



Impact of rising food prices on food security in Rajasthan and Gujarat

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ABSTRACT

A large area of Gujarat and Rajasthan is rain-fed exposing rural population to food prices spike due to frequent droughts. The present study was conducted in year 2020 and is based on NSSO data on household consumption expenditures of rural households of these states for the year 2009 to analyse the effects that food price changes have on food expenditure and calorie intake. The results show a strong negative effect of price rises on calorie intake. The negative impact of prices of foods particularly wheat, and milk is more on richer than on poorer households as they have the capability to cut calorie intake in the event of a price rise while its opposite for coarse cereals. The food prices particularly, milk, wheat and, pulses also have highly positive influence on food expenditure of poorer households. Rice price does not have much significant effect on food security in both the states.

Keywords: Food security, Food prices, Gujarat, Rajasthan

The production of foodgrains, pulses, milk, and edible oils has reached unprecedented levels, yet food security is an important issue as per capita availability is very low. Agriculture in India is still highly dependent on rain and a drought can weaken food security as the demand-supply imbalance aggravates the food price inflation. Further, price volatility has a strong impact on food security because it affects household incomes and purchasing power (FAO 2011).

According to a report by Institute for Human Development and World Food Programme (2010), rural areas of Rajasthan were under the grip of severe food insecurity with 22 of its 32 districts being labelled as ‘most food insecure’. Dand and Chakravarty (2006) in their study in Rajkot district of Saurashtra, found high prevalence of large scale food insecurity with less than 10% of the population surveyed found to be food secure all twelve months in a year. Gujarat is one of the five states where there has been strong to moderate agricultural growth and very poor nutrition outcomes (Headey *et al.* 2011). Both are drought-prone states as large parts are arid and semi-arid. Small and marginal farmers and agricultural farmers who are net consumers are affected very badly when the prices go up during drought.

In this paper, we examined the effects of prices of

different foods on food security of rural areas of Gujarat and Rajasthan. We first employ OLS and then quantile regression to see the response of rural population to the prices of major food products in terms of calorie intake and Real Monthly per Consumer Unit Food Expenditure (MPCFE). We hypothesise that impact of food prices changes will be more on those at lower quantiles of both the MPCFE and calorie intake distributions as the consumers belonging to lower end are poor ones and are severely hit by the price rise. Also, the impact of food prices on energy intake will be minimal on lower quantiles and will go on increasing across the distribution as they don't have the capacity to reduce the calorie intake which is already compromised.

MATERIALS AND METHODS

The present study was carried out during 2020 and is based on NSSO data on household consumption expenditure conducted in 2009–10 pertaining to the 66th round. This round covered a total of 540 rural villages in which 4302 households were surveyed encompassing almost all agro-climatic zones of both the states, making the sample a representative one. The food consumption (quantity) was converted into nutrient equivalents for calories and proteins using the conversion tables given in Gopalan *et al.* (1991). Then prices of different food products were calculated using the consumption data, including quantity as well as value. With Calorie Intake as dependent variable, the basic specification of the model is as follows:

$$\log Cal_h = \beta_0 + \beta_1 \log MPCE_h + \beta_2 \log FP_{hp} + \delta HH_h + \varepsilon \quad (1)$$

where, h denotes households. Cal denotes daily calorie intake per consumer-unit (cu); p symbolises different

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food products; *MPCE* is real Monthly per Consumer-unit Expenditure (in ₹) for each household; *FP* is a vector of real prices of different food products, viz. rice, wheat, pulses, and milk (in ₹); *HH* is a vector of household characteristics, viz. characteristics of head of households such as sex (sex = 1 if female and sex = 0 if otherwise), age (in years) and education (education = 1 if passed 8 standard and education = 0 if otherwise); household size (in consumer units). The food products considered in the study are the most common foods consumed by people of both the states and also are the major sources of calories.

