Growth of Food Grains Production and Agricultural Inflationary Trend in Indian Economy

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Abstract

This study analyses the growth of food grains production and its impact on agriculture inflation in Indian economy over the period 1991 to 2011. For this purpose the ordinary least square technique is used to check the relationship between food grain production and inflationary trend in India. The result revealed that inflation and food grain production basically rice and pulses are negatively associated with each other. It means rise in food grain production discourage the high inflation rate in India.

Keywords: Growth, Food Grains, Ordinary least square, Inflationary trend.

Introduction

Agriculture is a largest employment providing sector of developing economies. Developed economies are less dependent on agriculture sector as compared to developing economies. In these developing economies are mostly labour surplus. With rapid increase in population growth the number of people engaged in agriculture sector has increased. In India, there has been a decline in the share of the agriculture sector in the overall gross domestic product, mainly on account of the high growth in services sector. The share of agriculture in GDP was 53.1% in 1950-51, 29.76% during 1993-94 to 1995-96, it declined to 14.0% during the period 2011-12. But fast agriculture growth is remaining vital for income, jobs and the food security in domestic economy. Its role in the domestic economy is much higher with its share in total employment according to 2001 census, continuing to be as high as 58.2%.

Table: 1

Role of agriculture sector in Indian Economy 2011-12

Share of agriculture sector in GDP at Factor Cost	14%
Employment	56.7%
Male workers (2007-10)	46%
Female workers	65%
Share in Exports	12.3%

Source: Economic Survey 2012-13

Recently high food prices is a major challenge in front of Indian economy. On an average basis, the food products inflation rate recorded during the 31-month period from January 2008 to July 2010 was 10.20%.The food articles group witnessed an average inflation rate of 12.46% between March 2008 and November 2011(Nair and Eapen, 2012).

Table: 2

Compound average growth rate of Production of Principal Crops

Crop	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2011 - 12
Rice	3.62	2.02	1.78
Wheat	3.57	3.57	2.61
Coarse	0.40	-0.02	3.01
Total Pulses	1.52	0.59	3.69
Sugarcane	2.70	2.73	2.07
Total Oilseeds	5.20	1.63	3.36
Cotton	2.80	2.29	13.53

Source: Central Statistics office, Directorate of Economics & Statistics

Fall in agriculture production during 2008-09 and 2009-10 was the main cause of the high price of food products in India. Severe drought experienced in several parts of the country, deficiency of the southwest monsoon, Increase in the overall demand for food, higher food exports, high support prices for food grains, large-scale public procurement of food grains, hoarding and speculation, and global factors characterized by high world crude oil and food prices are the various factor responsible to high prices of agriculture products in India. Apart from this introduction, this paper is divided into four sections. Section two discusses the previous studies related to relationship between food grain production and agriculture Inflation and its different aspects, source of data and methodology, while section three present the regression results of this study, section four highlights the main findings, limitation and suggestions.

SECTION II

REVIEW OF LITERATURE, OBJECTIVES, HYPOTHESIS, DATA SOURCES, MODEL SPECIFICATION AND ESTIMATE TECHNIQUE

II.I Review of literature

A lot of studies have been done on the different aspects food grain production and agriculture Inflation at national and international level. A few studies have been taken for review

Farah and Sampath (1998) conducted a study on thirty five years of grain production in Sudan in terms of its growth and production variability during 1956 to 1990. It analyzes the effect of different variables on production and projects production under three plausible scenarios. Results indicate that growth in production has been horizontal with negative yields. Variability in production was in both areas and yields. Production function analysis showed positive contribution of all variables except for the proxy variable, time.

Bhalla and Singh (1997) analysed the agriculture development in India at state level data on area and output of 43 crops for the period 1962-65 to 1992-95. It reveals that there was a marked acceleration in the growth rate of agricultural output in India during 1980-83 to 1992-95 as compared with the earlier periods. This study also found that agricultural growth had become regionally much more diversified. The period 1980-83 to 1992-95 was also characterised by important cropping pattern changes away from coarse cereals towards rice and wheat cultivation on the one hand and towards oilseeds on the other.

Rao (1987), attempted to analyse the importance of agricultural input costs in the determination of food grain prices in India. The analysis pertains to the period 1961 through 1983 during which agriculture and in particular food production has become input intensive. The study analysed the differential price behaviour in the two sub-periods 1961-62 through 1969-70 and 1970-71 through 1982-83. It revealed the importance of money supply to GDP ratio, representing demand factors and stocks of food grains to public distribution, representing supply aspects in both the pre and post green revolution periods.

