The impact of rising food prices on household welfare in India

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Abstract

Food prices have more than doubled between mid-2006 and mid-2008, creating major distress among the poor across the world, but also gainers among farm producers. While transmission was largely averted in India, increasingly open food markets indicate the need to anticipate the welfare implications of a repetition of such events in the future. This paper simulates the welfare effects of the rise in the international price of cereals and edible oils on a comprehensive typology of Indian households. Results show that large farmers (with farm size of one hectare and more) would have gained as a group, and that the average gain is large for those who gain, but that 59% of them in fact lose. The main category of poor households negatively affected by the rise in prices is rural (representing 77% of all losing poor households), both farmers and non-farmers. This is contrary to conventional wisdom that looks at the urban poor as the main category to be sheltered from rising prices through safety net measures, and expects most farmers to gain. These rural households account for 79% of the aggregate welfare loss among the poor. This makes a forceful case for the need to look beyond the urban poor when food prices rise.

Introduction

The international market experienced a dramatic surge in the price of many food commodities between 2005 and mid-2008, with prices still remaining today significantly above the 2005 level. An important policy issue is to determine who is being hurt and benefited by such a food crisis. Urban and rural non-farm households are most likely to be the main losers from the price change, and proportionately more so the poorer since they have higher food budget shares. Conventional wisdom is that the increase in food prices should benefit farm households because agricultural activities are their main business. However, the actual benefits for them of higher food prices may be less than expected because benefits depend not on what they produce but on their net sales of these products. And many of them buy to make up for the deficit in production relative to household consumption. So it is important to carefully identify who gains and who loses among farm households, and how much more do non-farm households actually lose.

We start with a short section on the methodology that we use to simulate the welfare impact of rising food prices. We then observe in section 2 the price changes in India and discuss which price increase to simulate. Section 3 discusses the use and comparability of the National Sample

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Surveys of 2003 (round 59) and 2004-05 (Round 61) for farmer and non-farmer households, where farmers are defined by households cultivating land.[1] Household production and consumption patterns, and simulations of welfare gains and losses are reported in section 4 for farmer and non-farmer households, separately. We aggregate these results and conclude in section 5.

1. Methodology for analyzing the welfare impact of selected price increases[2]

The theoretical foundation to use the change in real income as a first approximation to the change in welfare is based on a concept similar to that of compensating variation, which is the money-metric loss in welfare due to changes in consumption prices and income. Its expression is best derived from the indirect utility function.

Consider a household that produces and consumes food and non-food items (the non-food items in production and consumption are usually not the same), and receives income from wage labor and transfers. Its indirect utility function can be written as:

$$V = V\left(p, y = p_F q_F + p_{NF} q_{NF} + wL + T\right),$$

where q_F and q_{NF} are production of food and non-food (this can include inputs, with a negative sign), labor income wL as the product of wage w and employment L, and T other incomes such as transfers. Production and labor supply are set at the levels that maximize utility. Taking first derivatives and using Roy's theorem gives:

$$dV = \frac{dV}{dy}\left[p_F \left(q_F - c_F\right) d\ln p_F + p_{NF}\left(q_{NF} - c_{NF}\right) d\ln p_{NF} + Lw\ d\ln w \ \right]. \qquad (1)$$

In this expression, one should think of non-food as a vector of items, some of them solely consumed, $q_{NF} = 0$, others solely produced, $c_{NF} = 0$. The expression in square brackets is a measure of the change in real income induced by changes in prices and wage, which is equal to the change in utility in money-equivalent.[3] An increase in the food price p_F has therefore a positive welfare effect if the household is a net seller of food and a negative welfare effect if it is a net buyer. Note that the effect is proportional to the net sale/purchase of the product. If changes in producer prices are different from change in consumer prices, this expression requires use of the consumer (purchase) price for net purchases and of the producer (sale) price for net sales. This derives from the standard household model with transactions costs on markets, in

[1] Round 59 was carried out in January to December 2003 and Round 61 in July 2004 to June 2005.

[2] This section draws on de Janvry and Sadoulet (2008).

[3] This is equivalent to a generalization of the compensating variation measure given by the change in

$$B = e\left(u_0, p, w\right) - y\left(p, w\right),$$

where e is the expenditure function and y the profit function, i.e., the maximum income a household can obtain given prices and wages. Total differentiation gives dB equal to the negative of the term in brackets in equation (1), noted dW below.

which the opportunity cost of consumption for a net seller is the sale price, while the opportunity cost of production for a net buyer is the purchase price.

The welfare effect of price increases is therefore measured by:

$$dW = p_F \left(q_F - c_F\right) d\ln p_F + p_{NF} \left(q_{NF} - c_{NF}\right) d\ln p_{NF} + Lw \; d\ln w \quad . \qquad (2)$$

This expression assumes that other incomes (noted as transfers T) remain constant. Hence, price and wage changes have to be measured relative to all other sources of income.

Two important caveats are in order regarding the use of this formula. First, it ignores substitutions between goods in consumption and in production in response to relative price changes.[4] This implies an overestimation of the welfare loss in consumption, and an underestimation of the income gain in production, that could be obtained by switching out of the consumption and into the production of the higher priced crops. Those second-order effects are however likely to be of small magnitude compared to the first-order effects. Second, while using marginal analysis techniques is adequate for small changes in prices, it may not be sufficient for an analysis of larger price changes as currently contemplated in the food crisis.