When MPCFE is taken as dependent variable, the specification becomes:

$$\log MPCFE_h = \beta_0 + \beta_1 \log MPCE_h + \beta_2 \log FP_{hp} + \delta HH_h + \varepsilon,$$

where, all the terms have the same meaning as mentioned in equation (1) except MPCFE which is Real Monthly per Consumer-unit Food Expenditure (in ₹). *MPCE* and prices of different food products have been taken in real terms. *MPCE* was deflated by the general index of CPI-AL (Consumer Price Index for Agricultural Labour) while prices were deflated by CPI-AL for Food. Prices of different food products have been derived from quantity as well as value data. It is likely to have zero/missing consumption of food products due to which prices of food products for

many households could not be determined. To avoid the dropping of observations, we calculated the average prices of different food products after taking into consideration the district and expenditure quartiles (this was calculated by dividing the *MPCE* distribution into four quartiles for each state) to which each household reporting missing values belonged.

For the purposes of examining food security, the OLS estimator can be potentially misleading. We estimated the parameters above with both ordinary least squares (OLS) and quantile regression (QR) for calorie intake and Real MPCFE. The quantile estimator allows the partial response to vary across the distribution. With the quantile estimator, marginal effects are typically compared at fixed points on the conditional distribution. Following Chamberlain (1994), Nguyen *et al.* (2007), and Stifel and Averett (2009), we use QR at 10th, 25th, 50th, 75th, and 90th quantiles on the calorie intake and Real MPCFE distributions in rural areas of both the states so as to compare marginal effects over the entire sample size.

RESULTS AND DISCUSSION

How food prices influence MPCFE?: The QR results (Table 1) shows that in general, the food prices have a strong influence on lower part of MPCFE distribution

Table 1 Effects of food price increases on Real MPCFE across quantiles

Log MPCFE	OLS	10 th	25 th	50 th	75 th	90 th
Log MPCE	0.6478** (0.0080)	0.5622** (0.0228)	0.6586** (0.0172)	0.7203** (0.0091)	0.7967** (0.0113)	0.8305** (0.0108)
Log wheat price	0.0627** (0.0069)	0.1286** (0.0139)	0.0961** (0.0163)	0.0335** (0.0088)	0.0038 (0.0120)	0.0119 (0.0131)
Log rice price	0.0045 (0.0068)	-0.0177 (0.0142)	-0.0011 (0.0153)	0.0182** (0.0084)	0.0104 (0.0105)	0.0145 (0.0129)
Log milk price	0.1553** (0.0136)	0.1553** (0.0311)	0.1562** (0.0291)	0.1498** (0.0157)	0.1295** (0.0185)	0.0979** (0.0202)
Log pulses price	0.0443** (0.0157)	0.1258** (0.0366)	0.0589 (0.0338)	0.0426* (0.0183)	-0.0087 (0.0227)	-0.0132 (0.0297)
Log coarse cereals price	-0.0029 (0.0150)	0.0235 (0.0323)	0.0005 (0.0303)	0.0320 (0.0189)	0.0236 (0.0255)	0.0104 (0.0368)
Log land possessed	0.0092** (0.0012)	0.0080** (0.0026)	0.0105** (0.0024)	0.0094** (0.0014)	0.0074 (0.0018)	0.0041 (0.0022)
Head sex	0.0765** (0.0102)	0.0520* (0.0245)	0.0866** (0.0198)	0.0838** (0.0129)	0.0726** (0.0175)	0.0608** (0.0177)
Head education	-0.0133 (0.0089)	0.0093 (0.0177)	-0.0261 (0.0179)	-0.0003 (0.0102)	-0.0149 (0.0139)	0.0175 (0.0185)
Household size	-0.0204** (0.0017)	-0.0156** (0.0034)	-0.0162** (0.0034)	-0.0151** (0.0020)	-0.0106** (0.0026)	-0.0106** (0.0033)
Log head age	0.0162 (0.0104)	0.0389 (0.0230)	0.0068 (0.0216)	0.0003 (0.0127)	0.0022 (0.0177)	-0.0024 (0.0243)
Constant	1.0529	0.9063	0.7906	0.6085	0.5089	0.4830
N	4081	4081	4081	4081	4081	4081
R ² /Pseudo R ²	0.7440	0.4254	0.4811	0.5383	0.5969	0.6391

Note: Figures in parentheses indicate the standard error of regression coefficients.

