the medium to long run. The policy induced effects are modeled in terms of a reduction in implicit tariff, whereas infrastructural improvements are modeled in terms of reduction in transport costs.

5.3.1 Reference Scenario

We define the base scenario as one, where movement restrictions exist and hence total interstate trade cannot exceed a certain level (which in the model is taken to be the equilibrium level observed in the base period). Trade and transport costs for interstate trade are set at actual levels in the base period. We take the base year as 2000-01 and 18 states that account for 99% of the country's grain production. The model equilibrium results give the implicit tariff in the base case as 8.4% for rice and 4.9% for wheat as mark-ups on cost of purchase plus transport cost from one state to another.

5.3.2 Changed Scenarios

We model relaxation of interstate trade restrictions by simulating different degrees of movement restrictions. This is implemented by reducing the implicit tariff on interstate trade by varying magnitudes. As mentioned above the implicit tariff reflects traders' costs arising due to policy related variables such as controls, licenses and permits etc. This tariff adds to the final price paid by consumers and creates a deadweight loss in the economy, as it does not accrue to any economic agent. In addition to this, we also consider reduction in transport costs for improving inter-regional trade. We consider four alternative scenarios as given in Table 5.5. First, in Scenarios 1 and 2, we consider two levels of reduction in implicit tariff: 50% and 100%. The latter case (Scenario 2) refers to complete elimination of movement restrictions in trading across states. In Scenarios 3 and 4, we consider the cases where in addition to the complete removal of interstate restrictions, transport costs are reduced by 25% and 50% respectively. Since implicit tariff can be reduced in the short run, it should be possible to implement Scenario 1 in the immediate future. Complete elimination of policy hurdles may need a little more time and could be implemented in the medium term (Scenario 2). Reduction in transport cost, requiring possible investments in roads and infrastructure, could be achieved in the medium to long term (Scenarios 3 and 4). With our simulations we obtain potential gains in terms of benefits to producers, consumers, traders, cost savings to the government and regional price stability.

The reduction in implicit tariff considered in our scenarios could be due to reduction or elimination in any of the taxes, *mandi* charges or other statutory charges levied by the government. If we would like to obtain efficiency gains from reforming any of these individual taxes/charges, then we need to explicitly introduce these variables in the model. This exercise, however, is beyond the scope of this paper.

Table 5.5—Scenarios for Simulation

Scenario	Reduction in Implicit Tariff on Regional Trade	Reduction in Transport Cost	Likely Time Required for Change/ Reform
Scenario 0 Base Case	---	---	---
Scenario 1	50%	---	Short Run
Scenario 2	100%	---	Medium Run
Scenario 3	100%	25%	Medium Run
Scenario 4	100%	50%	Medium-Long Run

5.4 REGIONAL REDISTRIBUTION AND EFFICIENCY GAINS

5.4.1 Production and Consumption

Let us first take the case of rice. In the aggregate, total production and market demand for rice do not change much as movement restrictions are relaxed (Table 5.6). Since PDS quantities are assumed fixed, this means that total consumption does not change either. But there is a distinct change in the spatial pattern of consumption and production as between surplus and deficit states, creating a 'ripple effect' through the country (Figure 5.1). In the major producing/ surplus states, namely AP, Haryana, Punjab and UP, domestic consumption falls and production rises (Tables 5.7 to 5.11).

In the case of wheat, production in surplus states does not change as market equilibrium price is equal to MSP, which is unchanged (Figure 5.2). But compared to the base case, aggregate national consumption rises by more than 2 million tonnes.

Consumption picks up in particular in major consuming states including Bihar, Gujarat and MP.

5.4.2 Procurement and Public Stocks

We assume, as is the current practice that there is levy procurement for rice and procurement at Minimum Support Price (MSP) for wheat. Our results reveal that with fixed levy percentages for rice procurement, the absolute level of its procurement rises due to higher production, though marginally by 0.07 million tonnes (Table 5.6). Since no such levy is imposed on wheat, there is a reduction in government wheat procurement by 2.5 million tonnes, which as we shall see, is on account of better price offers from domestic trade with other states (Figure 5.2). While Punjab and UP cut down sale to FCI at MSP by as much as 0.86 and 1.1 million tonnes, Haryana gives away almost 0.2 million tonnes more in procurement. Since there is not much change in production and consumption in this state, it achieves higher procurement by lowering its trade with Gujarat and HP where prices fall due to interstate trade liberalization (Figure 5.4 and Table 5.13). It is easy to see that as a major part of rice output is under levy, most of the changes occur through wheat. For example, wheat's domestic consumption (including any private storage) rises by more than 2 million tonnes. This is mainly on account of lower stockholding by the FCI.

The net effect of a far lower procurement for wheat than the increase in rice procurement results in a net reduction in total procurement which in turn reduces buffer stock holding of FCI (Table 5.6) When interstate transaction cost is reduced, surplus states increase their trade with other states and depend lesser on government price support. Total government stocks go down by 2.45 million tonnes from the base level of 44 million tonnes with complete elimination of movement restrictions and reduction of transport costs by half. This is driven largely by lower procurement of wheat as PDS demand is assumed fixed at the base level.

5.4.3 Domestic Trade

The directions of trade change in line with arbitrage opportunities from varying regional prices as seen from Table 5.13 and Figures 5.3 and 5.4. For example Gujarat, HP and Rajasthan find it relatively cheaper to import wheat from Punjab than from Haryana due to removal of trade restrictions. The combination of lower consumption and higher production for rice ends up in higher net exports by surplus states to other states as can be expected from freer domestic trade. Between Scenario 0 (base case) and Scenario 4, regional rice trade rises by 1.5 million tonnes (Table 5.12). AP, UP and WB export more rice to other states (Figure 5.5). Assam, Bihar and TN import more. As in the case of rice, there is an increase in domestic quantity traded for wheat though it is much higher at 2.25 million tonnes. Domestic regional exports of wheat grow substantially from Punjab (more than 1 million tonnes between Scenarios 0 and 4) and UP (1.5 million tonnes) as a result of fewer restrictions on trade. At the same time, major importing states – Bihar, Gujarat and Maharashtra – buy more wheat from other states (Figure 5.6).

5.4.4 Foreign Trade

When tariff is reduced, quantity traded domestically increases for both commodities while there is a reduction for both in external trade (Table 5.6). Given that world prices are lower than domestic prices, our simulations show no exports of either rice or wheat (Table 5.6). However, individual states find it cheaper to import from abroad than from neighbouring states. For example, TN imports both rice and wheat whereas Kerala goes in for wheat import from abroad and from Karnataka and MP instead of its base period imports mainly from UP. Total imports fall for both leading to a fall in import price paid (Figure 5.7).

5.4.5 Price Stability

In the deficit states, because of increased supply due to interstate trade, wholesale and weighted average prices fall and so does production (Tables 5.7 to 5.11). The

opposite holds true in surplus states except for wheat growing regions where the equilibrium price continues to be the MSP. The net effect is that as trading costs are lowered due to reduction of restrictions on intra-country movement of grains, prices stabilize across states in the country even though average national price for rice rises and that for wheat falls (Figures 5.3 and 5.4). Another finding from this study is that a reduction in transport cost in addition to lowering implicit tariff has a much larger impact in terms of price regional stability. This perhaps implies that infrastructure investments do hold a better key to improved domestic trade than mere policy reforms.

5.4.6 Surplus to Economic Agents

To make comparisons tractable, we compare Scenario 3 with the Base Scenario 0, i.e., the changes arising from complete elimination of movement restrictions (100% implicit tariff reduction) and 25% reduction in transport cost. The reforms envisaged in this study show a rise in consumer surplus from both rice and wheat though some states gain and the others lose (Table 5.15). But producer surplus rises only for rice and it falls in the case of wheat. Interestingly, there is a fall in producer surplus and rise in consumer surplus in the case of wheat in almost all the states. There is no change in producer surplus in states that are surplus in wheat (Haryana, Punjab and UP) since their local market prices do not change, remaining at the level of MSP. Consumer surplus is positive in all states being the largest in deficit states (e.g., Bihar, Kerala and Rajasthan). It is nil in the surplus states of Haryana, Punjab and UP as prices do not change in these states.

The model structure used here enables us to calculate welfare gains accruing to wholesale and retail traders. It is quite interesting to note that while the traders incur a net welfare loss in the case of rice they gain in the case of wheat trade in all states. This perhaps has to do with MSP-based free procurement for wheat but a levy for rice, which allows farmers and traders to freely trade the grains without being tied to FCI for part sales of marketable surplus. The magnitude of traders' surplus is much smaller than that for consumers and producers. In the aggregate at the national level, total producer surplus and consumer surplus are both positive. So is the surplus of wholesale traders. They gain

through higher stability of interstate prices that allows them to trade more profitably. There is a very small loss in retail traders' surplus, which when added to the rest, still yields a net positive gain in welfare in the economy.

5.4.7 Government Costs

Table 5.12 presents reduction in government cost that occurs from deregulating domestic trade. Since PDS quantities and prices are kept unchanged in the model, the costs of PDS and its sales realization remain unchanged due to reforms. However, interestingly and expectedly the costs of procurement and storage both fall. The cost savings rise as more restrictions are removed, moving through Scenarios 1 to 4. These savings could be as high as Rs.1200 crores with simple policy reform (Scenario 2) to Rs.3000 crores with both short and long-term policy changes (Scenario 4). This is in addition to the potential gain in terms of consumer plus producer surplus of more than Rs. 3800 crores in Scenario 4.

5.5 SUMMARY OF FINDINGS

Public policy towards food grain markets has tended to be highly interventionist with the central and state governments actively involved in grain storage and restrictions on the movement of food grains across states. These restrictions are often based on the assumption that markets cannot be expected to perform well in alleviating local scarcities. The continuation of such policies is based on the belief that such grain is bound for speculative stocks of traders in the deficit areas rather than for current sale. But since the constraints imposed on private trade through such restrictions are binding, as seems to be the case, then this implies that the markets will transfer grain in the right direction – from surplus to deficit areas – and in larger quantities than the FCI. In fact, zoning policies considerably and systematically increased (rather than reduce) interstate food price dispersion thereby worsening the situation of hardship for deficit households in deficit states.

Our simulation results show that private trade always takes place between neighboring states and not directly from Punjab in the north to Kerala in the south as is normally visualized by the government/ or its agencies who assume that private traders will directly compete with FCI in, e.g., transporting from Punjab to Kerala for PDS. The kind of optimization problem that FCI solves in shipping grain to different regions is not known to us due to lack of information requirements for this exercise. However, with competitive markets and free domestic trade, markets reveal all information needed to private profit maximizers who will obviously choose least cost options of trade. It is interesting to note that the direction of trade between any two states is determined more by the arbitrage possibilities rather than their deficit/ surplus status. External exports do not take place for either rice or wheat due to unattractive international prices and absence of export subsidies in the model. However, we observe that individual states find it attractive to import from abroad than buying locally from other states.