This method was used by Chen and Ravallion (2003) to measure the impact of changes in prices anticipated to follow the entry of China in the WTO, and has since been used in many studies on the impact of the food price crisis. Note that the essence of the method is to measure a welfare effect for each household as a function of its own income and consumption structures. It is therefore particularly well suited to analyze heterogeneity of impacts across different types of households. This welfare measure provides a money metric of the welfare effect of a price increase. Welfare effects can be computed from observations of the values of purchases and sales of the goods (consumption goods, production outputs, and inputs) whose prices are affected. Note that one does not need have a full account of all incomes or all expenditures or consumptions to perform this welfare analysis. It is however common to report welfare effects relative to some aggregate pre-crisis welfare level, using for example aggregate expenditures. In what follows, we report welfare effects as percentage change relative to total household expenditures (including home produced goods), dW/E_0, where E_0 is total expenditures prior to the price change.

2. The food price increase in India, 2006-2008.

While food prices have increased sharply on the world market, with a composite price index for wheat, corn, and rice doubling over the last three years, and the price of rice doubling in just four months early 2008, this has not been the case in India (Figure 1). Government has intervened to contain the rise in prices through trade and stocks policies, and also through increased fiscal expenditures on agricultural subsidies to fertilizers, pesticides, electricity, and diesel. Instead of growing at the high rates of international prices, cereal prices have increased at an annual rate of

[4] There is a generalization of the expression using second order derivatives, but its implementation would require knowledge of the main cross-price elasticities (de Janvry and Sadoulet, 2008).

6.4-6.8% between March 2006 and March 2008 (Table 1). Only oilseeds have seen a large price increase of 24% per year. With an overall 6% inflation rate during the same period, there has been no increase in the real price of cereals over the past two years.

In what follows, we will consequently simulate what the incidence of gains and losses would have been had there been price transmission from border into domestic prices. In order to isolate the effect of these drastic price changes, we assume that only the cereal and oil real prices would have increased, by the difference between the international price increase and the domestic inflation. We are studying first round effects, under the strong underlying assumption that these cereal and oil price increases of 28 to 52% would not have affected other prices and domestic inflation. In spite of these restrictive assumptions, the potential incidence of international price transmission across categories of households, particularly the poor, is revealing of differential exposure to price risks, and differential needs for compensation.

3. Population structure and welfare levels.

Calculating the net gains from price changes using equation (2) requires information on households' purchases and sales of food products. Only the NSS survey of 2003, Rd 59, provides sufficient information on crop production to be able to assess the income effects for farmers, defined as households cultivating land. On the other hand this survey does not cover any non-farmers. We will therefore treat farmers and non-farmers separately, using the survey of 2003 for farmer households and that of 2004-05 in Rd 61 for non-farmer households.

In 2004-05, two schedules were fielded that include information on consumption. Schedule 1 has detailed information on the consumption of many items and serves for the calculation of poverty rates. Schedule 10 has a shorter consumption module, similar to the consumption module in Rd 59 for farmer households.[5] The comparison of poverty rates and real consumption per capita computed from the two surveys shows some discrepancies (Table 2). With schedules 1 and 10 having the same sampling frame, it is not surprising that the distribution of households by rural/urban location and farmer status (defined as cultivating land) is the same in the two schedules. The average aggregate real consumption corrected for spatial price differences is also the same, but the distribution is slightly different, leading to a difference in poverty rates (Figure 2a). Small differences in real consumption per capita translate into substantial differences in poverty rates because the poverty line is so close to the mode of the distribution. Comparing farmers in Rd 61 in either schedule and farmers in Rd 59 also shows some discrepancies (Table 2 and Figure 2b).[6] Those of course may reflect not only differences in survey instruments but can also be partly due to the poor climatic conditions of 2003. Therefore, as it may be difficult to compare poverty or welfare levels across groups observed in different surveys, we will proceed with separate analyses for farmers and non-farmers, using schedule 10 for non-farmers, because it

[5] Consumption, or expenditures, includes the value of home consumption.
[6] Comparability between real incomes are obtained by inflating incomes of 2003-04 by 6.35% the inflation rate that year, and correcting them for spatial price difference using the ratio of state-sector level poverty lines to the all-India poverty line of 2004-05.

is more comparable to the information in Rd 59, even though it does not contain details on the different cereals that are consumed.

Table 2 shows that urban households have higher welfare level than rural households, and rural farmers than rural non-farmers. The low welfare level of rural non-farmer households is illustrated by their high poverty rate (31.9%), even compared to rural farmer households (25.9%). Among farmers, those with more land are better off. While the per capita consumption of large farmers is 28% higher than that of marginal farmers, their poverty rate (19.2%) is half that of marginal farmers (38.6%), but still high.

4. Simulation of welfare gains and losses from food price increases

Table 3 reports on the importance of the commodities of interest -- cereals and oils -- in household consumption and production for farmer households. While expenditures on edible oils are relatively similar at around 5% of expenditures across household groups, this is not the case for cereals (which also include cereal products). Marginal farmers spend on average 16.8% of their total expenditures on purchase of cereals, mainly rice and wheat, while large farmers spend only 5.6%. Similarly the poorest quintile spends on average 14.7% of its total expenditures buying cereals while the highest quintile spends 5.8%. Symmetrically, sales of cereals are an important source of income for large farmers, amounting to 25.1% of their total expenditures, but only 0.5% for marginal farmers. Despite this large average production of cereals, 60.9% of the population in the large farmer group lives in households that are net buyers of rice, and 26.9% in households that are net buyers of wheat. For marginal farmers, 88.1% and 39.8% are in households that are net buyers of rice and wheat, respectively.

These market positions immediately suggest what would be the incidence of a drastic increase in the price of cereals, wheat and rice in particular. As a group, large farmers should gain and marginal farmers should loose. This is what is observed in the lower panel of Table 3, where we simulate the effect of a price increase of 28.6% for rice, 45.4% for wheat, 34.5% for maize, and 51.8% for oil crops, corresponding to the average annual rate of international price increase relative to the CPI over the two years March 2006 to March 2008. Overall, farmers would be gaining from the cereal price increase, but losing from the large increase in oil prices, leaving them with only a minute positive gain (column 1). But there is great heterogeneity of incidence across farmers: 78% of them will suffer from an average 6.2% loss in welfare, while 22% will gain on average 17.5%.

