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IMPACT OF GOVERNMENT EXPENDITURE ON AGRICULTURE AND PERFORMANCE OF AGRICULTURAL SECTOR IN INDIA

K. N. Selvaraj

ABSTRACT

The agricultural development had to rely heavily on government finance since the inception of first Five Year plan (FYP) period. However, there has been declining share to agriculture from the public finance clue to planned achievements in agriculture, industrialisation and economic reforms. This trend may have deleterious effect on the performance of agricultural sector. An attempt is made in this paper to assess the impact of agricultural government expenditure on agricultural output growth using time-series data over the 1951-52 to 1988-89 period. The adverse effect of expenditure instability on agricultural growth is also analysed. The results indicate that the government expenditure policies are of vital importance for the growth of agricultural sector and any reduction in agricultural government expenditure adversely affects agricultural sector performance. It was also found that instability in agricultural government expenditure is inversely related to the growth of the sector.

I. INTRODUCTION

Agricultural sector is an instrumental factor for the development of the economy in India, as it sustains the livelihood of 75.0 per cent of the population (Khanna, 1990) and nearly constitutes 30.0-40.0 per cent in Total GDP. The growth of the sector was aimed at prime importance since the inception of first five year plan. Consequently, there has been substantial Growth in agricultural sector and die achievements are practically significant that the output expansion has been made possible with the increase in productivity of land through promotion of new technology, altering thee prices of farm inputs and outputs and changing institutions in which farm input and output markets operate.

However, in the farm sector, more than 60.0 per cent of production potential is unrealised and 23.0 per cent of the total culturable land remains uncultivated (Singh, 1990). According to the latest estimates, India's irrigation potential is 178 million hectares, which is 1.84 times the total cultivated area of China. Inspire of large population, on a per capita basis, India has a larger area under gratin cultivation as well as under in•igation. According to World Watch Institute, the per capita grain area in the world is 0.13 ha compared to the Indian average of 0.15 ha; the per capita irrigated land in the world is only 0.045 ha against the Indian average of 0.088 ha. In the world as a whole, the percentage of arable to total land area is only 11.0 and in India it is 51.5.

The author is an Assistant Professor, Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore - 641 003, Tamil Nadu, India.The author is grateful to referees Dr. Shamsul Alam and Dr. R. K. Talukder for their valuable comments. The author is responsible for any errors that remain.

The existing potential need to be exploited to meet the future challenges like raising food demand (population growth rate is 2.11 per cent per annum), increasing industrial raw materials and providing much gains in employment (employment elasticity is less that 0.4 per cent). On the other hand, the capital formation in agriculture tended to decline' (Singh, 1990) and the productivity of agricultural crops is less than the world average. According to World Bank estimate, the per capita GNP in India is $330 and the average per capita GNP of agriculturist derived from agriculture is about $150 and that of non-agriculturist $699. According FAO, the productivity of cereals in 1990 was 1893 kg per hectare, against the world average of 2802 kg per hectare.

So far the agricultural development had to rely heavily on government finance due to presence of externalities, high risk, and inadequacies in agricultural institutions (rural credit, input supply, etc.) which discourage investment in agriculture from private sources (FAO, 1987). As a consequence of industrialisation and economic reforms, one could expect government expenditure on agriculture would suffer setbacks relative to other sectors and this could have deleterious effect on the performance of the sector.

To keep pace and pattern, the progress of agricultural growth should be further augmented through price policies coupled with other non-price measures such as irrigation, infrastructure and research (Mellor and Ahmed, 1988). This calls for continuing attention and desired emphasis from the government in allocating outlays to agriculture. The study is carried out to show the pattern of investment in agriculture, performance of agricultural sector and the impact of government expenditure (agriculture) and its instability on the agricultural output growth.

