Roaring Food Prices in India

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Abstract

In this paper, we try to analyze the possible reasons behind food price hike. The motivation of doing this project is to see the probable reasons, which impact "common people" of India to the utmost extent. We concentrate mainly on the supply side, distribution aspects and the demand side. Checking these aspects we try to see their sensitivity in food prices.

Keywords: Wholesale Price Index; Food grain prices; Public investment; Grain orientation; Public Distribution System; Wholesale and retail prices; Per capita net availability of food grains; Durbin-Watson 'd' test; augmented Dicky-Fullar (ADF) test; NREGA.

JEL Classifications: C22, C32, C82, C87, G38, H30.

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Introduction

One of the reasons identified for the present inflationary situation in India has been the high food prices**.** From October 2009 to March 2010 the year-on-year food-price inflation announced every week hovered around 20%. It has declined since then, though it still remains above comfort level. The high food price inflation is having a significant impact on the Indian consumer in general and the Indian middle class in particular. The chart below gives the way the Indians spend.

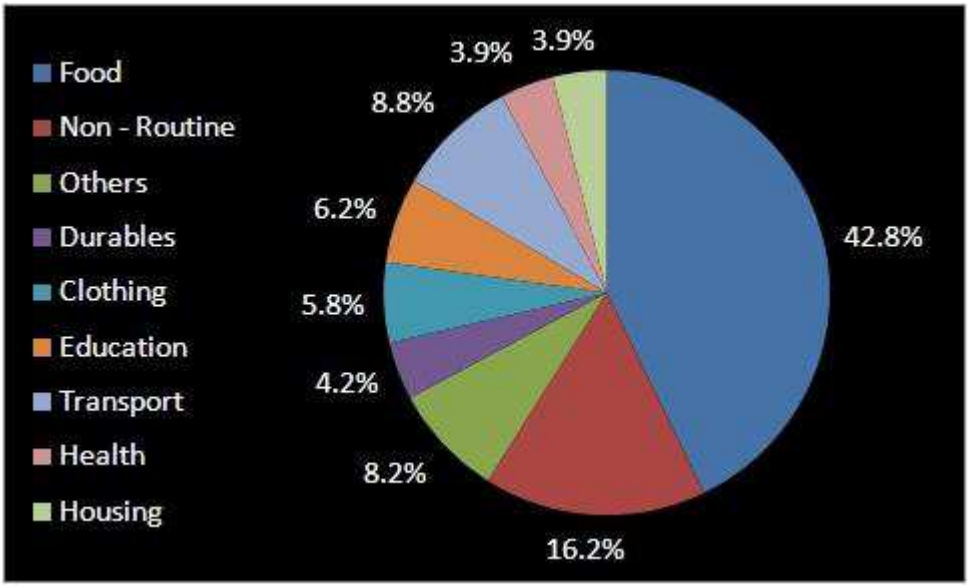


Figure 1

As evident from the chart above, nearly 43% of the personal disposable income goes into food products. Unfortunately, this is the segment, which is experiencing highest inflation. High food inflation ensures that consumers have to cut back on their spending (on non-necessary items). This in turn will impact the consumption part of the GDP growth. Also, the high prices of food have become a top issue in a country like India where nearly half the one point two billion people are poor and spend a large chunk of their meager earnings on food. How will the poor cope with high food inflation? Even going by the Planning Commission figures, there are over 300 million people living in abject poverty. According to it, there are less poor today than three years ago and poverty is supposed to have come down from 37 per cent to 32 per cent in 2009-2010. But there are many more millions who are just "above the poverty line" and are still miserably poor. Persistent double-digit food inflation for 20 months till March this year is estimated to have pushed around 50 million people into extreme poverty, based on the $1.25 a day poverty line. An Asian Development Bank (ADB) report, “Global Food Price Inflation and Developing Asia” has estimated the impact of an annual 10 per cent increase in food prices on poverty numbers at an additional 22.82 million in rural India and 6.68 million in urban India. The numbers swell to 45.64 million and 13.36 million in rural and urban India, respectively, in the case of an annual food price inflation of 20 per cent. For Asia as a whole, home to 3.3 billion people, ADB estimated that an additional 64 million people could be pushed below the poverty line as a direct impact of double-digit food inflation.

Of these, 29.5 million would be in India. Between June 2009 and March 2011, India has suffered from 20 months of double-digit food inflation with the price rise shooting up by over 20 per cent in at least two months – December 2009 and February 2010. Indian families on an average spent 57 per cent of their incomes on food, with the poorest of them spending as much as 62 per cent. The ADB report said soaring food prices undermined the recent gains in poverty reduction in Asia. In August 2008 the World Bank estimated that India had 42 per cent of its population – 456 million – under the internationally benchmarked $1.25 a day poverty line in 2005. Estimates made by the Tendulkar for the same year was at 37.2 per cent of India's total population, or 372 million. Tendulkar estimated the incidence of rural poverty at 41.8 per cent and urban poverty at 25.7 per cent. In absolute terms, however, there were more poor people at 384 million in 2009, up from 372 million in 2005. Inflation in food products has driven overall inflation.

WPI Inflation (year-on-year)

	2006-07	2007-08	2008-09	2009-10
All Commodities	6.51	4.82	8.03	3.57
Food	7.99	5.97	9.07	14.52

Source: Office of the Economic Adviser, Ministry of Commerce and Industry, GoI

Table-1

As per the latest data, overall WPI Inflation stood at 8.4% in December 2010. In the week ending 22nd January 2011, food inflation stood at 17.05%.

In this paper, we try to analyze what the main reasons are underlying food inflation in India leading to wretchedness of the Indians in recent years, especially of the '*Aam Aadmi*'.

Food-grain prices or non food-grain prices?

Some economists argue that, it is the increasing price of the non food grains that drives the overall food price hike. But if we look at the following table below, we find that:

Table 2: Rate of increase in prices of different food items according to wholesale price index:

Years	Rate of increase in prices of food items.	Price of food grains	Price of fruits	Price of milk	Prices of meat, fish, egg

Oct'09	12.99	14.75	5.9	10.03	23.37
Nov'09	18.66	18.99	10.19	13.74	30.11
Dec'09	20.04	20.16	10.6	13.36	27.68
Jan'10	18.41	19.32	7.61	13.99	31.01
Feb'10	18.11	15.25	18.02	14.82	30.63
March'10	16.65	13.46	12.02	17.64	31.00
April'10	16.87	11.93	13.69	21.95	32.24

Source: CMIE

From this table, it is clearly visible that, the rate of change in food prices is directly reflected by the change in food grain prices. This is because while calculating the FPI, more weights are assigned to the main food grain items and less weight on non food grain items. This is done as for a LDC like India 75% of the population constitutes the poor or the "common man" whose basic food items consists of the food grains only. So, the food grain prices as the main determinant of the rising price of food items. Therefore, in this paper, we concentrate mainly on rising prices of food grains.

International versus domestic food prices

Global food prices have been on an upward trend for a fairly long time, particularly since 2005. Prices accelerated starting in January 2007. Based on the Food and Agriculture Organization's (FAO) World Food Price Index, international food prices in April 2008 were 60% higher than 12 months earlier. World food prices have in particular been driven by higher grain prices. Two staple food grain of special importance to South Asia are wheat and rice.