Aggregate procurement of rice and wheat falls, as traders prefer to trade with other states than sell to FCI at MSP, but the composition of stocks in terms of rice and wheat changes. This holds especially for wheat, which has no levy. But for rice, levy procurement curtails the possibility of trade with other regions particularly since the levy percentage is as high as 50% to 75% in some states. The immediate effect of lower total procurement is that FCI's buffer stocks fall leading to a savings in cost of both procurement and storage.

We note that with reduction of interstate trade barriers, traders lose in rice trade but gain in wheat trade in all states. This perhaps has to do with MSP-based free procurement for wheat but a levy for rice, which allows farmers and traders to freely trade the grains without being tied to FCI for part sales of marketable surplus. In the aggregate at the national level, total surplus of wholesale traders is positive who gain through higher stability of interstate prices that allows them to trade more profitably. Although there is a very small loss in retail traders' surplus, it still yields a net positive total gain in welfare in the economy.

Results from our simulations show that if external trade is liberalized the consumers in deficit states with ports may benefit compared to those in the interior surplus states. In particular, we note that two states namely Kerala would find it worthwhile importing wheat and Tamil Nadu both rice and wheat from abroad than from neighbouring domestic markets. However, as domestic infrastructure is developed and transport costs reduce, their dependence on foreign trade would go down. On the other hand, because of poor road and marketing infrastructure the interior states may not be able to compete with exporting foreign countries.

There is a steep reduction in government cost from deregulating domestic trade as costs of procurement and storage both fall. The cost savings rise as more restrictions are removed. These savings could be as high as Rs.1200 crores with simple policy reform and rise to Rs.3000 crores with both short and long-term policy changes. This is in addition to the notional potential gain in terms of consumer plus producer surplus of more than Rs. 3800 crores.

We thus find it socially efficient to open up domestic markets for trade in grains by encouraging private agents to participate in marketing and investment. This can be facilitated by a number of long-term policy changes to reduce transaction costs of private traders. These include encouraging investment and modernization through improved infrastructure (e.g., roads/ ports/ storage), larger scale of operation (e.g., bulk handling/ transport) and innovations (e.g., fuel-efficient trucks). But more importantly, the government needs to develop better institutions for improving market information, grading/labeling facilities etc.

Even though the gains illustrated to accrue from the above changes seem to be small, note that they are derived from small changes in policy and reduced transportation cost. We also note that freeing of domestic trade as such would not solve the problem excessive food grain stocks with the government. So long as high MSP for wheat and levy procurement of rice remain intact, they would keep adding continually to large grain stocks with FCI through rising procurement. Much higher gains in efficiency and

economic welfare are possible through lower MSP for wheat sufficient to provide insurance in low price years, abolition of rice levy, decentralization of FCI's operations, in addition to opening up the markets for both domestic and external trade and encouraging investment in infrastructure.

Table 5.6—Aggregate Effects on Quantities and Prices

Scenario	Open market demand	Net production	Wholesale price	Procurement	PDS	Total Regional Trade	External Imports	External Exports	Closing FCI Stocks
RICE									
Scenario 0	48.175	79.454	1312	31.56	7.29	7.71	0.281	0	24.27
Scenario 1	48.177	79.490	1321	31.58	7.29	8.23	0.269	0	24.29
Scenario 2	48.176	79.532	1333	31.61	7.29	8.75	0.251	0	24.32
Scenario 3	48.181	79.552	1337	31.62	7.29	8.98	0.247	0	24.33
Scenario 4	48.186	79.572	1341	31.63	7.29	9.21	0.242	0	24.34
WHEAT									
Scenario 0	43.490	67.205	775	23.82	3.87	5.33	0.102	0	19.95
Scenario 1	43.962	67.175	771	23.30	3.87	5.80	0.092	0	19.44
Scenario 2	44.481	67.142	766	22.75	3.87	6.27	0.089	0	18.89
Scenario 3	45.150	67.100	759	22.02	3.87	6.93	0.075	0	18.16
Scenario 4	45.820	67.058	753	21.30	3.87	7.58	0.059	0	17.43
TOTAL									
Scenario 0	91.67	146.66	2087	55.38	11	13.04	0.383	0	44.22
Scenario 1	92.14	146.67	2092	54.89	11	14.03	0.361	0	43.73
Scenario 2	92.66	146.67	2098	54.36	11	15.02	0.340	0	43.20
Scenario 3	93.33	146.65	2096	53.64	11	15.90	0.322	0	42.49
Scenario 4	94.01	146.63	2094	52.92	11	16.79	0.301	0	41.77

Notes: 1 crore = 10 million. Prices are measured in Rs./ quintal and quantities in million metric tonnes.

The Scenarios are defined as follows:
Scenario 0: Base Case
Scenario 1: 50% Implicit Tariff Reduction
Scenario 2: 100% Implicit Tariff Reduction
Scenario 3: 100% Implicit Tariff Reduction + 25% Transport Cost Reduction
Scenario 4: 100% Implicit Tariff Reduction + 50% Transport Cost Reduction

Table 5.7—Scenario 0: Base Case, where movement restrictions exist

Results for Rice

State	Open market demand (million tonnes)	Net production (million tonnes)	Wholesale price (Rs./ quintal)	Weighted Average Price (Rs./ quintal)	Procurement (million tonnes)	PDS (million tonnes)	Net regional imports (million tonnes)	% change in price	Change in consumer surplus (Rs. Crores)	Change in producer surplus (Rs. Crores)	Change in total surplus (Rs. Crores)
AP	5.94	11.49	1365	999	5.31	1.93	-0.24	0	0	0	0
Assam	2.37	3.93	1582	1060	1.82	0.38	0.25	0	0	0	0
Bihar	7.23	5.51	1425	1147	0.00	0.13	1.73	0	0	0	0
Goa	0.08	0.15	1312	1056	0.00	0.01	-0.07	0	0	0	0
Gujarat	0.81	1.02	1223	973	0.07	0.12	-0.14	0	0	0	0
Haryana	0.17	2.70	1153	910	1.87	0.00	-0.66	0	0	0	0
HP	0.23	1.11	913	735	0.00	0.03	-0.88	0	0	0	0
J&K	0.45	0.41	1081	870	0.00	0.07	0.04	0	0	0	0
Karnataka	1.86	3.75	1329	990	1.14	0.95	-0.74	0	0	0	0
Kerala	2.04	0.77	1561	1256	0.00	0.49	1.27	0	0	0	0
MP	3.59	0.98	1388	979	0.45	0.28	3.07	0	0	0	0
Maharashtra	2.00	1.99	1444	1162	0.00	0.37	0.02	0	0	0	0
Orissa	3.74	4.72	1425	1008	2.18	0.66	1.20	0	0	0	0
Punjab	0.17	9.22	1153	910	6.39	0.00	-2.66	0	0	0	0
Rajasthan	0.13	0.16	1231	936	0.07	0.00	0.05	0	0	0	0
TN	4.32	7.34	1548	1038	3.39	1.21	0.09	0	0	0	0
UP	5.12	11.66	1204	919	5.39	0.32	-1.15	0	0	0	0
WB	7.91	12.56	1204	926	3.48	0.34	-1.17	0	0	0	0
All-India	48.18	79.45	1312		31.56	7.29	0.00	0	0	0	0

Results for Wheat

State	Open market demand (million tonnes)	Net production (million tonnes)	Wholesale price (Rs./ quintal)	Weighted Average Price (Rs./ quintal)	Procurement (million tonnes)	PDS (million tonnes)	Net regional imports (million tonnes)	% change in price	Change in consumer surplus (Rs. Crores)	Change in producer surplus (Rs. Crores)	Change in total surplus (Rs. Crores)
AP	0.19	0.01	928	768	0.00	0.00	0.19	0.00	0.00	0.00	0
Assam	0.17	0.09	1062	879	0.00	0.00	0.08	0.00	0.00	0.00	0
Bihar	5.66	4.47	892	738	0.00	0.55	1.19	0.00	0.00	0.00	0
Goa	0.03	0.00	977	0	0.00	0.00	0.03	0.00	0.00	0.00	0
Gujarat	1.75	0.65	904	748	0.00	0.29	1.10	0.00	0.00	0.00	0
Haryana	2.03	9.65	740	710	7.40	0.05	-0.22	0.00	0.00	0.00	0
HP	0.29	0.60	933	772	0.00	0.03	-0.31	0.00	0.00	0.00	0
J&K	0.63	0.15	1067	882	0.00	0.03	0.48	0.00	0.00	0.00	0
Karnataka	0.22	0.24	890	736	0.00	0.20	-0.03	0.00	0.00	0.00	0
Kerala	0.11	0.00	1050	0	0.00	0.03	0.08	0.00	0.00	0.00	0
MP	4.43	3.90	892	738	0.00	0.29	0.53	0.00	0.00	0.00	0
Maharashtra	2.19	0.98	910	753	0.00	0.63	1.21	0.00	0.00	0.00	0
Orissa	0.17	0.01	910	753	0.00	0.00	0.16	0.00	0.00	0.00	0
Punjab	2.19	15.55	740	711	12.01	0.01	-1.35	0.00	0.00	0.00	0
Rajasthan	5.77	5.47	846	700	0.00	0.33	0.30	0.00	0.00	0.00	0
TN	0.07	0.00	1008	0	0.00	0.00	0.00	0.00	0.00	0.00	0
UP	16.90	24.38	740	635	4.40	0.89	-3.08	0.00	0.00	0.00	0
WB	0.71	1.06	757	626	0.00	0.53	-0.35	0.00	0.00	0.00	0
All-India	43.49	67.21	775		23.82	3.87	0.00	0.00	0.00	0.00	0

Table 5.8—Scenario 1: Movement Restrictions are reduced by 50%

Results for Rice

State	Open market demand (million tonnes)	Net production (million tonnes)	Wholesale price (Rs./ quintal)	Weighted Average Price (Rs./ quintal)	Procurement (million tonnes)	PDS (million tonnes)	Net regional imports (million tonnes)	% change in price	Change in consumer surplus (Rs. Crores)	Change in producer surplus (Rs. Crores)	Change in total surplus (Rs. Crores)
AP	5.84	11.50	1390	1009	5.31	1.93	-0.35	1.83	-168	231	63
Assam	2.42	3.93	1550	1047	1.82	0.38	0.31	-2.03	90	-102	-12
Bihar	7.36	5.49	1399	1126	0.00	0.13	1.87	-1.83	210	-115	94
Goa	0.08	0.15	1337	1076	0.00	0.01	-0.07	1.91	-2	3	1
Gujarat	0.79	1.02	1248	992	0.07	0.12	-0.17	2.04	-25	21	-4
Haryana	0.17	2.71	1181	916	1.88	0.00	-0.67	2.43	-6	61	55
HP	0.22	1.11	983	791	0.00	0.03	-0.90	7.65	-18	62	44
J&K	0.44	0.41	1112	895	0.00	0.07	0.03	2.85	-25	10	-15
Karnataka	1.81	3.76	1354	1004	1.15	0.95	-0.80	1.88	-49	75	26
Kerala	2.09	0.77	1526	1229	0.00	0.49	1.32	-2.21	79	-21	57
MP	3.64	0.98	1364	969	0.45	0.28	3.11	-1.77	97	-19	77
Maharashtra	2.06	1.98	1416	1140	0.00	0.37	0.07	-1.93	63	-44	19
Orissa	3.83	4.71	1399	998	2.17	0.66	1.29	-1.83	106	-99	8
Punjab	0.16	9.24	1181	916	6.40	0.00	-2.67	2.43	-6	208	203
Rajasthan	0.12	0.16	1256	946	0.07	0.00	0.04	2.03	-4	3	0
TN	4.40	7.32	1517	1026	3.38	1.21	0.19	-1.99	155	-182	-26
UP	4.99	11.68	1232	930	5.40	0.32	-1.29	2.33	-163	263	101
WB	7.78	12.58	1232	942	3.49	0.34	-1.31	2.33	-236	284	48
All-India	48.18	79.49	1321		31.58	7.29	0.00	0.01	98	640	738