Kumar And Sharma (2006) Analysed the government price policy in controlling food price variability for this purpose this study used monthly indices of wholesale prices of wheat, rice and coarse-grains. Annual price analysis showed that inter-year variability in annual nominal prices declined for both wheat and rice in the

nineties as compared to eighties. The variability declined for the real price of rice also but the real price of wheat and nominal and real prices of coarse grains displayed increased variability during the 1990s in comparison to 1980s. Analysis of monthly prices revealed that intra-year variability shot up for wheat while it came down for rice during the nineties in comparison to eighties. The regression results indicated that the government actions of buying and selling were more successful in reducing the seasonal range in wholesale prices in the case of rice as compared to wheat. Deviations in rainfall, yield and wholesale prices were the significant variables, which lent instability into the production of wheat and rice.

Sthanumoorthy(2008) examined the nature of current inflation in food price in India. This study considered Food prices as main driver of the current inflationary spiral. The analysis showed that food products are mainly responsible for the surge in inflation. Among food products, oil cakes, edible oils and dairy products are the biggest contributors to the food price spiral.

Krishna Iyer (1970) conducted a study on Monetary Resources, Agricultural Production and Wholesale Prices, in India during 1953-54 to 1969-70.This study also analysed the factors that were responsible for the price situation. What emerges as evident is that, in analysing a price trend, one has to look for the trend in income velocity in addition to the trend in monetary resources. This study found that a fall in income velocity has moderated the inflationary impact of a rise in monetary resources, and vice versa. Another revealing fact is that, even a marginal fall in agricultural production or in availability of food grains results in a noticeable rise in prices.

Moreover, a lot of studies have been done on the food grain production and agriculture Inflation at national and international level. Our research study is somewhat unique in the sense that so far, no study has been covered impact of food grain production on Agriculture Inflation in India during the period 1991-92 to 2011-12 at national level. There is enough scope of research in this area.

II.II Objective of the paper:

The main objective of this study:

- To examine the growth of key food grains production.
- To Investigate the impact of food grain production on agriculture Inflation in India.

We want to empirically investigate the impact of key food grains i.e. Pluses, wheat and Rice production on agriculture Inflation in India during 1991-92 to 2011-12.

II.III Hypothesis

We have proposed the following hypothesis for this study:

H0: There is no significant impact of food grain production on agriculture Inflation in India.

II.IV Data Sources

This study employs investigative and empirical methods to analyze the relationship between food grain productions on agriculture Inflation in India in the last 21 years. We use price index of agricultural products with base year 2004-05 as a measure of agriculture Inflation, production of key food grains i.e. rice, wheat and pulses in our analysis for the period 1991-92 to 2011-12. The data from 1991-2011 has been collected from Economic Survey (2012-13) and Handbook of Statistics on the Indian Economy publication of the RBI.

The main divergence of the present from the existing literature is that it has utilized the price index of agricultural products with new base year 2004-05, to analyze the impact of food grain production on agriculture Inflation in India.

II.V Model Specification

The model for the study is specified as:

$LOG\ (RIC)_t = \beta_1 + \beta_2 t + \mu_t$

$LOG\ (WHT)_t = \beta_1 + \beta_2 t + \mu_t$

$LOG\ (PULS)_t = \beta_1 + \beta_2 t + \mu_t$

$LOG\ (AGRI)_t = \beta_1 + \beta_2 t + \mu_t$

$PRIC = \alpha_0 + \alpha_1 LOG\ (RIC)_t + \alpha_2 LOG\ (WHT)_t + \alpha_3 LOG\ (PULS)_t + \alpha_4 LOG\ (AGRI)_t + \mu_1$

RIC = Rice Production

PULS= pulses Production

AGRI= total agriculture food grain production

WHT = wheat production

PRIC= Price Index of Agricultural Products

α and β are the parameters of the intercept and slopes of the coefficients, while μ represents other variables that could have lent further explanation to explained variables but not included in the model.

The following semi-log trend is fitted for calculating the growth rate $Y = ae^{b\ trend}$

$\ln Y_t = \beta_1 + \beta 2\, t + \mu_t$

here , Y is regressand and time variable is regressor

Where β_1 and $\beta 2$ are intercept and slope coefficients, respectively and trend is the time variable. The growth rate is calculated as: $[\text{antilog}(\beta_2) - 1] * 100$.

II.VI Estimate Technique

The modern econometric approach for analyzing the relationship is employed. We adopted ordinary least square regression (OLS) for analyzing above models.