The paper is organised as follows. Section 2 briefly discusses the data used and test of structural stability. Section 3 investigates the investment pattern in agriculture and performance of agricultural sector. Section 4 indicates the contribution of government expenditure on agricultural output growth and presents empirical results. Section 5 provides estimates of the magnitude of instability in agricultural expenditure and examines the effect of instability on agricultural development. Finally, Section 6 summarises the results and provides policy implications.

II. SOURCE OF DATA AND STRUCTURAL STABILITY :

Secondary data on agricultural GDP and government expenditure on agriculture at constant prices, gross cultivated area, agricultural labour force were collected from the issues of National Accounts Statistics, Agriculture in Brief and Economic Survey from 1951-52 to 1988-89 (Vide Appendix-I)

The stability of the intercepts and coefficients of the production functions over time was statistically tested by applying Chow text (Gujarati, 1988). The data were divided into two periods, 1951-52 to 1965 -66 (pre-green revolution period) and 1966-67 to 1988-89 (Post-green revolution period). The equations can be specified as follows:

(i) Pre-green revolution period

$$Y_i = ß_1 + ß_2 X_i + U_{1i} \ldots (1)$$

$$i = 1, 2, \ldots N_1$$

(ii) Post-green revolution period

$Y_i = \alpha_1 + \alpha_2 X_i + U_{2i}$ .....(2)

$i=1,2, \ldots\ldots N_2$

Where Y_i =Dependent variable

X_i=Explanatory variable

U_{1i}, U_{2i} =Disturbances in the two regressions.

The Chow test is based on the following assumptions

(a) $U_{1i} \sim N(O, \sigma^2)$

$U_{2i} \sim N(O, \sigma^2)$

(b) U_{1i} and U_{2i} are distributed independently.

The disturbances are distributed normally with zero mean and constant or homoscedastic variance σ^2 and that the disturbances of the two regressions are independently distributed. Given these assumption the Chow test was applied as follows:

(1) Pooled regression was carried out combining all the N_1 and N_2 observations. Residual Sum of Squares (RSS) say, S was obtained from the pooled regression with df=N_1+N_2-K, where K is the number of parameters.

(2) Two regressions were estimated for two periods separately and RSS were obtained. Say, S_2, S_3 with N_1-K and N_2-K, respectively where K is number of parameters. Two residual sum of squares were added i.e.,

$S_4=S_2+S_3$ with df=N_1+N_2-2k.

(3) S_5 was obtained by subtracting S_1 from S_4 i.e., $S_5 = S_1 - S_4$.

(4) F test was applied and it is given by

$$F=\frac{S_5/K}{S_4/(N_1+N_2/2K)} \text{ with df=K, } N_1+N_2-2k$$

If the computed F exceeds the critical F, the hypothesis that the two regressions are the same can be rejected.

The estimated Chow test value was 3.00 and 0.40 for the regression equations used to find out the influence of agricultural government expenditure on agricultural performance and intensive form of Cobb-Douglas production function, respectively. The calculated values were less than the 'F' table values (4.02 and 4.51) at 1.00 per cent level of significance, indicating that the coefficients remain stable overtime and hence, estimation was carried out for the pooled data (1951-52 to 1988-89).

III. INVESTMENT PATTERN IN AGRICULTURE AND PERFORMANCE OF AGRICULTURAL SECTOR

India being primarily an agricultural economy, desired emphasis has been given to the sector over a period of time. However, there could be reduction in government expenditure on agriculture consequent of industrialisation and implementation of structural adjustment policies like devaluation of exchange rate, cut in imports, more reliance on the private sectors and curtailment in public investment. Total expenditure, agricultural government expenditure and percentage share of agricultural government expenditure in total expenditure are summarised in Table 1.