Results for Wheat

State	Open market demand (million tonnes)	Net production (million tonnes)	Wholesale price (Rs./ quintal)	Weighted Average Price (Rs./ quintal)	Procurement (million tonnes)	PDS (million tonnes)	Net regional imports (million tonnes)	% change in price	Change in consumer surplus (Rs. Crores)	Change in producer surplus (Rs. Crores)	Change in total surplus (Rs. Crores)
AP	0.19	0.01	925	765	0.00	0.00	0.19	-0.37	0.75	-0.02	1
Assam	0.17	0.09	1056	873	0.00	0.00	0.08	-0.61	1.27	-0.46	1
Bihar	5.73	4.46	872	721	0.00	0.55	1.27	-2.32	137.00	-76.56	60
Goa	0.03	0.00	954	0	0.00	0.00	0.03	-2.41	0.75	0.00	1
Gujarat	1.81	0.65	883	730	0.00	0.29	1.16	-2.32	45.88	-11.31	35
Haryana	2.04	9.65	740	711	7.48	0.05	-0.14	0.00	0.00	0.00	0
HP	0.30	0.60	912	754	0.00	0.03	-0.30	-2.32	7.51	-10.78	-3
J&K	0.65	0.15	1020	843	0.00	0.03	0.50	-4.41	35.34	-5.70	30
Karnataka	0.22	0.24	889	735	0.00	0.20	-0.03	-0.10	0.20	-0.17	0
Kerala	0.11	0.00	1024	0	0.00	0.03	0.11	-2.45	3.04	0.00	3
MP	4.54	3.89	872	721	0.00	0.29	0.66	-2.32	102.82	-66.75	36
Maharashtra	2.22	0.98	889	735	0.00	0.63	1.24	-2.32	57.94	-17.16	41
Orissa	0.18	0.01	889	735	0.00	0.00	0.17	-2.32	3.98	-0.23	4
Punjab	2.20	15.55	740	708	11.72	0.01	-1.64	0.00	0.00	0.00	0
Rajasthan	5.88	5.46	827	684	0.00	0.33	0.42	-2.32	130.51	-88.86	42
TN	0.09	0.00	982	0	0.00	0.00	0.00	-2.55	2.13	0.00	2
UP	16.93	24.38	740	634	4.11	0.89	-3.34	0.00	0.00	0.00	0
WB	0.69	1.06	775	641	0.00	0.53	-0.37	2.34	-13.02	15.49	2
All-India	43.96	67.18	771		23.30	3.87	0.00	-0.01	516.09	-262.51	254

Table 5.9—Scenario 2: Movement Restrictions are completely eliminated (reduced 100%)

Results for Rice

State	Open market demand (million tonnes)	Net production (million tonnes)	Wholesale price (Rs./ quintal)	Weighted Average Price (Rs./ quintal)	Procurement (million tonnes)	PDS (million tonnes)	Net regional imports (million tonnes)	% change in price	Change in consumer surplus (Rs. Crores)	Change in producer surplus (Rs. Crores)	Change in total surplus (Rs. Crores)
AP	5.79	11.51	1398	1013	5.32	1.93	-0.40	2.46	-226	311	85
Assam	2.46	3.92	1526	1037	1.81	0.38	0.35	-3.55	158	-178	-20
Bihar	7.45	5.48	1381	1112	0.00	0.13	1.96	-3.08	355	-194	161
Goa	0.08	0.15	1345	1083	0.00	0.01	-0.07	2.56	-3	4	1
Gujarat	0.78	1.03	1256	998	0.07	0.12	-0.18	2.75	-33	28	-5
Haryana	0.16	2.71	1219	923	1.88	0.00	-0.67	5.78	-13	145	132
HP	0.20	1.12	1069	861	0.00	0.03	-0.92	17.08	-39	140	101
J&K	0.43	0.41	1153	928	0.00	0.07	0.01	6.68	-58	24	-34
Karnataka	1.79	3.76	1362	1009	1.15	0.95	-0.82	2.53	-66	102	36
Kerala	2.15	0.76	1473	1186	0.00	0.49	1.39	-5.60	202	-54	148
MP	3.66	0.98	1347	962	0.45	0.28	3.14	-2.96	162	-32	130
Maharashtra	2.15	1.97	1367	1101	0.00	0.37	0.18	-5.29	176	-122	54
Orissa	3.88	4.70	1381	990	2.17	0.66	1.35	-3.08	181	-167	14
Punjab	0.16	9.26	1219	923	6.41	0.00	-2.69	5.78	-13	495	482
Rajasthan	0.11	0.16	1286	958	0.07	0.00	0.03	4.52	-8	7	-1
TN	4.52	7.30	1473	1008	3.37	1.21	0.34	-4.81	380	-439	-59
UP	4.81	11.70	1270	946	5.41	0.32	-1.49	5.54	-381	626	244
WB	7.60	12.60	1270	964	3.49	0.34	-1.51	5.54	-555	674	119
All-India	48.18	79.53	1333		31.61	7.29	0.00	0.02	217	1369	1587

Results for Wheat

State	Open market demand (million tonnes)	Net production (million tonnes)	Wholesale price (Rs./ quintal)	Weighted Average Price (Rs./ quintal)	Procurement (million tonnes)	PDS (million tonnes)	Net regional imports (million tonnes)	% change in price	Change in consumer surplus (Rs. Crores)	Change in producer surplus (Rs. Crores)	Change in total surplus (Rs. Crores)
AP	0.20	0.01	904	853	0.00	0.00	0.20	-2.60	5.49	-0.12	5
Assam	0.17	0.09	1032	704	0.00	0.00	0.08	-2.86	5.94	-2.16	4
Bihar	5.80	4.45	851	753	0.00	0.55	1.35	-4.65	276.12	-152.96	123
Goa	0.03	0.00	910	0	0.00	0.00	0.03	-6.90	2.19	0.00	2
Gujarat	1.87	0.65	862	612	0.00	0.29	1.22	-4.65	93.07	-22.59	70
Haryana	2.05	9.65	740	739	7.47	0.05	-0.13	0.00	0.00	0.00	0
HP	0.30	0.60	890	805	0.00	0.03	-0.30	-4.65	15.08	-21.54	-6
J&K	0.66	0.15	974	718	0.00	0.03	0.52	-8.71	70.52	-11.25	59
Karnataka	0.22	0.24	868	810	0.00	0.20	-0.02	-2.47	5.16	-4.40	1
Kerala	0.12	0.00	979	0	0.00	0.03	0.12	-6.74	8.73	0.00	9
MP	4.66	3.88	851	718	0.00	0.29	0.78	-4.65	208.44	-133.36	75
Maharashtra	2.25	0.98	868	718	0.00	0.63	1.27	-4.65	116.91	-34.28	83
Orissa	0.19	0.01	868	612	0.00	0.00	0.17	-4.65	8.17	-0.45	8
Punjab	2.21	15.55	740	721	11.50	0.01	-1.84	0.00	0.00	0.00	0
Rajasthan	5.99	5.45	807	807	0.00	0.33	0.54	-4.65	264.16	-177.54	87
TN	0.09	0.00	976	0	0.00	0.00	0.00	-3.15	2.65	0.00	3
UP	16.99	24.38	740	657	3.77	0.89	-3.62	0.00	0.00	0.00	0
WB	0.69	1.06	776	633	0.00	0.53	-0.37	2.51	-13.93	16.60	3
All-India	44.48	67.14	766		22.75	3.87	0.00	-0.01	1068.68	-544.06	525

Table 5.10—Scenario 3: Movement Restrictions reduced 100% and Transport Costs 25%

Results for Rice

State	Open market demand (million tonnes)	Net production (million tonnes)	Wholesale price (Rs./ quintal)	Weighted Average Price (Rs./ quintal)	Procurement (million tonnes)	PDS (million tonnes)	Net regional imports (million tonnes)	% change in price	Change in consumer surplus (Rs. Crores)	Change in producer surplus (Rs. Crores)	Change in total surplus (Rs. Crores)
AP	5.83	11.50	1386	1008	5.31	1.93	-0.35	1.58	-146	199	54
Assam	2.52	3.92	1482	1020	1.81	0.38	0.42	-6.33	284	-317	-32
Bihar	7.48	5.48	1373	1106	0.00	0.13	2.00	-3.63	419	-229	191
Goa	0.08	0.15	1346	1084	0.00	0.01	-0.07	2.65	-3	4	1
Gujarat	0.76	1.03	1280	1016	0.07	0.12	-0.20	4.67	-55	47	-8
Haryana	0.15	2.72	1252	930	1.88	0.00	-0.68	8.62	-19	216	197
HP	0.19	1.13	1139	917	0.00	0.03	-0.94	24.77	-54	204	150
J&K	0.41	0.41	1185	954	0.00	0.07	0.00	9.63	-83	35	-48
Karnataka	1.80	3.76	1359	1007	1.15	0.95	-0.82	2.30	-60	92	32
Kerala	2.19	0.76	1442	1161	0.00	0.49	1.43	-7.58	275	-73	202
MP	3.66	0.98	1348	963	0.45	0.28	3.13	-2.91	159	-32	127
Maharashtra	2.15	1.97	1363	1097	0.00	0.37	0.18	-5.59	186	-128	58
Orissa	3.90	4.70	1373	987	2.17	0.66	1.37	-3.63	213	-196	17
Punjab	0.15	9.27	1252	930	6.43	0.00	-2.70	8.62	-19	738	719
Rajasthan	0.11	0.16	1302	965	0.07	0.00	0.02	5.81	-10	9	-1
TN	4.59	7.29	1442	996	3.37	1.21	0.42	-6.80	541	-621	-80
UP	4.71	11.72	1290	954	5.41	0.32	-1.59	7.19	492	813	1306
WB	7.50	12.62	1290	975	3.50	0.34	-1.62	7.19	718	876	1594
All-India	48.18	79.55	1337		31.62	7.29	0.00	0.02	418	1639	2057