** Significant at 1% level. * Significant at 5% level.

and the impact goes on decreasing as we go higher on distribution. Also, all food prices are significant at lower quantiles (at least for 10th quantile) except rice price. Milk price has greatest and statistically significant effect on MPCFE and shows a slight decline in impact as we go higher on MPCFE distribution. This shows the importance of controlling/regulating milk price which if not controlled, can put huge pressure on food consumption expenditure of all sections of society. The marginal effects of wheat and pulses price are higher and similar at 10th quantile, but the impact goes on decreasing as we move higher on MPCFE distribution. Also, the wheat price is significant in lower quantiles and becomes insignificant at higher quantiles, while the pulse prices are insignificant at even the middle quantiles. It means that in the event of pulse price rise, consumers at lower quantiles will devote a higher share of MPCFE on pulses and if the poor households don't have the extra income then they will resort to either substitution/decrease the pulse consumption. The mean consumption of pulses is 0.71 kg/cu/month, is already very less, keeping in view that pulses along with milk are the only source of protein in predominantly vegetarian states of Rajasthan and Gujarat. So, if pulse price rises, the malnutrition of already economically compromised will be further aggravated.

The rice price has very minimal and insignificant impact on MPCFE across the quantiles due to relatively lower expenditure on rice, i.e. 16.85 ₹/person/month of states as compared to the national average (rural) of 84.98 ₹/person/month (NSSO 2011). Similarly, the coarse cereal price has very less/negligible impact on MPCFE across the quantiles. This can be attributed to reduced preference for coarse cereals as shown by their declining per capita consumption over time (Kumar *et al.*, 2011).

How food prices influence calorie intake?: Data shows that in general, all food prices have expected negative impact on calorie intake (Table 2). The wheat price has a low influence on calorie intake in the lower quantiles and goes on increasing when we move to higher quantiles. Also, the wheat prices are insignificant in lower quantiles as consumers belonging to lower quantile are poor and so their energy intake is already severely compromised; so when the price of wheat rises it will not impact calorie intake as he will divert a larger part of his income on food expenditure. The households in higher quantiles, have the ability to reduce the calorie intake in the event of price rise. This whole argument is called "Ability to cut back". The rice price has lower, uniform and significant impact on calorie intake across the quantiles due to relatively lower

Table 2 Effects of food price increases on daily calorie intake across quantiles

Log Calorie Intake	OLS	10 th	25 th	50 th	75 th	90 th
Log MPCE	0.3872** (0.0078)	0.2845** (0.0184)	0.3856** (0.0173)	0.4137** (0.0073)	0.4600** (0.0099)	0.4983** (0.0096)
Log wheat price	-0.0411** (0.0067)	0.0098 (0.0136)	-0.0201 (0.0168)	-0.0362** (0.0070)	-0.0444** (0.0099)	-0.0839** (0.0106)
Log rice price	0.0333** (0.0066)	0.0384** (0.0125)	0.0138 (0.0160)	0.0372** (0.0065)	0.0412** (0.0086)	0.0447** (0.0099)
Log milk price	-0.0943** (0.0131)	-0.0584* (0.0257)	-0.0953** (0.0283)	-0.0858** (0.0125)	-0.1435** (0.0163)	-0.1468** (0.0166)
Log pulses price	-0.0991** (0.0152)	-0.0783** (0.0291)	-0.0793* (0.0339)	-0.1222** (0.0149)	-0.0982** (0.0184)	-0.1050** (0.0202)
Log coarse cereals price	-0.0630** (0.0145)	-0.0956** (0.0291)	-0.0947** (0.0352)	0.0029 (0.0150)	-0.0353 (0.0215)	-0.0399 (0.0275)
Log land possessed	0.0079** (0.0012)	0.0134** (0.0022)	0.0094** (0.0026)	0.0082** (0.0011)	0.0021 (0.0015)	0.0046** (0.0015)
Head sex	0.0775** (0.0099)	0.0105 (0.0185)	0.0672** (0.0229)	0.0756** (0.0097)	0.0823** (0.0131)	0.1205** (0.0120)
Head education	-0.0408** (0.0086)	-0.0607** (0.0138)	-0.0466** (0.0178)	-0.0288** (0.0079)	-0.0334** (0.0115)	-0.0081 (0.0132)
Household size	-0.0194** (0.0017)	-0.0247** (0.0029)	-0.0122** (0.0035)	-0.0117** (0.0016)	-0.0132** (0.0021)	-0.0155** (0.0022)
Log head age	0.0627** (0.0100)	0.0798** (0.0188)	0.0556** (0.0214)	0.0576** (0.0101)	0.0312** (0.0146)	0.0410* (0.0182)
Constant	5.8106	5.9929	5.7118	5.5552	5.6172	5.5168
N	4081	4081	4081	4081	4081	4081
R ² /Pseudo R ²	0.5404	0.2341	0.2763	0.3416	0.3901	0.4081