The maximum share of agricultural government expenditure to total expenditure (30.60%) was noticed in the first FYP period (1951-52 to 1955-56) and die minimum share (13.40%) was observed in seventh FYP period (1985-86 to 1989-90). From the Second FYP period to sixth FYP period, the share was nearly stable and it approximately stood at 20 per cent. Khanna (1990) reported that in agriculture sector the percentage reduction in the allocation of funds has been from 36.9 per cent to 22.1 per cent. With respect to agriculture and allied services the reduction in the allocation of funds has been 14.8 per cent to 5.9 per cent during various plan periods.

It is evident from the Table that during die first FYP period more emphasis was given to agriculture because one third of expenditure was expended on agriculture. From second FYP period onwards, emphasis was laid on industrial sector due to planned achievement in agriculture starting from first FYP period.

Since the advent of first Five Year plan (1951-52 to 1955-56), agricultural production increased from 53 million tonnes to 174 million tonnes in 1989-90 and it is expected to increase 240 million tonnes in 2000 AD. In the export front, al-11iculture has made sizeable progress due to the sectoral policies of the government. It is found that agricultural exports would more than double to $5 billion in 1997 (end of Eighth plan period) from the present level of $2 billion. The growth of agricultural sector in terms of production and productivity of agricultural crops was assessed by estimating the compound growth rate. The estimates are presented in Table 2.

Table1: Percentage Share of Government Agricultural Expenditure in Total Expenditure

Plan Period	Total Expenditure Rs. crores	Govt. Agril. Expenditure Rs. crores	Percentage Share of Agrl. Govt. Expenditure in Total Expenditure
I (1951-52 to 1955-56)	1960.00	600.00	30.60
II (1956-57 to 1960-61)	4600.00	950.00	20.65
III (1961-62 to 1965-66)	8576.50	1750.00	20.40
IV (1969-70 to 1973-74)	15778.80	3300.00	20.90
V (1974-75 to 1978-79)	39426.20	8080.00	20.49
VI (1980-81 to 1984-85)	109645.80	24700.00	22.53
VII (1985-86 to 1989-90)	222169.30	29770.00	13.40

The compound growth rate indicated that both production and productivity of almost all the agricultural crops significantly increased over the years. The growth is mainly due to planned investment made in agriculture through expansion of irrigation facilities and spread of fertilizer and credit outlets coupled with favourable prices.

IV. GOVERNMENT EXPENDITURE ON AGRICULTURE AND AGRICULTURAL OUTPUT GROWTH

The contribution of government expenditure on agricultural output growth was empirically anlaysed by employing a neo-classical production function of the Cobb-Douglas

Table 2 : Perfomance of Agriculture - Growth Indicators

S. No.	Particulars	Compound growth rate in percentage (1951-52 to 1989-90)Production	Productivity
1	Total Cereals	3.05 ***	2.02 ***
		(0.24)	(0.21)
2	Total Pulses	0.60 NS	0.30 NS
		(0.69)	(0.23)
3	Total foodgrains	2.68 ***	2.02 ***
		(0.24)	(0.21)
4	Groundnut	2.02 ***	0.70 NS
		(0.47)	(0.46)
5	Cotton(Lint)	2.14 ***	2.15 ***
		(0.47)	(0.23)
6	Sugarcane	3.05 ***	2.02 ***
	(cane)	(0.47)	(0.47)
7	Total Oilseeds	2.02 *	1.01 **
		(1.17)	(0.47)

*** $P \leq 0.01$ (two tailed test)

** $P \leq 0.05$ (two tailed test)

* $P \leq 0.10$ (two tailed test)

NS -Not Significant

Figures in parentheses indicate standard error of the compound growth rate (r). The standard error of the compound growth rate (r) is given by SE (r) =

$$\frac{100\, b}{10g^e}\sqrt{\frac{\sum \log Y^2 - (\sum \log Y)^2 - \log\, b \sum x\, \log Y}{n\text{-}2\ x^2}}$$

where $\sum X^2 = \sum t^2 - \sum t^2/n$ The test of significance is applied using 't' test. The 't' test is given by $t = \frac{r}{SE(r)}$ with n-2 df.