Across farm sizes, the contrast is also sharp, with all but 1.5% of marginal farmers loosing on average 8.4% in welfare, while large farmers on average gain 7.7% in welfare from their crop sales. Note however that even among “large” farmers (defined as cultivating at least 1ha, which is not very large), a large fraction is net buyer of rice or wheat, and overall 58.9% of them loose from the price increase. The remaining 41.1% however make a hefty gain of 22.5%. The whole distribution of gains and losses is represented in Figure 3. It clearly shows the very large

asymmetry between a large number of losers and a small number of gainers, in all three classes of farmers. There are similar contrasts across quintiles of household expenditures per capita, although less sharp, as would be expected. Only the highest quintile captures an aggregate positive gain, while all other quintiles lose. In the poorest quintile, 87.4% are losing, on average 8.3% in welfare. Numbers of gainers and size of gains and losses increase across the quintiles, still leaving more than two-thirds of the highest quintile losing on average 4.4%.

In Table 4, the incidence analysis is done by agro-ecological region: arid, coastal, hill and mountain, irrigated, and rainfed. This agro-ecological characterization, defined by the National Agricultural Technology Project (NATP) of the Ministry of Agriculture of India, is available for 15 states, which include 74.2% of the farm household population (see Appendix table for the distribution of districts in agro-ecological zones). As can be seen in Table 4, gains are concentrated in the best endowed irrigated region (with 30% of farm households), in which 31.2% of farm households gain on average 18.6% in welfare from their net sales of wheat and rice. It is the only region with an aggregate positive gain for the farm sector. The arid region (with only 2.2% of farm households) presents the sharpest contrast with a large gain from the oil seeds price increase for those producing them, but large losses as consumers from the wheat price increase.

Table 5 reports on the effect of the same price increases on non-farmers, whether rural or urban. By construction non-farmers are all losers in food price increases. Not having a detailed measure of purchase across cereals, we simulate an increase in cereal price of 45%, close to the observed increase in wheat price. Overall, non-farmers incur an 8.9% loss in welfare, 6.7% from the increase in cereal prices and 2.2% from the oil price increase. Poor people loose more in percentage terms that non-poor, and rural more than urban, as a direct consequence of the share of basic foods in the budget of these different groups. The distribution of losses for urban and rural non-farming households, reported on Figure 4, clearly shows the larger losses incurred by rural non-farmers than by urban households.

Rural non-farmer poor households constitute by far the most vulnerable group (Table 5). Purchase of cereals represents 27.9% of their aggregate total expenditures. They suffer large losses in welfare of 15.6%. While the surveys administered to farmers and non-farmers are not exactly the same, the order of magnitude of the differences between the losses of rural landless (15.6%) and of marginal farmers (8.2%) is important. This shows how important access to even a tiny plot of land can be in protecting households in periods of large food price surge.

5. Targeting the categories at risk: preponderance of the rural

In this section we focus on the poor households, and the loss they would incur in this simulation of full transmission of international into domestic real prices for cereals and edible oils. We look at the losses in two ways, first in terms of the relative losses incurred by the poor in each

household category, and second in terms of the distribution of poor losers and of total loss by the poor across household categories.

In order to do this, we pull together the welfare effects for farmers and non-farmers, separately analyzed in the section above. A caveat is thus in order in using these results, as the surveys did not use the same questionnaires and they were fielded in two different years. While the percentage changes in welfare are probably not very sensitive to the differences between the two surveys, this aggregation requires a comparable measure of the base welfare levels for each group. We therefore assume that total expenditures measured in the two surveys (deflated by the observed CPI) are comparable, and we aggregate welfare gains and losses, using the distribution of the poor in farmer/non-farmer households from Rd 61, Sch. 10.

Results in Table 6 show the tremendous preponderance of rural households among the losing poor. The largest losers, both in absolute level and as a share of their pre-crisis total expenditures, are the rural non-farmer households. They represent 30.8% of the poor population. Their expenditure level is reduced by 15.6% and they absorb 39.7% of the total loss incurred by the poor. Next come the marginal farmers who (surprisingly) lose nearly as much as the urban: 10.6% of their expenditure level compared to 11.7% for the urban poor. Considering together all farmer households, they account for a surprising 43.9% of all poor losers. Expectations that farmers would gain from rising food prices are thus largely not met. 85.4% of all poor farmers in fact lose, 98.6% among marginal farmers. Considering together poor farmers and poor rural non-farmers – i.e., the rural poor –, they account for 77.1% of all poor losers and 78.6% of expenditure losses across all poor. Clearly, the rural poor, both landless and landed, are the main losers from a rise in the price of staple foods.

This result is highly significant from a policy standpoint. Much of the response to the food crisis across the world has been focused on the urban poor for three reasons. The first is that they are presumed to be the main losers, when in fact in India they account for only 22.9% of the total number of poor losers, and 21.4% of total expenditure losses among the poor. The second is that they are easier to reach, typically through urban ration shops and cash transfers, sometimes conditional on sending their children to school. And the third is that they are the politically more organized and vocal, close to the seats of government and effective in protesting. However, results show another reality. Rural households are the main categories at risk. Yet, they are difficult to reach through the same instruments as the urban. This indicates how important it is to respond to a food crisis by raising the productivity of land and labor in smallholder farming and facilitating access to even tiny plots of land for landless for rural households to produce more of their own food needs. In general, insufficient attention has been given to approaching the food crisis through improved capacity to produce for home consumption, and insuring that response is achieved in “next harvest” programs delivering quick relief.