The international price of wheat more than tripled between 2002 and March 2008. The wheat price was relatively stable until 2006, but surged in 2007 and early 2008, reaching a global peak in March 2008. The price has since then come down, but as of August 2008 it remained 70% higher than the average price in 2006. The price of rice increased nearly five-fold between 2002 and May 2008, when it reached a global peak. Rice price started rising since 2004, but the spike came in 2008 when the price more than doubled in five months between January and May. Rice price has also come down after May.

Rise in food prices in India was not far removed from the global pattern. Sharp increases in domestic prices were recorded in the year 2006-07, according to the Economic Survey 2006-07; primary articles recorded an inflation rate of 9.76 per cent in the year ending 2007 and contributed 34.87 per cent to overall inflation. Commodity-wise analyses of inflation in primary products revealed that in cereals and pulses sub-groups, eight commodities urad, moong, gram, wheat, maize, ragi, jowar and arhar had inflation

in excess of 5 per cent. Duty-free import of wheat and pulses to ameliorate the shortfall in domestic output relative to domestic demand had limited impact on domestic prices because of firm international prices.

Table 3: **Global versus domestic food prices**

Period	FAO Food Indices	Food WPI Indices
2005-2008	83.76	19.72
2007-2008	51.41	5.54
March 2008 to May 2008	-2.27	3.74

Source: **FAOSTAT and Ministry of Industry, GOI.**

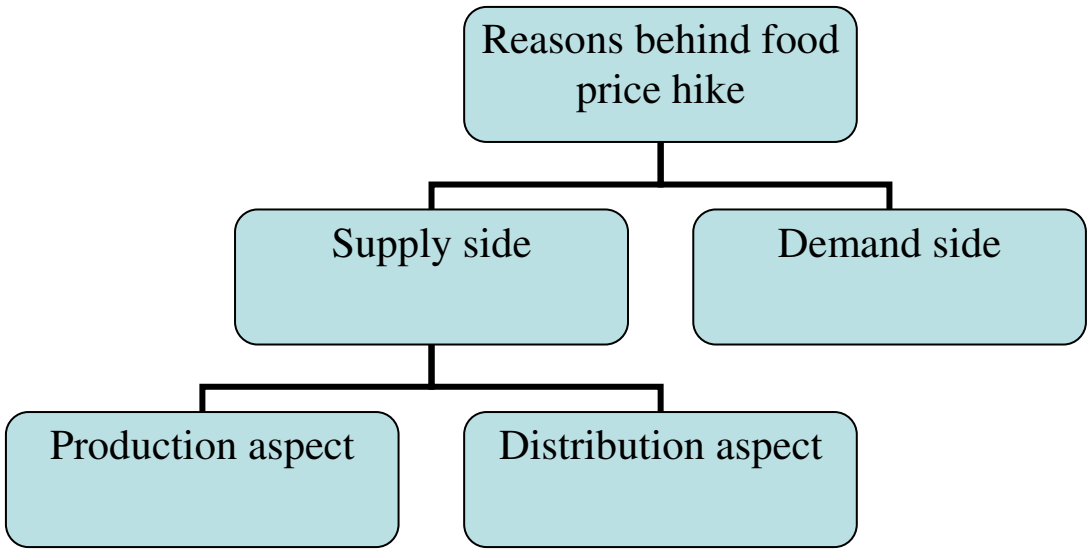
Even so, as of August 2008, international rice price was 128% higher than the average in 2006. These large increases in global prices of food grains have huge adverse implications for rise in domestic price of food grains. As compared to the year 2005, food indices have nearly doubled in recent months (Jul 2008). Disaggregated level analysis indicated that the biggest contributor to this rise in prices were cereals followed by the oil and fats then dairy, sugar and meat.

Adverse Effects of Trade Policy Bans:

The introduction of export restrictions and bans (such as those imposed by India and China on rice) has further restricted global supply and aggravated shortages. India's decision to ban rice exports (except for 'Basmati' rice) was quickly followed by export restrictions placed by Vietnam and other major players, with an immediate impact on prices.

Classification

Now we empirically discuss to what extend it creates an impact on price hike. To discuss it we divide our topic into two aspects 1) SUPPLY SIDE and 2) DEMAND SIDE



First let us concentrate on Supply Side viz. **Production Aspect.**

SUPPLY SIDE – PRODUCTION ASPECT:

1. **Public investment**

Table 5:

Year	Public investment	Private investment	Total investment	Share of public investment	Share of private investment	FPI(2004-2005=100)*
2004-2005	16183	62665	78848	20.5	79.5	100
2005-2006	19909	73211	93121	21.4	78.6	103.06
2006-2007	22978	71422	94400	24.3	75.7	111.54
2007-2008	23039	86967	110006	20.9	79.1	152.64
2008-2009	24452	114145	138597	17.6	82.4	155.75

*calculated

Source: **Economic Survey, 2010**

The most striking transformation occurring in Indian agriculture is the shift from a food grain-oriented supply-led framework dominated by the public sector, to a more

diversified and demand driven framework with an expanding role for the private sector. Indian farm output has been diversifying away from cereals and towards high-value crop and livestock products since the early 1990s and growth in high-value products has significantly outpaced that of cereals. The expansion of high-value crop and livestock agriculture has been led primarily by growth in consumer demand and changing preferences associated with rising incomes, urbanization and youthful demographics. This diversification of agricultural production offers the primary opportunity to strengthen lagging growth in farm output and rural employment.

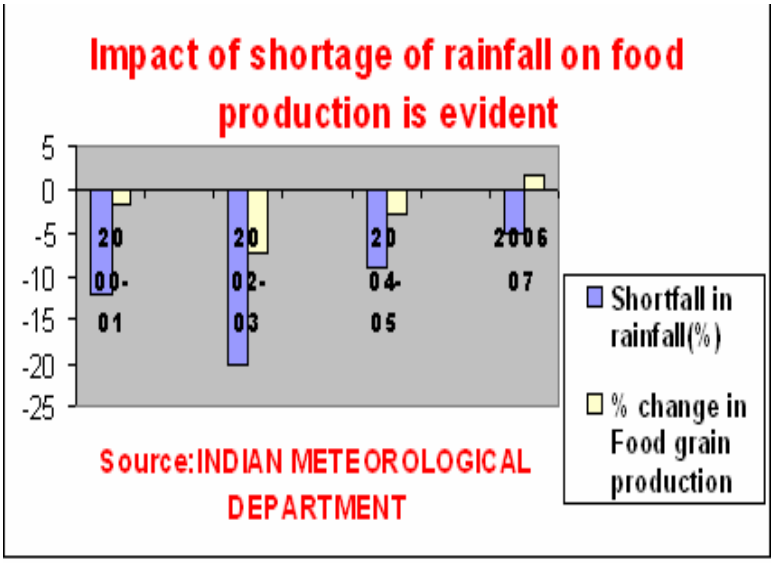
However, level of investment must be increased to achieve diversified growth with equity. To ensure that the transformation to higher-value agriculture is inclusive of India's large number of marginal and small farmers, a large share of public investment is much needed in total agricultural investment. However, it is evident from the above data that the share of public investment compared to that of private investment is declining (from 2006-07 to 2007-08 & from 2007-08 to 2008-09). Instead of increase in public investment in absolute terms throughout the years, the increase in private investment overshadowed the effect of public investment due to its (private) larger shares. Due to inadequate public investment, irrigation and storage facilities as well as power and transport infrastructure are in a poor condition and only big farmers can get access to produce high-yield crops. Therefore, low level of public investment (in terms of declining shares) is one of the possible reasons behind price hike of food grains. This hypothesis partly get supported by the moderately negative (-0.45) value of the correlation coefficient between FPI (Food Price Index) and share of public investment.