Results for Wheat

State	Open market demand (million tonnes)	Net production (million tonnes)	Wholesale price (Rs./ quintal)	Weighted Average Price (Rs./ quintal)	Procurement (million tonnes)	PDS (million tonnes)	Net regional imports (million tonnes)	% change in price	Change in consumer surplus (Rs. Crores)	Change in producer surplus (Rs. Crores)	Change in total surplus (Rs. Crores)
AP	0.22	0.01	863	695	0.00	0.00	0.21	-7.02	15.57	-0.32	15
Assam	0.18	0.09	959	772	0.00	0.00	0.09	-9.73	20.69	-7.33	13
Bihar	5.90	4.44	823	663	0.00	0.55	1.46	-7.76	465.61	-254.96	211
Goa	0.03	0.00	868	0	0.00	0.00	0.03	-11.25	3.67	0.00	4
Gujarat	1.95	0.65	832	669	0.00	0.29	1.31	-8.02	163.91	-38.94	125
Haryana	2.05	9.65	740	709	7.59	0.05	-0.01	0.00	0.00	0.00	0
HP	0.31	0.60	853	686	0.00	0.03	-0.28	-8.66	28.37	-40.10	-12
J&K	0.68	0.15	916	737	0.00	0.03	0.54	-14.19	116.22	-18.29	98
Karnataka	0.23	0.24	836	673	0.00	0.20	-0.01	-6.07	12.93	-10.77	2
Kerala	0.13	0.00	919	0	0.00	0.03	0.13	-12.43	16.93	0.00	17
MP	4.83	3.87	823	663	0.00	0.29	0.97	-7.76	354.17	-222.29	132
Maharashtra	2.30	0.98	836	673	0.00	0.63	1.33	-8.16	208.06	-60.11	148
Orissa	0.20	0.01	836	673	0.00	0.00	0.19	-8.16	14.92	-0.80	14
Punjab	2.22	15.55	740	699	11.16	0.01	-2.18	0.00	0.00	0.00	0
Rajasthan	6.08	5.44	790	636	0.00	0.33	0.64	-6.63	380.48	-252.94	128
TN	0.12	0.00	919	0	0.00	0.00	0.04	-8.78	7.77	0.00	8
UP	17.02	24.38	740	615	3.28	0.89	-4.08	0.00	0.00	0.00	0
WB	0.70	1.06	767	617	0.00	0.53	-0.35	1.32	-7.38	8.73	1
All-India	45.15	67.10	759		22.02	3.87	0.00	-0.02	1801.92	-898.12	904

Table 5.11—Scenario 4. Movement Restrictions reduced 100% and Transport Costs 50%

Results for Rice

State	Open market demand (million tonnes)	Net production (million tonnes)	Wholesale price (Rs./ quintal)	Weighted Average Price (Rs./ quintal)	Procurement (million tonnes)	PDS (million tonnes)	Net regional imports (million tonnes)	% change in price	Change in consumer surplus (Rs. Crores)	Change in producer surplus (Rs. Crores)	Change in total surplus (Rs. Crores)
AP	5.87	11.49	1374	1003	5.31	1.93	-0.31	0.71	-66	90	24
Assam	2.59	3.91	1438	1002	1.81	0.38	0.49	-9.10	413	-455	-42
Bihar	7.51	5.48	1366	1099	0.00	0.13	2.03	-4.16	482	-262	220
Goa	0.08	0.15	1348	1085	0.00	0.01	-0.07	2.76	-3	4	1
Gujarat	0.74	1.03	1303	1034	0.07	0.12	-0.23	6.60	-77	67	-11
Haryana	0.15	2.72	1285	937	1.89	0.00	-0.69	11.47	-25	288	263
HP	0.18	1.14	1210	974	0.00	0.03	-0.96	32.48	-68	268	200
J&K	0.41	0.41	1190	958	0.00	0.07	0.00	10.11	-87	36	-50
Karnataka	1.80	3.76	1356	1005	1.15	0.95	-0.82	2.09	-55	84	29
Kerala	2.22	0.76	1412	1136	0.00	0.49	1.46	-9.54	348	-91	257
MP	3.65	0.98	1349	963	0.45	0.28	3.12	-2.84	156	-31	124
Maharashtra	2.16	1.97	1359	1094	0.00	0.37	0.19	-5.87	196	-135	61
Orissa	3.92	4.69	1366	984	2.17	0.66	1.39	-4.16	245	-225	20
Punjab	0.14	9.29	1285	937	6.44	0.00	-2.71	11.47	-25	983	958
Rajasthan	0.11	0.16	1318	971	0.07	0.00	0.02	7.13	-12	11	-1
TN	4.66	7.27	1412	983	3.36	1.21	0.50	-8.78	703	-801	-97
UP	4.62	11.73	1310	962	5.42	0.32	-1.69	8.87	603	1003	1606
WB	7.40	12.63	1310	986	3.50	0.34	-1.73	8.87	881	1081	1962
All-India	48.19	79.57	1341		31.63	7.29	0.00	0.02	641	1915	2556

Results for Wheat

State	Open market demand (million tonnes)	Net production (million tonnes)	Wholesale price (Rs./ quintal)	Weighted Average Price (Rs./ quintal)	Procurement (million tonnes)	PDS (million tonnes)	Net regional imports (million tonnes)	% change in price	Change in consumer surplus (Rs. Crores)	Change in producer surplus (Rs. Crores)	Change in total surplus (Rs. Crores)
AP	0.23	0.01	822	680	0.00	0.00	0.23	-11.43	26.62	-0.52	26
Assam	0.18	0.09	886	733	0.00	0.00	0.10	-16.60	36.09	-12.48	24
Bihar	6.00	4.43	796	658	0.00	0.55	1.57	-10.87	658.88	-356.68	302
Goa	0.03	0.00	825	0	0.00	0.00	0.03	-15.59	5.22	0.00	5
Gujarat	2.04	0.65	801	662	0.00	0.29	1.39	-11.39	237.50	-55.24	182
Haryana	2.06	9.65	740	712	7.57	0.05	-0.02	0.00	0.00	0.00	0
HP	0.32	0.59	815	674	0.00	0.03	-0.27	-12.68	41.87	-58.59	-17
J&K	0.70	0.14	857	709	0.00	0.03	0.56	-19.68	162.94	-25.29	138
Karnataka	0.24	0.24	804	665	0.00	0.20	0.00	-9.66	21.04	-17.12	4
Kerala	0.14	0.00	860	0	0.00	0.03	0.14	-18.13	25.89	0.00	26
MP	5.01	3.86	796	658	0.00	0.29	1.15	-10.87	504.90	-310.96	194
Maharashtra	2.36	0.97	804	665	0.00	0.63	1.39	-11.68	301.56	-85.86	216
Orissa	0.22	0.01	804	665	0.00	0.00	0.20	-11.68	22.17	-1.14	21
Punjab	2.22	15.55	740	702	10.94	0.01	-2.39	0.00	0.00	0.00	0
Rajasthan	6.17	5.44	774	640	0.00	0.33	0.74	-8.61	499.08	-328.20	171
TN	0.15	0.00	860	0	0.00	0.00	0.09	-14.71	13.70	0.00	14
UP	17.04	24.38	740	627	2.78	0.89	-4.55	0.00	0.00	0.00	0
WB	0.71	1.06	758	627	0.00	0.53	-0.34	0.13	-0.74	0.87	0
All-India	45.82	67.06	753		21.30	3.87	0.00	-0.03	2556.71	-1251.20	1306

Figure 5.1—Rice: Changes in Open Market Demand, Production and Procurement Trade Restrictions Eliminated and Transport Cost Reduced 25%

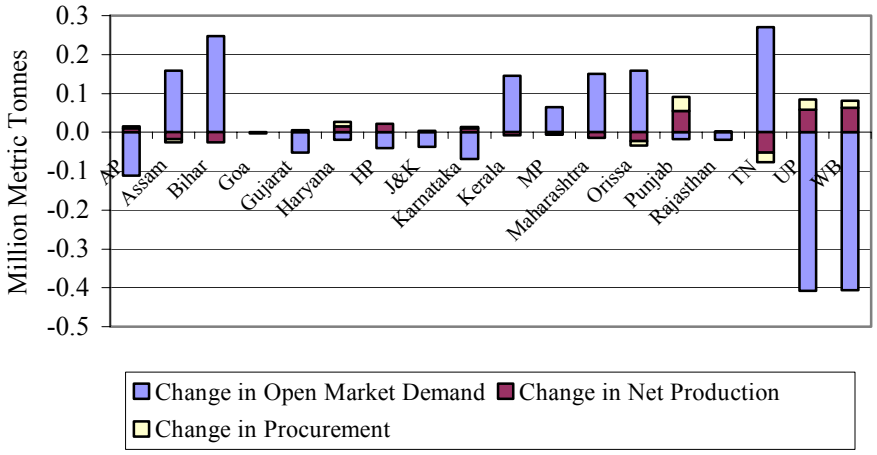


Figure 5.2—Wheat: Changes in Open Market Demand, Production and Procurement Trade Restrictions Eliminated and Transport Cost Reduced 25%