References

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Table 1. International and domestic food price increases, 2006-08

	Annual growth rates March 06 - March 08 (%)		
	Domestic WPI	Consumer price	International price
Rice	6.8		34.6
Wheat	6.7		51.4
Maize	6.4		40.5
Oil seeds	24.2		57.8
Cereals		6.5	
Edible oil		21.2	
CPI		6	

International commodity prices: IMF, International Finance Statistics (rice, wheat, maize, soybeans) http://www.imf.org/external/np/res/commod/index.asp

Indian wholesale and consumer prices: http://mospi.nic.in/cso_test1.htm

Table 2. Consumption per capita and poverty rates from NSS Rd 59 and Rd 61

	Total	Urban		Rural		Farmers (Round 59)			
		Farmers	Non-farmers	Farmers	Non-farmers	Total	Marginal	Small	Large
	Round 61, Sch 1								
Share of households (%)	100	2.2	25.3	42.4	30.1	100.0	24.3	50.2	25.5
Monthly per cap. consumption (Rs.)	672	749	797	636	621	562	509	533	650
Poverty rate (%)	27.5	28.1	25.6	25.9	31.9	29.6	38.6	31.9	19.2
	Round 61, Sch 10								
Share of households (%)	100	2.1	25.4	41.5	31.0				
Monthly per cap. consumption (Rs.)	671	712	824	624	618				
Poverty rate (%)	24.2	28.3	24.5	22.1	27.2				

Note: Marginal farmers are households with less than 0.2 ha of land in use, small farmers with between 0.2 ha and 1 ha, and large farmers with more than 1 ha of land in use. Consumption per capita is expressed in all-India price in 2004 (Rd. 61). The Rd. 59 consumption per capita is corrected for spatial price differential using the Rd. 61 correction ratios and an inflation rate of 1.0635 between 2003 and 2004. The poverty line in all-India price is 406.56 Rs. Exchange rate in 2004 is 45.6 Rupees per US$.

Table 3. Welfare effects of cereal and oil price changes - Farmers (Rd 59)

		By farm size			By quintile of total expenditures per capita				
	All	Marginal	Small	Large	Lowest	2	3	4	Highest
Household purchases and sales (as % of total expenditures)									
Household food purchases									
Rice	5.8	10.5	6.2	3.1	8.7	6.9	6.0	5.4	3.9
Wheat	3.3	6.1	3.0	2.4	5.6	4.4	3.4	3.0	1.9
Maize	0.1	0.2	0.2	0.1	0.4	0.2	0.1	0.1	0.0
Edible oils	4.5	4.9	4.7	4.0	5.5	5.0	4.9	4.5	3.4
Value of food product sales									
Rice	6.0	0.3	3.3	11.4	3.6	3.4	4.4	5.5	9.8
Wheat	6.0	0.2	2.2	12.6	2.3	3.8	5.0	5.1	10.0
Maize	0.6	0.0	0.4	1.1	0.4	0.6	0.6	0.6	0.8
Oil crops	2.2	0.1	0.7	4.7	0.5	0.9	1.7	1.8	4.2
Production expenses									
Fertilizer	6.7	1.1	4.6	11.4	4.0	5.2	6.1	7.1	8.8
Pesticides	2.1	0.3	1.1	3.9	0.8	1.1	1.6	2.0	3.5
Net buyers (% of population)									
Rice	69.8	88.1	67.0	60.9	72.8	70.1	70.0	68.2	68.0
Wheat	30.1	39.8	27.7	26.9	34.2	31.5	29.2	28.9	26.8
Maize	8.1	11.7	7.9	5.7	10.8	8.3	7.8	6.7	6.9
Net welfare gains (as % of total expenditures)									
From rice price	0.1	-2.9	-0.8	2.4	-1.5	-1.0	-0.5	0.0	1.7
From wheat price	1.2	-2.7	-0.4	4.6	-1.5	-0.3	0.7	1.0	3.7
From oil prices	-1.2	-2.5	-2.1	0.4	-2.6	-2.1	-1.6	-1.4	0.4
Overall gain	0.3	-8.2	-3.2	7.7	-5.5	-3.2	-1.2	-0.2	6.0
Average loss for losers	-6.2	-8.4	-5.8	-5.0	-8.3	-7.1	-6.3	-5.8	-4.4
Average gain for gainers	17.5	5.5	7.3	22.5	11.5	11.3	13.4	14.7	23.7
Net losers (% of pop.)	78.0	98.5	80.2	58.9	87.4	81.3	77.7	75.5	67.8

All expenditures have been adjusted by the spatial price deflator from Rd 61.
Note: Simulation are of average annual percent changes of international prices from April 2006 to March 2008, relative to CPI: rice (28.6), wheat (45.4%), maize (34.5%), and oil crops (51.8%).
Source: NSS Rd 59th

Table 4. Welfare effects of cereal and oil price changes – Farmers, by agroecological regions (Rd 59)