SECTION III
REGRESSION RESULTS

Model 1 : LOG (RIC) $_t = \beta_1 + \beta_2 t + \mu_t$ *Table: 3*

Dependent Variable: LOG(RIC) 1991 TO 2011				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	4.311792	0.028599	150.7648	0.0000
TIME	0.013103	0.002278	5.752779	0.0000
R-squared	0.635278	F-statistic		33.09446
Adjusted R-squared	0.616082	Prob(F-statistic)		0.000015
Durbin-Watson stat	2.342708	**Instantaneous rate of Growth**		1.310
Anti-log(β_2)	1.013189	**Compound Rate of Growth**		1.318

Source: Researcher's own calculation

Table: 4

Dependent Variable: LOG(RIC) 1991 TO 2000				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	4.292916	0.023135	185.5594	0.0000
TIME	0.018490	0.003729	4.959045	0.0011
R-squared	0.754542	F-statistic		24.59212
Adjusted R-squared	0.723860	Prob(F-statistic)		0.001108
Durbin-Watson stat	2.44	**Instantaneous rate of Growth**		1.84
Anti-log(β_2)	1.0186619985	**Compound Rate of Growth**		1.86

Source: Researcher's own calculation

Table: 5

Dependent Variable: LOG(RIC) 2001 TO 2010				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	4.238989	0.144697	29.29559	0.0000
TIME	0.016716	0.009179	1.821074	0.1061
R-squared	0.293056	F-statistic		3.316310
Adjusted R-squared	0.204688	Prob(F-statistic)		0.106078
Durbin-Watson stat	2.58	**Instantaneous rate of Growth**		1.67
Anti-log(β_2)	1.01685	**Compound Rate of Growth**		1.68

Source: Researcher's own calculation

The results of model 1 shows that the production of rice increases at a rate of 1.31% per annum during entire study period. if we look on decade growth of rice production it shows upward trend during 1991 to 2000 but growth of rice production has been declined during 2001 to 2010. The obtained R- square values are quite low but it is significant. The value of F-statistics shows satisfactory result. The D-W statistics indicate the absence of autocorrelation among residuals.

Model 2 : LOG (WHT) $_t = \beta_1 + \beta_2 t + \mu_t$

Table: 6

Dependent Variable: LOG(WHT) 1991 TO 2011				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	4.052573	0.027084	149.6309	0.0000
TIME	0.018788	0.002157	8.710414	0.0000
R-squared	0.799729	F-statistic		75.87131
Adjusted R-squared	0.789188	Prob(F-statistic)		0.000000
Durbin-Watson stat	1.17	**Instantaneous rate of Growth**		1.87
Anti-log(β_2)	1.01896	**Compound Rate of Growth**		1.89

Source: Researcher's own calculation

Table: 7

Dependent Variable: LOG(WHT) 1991 TO 2000				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	4.006975	0.030456	131.5650	0.0000
TIME	0.030613	0.004908	6.236860	0.0002
R-squared	0.829419	F-statistic		38.89842
Adjusted R-squared	0.808096	Prob(F-statistic)		0.000249
Durbin-Watson stat	2.64	**Instantaneous rate of Growth**		3.06
Anti-log(β_2)	1.0310863962	**Compound Rate of Growth**		3.10

Source: Researcher's own calculation

Table: 8

Dependent Variable: LOG(WHT) 2001 TO 2010				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	3.939926	0.080034	49.22817	0.0000
TIME	0.024188	0.005077	4.764097	0.0014
R-squared	0.739385	F-statistic		22.69662
Adjusted R-squared	0.706808	Prob(F-statistic)		0.001419
Durbin-Watson stat	1.90	**Instantaneous rate of Growth**		2.41
Anti-log(β_2)	1.02448	**Compound Rate of Growth**		2.44

Source: Researcher's own calculation

Table 6 to table 8 depict the wheat production growth rate during 1991 to 2011 and sub periods 1991 to 2000 and 2001 to 2010. Results clearly indicates that wheat production grew at a rate of 1.87% per annum during 1991 to 2011. The wheat production increase at a rate of 3.06% and 2.46% per annum during sub periods 1991 to 2000 and 2001 to 2010. The production growth of wheat is highest during the sub period 1991 to 2000. . D.W statistics are 1.17, 2.64 and 1.90 which confirm to some extent of absence of auto-correlation among residuals.

Model 3 : LOG (PULS) $_t = \beta_1 + \beta_2 t + \mu_t$

Table: 9

Dependent Variable: LOG(PULS) 1991 TO 2011				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	2.500976	0.045846	54.55163	0.0000
TIME	0.011146	0.003651	3.052808	0.0065
R-squared	0.329087	F-statistic		9.319638
Adjusted R-squared	0.293776	Prob(F-statistic)		0.006548
Durbin-Watson stat	1.65	**Instantaneous rate of Growth**		1.11
Anti-log(β_2)	1.0112083481	**Compound Rate of Growth**		1.12

Source: Researcher's own calculation

Table: 10

Dependent Variable: LOG(PULS) 1991 TO 2000				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	2.568092	0.064808	39.62591	0.0000
TIME	0.001489	0.010445	0.142587	0.8901
R-squared	0.002535	F-statistic		0.020331
Adjusted R-squared	-0.122148	Prob(F-statistic)		0.890142
Durbin-Watson stat	1.41	**Instantaneous rate of Growth**		0.14
Anti-log(β_2)	1.0014901091	**Compound Rate of Growth**		0.14