Low level of public investment results in inadequate irrigation facility. As a consequence, small and marginal farmers have to depend on monsoon for harvesting. Therefore, in our analysis, 'effect of monsoon' appears as a sub-point of 'public investment'.

Effect of monsoon:

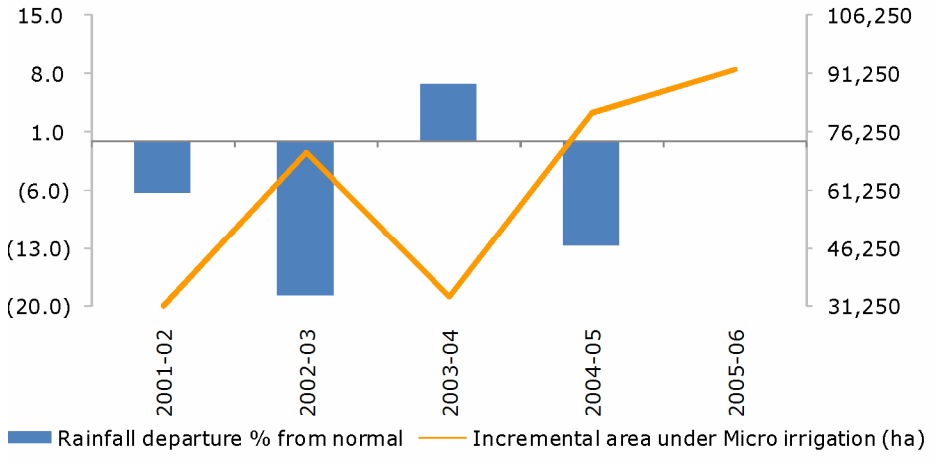
The Indian Meteorological Department's monsoon forecast has become an annual media topic. In an agricultural based country like India, kharif crop is the main monsoon-dependent crop. Due to insufficient rain in the year from 2003 to 2005, there arises shortfall in the production of kharif crops (though sufficient rain in the year 2006-2007 led to rise in production in that financial year; but was not sufficient at all to improve the worst condition). For this reason, availability of food grains in the market has been declined over the years. So, by the simple market mechanism, the prices of food grains should increase. We can show this by using a graph**.**

Chart 1:



More than 73% of annual rainfall in India is received during the South-West monsoon season. As a result, areas affected by low rains need to wait till the next monsoon. Reservoir levels are also largely dependent on South-West season rainfall. The problem is that, public investment in irrigation facilities is not directed towards these kharif crops. So, in spite of the existence of micro irrigation facilities, it primarily caters to irrigated areas (for horticultural / cash crops), where the impact of rain deficiency is less severe. This is evident from the following figure:

Chart 2:



Source: Edelweiss research, Indiastat, IMD

2. Gross cropped area of foodgrains and changing grain orientation:

In the post independence period until 1967-68, much of the increase in food production had taken place from expansion of farm areas. The area expansion slowed down by 1970; and since then, the total net area sown for crops has not increased much. Most of the increase in gross sown area, however, has been achieved from increasing cropping intensity, mainly driven by the development of irrigation.

	Rice	Wheat	Coarse Cereals	Pulses	Total food grains	Growth Rate
1950-51	20.58	6.46	15.38	8.41	50.82	-
1960-61	34.58	11	23.74	12.7	82.02	4.90
1970-71	42.22	23.83	30.55	11.82	108.43	2.83
1980-81	53.63	36.31	29.02	10.63	129.59	1.80
1990-91	74.29	55.14	32.7	14.26	176.39	3.13
2000-01	84.98	69.68	31.08	11.07	196.81	1.10

Table 6: Production of food grains; **Source:** Ministry of Agriculture, Government of India.

Figure 2.1 illustrates the gross and net sown area, with the difference signifying the cropping intensity. From the beginning of the last decade we observe high difference in net and gross sown area, highlighting the growing cropping intensity. Table 2.2 shows the cropping intensity, irrigation intensity and the rainfed intensity. In 2000 we observe a decline in cropping intensity in both irrigated and rainfed area, and if we exclude that year we find considerable growth in the rainfed intensity. This is largely due to governmental policies directed towards improving the position of small farmers in the non-irrigated areas through extending the productivity revolution and production of high valued crops.
However, cropping intensity growth in the irrigated area is still higher than that of the rain fed area.

	Irrigation intensity	Cropping intensity	Rainfed intensity
1990	1.31	1.30	1.29
1991	1.32	1.29	1.27
1992	1.33	1.30	1.29
1993	1.33	1.31	1.30
1994	1.33	1.32	1.31
1995	1.34	1.32	1.31
1996	1.33	1.33	1.33
1997	1.33	1.34	1.35
1998	1.32	1.35	1.37
1999	1.37	1.35	1.33
2000	1.35	1.32	1.30

Table 2.2: Cropping , irrigation and rainfed intensity of India during 1990-2000; **Source:** Ministry of Agriculture, Government of India.

The growth in irrigation intensity is mainly contributed by groundwater expansion and increasing level of mechanization, while rainfall and the need to sustain livelihood

determine the growth of intensity in the rainfed area, where majority of the rural poor people live. Most of the diversified and mixed farming are taking place in the rainfed part of the cropped area, and it contributes in increasing the cropping intensity.

We analyze the state wise variation in cropping intensity across states in the last decade. Many climatic factors like rainfall, drought affects cropping intensity. So, we have taken a four-year average for the period 1990-1993 and 1997-2000.Table 2.1 shows the average cropping intensity and the corresponding growth rate. We observe high growth of cropping intensity in the northern and eastern states, and mainly in Uttar Pradesh and West Bengal. In the latter two states, intensity is driven by higher irrigation expansion. In Tamil Nadu, however, there is decrease in cropping intensity. In Tamil Nadu, depletion of groundwater resource increases the opportunity cost of increasing the intensive margin, and resulting a decrease in cropping intensity.