	By agroecological regions (NATP)				
	Arid	Coastal	Hill & mountain	Irrigated	Rainfed
Share of households (%)	2.2	4.9	1.5	30.4	35.2
Household purchases and sales (as % of total expenditures)					
Household food purchases					
Rice	0.5	10.3	7.2	3.9	5.3
Wheat	8.4	0.8	1.4	3.7	3.7
Maize	0.0	0.0	0.0	0.1	0.2
Edible oils	4.4	3.6	4.7	3.8	5.2
Value of food product sales					
Rice	0.0	3.6	5.5	9.0	4.1
Wheat	1.3	0.0	2.3	9.6	4.1
Maize	0.0	0.0	0.1	0.4	0.8
Oil crops	9.4	0.4	0.3	2.0	2.4
Production expenses					
Fertilizer	2.8	4.6	3.9	6.6	7.1
Pesticides	0.9	0.9	0.7	1.8	2.2
Net buyers (% of population)					
Rice	53.8	77.9	64.2	63.2	75.1
Wheat	55.5	26.9	21.0	24.9	40.3
Maize	1.0	0.7	2.6	11.7	6.7
Net welfare gains (as % of total expenditures)					
From rice price	-0.1	-1.9	-0.5	1.5	-0.4
From wheat price	-3.2	-0.3	0.4	2.7	0.2
From oil prices	2.6	-1.6	-2.3	-0.9	-1.5
Overall gain	-0.8	-3.9	-2.3	3.3	-1.4
Average loss for losers	-5.9	-5.3	-5.5	-6.0	-6.2
Average gain for gainers	25.8	10.5	6.4	18.6	15.5
Net losers (% of population)	85.9	92.0	76.3	68.8	82.0

All expenditures have been adjusted by the spatial price deflator from Rd 61. NATP agroecological regions are available for 15 states only, including 74.2% of the farmer household population. (source: Himanshu, PhD dissertation, see Appendix Table for allocation of districts to regions)
Note: Simulation are of average annual percent changes of international prices from April 2006 to March 2008, relative to CPI: rice (28.6), wheat (45.4%), maize (34.5%), and oil crops (51.8%).
Source: NSS Rd 59th

Table 5. Welfare effects of cereal and oil price changes - Non-farmers (Rd 61)

	By location and poverty status					By quintile of total expenditures per capita				
	All	Urban poor	Urban non-poor	Rural poor	Rural non-poor	Lowest	2	3	4	Highest
Share of households (%)	100	11.2	34.5	14.8	39.5					
Household purchases (as % of total expenditures)										
Cereals	14.9	19.9	9.7	27.9	17.0	25.0	21.0	18.0	14.1	7.8
Edible oils	4.2	5.3	3.4	5.9	4.7	5.7	5.3	5.0	4.4	2.9
Net welfare gains (as % of total expenditures)										
Simulated price increase: cereals (45%), edible oil (52%)										
From cereal price	-6.7	-9.0	-4.4	-12.6	-7.6	-11.3	-9.4	-8.1	-6.3	-3.5
From oil price	-2.2	-2.7	-1.8	-3.0	-2.4	-2.9	-2.8	-2.6	-2.3	-1.5
From cereal and oil prices	-8.9	-11.7	-6.1	-15.6	-10.1	-14.2	-12.2	-10.7	-8.6	-5.0

All expenditures have been adjusted by the spatial price deflator. Quintiles defined on monthly per capita total expenditure.
Note: Simulated price changes are percentage international price changes from April 2006 to March 2008, relative to CPI.
Source: NSS Rd. 61, Schedule 10 for 70492 non-farming households.

Table 6. Distribution of losses across categories of poor households

	Farmers, by farm size			Non-farmers, by location		All	All farmers
	Marginal	Small	Large	Rural	Urban	farmers	and rural
Net welfare gains of poor							
Overall gain (% of total expenditures)	-10.6	-4.5	1.1	-15.6	-11.7	-4.7	-9.0
Net losers (% of population)	98.6	84.1	69.1	100.0	100.0	85.4	91.1
Average loss for losers (% of total exp.)	-10.8	-7.0	-5.8			-7.9	-11.2
Average gain for gainers (% of total exp)	4.0	8.4	15.4			11.7	
Average loss for losers (in 2004 Rs)	2916	2120	2247	3752	2930	2401	2982
Distribution across household categories							
Share of poor population	13.6	25.1	9.1	30.8	21.3	47.9	78.7
Share of poor losers	14.4	22.7	6.8	33.2	22.9	43.9	77.1
Share of loss by poor	13.6	18.3	7.0	39.7	21.4	38.9	78.6

All expenditures have been adjusted by the spatial price deflator from Rd 61. Values in 2003 adjusted for the 6.35 rate of inflation in
Note: Simulation are of average annual percent changes of international prices from April 2006 to March 2008, relative to CPI: rice (28.6), wheat (45.4%), maize (34.5%), and oil crops (51.8%).
Source: Shares of population by urban/rural farmers/non-farmers from Rd 61, Schedule 10. All other information from NSS Rd. 59 for farmers and NSS Rd. 61, Sch. 10, for non-farmers.