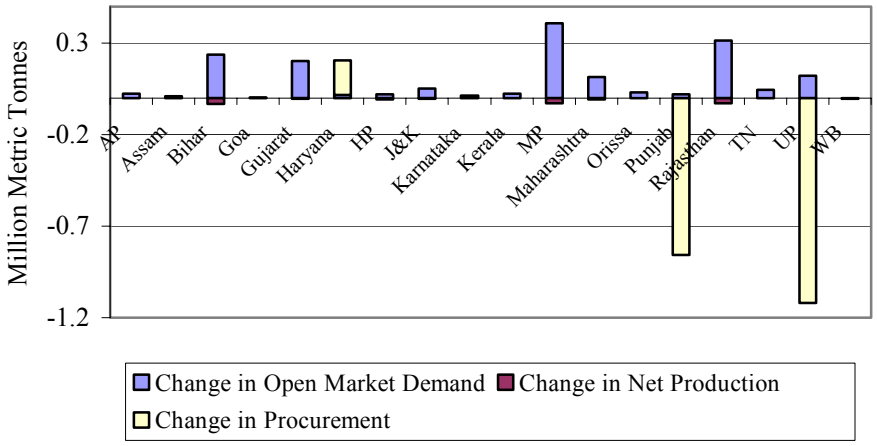


Figure 5.3—Rice: Impact on Interstate Variation of Weighted Average Price

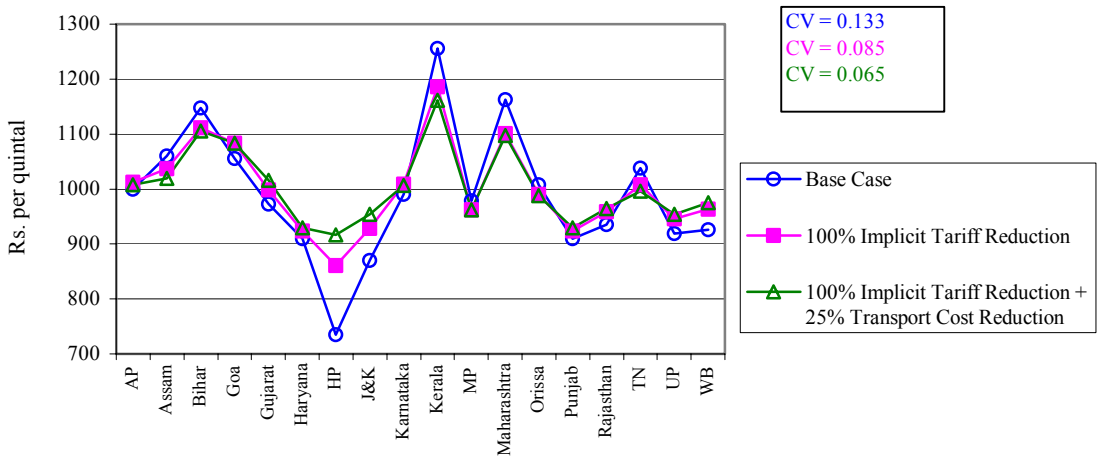


Figure 5.4—Wheat: Impact on Interstate Variation of Weighted Average Price

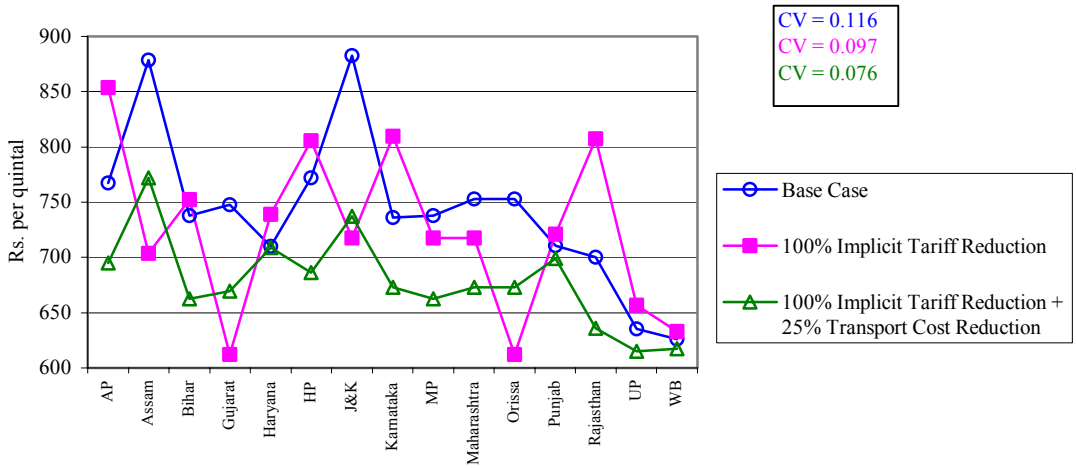


Figure 5.5—Rice:Domestic Exports Trade Restrictions Eliminated and Transport Cost Reduced 25%

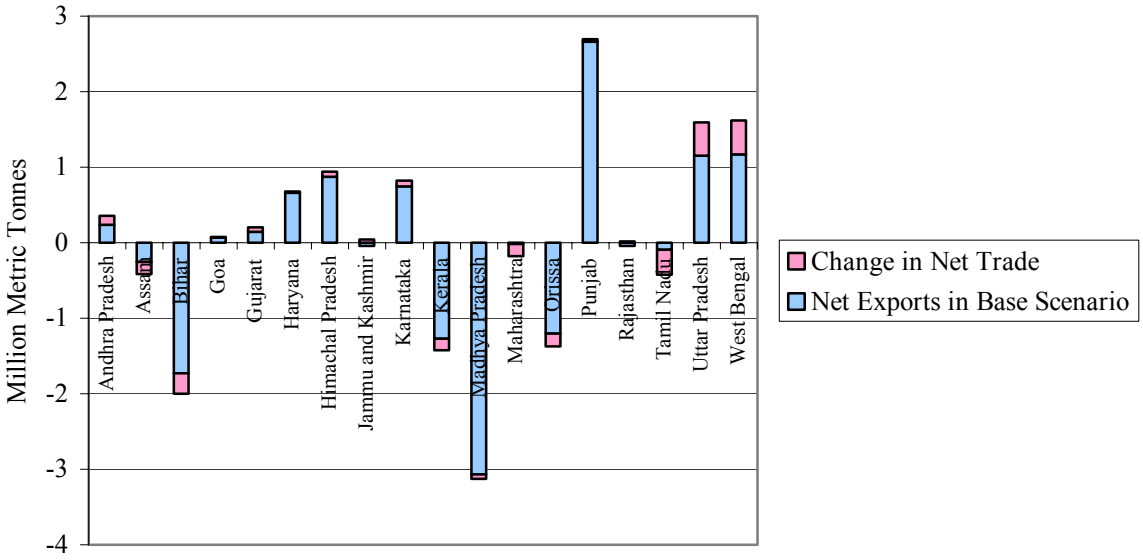


Figure 5.6—Wheat: Domestic Exports Trade Restrictions Eliminated and Transport Cost Reduced 25%

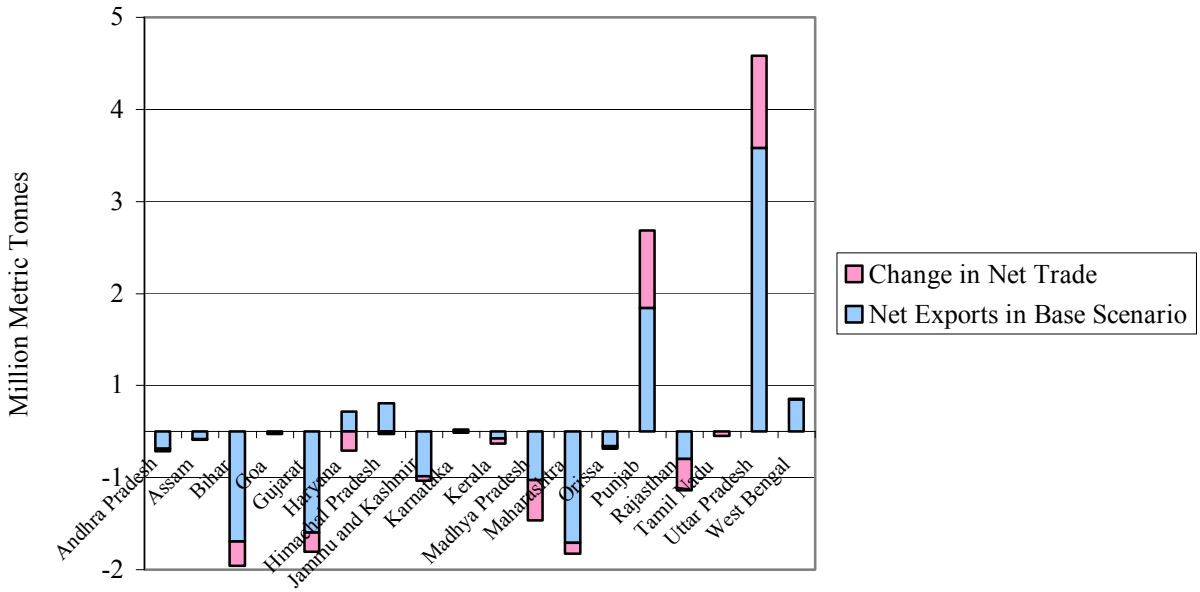


Figure 5.7—Foreign Trade: Quantity Imported by States

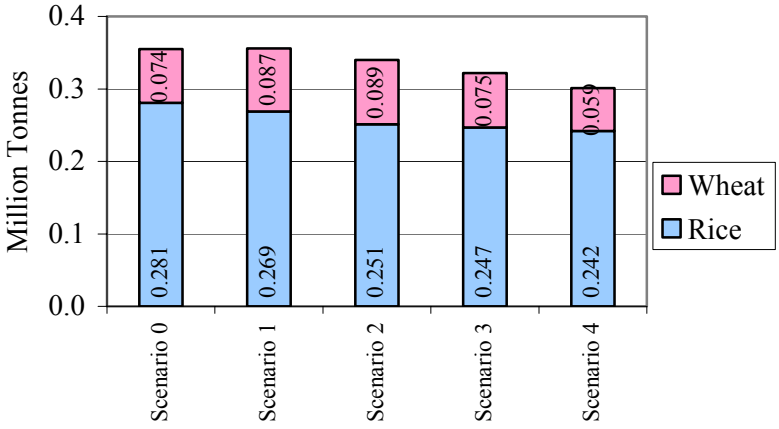


Table 5.12—Efficiency Gains compared to Base Case

Scenario	Total Regional Trade (million tonnes)	Regional Price Variation: CV of Prices	PDS Cost (Rs. Crores)	Procurement Cost (Rs. Crores)	Storage Cost (Rs. Crores)	Sales Realization (Rs. Crores)	Net Government Cost (Rs. Crores)	Total Consumer Surplus (Rs. Crores)	Total Producer Surplus (Rs. Crores)	Total Consumer + Producer Surplus (Rs. Crores)
Scenario 1										
Rice	0.52	-0.022	0	22	4	0	26	98	640	738
Wheat	0.47	-0.009	0	-486	-127	0	-613	516	-263	254
Total	0.99		0	-464	-123	0	-587	614	377	991
Scenario 2										
Rice	1.04	-0.048	0	48	10	0	58	217	1369	1587
Wheat	0.94	-0.019	0	-1011	-265	0	-1276	1069	-544	525
Total	1.98		0	-963	-255	0	-1218	1286	825	2111
Scenario 3										
Rice	1.27	-0.068	0	60	12	0	72	418	1639	2057
Wheat	1.60	-0.040	0	-1698	-445	0	-2143	1802	-898	904
Total	2.86		0	-1639	-433	0	-2072	2220	741	2961
Scenario 4										
Rice	1.50	-0.086	0	72	14	0	86	641	1915	2556
Wheat	2.25	-0.064	0	-2388	-625	0	-3013	2557	-1251	1306
Total	3.75		0	-2316	-611	0	-2927	3198	663	3861

Notes: 1 crore = 10 million. Prices are measured in Rs./ quintal and quantities in million tonnes.
The Scenarios are defined as follows:
Scenario 0: Base Case
Scenario 1: 50% Implicit Tariff Reduction
Scenario 2: 100% Implicit Tariff Reduction
Scenario 3: 100% Implicit Tariff Reduction + 25% Transport Cost Reduction
Scenario 4: 100% Implicit Tariff Reduction + 50% Transport Cost Reduction

Table 5.13—Pattern of Interstate Trade (Million Tonnes)