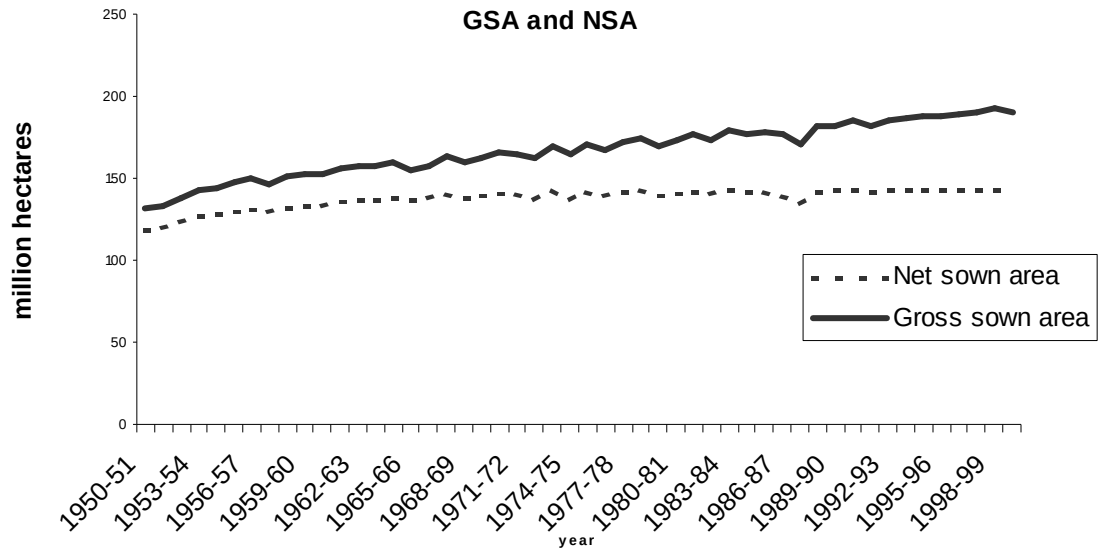


Figure 2.1: Gross and net sown area of India during 1950-2000; **Source:** Ministry of Agriculture, Government of India.

States	1990-1993	1997-2000	Growth Rates (Per Cent 1997-2000 over 1990-1993)
Haryana	1.58	1.72	8.81
Punjab	1.79	1.90	5.84
Himachal Pradesh	1.71	1.74	1.78
Uttar Pradesh	1.33	1.51	13.81
North Zone	1.45	1.61	11.12
West Bengal	1.37	1.71	24.52
Bihar-	1.29	1.35	4.61
Orissa	1.33	1.39	4.29
Assam	1.31	1.47	12.77
East Zone	1.35	1.47	8.67
Karnataka	1.14	1.17	2.51
Kerala	1.29	1.33	2.92

Tamil Nadu	1.26	1.18	-5.83
Andhra Pradesh	1.22	1.23	1.12
South Zone	1.20	1.21	0.46
Gujarat	1.12	1.12	0.46
Maharashtra	1.17	1.24	6.08
MP	1.20	1.28	6.99
Rajasthan	1.24	1.27	3.16
West Zone	1.19	1.25	4.79
INDIA	1.30	1.34	3.16
All major states	1.26	1.34	6.07

Table 6: Cropping intensity in India during 1990-1993 and 1997-2000. **Source:** Ministry of Agriculture, Government of India.

Changing grain orientation

With technologies developments in agriculture and rising demand of non-food-grain, traditional farming is changing into modern commercial farming. In case of India, prior to Globalization, there is a huge demand for cash crops, like tea, coffee, jute, etc. in the export market. It creates incentive for the domestic farmers to switch from food grain production to the production of cash crops. Also, both in India and outside, from the point of view of consumers, income-elasticity is much higher for the non food grains compared to that of food grains; with the increase in per capita income of the economy, preference pattern of the consumers is shifting from food grains to non food grains, like meat, fish, egg, milk etc. So, to meet this demand, farmers are using more and more area for non food grains production. . Between 1990-91 and 2000-01, around 4 percent of the gross cultivated area (GCA) - representing approximately about 6.7 million hectares (m/ha) - has shifted from food-grain crops to non-food-grain crops. Among the food grain crops, the area under superior cereals, i.e., rice and wheat, is increasing; while that of coarse cereals (millets) is on decline.

While cereals and pulses have lost area, the major gainers of this area shift are the non food grain crops especially oilseeds. If we look at the grain orientation of agriculture defined as a ratio of gross cropped area for food-grain to total cropped area, we observe a declining trend. Grain orientation of agriculture during the last decade has decreased from 71% to 67%. Most of the change in grain orientation, however, is taking place under rain-fed conditions to reduce the risk factor of crop failures due to drought or less rain. This is also evident from chart 2.1.

Although comparative advantage, yield difference and crop rotation considerations often favour diversification in irrigated areas.

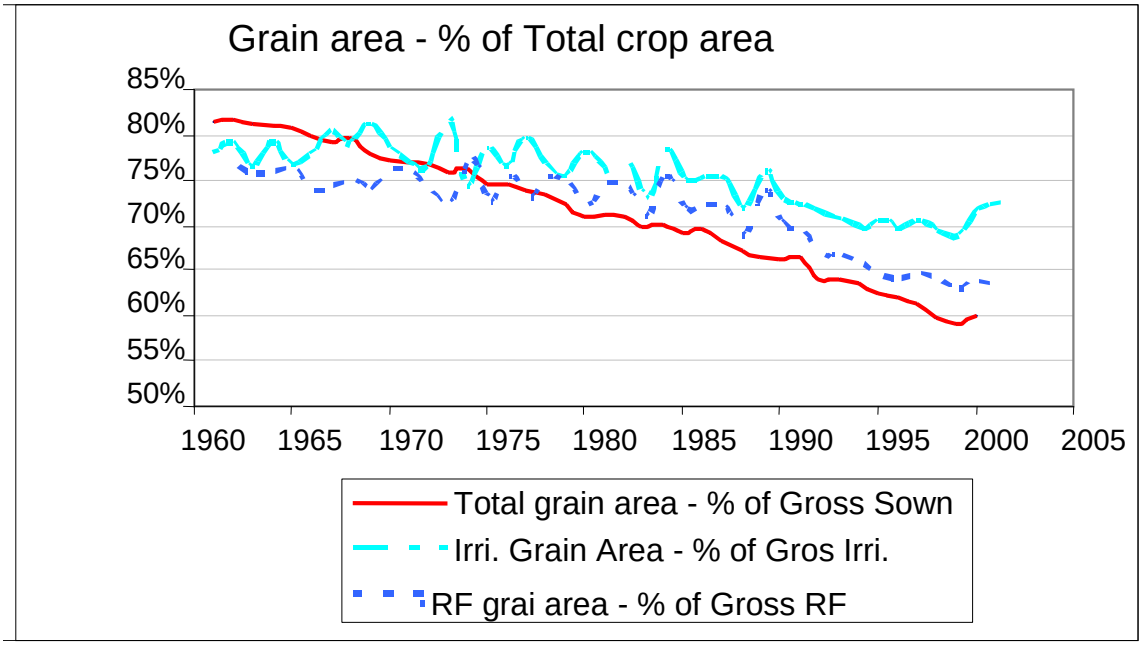


Chart 2.1: Grain orientation in irrigated and rain-fed area from 1960 onwards. **Source:** Ministry of Agriculture, Government of India.