Figure 1. Evolution of Indian and international cereal prices, 2002-2008

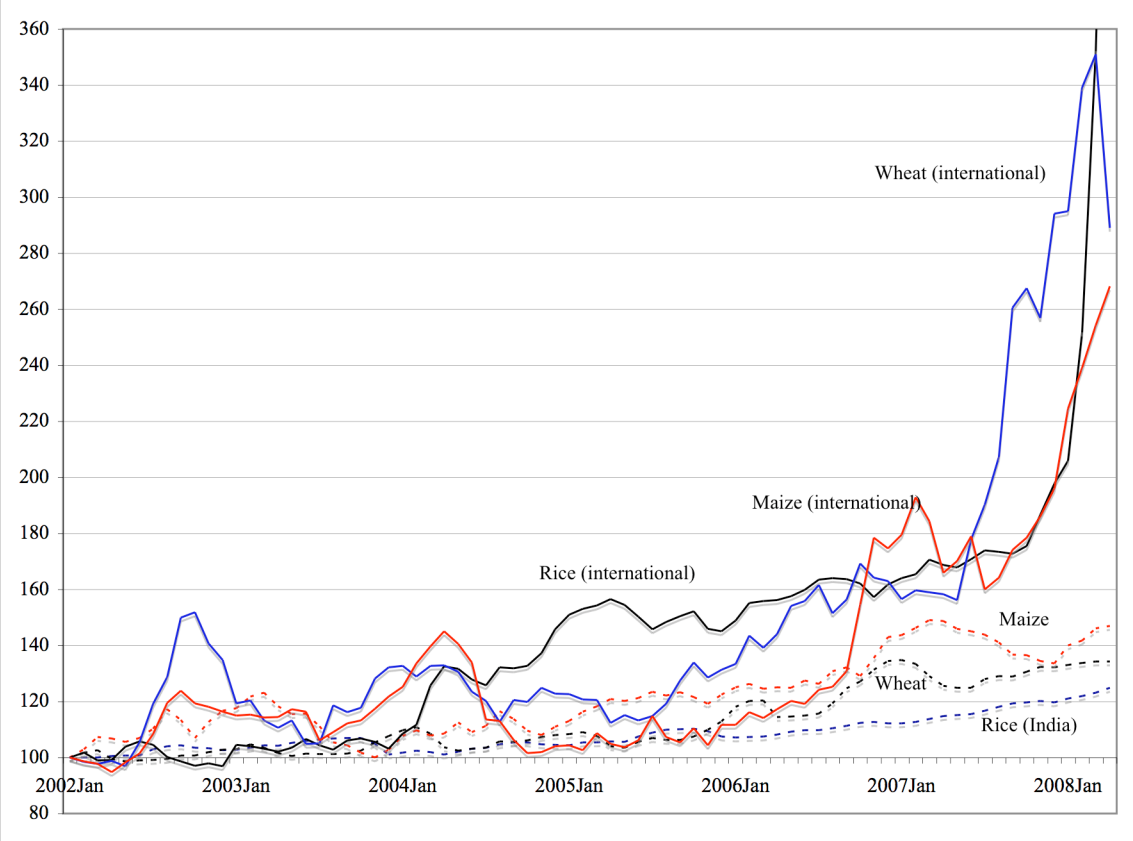
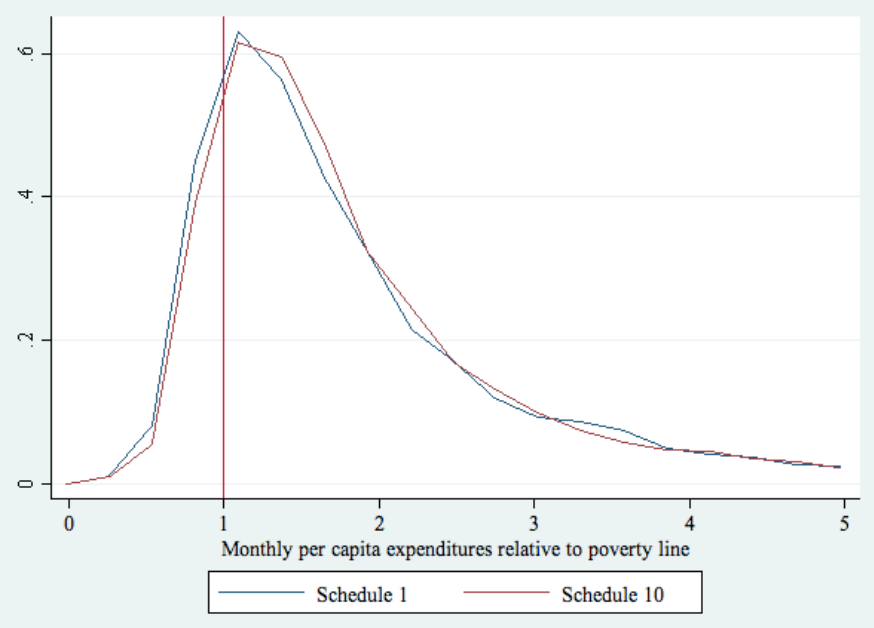


Figure 2. Distribution of household per capita expenditures in the different surveys

a. Round 61



b. Farmers only

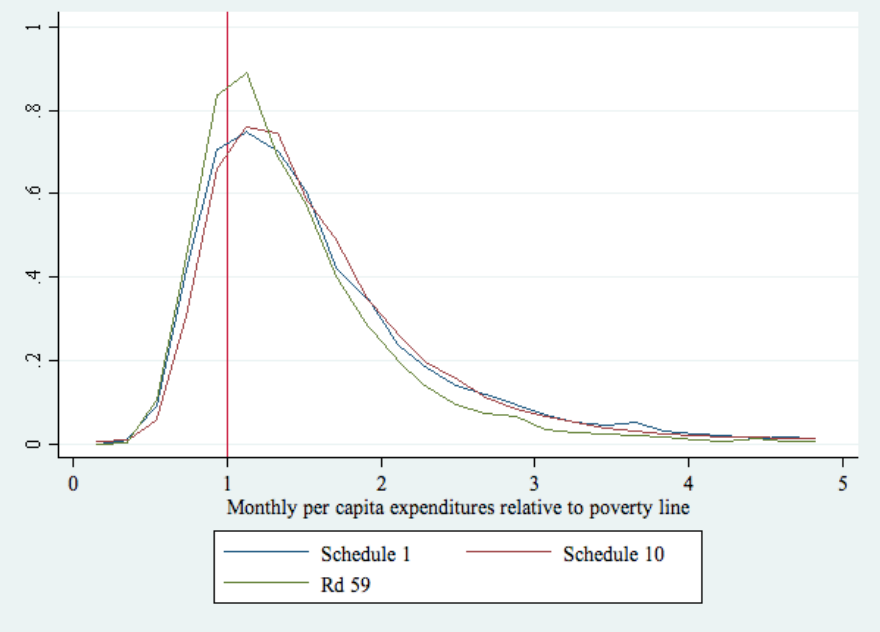


Figure 3. Distribution of net gains from the world price changes by farm household category