Rice			Wheat		
From.To	**Base Case: movement restrictions exist**	**100% Implicit Tariff Reduction + 25% Transport Cost Reduction**	**From.To**	**Base Case: movement restrictions exist**	**100% Implicit Tariff Reduction + 25% Transport Cost Reduction**
AP.KER	0.024	0.669	AP.KER		0.025
AP.TN		0.263	AP.TN		0.026
GOA.KER	0.070	0.073	HAR.GUJ	0.024	0.003
GUJ.KER	0.144	0.012	HAR.HP	0.087	0.007
GUJ.MAH		0.181	HAR.RAJ	0.110	0.004
GUJ.TN		0.009	HP.JK	0.482	0.537
HAR.KER	0.039		KAR.GOA	0.025	0.010
HAR.MP	0.838	0.698	KAR.KER	0.001	0.002
HAR.ORI	0.134	0.511	MP.KER		0.103
HAR.RAJ		0.012	MP.TN		0.018
HAR.TN	0.040		MAH.GOA		0.018
HP.HAR	0.394	0.539	PUN.GUJ	1.075	1.302
HP.JK	0.041		PUN.HP	0.084	0.247
HP.PUN	0.397	0.399	PUN.RAJ	0.187	0.633
HP.RAJ	0.045		UP.BIH	1.194	1.459
KAR.KER	0.744	0.672	UP.KER	0.075	
KAR,TN		0.146	UP.MP	0.529	1.087
PUN.KER	0.041		UP.MAH	1.207	1.346
PUN.MP	0.227	2.433	UP.ORI	0.074	0.189
PUN.ORI	0.741	0.652	WB.AP	0.187	0.264
PUN.RAJ		0.012	WB.ASS	0.079	0.090
PUN.TN	0.050		WB.ORI	0.082	
UP.BIH	1.134	1.590			
UP.MAH	0.017				
WB.AP		0.584			
WB.ASS	0.250	0.417			
WB.BIH	0.591	0.408			
WB.ORI	0.328	0.211			

Table 5.14—Changing Trading Partnerships with Freer Domestic Trade

Rice

Trading State	Scenario 0				Scenario 3			
Andhra Pradesh	Kerala				Kerala	Tamil Nadu		
Goa	Kerala				Kerala			
Gujarat	Kerala				Kerala	Maharashtra	Tamil Nadu	
Haryana	Kerala	Madhya Pradhesh	Orissa	Tamil Nadu	Madhya Pradhesh	Orissa	Rajasthan	
Himachal Pradesh	Haryana	Jammu & Kashmir	Punjab	Rajasthan	Haryana	Punjab		
Karnataka	Kerala				Kerala	Tamil Nadu		
Punjab	Kerala	Madhya Pradhesh	Orissa	Tamil Nadu	Madhya Pradhesh	Orissa	Rajasthan	
Uttar Pradesh	Bihar	Maharashtra			Bihar			
West Bengal	Assam	Bihar	Orissa		Andhra Pradesh	Assam	Bihar	Orissa

Wheat

Trading State	Scenario 0					Scenario 3			
Andhra Pradesh						Kerala	Tamil Nadu		
Haryana	Gujarat	Himachal Pradesh	Rajasthan			Gujarat	Himachal Pradesh	Rajasthan	
Himachal Pradesh	Jammu & Kashmir					Jammu & Kashmir			
Karnataka	Goa	Kerala				Goa	Kerala		
Madhya Pradesh						Kerala	Tamil Nadu		
Maharashtra						Goa			
Punjab	Gujarat	Himachal Pradesh	Rajasthan			Gujarat	Himachal Pradesh	Rajasthan	
Uttar Pradesh	Bihar	Kerala	Madhya Pradesh	Maharashtra	Orissa	Bihar	Madhya Pradesh	Maharashtra	Orissa
West Bengal	Andhra Pradesh	Assam	Orissa			Andhra Pradesh	Assam	Orissa	

Notes:
Scenario 0: Base Case
Scenario 3: 100% Implicit Tariff Reduction + 25% Transport Cost Reduction

Table 5.15—Welfare Gains from Base Case (Rs. Crores) Trade Restrictions Eliminated and Transport Cost Reduced 25%

States	Rice					Wheat					Rice + Wheat				
	Change in Consumer Surplus	Change in Producer Surplus	Change in Wholesale Traders Surplus	Change in Retail Traders Surplus	Total Surplus	Change in Consumer Surplus	Change in Producer Surplus	Change in Wholesale Traders Surplus	Change in Retail Traders Surplus	Total Surplus	Change in Consumer Surplus	Change in Producer Surplus	Change in Wholesale Traders Surplus	Change in Retail Traders Surplus	Aggregate Total Surplus
AP	-146	199	-0.77	-0.88	52	15.57	-0.32	0.00	0.00	0.21	-130	199	-0.77	-0.87	52.39
Assam	284	-317	-0.10	-0.11	-33	20.69	-7.33	0.00	0.00	0.09	305	-324	-0.10	-0.11	-32.51
Bihar	419	-229	-0.97	-1.07	189	465.61	-254.96	0.00	0.55	1.46	885	-484	-0.97	-0.52	190.09
Goa	-3	4	-0.05	-0.05	1	3.67	0.00	0.00	0.00	0.03	1	4	-0.05	-0.05	1.06
Gujarat	-55	47	-0.63	-0.77	-10	163.91	-38.94	0.00	0.29	1.31	109	8	-0.63	-0.48	-8.46
Haryana	-19	216	-0.22	-0.26	196	0.00	0.00	7.59	0.05	-0.01	-19	216	7.37	-0.21	196.43
HP	-54	204	0.17	0.20	150	28.37	-40.10	0.00	0.03	-0.28	-26	164	0.17	0.23	149.68
J&K	-83	35	0.08	0.14	-48	116.22	-18.29	0.00	0.03	0.54	33	16	0.08	0.17	-47.58
Karnataka	-60	92	-1.01	-1.09	30	12.93	-10.77	0.00	0.20	-0.01	-47	82	-1.01	-0.89	30.18
Kerala	275	-73	-0.90	-0.99	200	16.93	0.00	0.00	0.03	0.13	292	-73	-0.90	-0.96	200.38
MP	159	-32	-1.73	-1.88	124	354.17	-222.29	0.00	0.29	0.97	513	-254	-1.73	-1.59	124.64
Maharashtra	186	-128	1.24	1.39	60	208.06	-60.11	0.00	0.63	1.33	394	-189	1.24	2.02	61.74
Orissa	213	-196	0.67	0.72	18	14.92	-0.80	0.00	0.00	0.19	228	-197	0.67	0.72	18.49
Punjab	-19	738	-0.18	-0.22	718	0.00	0.00	11.16	0.01	-2.18	-19	738	10.97	-0.21	716.21
Rajasthan	-10	9	-0.51	-0.58	-2	380.48	-252.94	0.00	0.33	0.64	370	-244	-0.51	-0.25	-1.34
TN	541	-621	-1.86	-2.16	-84	7.77	0.00	0.00	0.00	0.04	549	-621	-1.86	-2.16	-83.64
UP	492	813	-2.41	-2.76	1300	0.00	0.00	3.28	0.89	-4.08	492	813	0.87	-1.87	1296.37
WB	718	876	4.64	4.97	1604	-7.38	8.73	0.00	0.53	-0.35	710	885	4.64	5.50	1603.31
All India	418	1639	-4.53	-5.38	2047	1801.92	-898.12	22.02	3.87	6.93	2220	741	17.50	-1.52	2054.10

Note: 1 crore = 10 Million

6. SUMMARY AND CONCLUSIONS

This study evaluates the domestic and international trade and marketing policies in India and obtains the effects of deregulating domestic markets and liberalizing external trade on the food grain sector. To alleviate household food insecurity the Government of India (GOI) supports several food-based programs that are amongst the largest in the world. But pervasive inefficiencies in implementation observed in several such programs seriously undermine their ability to achieve the intended goals. The government is now making attempts to improve the effectiveness of public spending by rationalizing expenditure. It has altered the design of programs, e.g., by adopting better targeting methods such as through income-based identification and social and demographic characteristics of households etc. It is also attempting to reform pricing policy with a view to encourage better private sector participation.

Traditionally the government fixed prices for both producers and consumers, it decided how much to distribute where, how much of stocks to release or accumulate for price stabilisation and so on. But a comparison of costs and functioning of the Food Corporation of India (FCI, a government of India agency) and private traders shows that the latter operate at costs lower than public costs in both storage and trade despite several controls and restrictions. The analysis carried out in this Report demonstrates the desirability of a greater role for the private sector in distribution, trade and storage of food grains.

Public policy towards food grain markets has tended to be highly interventionist with the central and state governments actively involved in grain storage and restrictions on the movement of food grains across states. These restrictions are often based on the assumption that markets cannot be expected to perform well in alleviating local scarcities. The continuation of such policies is based on the belief that such grain is bound for speculative stocks of traders in the deficit areas rather than for current sale. But it has been shown that *zoning* policies considerably and systematically increased (rather

than reduce) interstate food price dispersion thereby worsening the situation of hardship for deficit households in deficit states.

Public interventions to manage price risks should be designed such that they do not unduly restrict the normal flow of commodities in the economy but allow for smooth functioning of private trade and market prices to determine resource allocation. The high costs of maintaining public stocks can be reduced through encouragement of private storage, which plays a complementary role to public storage, and liberalization of external trade. Efficient functioning of private agents would also require the removal of restrictions such as limits on stock holdings and controls on movement of grain across state boundaries. Since such constraints appear to be binding, opening up the markets to free domestic as well as international trade would transfer grains in the right direction – from surplus to deficit areas – and perhaps in larger quantities than FCI. Support price should not be fixed at unduly high levels but provide a protection against distress sales during surplus situations. Complete elimination of price volatility by the government through inter-regional or inter-seasonal policies is neither desirable nor feasible. There should be enough scope for traders to undertake the arbitrage transactions that are worthwhile, and not be hindered by restrictions on storage, movement and access to trade and credit. Such restrictions would need to be either permanently eliminated or significantly reduced.

A major contribution of this study is to analyze and quantify the impacts of relaxation of restrictions on private domestic trade of rice and wheat based on a spatial equilibrium model of inter-state trade that takes place under arbitrage opportunities. A unique feature in our analysis of Indian grain markets is that wholesale and retail traders are considered as a separate set of agents in addition to consumers, producers and the government. The analysis throws up some interesting results.

Public sector agencies are known to visualize private traders as a competitor to FCI. Based on this, the general perception is that private trade will mimic the behavior of FCI by, e.g., transporting grains from Punjab in the north of the country to Kerala in the

south. However, contrary to this perception, private trade does not necessarily take place only and directly between a surplus and a deficit states. Our results show that it is possible for a deficit state to import grains from a neighboring deficit state, which in turn could import from another deficit or a surplus state or even from abroad depending on arbitrage benefits. With freer domestic trade, markets reveal all information needed to private profit maximizers who obviously choose least cost options of trade.

As restrictions are relaxed, prices stabilize across states and there are welfare gains to producers, consumers and wholesale traders at the national level. The gains are much higher in the case of wheat compared to rice. This could be due to the fact that rice market continues to be controlled through levy procurement. There is a steep reduction in government cost from deregulating domestic trade as costs of procurement and storage both fall due especially to lower wheat procurement since traders prefer to sell wheat in other states than to FCI, fetching them a better price than MSP. In a liberalized trade regime for both domestic and foreign trade, states make new trading partners domestically and may even prefer to trade abroad than domestically to make the best of price differences.