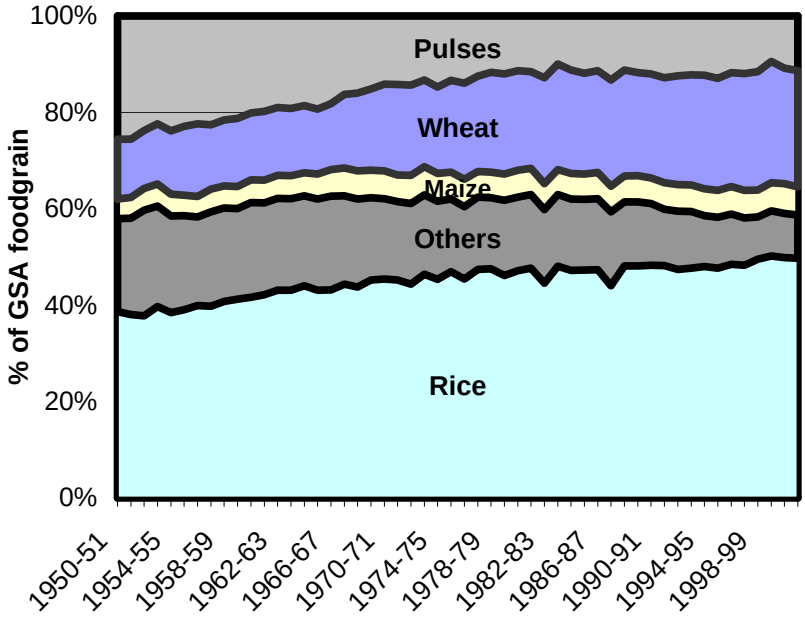


Figure 2.1: Composition of foodgrains in India from 1950-2000. **Source:** Ministry of Agriculture, Government of India.

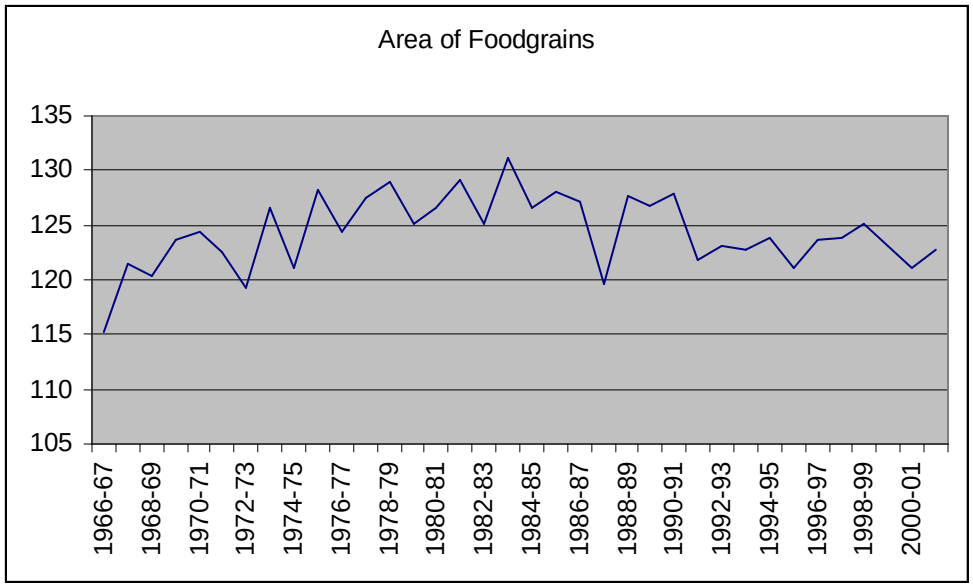


Figure 2.2: Trend in gross sown area of foodgrains in India from 1966-2000. **Source:** Ministry of Agriculture, Government of India.

Table 6 shows the grain orientation of 16 major states and the growth from the period 1990-1993 to 1997-2000. The table suggests changes in grain orientation are taking place in most of the major states and with greater prominence in the rain fed area. Area wise change in grain orientation is more among the southern states. In the rice wheat producing states of Punjab, Haryana and Uttar Pradesh, diversification is taking place slowly in irrigated area. Much of diversification in Punjab is taking place in the rain-fed area. The minimum support price provided to farmers in the northern agricultural states act as risk reducing insurance against fluctuation in price. Farmers have little incentive to change to other high valued crops. Considering the rice dominant states, we observe a decline in grain orientation in West Bengal. Among the southern states, crop diversification is taking place only under irrigated conditions during the period 1997-2000 in Andhra Pradesh and Tamil Nadu. One of the reasons of change in grain orientation in Tamil Nadu especially is rapidly decline in groundwater level, caused by higher withdrawal rate than the recharge rate. It induces farmers to shift to water saving commercial crops in irrigated area.

States	1990-1993		1997-2000		Growth Rates (Per Cent 1997-2000 over 1990-1993)	
	Grain orientation (GOA)	Grain orientation-Irrigated (GOA-IR)	Grain orientation (GOA)	Grain orientation-Irrigated (GOA-IR)	Grain orientation (GOA)	Grain orientation-Irrigated (GOA-IR)
Haryana	0.77	0.70	0.70	0.70	-9.22	-0.88
Punjab	0.93	0.78	0.76	0.78	-17.77	-0.98
Himachal Pradesh	0.87	0.63	0.86	0.85	-0.48	34.99
Uttar Pradesh	0.88	0.81	0.84	0.77	-4.75	-4.96
North Zone	0.88	0.79	0.81	0.76	-7.85	-3.07
West Bengal	0.86	0.95	0.70	0.77	-18.36	-19.18
Bihar-	0.92	0.89	0.95	0.92	3.46	2.60

Orissa	0.81	0.70	0.64	0.80	-20.26	13.90
Assam	0.76	0.94	0.69	0.66	-8.97	-29.79
East Zone	0.85	0.86	0.76	0.83	-10.50	-2.62
Karnataka	0.58	0.52	0.62	0.55	7.25	6.07
Kerala	0.22	0.55	0.13	0.46	-41.10	-15.83
Tamil Nadu	0.55	0.66	0.56	0.62	1.74	-5.97
Andhra Pradesh	0.54	0.74	0.55	0.71	0.93	-3.64
South Zone	0.53	0.66	0.54	0.64	1.10	-3.31
Gujarat	0.40	0.42	0.34	0.34	-14.68	-19.73
Maharashtra	0.83	0.60	0.73	0.55	-11.92	-8.04
MP	0.59	0.93	0.53	0.84	-11.32	-9.51
Rajasthan	0.60	0.53	0.60	0.51	0.77	-3.65
West Zone	0.63	0.64	0.58	0.59	-8.71	-7.88
Total	0.70	0.74	0.65	0.71	-6.33	-4.76
INDIA	0.68	0.71	0.65	0.71	-3.98	0.31

Table 7: Grain orientation in India during 1990-1993 and 1997-2000
Note GOA=GSA-fg/GSA
GOA-IR=GIA-fg/GIA
Source: Ministry of Agriculture, Government of India.

DISTRIBUTION ASPECT

Mismatch between allocation and off-take in the Public Distribution System (PDS):

A problem in the PDS is the amount of leakages of food grains and other commodities in the form of losses in the transport and storage and diversion to the free market. According to some estimates a little more than a third of the food grains and sugar and over half of the edible oil (38% of wheat, 36% of rice, 39% of sugar and 55%of the edible oil) does not reach the actual users of PDS[1].The major part of the leakage is due to the diversion of food grains to the free market.