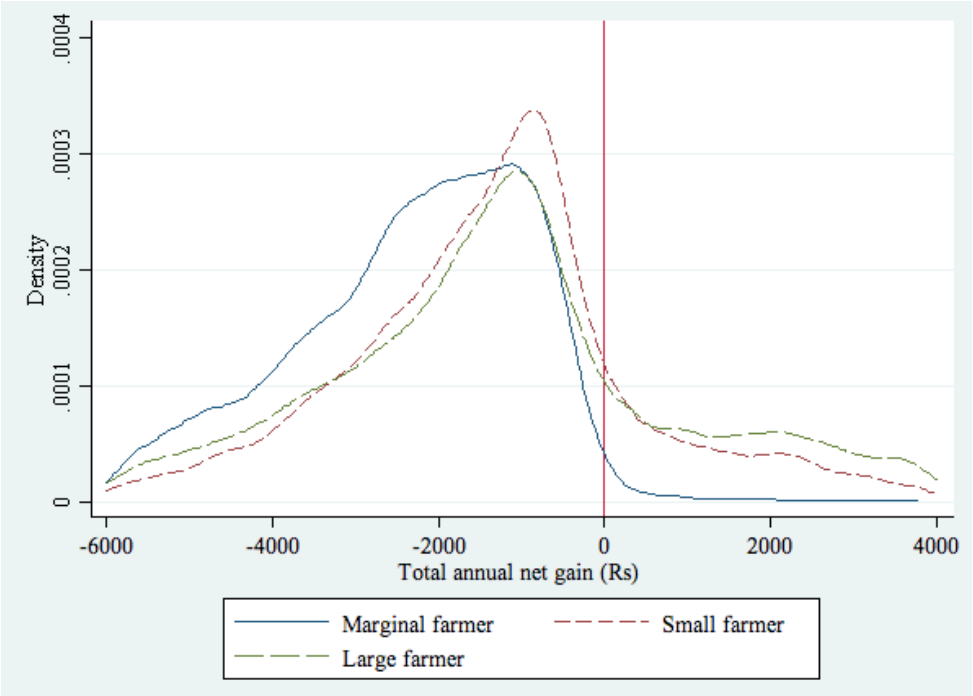
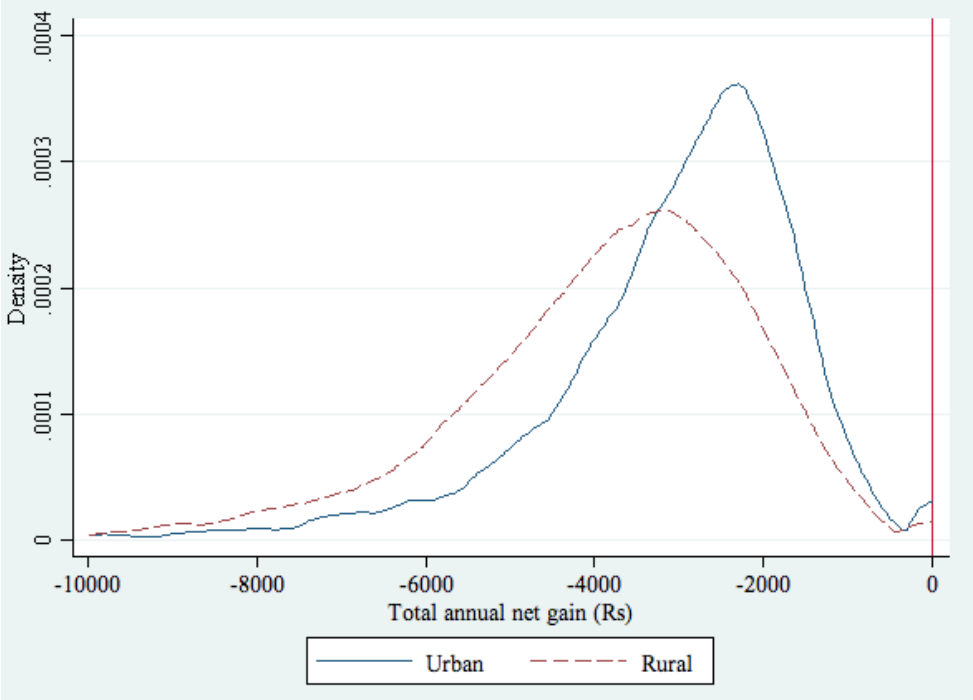


Figure 4. Distribution of losses from the world price changes for non-farmers, by sector