Note: Figures in parentheses indicate the standard error of regression coefficients.

** Significant at 1% level. * Significant at 5% level.

consumption of rice as reflected by its weighted mean consumption, i.e. 0.93 kg/person/month of both states as compared to the national average (rural) of 6.140 kg/person/month (NSSO 2011).

This explains why rice price does not have much impact on MPCFE across all sections. The milk price effect on calorie intake again reflects “ability to cut back” argument as lower quantiles have relatively less impact as compared to higher quantiles. This finding is similar to D’Souza and Jolliffe (2012) for wheat price in Afghanistan. But still the milk price effect on calorie intake is much higher than wheat price impact, particularly for lower quantiles. This finding is very significant since a small increase in milk price can jeopardise the energy intake of poor. Further, the pulse price effect is strong, uniform and significant across the quantiles. Similar to milk price, the pulse price rise puts a serious strain on calorie intake of poor ones and therefore, the finding calls for effective controlling of pulse prices. The coarse cereal price effect on calorie intake is exactly opposite to wheat price impact. The plausible explanation for this is that the coarse cereals prices form an important part of the diet of the lower/middle income households in regions where they are grown. Among the major pearl millet producing regions, per capita consumption was highest (69 kg/year) in rural Rajasthan and in the dry areas of Gujarat (59 kg/year). In these two regions, pearl millet accounts for more than 50% of cereal consumption, contributing about 20–40% of the total energy and protein intake (Parthasarathy et al. 2010). Also, the coarse cereals have not been covered effectively under PDS. So when their price rises, the poor consumer is severely hit. An important demographic finding from above tables is that household size negatively affects the food security in the study area across all the quantiles. Further, women-headed households are more food secure than male-headed households. As is evident from both the tables, OLS results are quite different from QR results and mask many of the important phenomena. QR brings out the variation in response of the majority of the variables across the distribution as shown by price of wheat, milk, and pulses in case of MPCFE model, and price of wheat, milk and coarse cereals, when calorie intake is dependent variable. Also, it brought out the insignificance of estimates in specific quantiles which were shown as significant in OLS and vice-versa.

It can be concluded that food security in both the states is seriously compromised. The negative impact of price rise is one of grave concerns to be addressed to ensure the food security particularly in arid and semi-arid regions due to drought and crop failure. The state governments should particularly control the prices of milk and pulses, both of which have adverse impact on food security. The coarse cereals should be roped in PDS through Decentralised Procurement so that poor people get their desired staple

and simultaneously maintain their nutrition. This will, in the long run, help both the producers and consumers. The share of rice can be reduced in PDS in both states and the resultant freed infrastructure can be used for coarse cereals/pulses. The Indian government should re-orient the PDS to make it more location specific. Milk prices should be kept stable in rural areas by the state governments with the help of cooperative sector. The productivity of milk should be further enhanced particularly for local breeds which being resilient to climate change would help in cushioning the milk prices. The laws against black-marketing and hoarding should be implemented in practice. The study also confirms the superiority of QR over the OLS. Gender-sensitisation programmes regarding health and nutrition should be carried out to further the cause of food security through relevant media. Population control measures should be implemented in both the states so as to increase the food security.

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