The gains illustrated to accrue from liberalizing domestic and foreign trade are derived from small policy changes that reduce/ eliminate movement restrictions and also from reduced transportation cost. The problem of excess stock accumulation would however not be solved by these policy changes. So long as high minimum support price (MSP) for wheat and levy procurement of rice remain intact, much higher gains in efficiency and economic welfare are possible if opening up the markets for both domestic and external trade is accompanied by investment in roads and other infrastructure; lower MSP for wheat just sufficient to provide an insurance in low price years; abolition of rice levy and decentralization of FCI's operations.

It is thus socially efficient to open up markets for trade in grains by encouraging private agents to participate in marketing and investment. This can be facilitated by a number of long-term policy changes to reduce transaction costs of private traders. These

include encouraging investment and modernization through improved infrastructure (e.g., roads/ ports/ storage), larger scale of operation (e.g., bulk handling/ transport) and innovations (e.g., fuel-efficient trucks). But more importantly, the government needs to develop better institutions for improving market information, grading facilities etc.

The government has already initiated steps to encourage private participation in grain markets. The role of FCI is proposed to be restricted to timely sales and purchases to maintain stability in food prices and resort to exports and imports of food grains, when required. The budgetary savings of the central government realized by limiting the role of FCI can be used to provide subsidy to the states for the specific purpose of procuring grains through their agencies, private or public. Given the cost factor, they can choose the most appropriate way to purchase grain. But more needs to be done. If price distortions are eliminated, farmers could shift away from rice and wheat and diversify to high value farming that offers higher market price such as fruits and vegetables, poultry and dairy. Subsidized loans could be offered to improve the restricted access to credit and to encourage private storage facilities that are used co-operatively. In line with this, the *National Policy on Handling and Storage of Foodgrains* envisages encouragement of private sector for building storage capacities for rental use by government agencies and also development of infrastructure for integrated bulk handling, storage and transportation of food grains.

As for external policy, the era of globalization has brought with it new opportunities as well as challenges to the food security system. Being a signatory to the WTO, the country is moving towards more open trade in agriculture. The challenges are in terms of developing appropriate marketing infrastructure and institutions to deal with trade in agricultural commodities and appropriate policies to deal with price risk. The opportunities under liberalized external trade are in terms of reduced dependence on buffer stocks and greater dependence on trade for price stabilization. As India becomes a major force in the global rice and wheat markets, new strategies are required to sustain its position. As part of a new strategy, the government plans to promote exports through

long-term credit, removal of export restrictions, establishment of Agricultural Export Zones and transport subsidies for exports of rice and wheat from government warehouses. But it also needs to improve facilities for grading and measuring standards, and address quality problems. Exporters face distribution and storage problems too. In order to take full advantage of growing exports, the exporters would need to have better port and domestic infrastructure facilities, which are currently very meager. The ports are highly congested, have obsolete equipment, are managed by government controlled port trusts and thus marred by bureaucracy. Loading a ship takes enormous time and is extremely slow compared to international standards. Improving these facilities would go a long way in reducing the high handling costs and margins of exporters and make India competitive in the world grain markets.

APPENDIX: BASE YEAR DATA 2000-01
COMPILATION, ADJUSTMENT AND SOURCES

A.1 WHOLESALE MARGINS

Wholesale price equals farm harvest price plus a mark-up comprising traders margin, marketing cost and transport cost. The traders' margin includes margins of the wholesalers and, in the case of rice, also the rice millers. The marketing cost consists of statutory charges (purchase tax, market fee, surcharge, commission), cost of material, labour and storage, processing cost (for paddy) forwarding charges and interest on working capital. Using data from Chand (2002), we calculate these costs as percentage of wholesale price for the base year. For the FCI corresponding to traders' margin we consider its administrative costs. In this case, we calculate the rates as percentage of total purchase cost plus other costs including administration and post-procurement incidental costs. The data for FCI are taken from GOI (2002a) and CACP (2000).

A.2 RETAIL MARGINS

While modeling consumer demand we consider the retail price, which is obtained by applying the retail margin to inflate wholesale price taken from Chand (2002). See Table A.1 for base year data on prices.

A.3 INTER-STATE TRANSPORT COST

Private transport cost data is from Chand (2002) and FCI data from CACP (2000). In order to obtain state x state transport cost matrix, we use the data on transport cost per quintal by truck from Punjab to other states as given by Chand and extrapolate it to generate the entire matrix based on approximate metric distances. In doing so, we assume that it will cost the same to transport goods to states with similar distances. However, for three states, namely Assam, HP and J&K we double this cost under the assumption that

the physical and natural geographical barriers such as hills, mountains, rivers and other country boundaries in between make it that much more costly to transport grains from these states to all the other destinations in the country.

A.4 FOREIGN TRADE

External trade is modeled by treating the rest of the world as another region with which individual states can directly trade by incurring the additional costs of transport from the nearest/ cheapest port. The cost of foreign trade incurred by a state is obtained from the transportation costs of moving goods from the state to the nearest port and port charges. Net export price received is defined as border price (fob) minus domestic trade cost (transportation plus traders' margin) minus port charges. Net import price paid is defined as border price (cif) plus domestic trade cost plus port charges.

The export (import) coefficients are obtained from the price elasticity of exports (imports) with respect to exports (imports), evaluated at the base year values. Port clearance charges up to 1995 are taken from Pursell and Gupta (1996) and extrapolated to 2000-01 based on observed growth rates. The border prices for the base year 2000-01 are

Rice: $ 149.1 per ton (Thai 35% broken)

Wheat: $ 126.8 per ton (US Hard Red Winter)

Exchange rate: Rs. 46.64 per US $

Port Clearance Charges = Rs. 80.5 per Quintal

Sources: GOI (2002a), Department of Food and Public Distribution. Ministry of Consumer Affairs, Food and Public Distribution; Handbook of Statistics (2002), RBI and Pursell and Gupta (1996).

A.5 PDS PRICE

We have two types of central issue prices (CIPs) for families below poverty line (BPL) and above poverty line (APL), but offtake falls under three categories (BPL, APL and AAY – the Antyodaya Anna Yojana program for the poorest of the poor). We

clubbed AAY with BPL and took a weighted average of APL and BPL CIPs to compute a common PDS price:

PDS price = CIPA (APL/total off take) + CIPB (BPL/total offtake).

where

CIPA = APL's CIP

CIPB = BPL's CIP

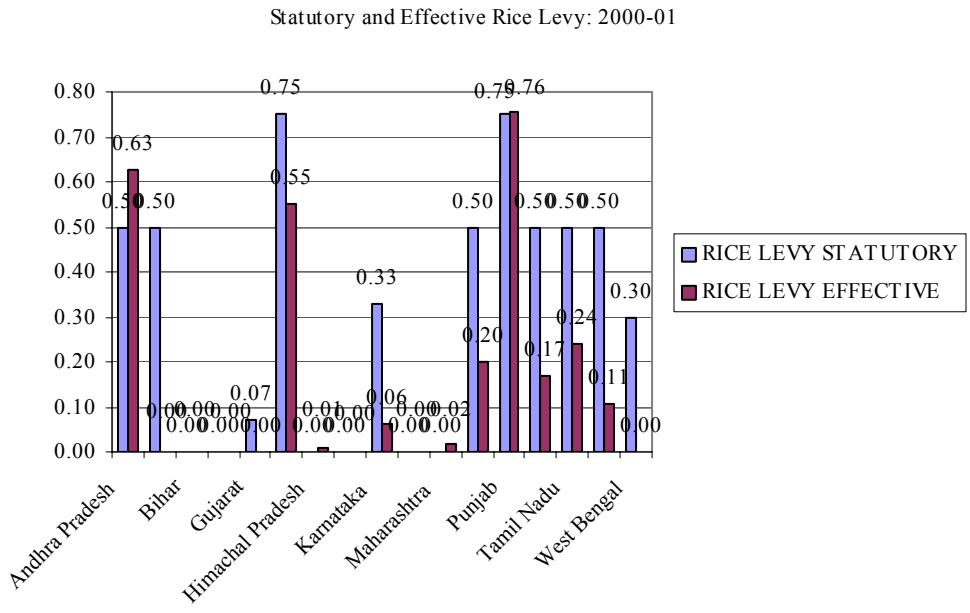
Sources: GOI (2002a), Department of Food and Public Distribution. Ministry of Consumer Affairs, Food and Public Distribution.

A.6 PROCUREMENT, LEVY AND MSP

Data on statutory levy percentage for rice procurement is taken from Annual Report (2002), Department of Food and Civil Supplies, Government of India. It is to be noted however, that effective levy differs from statutory levy in most states and the difference is quite substantial in some states (Figure below). To be consistent with base year actual levy, we therefore assumed the levy in the model to be equal to the effective levy.

In the model we derive equilibrium solution in terms of wholesale price. But since levy prices and MSP are fixed in terms of farm-gate prices, we inflated them using the wholesale margins to make them comparable to the wholesale level prices. For this purpose we used the margins pertaining to surplus states from where the Government makes procurement. See Tables A.2-A.4 for base-year data on quantities and prices related to PDS and procurement.

Data on MSP for wheat and levy rice prices are taken from Bulletin of Food Statistics 2000. Ministry of Agriculture, Government of India and http://www.indiastat.com/



A.7 DEMAND ELASTICITIES

We use data from Murty (1997) on own price elasticity separately for rural & urban areas, so we use weighted average of these with population weights to compute the state-wide price elasticity of demand. We also assume that the price elasticity for the following states are the same as the corresponding states given on the right hand side:

Uttar Pradesh	-	Assam & Bihar
Punjab	-	HP & JK
Tamil Nadu	-	Kerala
MP	-	WB
Karnataka	-	Goa
AP	-	Orissa

Similarly, we use weighted averages to calculate income and cross price elasticity of demand. Source: Gulati and Kelly (1999, page no.148 and 149). Table A.5 presents the elasticities used in the model.

A.8 SUPPLY ELASTICITIES

A.8.1 Own price elasticity of supply

We use all India elasticity for wheat due to non-availability of state-wise data. The production is taken as net production obtained after adjusting for seed, feed and wastage. The ratio of net to gross production is 0.924 for rice and 0.879 for wheat. Source: Jha and Srinivasan (1999).

A.8.2 Cross price elasticity of supply

In order to get cross price elasticity of supply between rice and wheat, we need to know the states where these crops are substitutable. The following information revealed no such substitution.