Annex Table : Distribution of districts by agro-ecological zones

Arid
Rajasthan (Barmer, Bikaner, Churu, Jaisalmer, Jalore, Jhunjhunu, Jodhpur, Nagaur, Pali, Sikar, Sirohi)
Gujarat (Banaskantha, Jamnagar, Kutch, Rajkot)
Coastal
Andhra Pradesh (East Godavari, Guntur, Krishna, Nellore, Prakasam, Srikakulam, Vishakhapatnam, Vizyanagaram, West Godavari)
Karnataka (Dakshin Kannada, Uttar Kannada)
Kerala (Alappuzha, Ernakulam, Idukki, Kannur, Kasaragod, Kollam, Kottayam, Kozhikode, Malappuram, Palakkad, Pathanamthitta, Thiruvanathapuram, Thrissur, Wayanad)
Maharashtra (Bombay, Raigarh, Ratnagiri, Sindhudurg, Thane)
Orissa (Baleshwar, Cuttack, Ganjam, Puri)
Tamil Nadu (Chengai Anna, Kanyakumari, Madras, Ramanathapuram, South Arcot, Thanjavur)
Hill & Mountain
Assam (Cachar, Hailakandi, Karbi-Anglong, Karimganj, N.C. Hills)
West Bengal (Darjiling, Jalpaiguri)
Uttar Pradesh (Almora, Chamoli, Dehradun, Garhwal, Nainital, Pithoragarh, Tehri Garhwal, Uttarkashi)
Irrigated
Bihar (Aurangabad, Begusarai, Bhagalpur, Bhojpur, Darbhanga, Gaya, Gopalganj, Jehanabad, Khagaria, Madhepura, Madhubani, Munger, Muzaffarpur, Nalanda, Newada, Pashchim Champaran, Patna, Purbi Champaran, Purnea, Rohtas, Saharsa, Samastipur, Saran, Siwan, Vaishali
Haryana (Ambala, Bhatinda, Faridabad, Faridkot, Jind, Kaithal, Karnal, Kurukshetra, Panipat, Sonipat, Bhiwani, Gurgaon, Hissar, Mahendragarh, Rewari, Rohtak, Sirsa, Yamunanagar)
Punjab (Amritsar, Firozpur, Gurdaspur, Hoshiarpur, Jalandhar, Kapurthala, Ludhiana, Patiala, Roopnagar, Sangrur)
Uttar Pradesh (Agra, Aligarh, Allahabad, Azamgarh, Bahraich,Ballia, Barabanki, Bareilly, Basti, Bhatinda and Faridkot, Bijnor, Budaun, Bulandshahar, Deoria, Etah, Etawah, Faizabad, Farrukhabad, Fatehpur, Firozabad, Ghaziabad, Ghazipur, Gonda, Gorakhpur, Hardoi, Haridwar, Jaunpur, Kanpur(Rural and Urban), Kheri, Lucknow, Maharajganj, Mainpuri, Mathura, Mau, Meerut, Mirzapur, Moradabad, Muzaffarnagar, Pilibhit, Pratapgarh, Rae-bareli, Rampur, Saharanpur, Shahjahanpur, Siddharthanagar, Sitapur, Sonbhadra, Sultanpur, Unnao, Varanasi)
West Bengal (Bardhaman, Birbhum, Calcutta, Haora, Hugli, Maldah, Murshidabad, Nadia, 24 Parganas)
Rajasthan (Alwar, Bharatpur, Ganganagar and Jaipur)
Rainfed
Andhra Pradesh (Adilabad, Anantapur, Chittor, Cuddapah, Hyderabad, Karimnagar, Khammam, Kurnool, Mahbubnagar, Medak, Nalgonda, Nizamabad, Rangareddi, Warangal)
Assam (Barpeta, Bongaigaon, Darrang, Dhemji, Dhubri, Dibrugarh, Goalpara, Golaghat, Jorhat, Kamrup, Kokrajhar, Lakhimpur, Marigaon, Nagaon, Nalbari, Sibsagar, Sonitpur, Tinsukia)
Bihar (Deoghar, Dhanbad, Dumka, Giridh, Godda, Gumla, Hazaribag, Katihar, Kishangunj, Lohardagga, Palamu, Singhbhum (East and West), Ranchi, Araria, Sahibganj and Sitamarhi)
Gujarat (Ahmedabad, Amreli, Bharuch, Bhavnagar, Gandhinagar, Kheda, Junagarh, Mehsana, Panch Mahals, Sabarkantha, Surat, Surendranagar, The Dangs, Vadodara, Valsad)
Karnataka (Bangalore, Belgaum, Bellary, Bidar, Bijapur, Chikamagalur, Chitradurga, Dharwad, Gulbarga, Hassan, Kodagu, Kolar, Mandya, Mysore, Raichur, Shimoga, Tumkur)
Madhya Pradesh (Balaghat, Bastar, Betul, Bhind, Bhopal, Bilaspur, Chhatarpur, Chhindwara, Damoh, Datia, Dewas, Dhar, Durg, East Nimar, Guna, Gwalior, Hoshangabad, Indore, Jabalpur, Jhabua, Mandla, Mandsaur, Morena, Narsinghpur, Panna, Raigarh, Raipur, Raisen, Rajgarh, Rajnandgaon, Ratlam, Rewa, Sagar, Satna, Sehore, Seoni, Shahdol, Shajapur, Shivpuri, Sidhi, Surguja ,Tikamgarh, Ujjain, Vidisha, West Nimar)
Maharashtra (Ahmadnagar, Akola, Amravati, Aurangabad, Bhandara, Beed, Buldhana, Chandrapur, Dhule, Nasik, Jalgaon, Jalna, Kolhapur, Latur, Nagpur, Nanded, Osmanabad, Parbhani, Pune, Sangli, Satara and Solapur, Wardha, Yeotmal)
Orissa (Bolangir, Dhenkanal, Kalahandi, Keonjhar, Koraput, Mayurbhanj, Phulbani, Sambalpur, Sundergarh)
Rajasthan (Ajmer, Banswara, Bhilwara, Bundi, Chittaurgarh, Dholpur, Dungarpur, Gadchirol, Jhalawar, Kota, Sawai Madhopur, Tonk, Udaipur)
Tamil Nadu (Chidambaranar, Coimbatore, Dharmapuri, Dindigul Anna, Kamarajar, Madurai, Nilgiri, North Arcot, Pasumpon Thevar, Periyar, Puddukottai, Salem, Tiruchirapalli, Tirunelveli, Tiruvannamalai)
Uttar Pradesh (Banda, Hamirpur, Jalaun, Jhansi, Lalitpur)
West Bengal (Purulia, West Dinajpur, Bankura, Medinapur, Koch Bihar)

Note: The table includes all districts existing in 1991 for fifteen states.
Source: Himanshu (2005), Appendix A.