type (Hayami and Ruttan, 1970; Antle, 1983; Elias, 1985). The model was estimated by Ordinary Least Squares (OLS) by incorporating expenditure variable along with other conventional inputs such as land and labour. The function is given by

$$\log (AGDP)_t = \beta_0 + \beta_1 \log(AGE)t + \beta_2 \log (GCA)_t + \beta_3 \log(ALF)_t + U_t ...(3)$$

Where, the dependent variable AGDP is agricultural GDP at constant price expressed in crore rupees. Land and labour, representing the country's resource endowments, were measured by gross cropped area (GCA) which is expressed in thousand hectares and agricultural labour force (ALF) which is expressed in million number. The agricultural government expenditure at constant Price (AGE) is expressed in crores rupees. U_t is the stochastic disturbance term with Ut ~N(O, σ^2). The time period considered for the analysis is from 1951-52 to 1988-89. β_1, β_2 and B_3 are the respective elasticities and β_0, is regression constant. The results of the equation 3 are presented in Table 3.

Table 3. Estimates of the Production Function (Log Linear Relation) 1951-52 to 1988-89

Variable	Bi	SE $\hat{\beta}i$	T Ratio	Level of Signifiance
Constant	-1.33	14.80	-0.09	NS
AGE_t	0.72	0.09	7.74	**
GCA_t	0.78	1.34	0.58	NS
ALF_t	-0.62	0.88	-0.71	NS

$R^2 = 0.96$ ** $p \leq 0.01$ -(two tailed test)

$R^2 = 0.95$ (Adj.) NS- Not Significant

F - 291.96

The estimated elasticity of the government expenditure on agriculture is 0.72 which is significant at one per cent level of probability. The elasticity of the government expenditure on agriculture indicates 10.0 per cent increase in government expenditure would induce 7.2 per cent increase in agricultural production. The results clearly show that government expenditure policies are important determinants of the performance of the agricultural sector. The growth of agriculture can be further realised through adequate investment from public finance.

V. GOVERNMENT AGRICULTURAL EXPENDITURE INSTABILITY

Agricultural government expenditure instability may affect the development of agricultural sector (Lim, 1983). Again uncertainty associated with instability in public expenditure may reduce the level of investment and hence thwart the growth of the sector, if risk averse behavior characterises farmers. Instability in government expenditure might also jeopardise the planning ability of the government and parastatal organisations thereby adversely affect economic growth.

In what follows, an attempt was made to analyse the adverse effect of expenditure instability on agricultural growth. Instability was measured by instability index and instability index is the average absolute percentage deviations from an exponential trend. Instability indices are presented in Table 4.

Table 4. Instability in Government Expenditure on Agriculture during plan periods *

Plan Period	Instability Index **
I (1951-52 to 1955-56)	3.62
II (1956-57 to 1960 -61)	2.14
III (1961-62 to 1965-66)	1.98
IV (1969-70 to 1973-74)	2.93
V (1974-75 to 1978-79)	2.15
VI (1980-81 to 1984-85)	6.90
VII (1985-86 to 1989-90)	1.98
Overall	3.10

* Unweighted average
** Absolute percentage deviation from an exponential trend.

The overall instability index observed is 3.10. The maximum of 6.90 was noticed in sixth FYP period (1980-81 to 1984-85) and minimum of 1.98 was observed in the third and seventh FYP periods.

In order to test the effect of fluctuations in government expenditure on agricultural growth, the rate of change of agricultural production is assumed to be explained by the instability of expenditure, after accounting for other relevant explanatory factors such as land and labor. The intensive form of Cobb-Douglas production function was specified i.e. output and land were expressed in terms of labor. The function was estimated by Ordinary Least-Squares (OLS) method. The intensive form of Cobb-Douglas production function assumes

constant return to scale and reduces problems of multicollinearity and heteroscedasticity. The model is specified as follows:

$$\log (OPLRC)_t = b_o + b_1 \log (LPLRC)_t + b_2 \log(IIAGE)_t + V_t \ldots(4)$$

Where, OPLRC refers to output per labour rate of change (output is agricultural GDP at constant price), LPLRC indicats land per labour rate of change, IIAGE denotes instability index of agricultural government expenditure and V_t is stochastic disturbance term with $v_t \sim N(o, \sigma^2)$.