Sometimes, shop owners make bogus entries in the ration cards. For example, in a village in ***'Dahanu Taluka'*** in Maharashtra, the tribes have not tested sugar for over a year. But, one family's ration card tells a different story. According to an entry made for June 1995, this undernourished tribal bought 26 kgs of sugar on a single day[2]! The same is true of the other villages in Dahanu. The delivery systems in rural areas are generally very poor. Even if a fair price shop exists, food grains are not available in many places.

Recently, it has been observed that, Government has increased the procurement price, acting as support price (price-floor), for rice, dal and pulses. Probably, one possible reason was that: despite the short-term hike in food grain prices, there would be a long term benefit due to the fact that, the farmers would work hard to get higher return; so that production could rise. But along with this, Government has to raise the issue price of food grains through the PDS. Consequently, the price-differential between open market and PDS issue price has narrowed down. Here quality also plays an important role, so

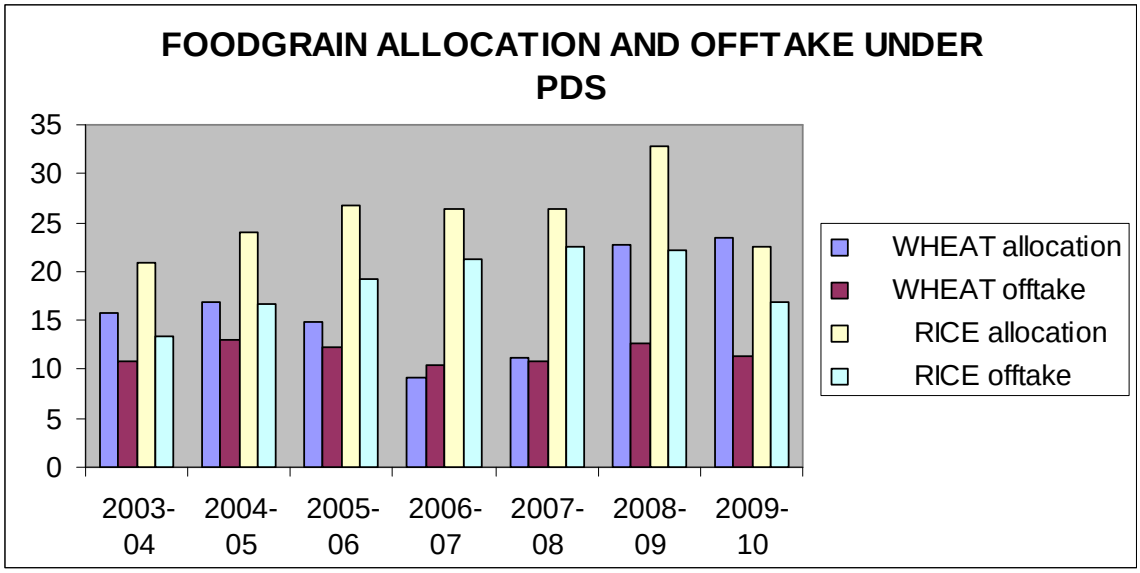
[1]Ahluwalia, D. (1993) - "Public distribution in India; coverage, Targeting and Leakages". Food Policy, vol.8, no.1.

[2]Menezes (1995).

willingness to buy from PDS falls. It is basically a ***demand-driven*** reduction. As a result, PDS off-take has been declined in recent years, which implies rise in carrying cost and wastages. This, in turn, leads to loss in welfare and therefore leading to budgetary burden to the government.

Table 8:

Year	Wheat allocation	Wheat off take	Rice allocation	Rice off take
2003-04	15.8	10.8	20.8	13.4
2004-05	16.8	13.1	24	16.6
2005-06	14.8	12.2	26.7	19.2
2006-07	9.2	10.4	26.3	21.2
2007-08	11.1	10.9	26.3	22.6
2008-09	22.7	12.6	32.8	22.2
2009-10	23.4	11.4	22.5	16.8



Source: Economic Survey, 2010. **Figure: 3.**

Wholesale and retail prices

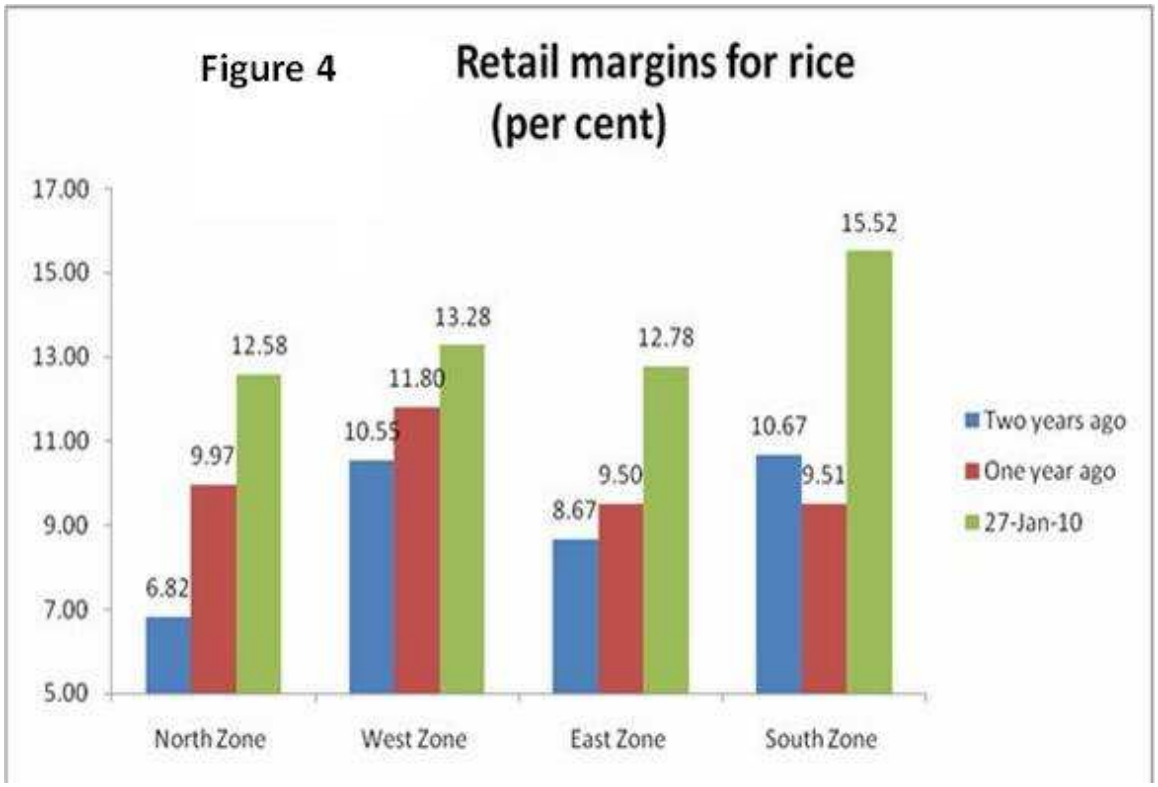
It has been found that the gap between wholesale and retail prices is widening. It appears that there are forces that are allowing marketing margins- at both wholesale and retail levels- to increase. This means that the direct producers, the farmers do not get the benefit of rising price, which the consumers in both rural and urban areas are forced to pay.