Source: Researcher's own calculation

Table: 11

Dependent Variable: LOG(PULS) 2001 TO 2010				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	2.177286	0.155570	13.99556	0.0000
TIME	0.030414	0.009869	3.081809	0.0151
R-squared	0.542793	F-statistic		9.497549
Adjusted R-squared	0.485642	Prob(F-statistic)		0.015076
Durbin-Watson stat	2.76	**Instantaneous rate of Growth**		3.04
Anti-log(β_2)	1.0308812305	**Compound Rate of Growth**		3.08

Source: Researcher's own calculation

Table 9 to table 11 depicted the growth rate of pulses production in India. The result shows there is significant positive trend of the pulses production during the entire period under consideration and increases at a rate 1.11% Per Annum significant at 5% level. The production of pulses declined during the sub period 1991 to 2000.

From the above regression result, it is clear that coefficient of determination is quite low it is about 0.32, 0.0025 and 0.54. The compound rate of growth of pluses production is 1.12 which quite higher than instantaneous rate of growth.

MODEL 4

$LOG\ (AGRI)_t = \beta_1 + \beta_2 t + \mu_t$

Table: 12

Dependent Variable: LOG(AGRI) 1991 TO 2011				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	5.150620	0.026473	194.5622	0.0000
TIME	0.015394	0.002108	7.301706	0.0000
R-squared	0.737260	F-statistic		53.31491
Adjusted R-squared	0.723432	Prob(F-statistic)		0.000001
Durbin-Watson stat	2.13	**Instantaneous rate of Growth**		1.53
Anti-log(β_2)	1.015513098	**Compound Rate of Growth**		1.55

Source: Researcher's own calculation

TABLE: 13

IMPACT OF FOOD GRAIN PRODUCTION ON AGRICULTURE INFLATION TREND

Dependent Variable: PRIC				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-147.1091	32.45612	-4.532553	0.0003
AGRI	16.97530	10.77454	1.575501	0.1347
RC	-30.47984	15.14607	-2.012393	0.00613
WT	28.93965	12.97717	2.230044	0.0404
PL	-33.51664	39.99504	-0.838020	0.4144
R-squared	0.908157	**F-statistic**		39.55242
Adjusted R-squared	0.885196	**Prob(F-statistic)**		0.000000
Durbin-Watson stat	1.700028			

Source: Researcher's own calculation

Table 13 shows the relationship between food grain production and agriculture Inflation trend in India. The coefficient of constant is -147.10, implying that when all other selected independent variables are held constant, the value of the dependent variable i.e. agriculture inflation is -147.10. Rice has a coefficient of -30.47, this implies that 1% increase in rice production leads to 30.47% decrease in the agriculture inflation. Pulses has a coefficient of -33.51, this indicates that 1% increase in production of pulses leads to 33.51% decrease in inflation trend in agriculture. The coefficients of rice and pulses production are highly negative and significant. It means production of rice and pulses have negative impact on inflationary trend in India. In this model coefficient of determination is 0.90, which means that 90 percent of the variation in agriculture Inflation are explained by the independent variables. The F- test for the model also

indicates it is highly significant, F = 39.55 at sig F= .0000.

From our regression results, the obtained R-square is 0.90. This shows that almost 90% of the variation in agriculture Inflation is explained by the independent variables. The results of t-test revealed that only rice and wheat production have significant impact on agriculture inflation.

SECTION IV
CONCLUSION, LIMITATIONS AND SUGGESTIONS

Conclusion

The main objective of this study was to examine the growth of key food grains production and its impact on agriculture inflation in India during 1991 to 2011. Production of rice, wheat and pulses were used as independent variables, on the other hand agriculture inflation used as dependent variable. To examine the growth of selected variables, time variable was used as independent variable. From the above results and analysis we could draw the conclusion as below:

- Production of rice has increased at a rate of 1.31% per annum during 1991 to 2011.
- Production of wheat has increased at a rate of 1.89 % per annum during 1991 to 2011.
- Production of pulses has increased at a rate of 1.11 % per annum during 1991 to 2011.
- From regression coefficient it is clear that there were high and significant negative relationship among production of key food grains and agriculture Inflation.

IV.II Limitation of the study:

The limited database, short time period and selected variables are some of the major limitations of this study. However in future research scholars or students can work on more variables which will provide better experience to the students for their bright career

IV.III Suggestions

From the above results it is suggested that there is need to focus on supply side measures to control agriculture inflation. It may be controlled by

- Increase investment and productivity in agriculture sector
- Increase supply of essential agriculture food products by importing from other countries for short period.
- The focus should be given on better provision of inputs, subsidies, storage and marketing facilities.

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