Substitutability of crops in major states of India is as follows:

Andhra Pradesh	(rice, ragi, mesta), (jowar, maize, bajra), (cotton, groundnut, sesamum), (wheat, gram)
Assam	(rice, jute), (moong, gram, urad, cotton, wheat)
Bihar	(ragi, rice, jute), (wheat, barley, peas, gram, sugarcane)
Maharashtra	(linseed, wheat, gram), (sugarcane, wheat, gram), (jowar, bajra, maize, cotton)
Madhya Pradesh	(linseed, wheat, gram), (jowar, bajra, cotton)
Karnataka	(rice, ragi), (jowra, sugarcane), (cotton, groundnut), (bajra, maize)
Orissa	(rice, ragi, jute)
Punjab	(wheat, barley, gram, peas), (jowar, bajra, maize, cotton, sugarcane)
Rajasthan	(jowar, bajra, maize, pulses), (wheat, barley, gram, peas)
Tamil Nadu	(rice, ragi, mesta), (jowar, maize, bajra), (cotton, groundnut, sesamum)
Uttar Pradesh	(wheat, barley, gram, peas), (jowar, bajra, maize, sugarcane)

Source: Bansil (1990), page 347

As the above data shows no substitution in production of rice and wheat in major producing states, so, in calibrating the supply functions, we do not incorporate cross-price elasticities.

Table A.1—Base Year (2000-01) Prices: Rs. Per Quintal

STATE	WHOLESALE PRICE		RETAIL PRICE	
	WHEAT	RICE	WHEAT	RICE
Andhra Pradesh	1002	1291	1146	1477
Assam	1038	1328	1216	1554
Bihar	957	1247	1108	1378
Goa	1016	1305	1261	1465
Gujarat	863	1152	1062	1418
Haryana	739	1028	876	1218
Himachal Pradesh	739	1105	876	1310
Jammu & Kashmir	927	1216	1098	1442
Karnataka	988	1277	1058	1368
Kerala	1027	1317	1138	1459
Madhya Pradesh	868	1158	960	1261
Maharashtra	932	1222	1157	1372
Orissa	902	1192	978	1292
Punjab	739	1028	876	1218
Rajasthan	1016	1097	840	1248
Tamil Nadu	752	1305	1114	1515
Uttar Pradesh	988	1028	852	1176
West Bengal	791	1028	1040	1100

Sources: Chand (2002) and http://www.indiastat.com/

Table A.2—Base Year (2000-01) Quantities: Million Tonnes

STATE	SUPPLY		DEMAND		OPEN MARKET DEMAND		PROCUREMENT		PDS	
	WHEAT	RICE	WHEAT	RICE	WHEAT	RICE	WHEAT	RICE	WHEAT	RICE
Andhra Pradesh	0.01	11.45	0.17	8.21	0.16	6.28	0.000	7.173	0.003	1.927
Assam	0.09	3.89	0.17	3.18	0.16	2.80	0.000	0.000	0.000	0.380
Bihar	4.50	5.42	5.77	8.33	5.35	8.20	0.000	0.008	0.430	0.132
Goa	0.00	0.15	0.03	0.09	0.02	0.08	0.000	0.000	0.002	0.009
Gujarat	0.65	1.01	2.14	0.99	1.85	0.87	0.000	0.000	0.287	0.117
Haryana	9.65	2.68	2.06	0.20	2.01	0.20	4.498	1.477	0.048	0.002
Himachal Pradesh	0.59	0.12	0.36	0.22	0.33	0.19	0.000	0.001	0.028	0.026
Jammu & Kashmir	0.15	0.41	0.71	0.47	0.68	0.40	0.000	0.000	0.031	0.069
Karnataka	0.24	3.73	0.39	2.93	0.19	1.98	0.000	0.230	0.199	0.948
Kerala	0.00	0.75	0.14	2.86	0.11	2.37	0.000	0.000	0.030	0.489
Madhya Pradesh	3.89	0.96	4.77	4.32	4.48	4.04	0.351	1.030	0.289	0.283
Maharashtra	0.98	1.95	2.74	2.82	2.11	2.44	0.000	0.036	0.627	0.374
Orissa	0.01	4.61	0.17	5.19	0.17	4.53	0.000	0.918	0.000	0.663
Punjab	15.55	9.15	2.18	0.19	2.17	0.19	9.424	6.935	0.012	0.000
Rajasthan	5.55	0.16	5.19	0.17	4.86	0.17	0.539	0.026	0.331	0.001
Tamil Nadu	0.00	7.22	0.20	6.14	0.20	4.93	0.000	1.720	0.001	1.210
Uttar Pradesh	24.94	11.54	15.15	6.34	14.26	6.01	1.545	1.212	0.889	0.321
West Bengal	1.06	12.43	1.20	9.10	0.66	8.76	0.000	0.000	0.533	0.340
Total	67.86	77.64	43.53	61.72	39.79	54.43	16.357	20.766	3.742	7.292

Sources: GOI (2002a), *Bulletin of Food Statistics 2000*. Ministry of Agriculture, Government of India, Department of Food and Public Distribution. Ministry of Consumer Affairs, Food and Public Distribution. www.indiastat.com.

Table A.3—Levy Procurement of Rice: 2002-2003 Kharif Marketing Season

Sl No	Name of the State/UT	Category	Quantum of Levy
1.	ANDHRA PRADESH	MILLERS/DEALERS	50%
2.	ASSAM	MILLERS	50%
3.	BIHAR	MILLERS/DEALERS	40% or 2500 qtls. compound levy on millers. 25% or 500 qtls. compound levy on wholesalers.
4.	GUJARAT	MILLERS	10%
5.	HARYANA	MILLERS/DEALERS	75%
6.	HIMACHAL PRADESH	MILLERS/DEALERS	50%
7.	KARNATAKA	MILLERS/DEALERS	33.33%
8.	MADHYA PRADESH	MILLERS/DEALERS	30% (Raw rice)
9.	MAHARASHTRA	MILLERS	30%
10.	ORISSA	MILLERS	75%
11.	PUNJAB	MILLERS/DEALERS	75%
12.	RAJASTHAN	MILLERS/DEALERS	50%
13.	TAMIL NADU	MILLERS/DEALERS	50%
14.	UTTAR PRADESH	MILLERS/DEALERS	60% (Western UP) 40% (Some Distts.in Eastern UP)
15.	UTTARANCHAL	MILLERS/DEALERS	60%
16.	WEST BENGAL	MILLERS	50%
17.	CHANDIGARH	MILLERS/DEALERS	75%
18.	DELHI	MILLERS/DEALERS	75%
19.	PONDICHERRY	MILLERS/DEALERS	10% (20% transport levy)

Table A.4—State-wise Prices of Levy Rice (raw & parboiled) in Kharif Marketing Season 2000-2001 and 2001-2002 (Rupees per Quintal)

SR.NO.	STATE	RAW RICE				PAR BOILED			
		COMMON		GRADE "A"		COMMON		GRADE "A"	
		2000-2001	2001-2002	2000-2001	2001-2002	2000-2001	2001-2002	2000-2001	2001-2002
1.	ANDHRA PRADESH	899.80	935.10	949.60	985.00	900.90	931.00	950.00	980.10
2.	ASSAM	845.90	879.10	892.50	926.00	847.80	875.80	893.80	921.80
3.	BIHAR	861.20	895.10	908.80	942.60	863.00	891.60	909.80	938.50
4.	CHANDIGARH	876.70	911.10	925.10	959.50	878.20	907.40	925.90	955.10
5.	DELHI	896.50	937.50	946.20	987.40	897.70	933.40	946.60	982.60
6.	GUJARAT	826.60	859.10	872.10	904.60	828.80	856.10	873.70	901.00
7.	HARYANA	904.20	939.10	954.30	989.10	905.30	935.00	954.70	984.30
8.	KARNATAKA	830.40	863.10	876.20	908.80	832.60	860.10	877.70	905.10
9.	MADHYA PRADESH	839.70	872.70	886.00	919.00	841.70	869.50	887.30	915.10
10.	MAHARASHTRA	831.50	863.10	877.20	909.20	833.70	860.50	878.70	905.60
11.	ORISSA	869.00	903.10	917.00	951.10	870.60	899.50	917.90	946.80
12.	PONDICHERRY	822.70	855.10	868.00	900.40	825.00	852.20	869.70	896.80
13.	PUNJAB	903.60	939.10	953.70	989.10	904.70	935.00	954.00	984.30
14.	RAJASTHAN	881.30	915.90	930.00	964.60	882.70	912.10	930.70	960.10
15.	UTTAR PRADESH	868.90	903.10	917.00	951.10	870.60	899.50	918.00	946.80
16.	WEST BENGAL	826.60	875.10	872.10	921.50	828.80	871.90	873.70	917.60
17.	CHHATISGARH	-	871.10	-	917.30	-	868.00	-	913.50
18.	UTTARANCHAL	-	883.10	-	930.00	-	879.80	-	926.00

Source: http://fcamin.nic.in/pol_proc_price.htm.

Table A.5—Base Year (2000-01) Elasticities

STATE	OWN PRICE ELASTICITY OF DEMAND		INCOME ELASTICITY OF DEMAND		CROSS PRICE ELASTICITY OF DEMAND		PRICE ELASTICITY OF SUPPLY	
	WHEAT	RICE	RICE	WHEAT	RICE	WHEAT	WHEAT	RICE
Andhra Pradesh	-2.403	-0.888	0.320	0.370	0.050	0.100	0.090	0.060
Assam	-0.669	-0.806	0.330	0.380	0.040	0.100	0.090	0.060
Bihar	-0.669	-0.806	0.330	0.380	0.040	0.100	0.090	0.115
Goa	-1.250	-1.322	0.320	0.370	0.050	0.100	0.090	0.090
Gujarat	-1.240	-1.152	0.310	0.360	0.050	0.100	0.090	0.115
Haryana	-0.533	-1.037	0.320	0.370	0.050	0.100	0.090	0.060
Himachal Pradesh	-0.426	-0.995	0.320	0.370	0.050	0.100	0.090	0.090
Jammu & Kashmir	-0.426	-0.995	0.320	0.370	0.050	0.100	0.090	0.090
Karnataka	-1.250	-1.322	0.320	0.370	0.050	0.100	0.090	0.115
Kerala	-1.933	-0.750	0.310	0.360	0.050	0.100	0.090	0.115
Madhya Pradesh	-1.186	-0.558	0.320	0.370	0.050	0.100	0.090	0.115
Maharashtra	-0.764	-0.984	0.310	0.360	0.050	0.100	0.090	0.115
Orissa	-2.403	-0.888	0.320	0.370	0.050	0.100	0.090	0.115
Punjab	-0.043	-0.995	0.320	0.370	0.050	0.100	0.090	0.060
Rajasthan	-1.047	-1.832	0.330	0.380	0.040	0.100	0.090	0.115
Tamil Nadu	-1.933	-0.750	0.310	0.360	0.050	0.100	0.090	0.090
Uttar Pradesh	-0.669	-0.806	0.330	0.380	0.040	0.100	0.090	0.060
West Bengal	-1.186	-0.558	0.300	0.370	0.050	0.100	0.090	0.060
Average	-1.113	-0.969					0.090	0.091

Sources: Gulati and Kelly (1999), page 148-149; Murty (1997), page B-33, Jha and Srinivasan (1999).

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