Table 9 represents the prices increase in cities averaged across the major regions for rice and atta, which are among the most essential food grains in any households. It is evident that the price increase has been as rapid as to be alarming especially over the past two years, with rice prices increasing by nearly half in Northern cities and more than half in Southern cities. Atta prices have, on average, increased by around one-fifth from their level of two years ago.

Table 9: Retail prices in major cities/towns, by zone.			
	Average retail price on 27.01.10 (in Rupees)	Increase over 1 year (per cent)	Increase over 2 years (per cent)
Rice			
North Zone	19.92	11.94	48.45
West Zone	19.33	9.78	29.37
East Zone	16.19	10.31	16.30
South Zone	22.25	32.84	58.93
Atta			
North Zone	17.00	24.90	24.90
West Zone	17.17	15.73	21.85
East Zone	17.50	19.32	22.09
South Zone	20.38	5.16	13.19

Source: Ministry of Food and Civil Supplies, Food Price Monitoring System, 12 February 2010.

Other food grains, like pulses, dal & vegetables, have also shown dramatic increase especially in the past year.



In rice, the gap between average wholesale and retail prices widened considerably - even doubled - across the four major zones of the country, as shown in Chart 1. If wholesale price rises, there are two possibilities: a) some part is absorbed by the retailers; b) total increase goes to the consumers. In case of rice, the retail margin increases over the years across the four major zones because of (b).

Effect of oil and petroleum prices:

Table 9:

YEARS	FOOD PRICE INDICES	OIL PRICE INDICES
1999	91.13	91.57
2000	89.5	67.82
2001	92.29	67.61
2002	90.18	87.02
2003	98.35	100.81
2004	111.47	112.18
2005	114.68	103.64
2006	122.43	112
2007	154.07	169.08
2008	191.28	225.42

2009	151.54	149.95

Source: Ministry of Petroleum

There is a huge effect of oil price on the food price indices in both developed and developing nations with the bulk of the effect falling on the latter nations. In this chart, we portray the effect of oil price indices on the food price indices over the years for a developing country like India.

The upshot of the given data set is that as oil price rises over the years, the transportation cost of food rises. So to recover these costs, the firms raise the prices of food. As a result food price increases as petroleum price rises.

Using data from 1999 to 2009, we observe that our hypothesis is supported from the strong positive correlation coefficient (0.976) between food price indices and oil price indices. Due to this highly strong positive correlation coefficient, it was initially expected whether the data set has any autocorrelation (AR) problem. In order to examine this, a Durbin-Watson'd' test was conducted, the result of which is as follows:

The'd'-test result:

We find that our'd' value comes out to be 1.783317.
Value of d_U for one explanatory variable = 1.324 at 5% level of significance.
Therefore $4-d_U = 2.676$.
So we find that $d_U<d<4-d_U$.

Here we have, H_O: $\rho=0$
Against H_1:$\rho\neq0$

After testing this, the null hypothesis is accepted at 5% level of significance. Therefore there is no AR, positive or negative.

Inference:

So we can infer that the strong positive correlation between oil price indices and food price indices is justified and is free from any sort of autocorrelation.

DEMAND SIDE ASPECT

1. Population growth rate, total net availability and food grain prices:

With the burden of increasing population in India over the years, the excess demand for food grains also accelerates consequently. This is because, with the increase in population, total net availability has not been increased proportionately. By the simple market mechanism, this excess demand for food grains propels food grain prices.

To test the validity of this hypothesis, we take data from 1960 to 2009 and conduct a time-series econometric analysis. For this purpose, we first check the orders of integration of the variables by augmented Dicky-Fullar (ADF) test:

Table 9: Unit Root Test of food grain prices (WPI), total net availability and population growth rate

Variables	Orders of Integration
1. Food grain prices (in terms of WPI)	**1**
2. Total net availability	**1**
3. Population growth rate	**1**

Then, we check whether these three time-series variables are actually co-integrated by Engel-Granjer test and we find that the estimated residual series is stationary at 5% level of significance by ADF test. Lastly, we regress food grain prices (in terms of WPI) over our stipulated time period on population growth rate and total net availability. We find that:

	Total net availability	Population growth rate
Food grain prices (in terms of WPI)	-3.16E-10* [-1.965]** (0.056)***	-348769.5* [-10.208]** (0.000)***

*estimated slope-coefficients
**computed t-statistics
***p-values

The estimated slope coefficients are turned out to be negative, which supports our theory and since the computed t-statistics corresponding to the estimated slope coefficients are statistically significant (for total net availability, at 10% level of significance and for population growth rate, at 1% level of significance); our proposition gets adequate support.

DIFFERENT POLICIES

- **Need and effect of these policies:**

Such policies were needed to reduce the unemployment in rural areas by creating gainful additional employment. Creation of additional employment is crucial in the sense that these additional employment generation transfers some amount of money to the people which increases people's purchasing power, which stimulates rural demand. Thus there is a sharp increase in demand for food grains (as for poor people food grain is of at most necessity). So, the government objective in generating employment is taken care of. But

it creates a burden on agricultural sector to produce more output and if agricultural output doesn't expand sufficiently then it results in increase in food prices. Here we'll consider two wage employment policies namely Jawahar Rozgar Yojana (JRY) and Employment Assurance Scheme (EAS), which came into presence from 1989 onward.

- **Jawahar Rozgar Yojana (JRY):**

JRY is a poverty alleviation scheme, which falls under the category of programme for creation of supplementary employment opportunities. It was formed on April, 1, 1989. It is a self targeting scheme and it offers a legitimate minimum wage for unskilled labours, which is generally lower than the prevailing market wage rates.

Based on the data collected by the field teams, it is observed that 35.9% of the total populations in all the selected ***Gram Panchayat*** were available for employment. Of these, 14.8 percent and 14.3 percent were actually employed during 1989-90 and 1990-91, respectively. However, in the first half of 1991-92 (Up to September, 1991) only 3 percent of those available for employment were employed.

- **Employment Assurance Scheme (EAS):**

EAS was launched on 2nd October, 1993 in 1773 blocks of the country. The scheme was aimed at providing assured employment to all rural adults who are below poverty line and are seeking for employment but are unable to find it. The programme has been restructured on 1st Apr 1999. At present, the EAS is being implemented in 3198 blocks of the country.

As per report received up to March, 1999, the employment generated is 4165.31 lakh man days and 745.24 lakh man days during 2000-01.

It is clear that both JRY & EAS had provided an increase in the level of employment. But that increase was not as effective as the 2005 implemented project **National Rural Employment Guarantee Act (NREGA)**. This project was taken on a large scale compared to the earlier projects such as JRY & EAS. So, we'll try to capture its effect on food grain prices.

National Rural Employment Guarantee Act

National Rural Employment Guarantee Act (NREGA) is a policy taken up by the government in 2005 to enhance the purchasing power of the poor rural people of India.

It constructed a 100 day work scheme for the rural poor. This scheme generated a higher rural demand for the food grains. This resulted in an upward trend in food prices.

In this analysis we have taken number of man days generated as a proxy for income generated (taking wages constant) as the explanatory variable. We have monthly data from April, 2008 to March, 2010.

Man Days(x)	FPI	Lagged FPI(y)
23037.85	208.38	133.33
28546.27	213.29	136.59
28856.94	213.54	139.05
28928.35	208.16	139.70
28954.05	196.60	142.82
28965.32	185.23	143.28
28969.93	163.46	146.16
28977.86	150.49	147.14
28981.71	133.33	152.18
29009.26	136.59	152.84
29018.61	139.05	156.77
29046.28	139.70	168.64
39556.91	142.82	172.35
40022.70	143.28	174.00
40085.82	146.16	179.70
40107.45	147.14	182.23
40109.52	152.18	
40109.52	152.84	
40144.13	156.77	
40144.29	168.64	
40146.14	172.35	
40146.14	174.00	
40146.14	179.70	
40146.14	182.23	

Source: nrega.nic.in.

As funds allocated by the government takes some time to reach the hands of the employees in NREGA through proper channels, food prices also begin to increase after that stipulated period as a result of increase in purchasing power of those people. So we have to take lag in food prices. Taking lags in food price indices (FPI) of different months, we have empirically observed that value of r^2 is maximum (0.775) if we take 9 month's lag. So, our model is:

$$Y_t = \alpha + \beta X_{t-9} + €_t$$

Dependent Variable: Y
Method: Least Squares
Sample (adjusted): 1 - 16
Included observations: 16 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	70.80257	12.18346	5.811366	0.0000
X	0.002662	0.000384	6.935942	0.0000

R-squared	0.774584	Mean dependent var	154.174
Adjusted R-squared	0.758482	S.D. dependent var	16.1794
S.E. of regression	7.951286	Akaike info criterion	7.10101
Sum squared resid	885.1214	Schwarz criterion	7.19758
Log likelihood	-54.80810	Hannan-Quinn criter.	7.10595
F-statistic	48.10729	Durbin-Watson stat	1.08132
Prob(F-statistic)	0.000007		

Hence, by looking at the P-value for the slope coefficient, the chances of calculating a t-value of 6.936 or more, when the true value is in fact zero, is 6.92E-06 = $6.92/10^6$ = 0.00000692 = 0.000692%. Since, this is such a small probability; we concluded that there is a very little chance that the true population slope coefficient is zero. Note that, 95% of all possible slope parameters lie between 0.00184 & 0.003485, which does not include zero, and so the slope coefficient is significantly different from zero at the (100% - 95%) = 5% level of significance.

Test for autocorrelation:

Now we test for the presence of autocorrelation in this model, i.e. we'll examine whether the disturbance terms in the various years are correlated or not.

We have calculated,

$$d = 1.387755971$$

d_U for 1 explanatory variable and for 16 observations is 1.371, at 5% level of significance.

Since d_U (=1.371) < d (=1.388) < 4-d_U (= 2.629), so to test H_0: $\rho = 0$, vs., H_1: $\rho \neq 0$, we accept H_0 at 5% level of significance. So there is no presence of autocorrelation.

Inference:

So, man days generated in NREGA program can significantly increase food grain prices by stimulating rural demand.

Conclusion

In the conclusion of our study we see that the pre existing factors or the exogenous factors (such as public investment) were present in the preceding periods but the severity have increased and there are others new endogenous factors which were also present (such as NREGA). These two types of factors played a culminating role in increasing the food prices. Endogenous factors could also be termed as demand driven factors, which had an important role to increase the demand for essential food articles.

Apart from these factors another important factor has been the impact of crude oil prices. As crude oil prices increased internationally the transportation cost increased, so the problem got more aggravated.

Lack of policy implementation by the government also aggravated the situation. Public investment channelization became more important in this context. Especially when the farmers are switching from food grain production to cash crop production, there have to be some incentive given to the farmers so that farmers produce food grains.

Public investment in irrigation facility is also very important in this context to increase the production levels (i.e. it will reduce the dependence of agricultural production to monsoon).

As all these factors are interlinked, so we recommend a revamp in the government's policy so that these problems could be mitigated.

The government needs to play as a planned player to increase production such as in the recent budget recommendation of need for another Green Revolution. Though there is a lot of negativity associated with it, but still some policy measures have to be considered by the government so that the food security problem can be tackled in a proper way.

Limitations

In our analysis, we tried to incorporate the most probable variables but our study is not complete due to the following reasons:

Lack of availability of long term data (specially on wholesale and retail prices when we tried to capture the effect of intermediaries, data of different parts specially of corruption and hoarding is not available, so knowing these economic facts impact on food prices, we cannot capture its exact effects.

Due to the above problem, we cannot run a multiple regression model to capture all the effects simultaneously.

But still we tried in these contexts to present the economic reasons, which could be responsible. Admitting these drawbacks we tried here to analyze the different factors effects on recent food price hike in the context of India.

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Appendix:

Table A.1: Population growth rate, Total net availability and Food price indices (in terms of WPI) for India from 1961-2009.

YEAR	Population growth rate	Total net availability	WPI of Food Grains
1961	0.00	76048817000.00	4.43
1962	0.001130068	76461197000.00	4.67
1963	0.001150669	75351546000.00	5.10
1964	0.001163584	78740489400.00	6.44
1965	0.001170269	85427897200.00	6.83
1966	0.00117196	74333716000.00	8.10
1967	0.001169687	74818868500.00	10.11
1968	0.001164572	88035310000.00	8.90
1969	0.001157533	86948062500.00	9.22
1970	0.001149386	90951210900.00	9.16
1971	0.001139444	95861854800.00	9.47
1972	0.001126758	97775978000.00	10.94
1973	0.0011198	90219258000.00	12.99
1974	0.001121358	98761202100.00	17.93
1975	0.00112701	90791932000.00	15.94
1976	0.001128787	97471249600.00	13.98
1977	0.001127634	100686611200.00	15.60
1978	0.001124106	112205522800.00	15.80
1979	0.001117828	116864451900.00	16.98
1980	0.001108337	103237266400.00	19.84
1981	0.001095166	116668286000.00	21.74
1982	0.001078047	119330558600.00	23.71
1983	0.001056483	117084484000.00	25.95
1984	0.001030431	131193475000.00	25.45
1985	0.000999529	126631828500.00	27.06
1986	0.001058388	136283949900.00	28.13
1987	0.00103737	137372960000.00	30.71
1988	0.001022096	133267406000.00	35.17
1989	0.001002147	149939553500.00	35.95
1990	0.000982977	146541337500.00	38.95
1991	0.000964541	161347886000.00	47.04
1992	0.00090504	151050673100.00	52.69
1993	0.000899403	152346332600.00	56.69
1994	0.000874834	157499884000.00	65.02
1995	0.000864562	168538144000.00	69.44
1996	0.000853574	164609686500.00	78.00
1997	0.000842581	177252580800.00	78.97
1998	0.000831643	160292102400.00	86.17
1999	0.000820765	169832720000.00	100.00
2000	0.000813512	168554400000.00	98.24
2001	0.000753422	156760800000.00	101.32
2002	0.000787225	189239600000.00	99.01
2003	0.000683549	169920800000.00	107.90

2004	0.000718087	182412000000.00	122.39
2005	0.000663133	168849000000.00	125.91
2006	0.000653677	180375000000.00	134.36
2007	0.000644482	180450000000.00	169.15
2008	0.000635536	181488000000.00	209.99
2009	0.000626829	1.87226E+11	215.00

Source: Planning Commission of India.