The time period taken for the estimation is from 1951-52 to 1988-89 and b_0, b_1 and b_2 are the parameters of the estimable equation.

The results of the equation 4 are furnished in Table 5.

Table 5 : Instability in Government Agricultural Expenditure and Agricultural output Growth: Estimation Results (1951-52 to 1988-89)

Variable	b_i	Se_{bi}	T Ratio	Level of Significance
Constant	10.48	2.57	4.08	**
LPLRC	2.15	0.57	3.79	**
IIAGE	-0.50	0.69	-0.72	NS

R^2 = 0.30

R^2 = 0.25 (Adj.)

F = 7.42

** P 0.01 - ≤ two tailed test

NS - Not Significant

The instability variable has the expected negative sign but it is not significant. However, it is evident from the empirical results that instability in government expenditure has detrimental effect on agricultural production growth. To attain sustainable growth in agriculture, empirical findings suggest that provision of adequate public finance on a predictable basis is an important stimulus to agricultural output growth.

VI. SUMMARY AND POLICY IMPLICATIONS

The main objective of this paper was directed towards assessing the contribution of government expenditure on agricultural output growth over a period of 1951-52 to 1988-89.

The analysis shows that India has witnessed an overall decline in the share of agricultural expenditure in total government expenditure; the rate of instability was less; reduction in agricultural government expenditure adversely affects agricultural sector performance. On an average, 10 per cent increase in government expenditure would induce an almost 7 per cent increase in agricultural production; instability in agricultural government expenditure is inversely related to the growth of the sector.

India has been switching over to new economic reforms reducing public sector deficits and public sector intervention. However, the empirical evidence of this paper suggests that public expenditure is an important determinant of agricultural growth. Hence, expenditure reducing policies should be guided by careful assessment of cost-effectiveness of on-going projects rather than by indiscriminately cutting across the board.

There was obviously potential areas in agricultural sector, which could be adequately tapped through government intervention. Apart from the concerns related to food security and poverty alleviation, government involvement may be essential for creating exportable surplus through adequate investment on infrastructure, irrigation, agricultural research and extension as they are expected to have a high pay-off in India. Provision of these critically needed public goods would stimulate the private investment in the form of agricultural input markets, agro based industries, agricultural processing and product markets. Biases in the existing structure of government investment (eg. irrigated vs rainfed, by crop, by farm size) need to be corrected. For achieving sustainable growth in the agricultural sector, a rational allocation of budgetary outlays and the development of better systems for establishing sectoral allocations remain the key issues.

Footnote:

[1] The gross capital formation in agriculture was Rs. 25568 crores during 1970-71 to 1979-80 which formed 17.2 per cent of the total gross capital formation. Between 1980-81 and 1988-89, it was Rs. 60498 crores which accounted for 12.3 per cent of the total gross capital formation

APPENDIX I : Government Expenditure, GDP and Employment in Agriculture Sector in India

S. No.	Year	GDP in Agriculture (Rs. in crores)	Government Expenditure on Agriculture (Rs. in crores)	Gross Cropped Area (000'ha)	Labour Force in Agriculture (million)
1	1951-52	4852	79.47	133243	100.22
2	1952-53	4771	81.92	137675	103.14
3	1953-54	5290	105.00	142480	106.06
4	1954-55	4438	145.68	144087	108.98
5	1955-56	4289	187.93	147311	111.90
6	1956-57	5486	130.69	149492	114.82
7	1957-58	5360	182.61	145832	117.74
8	1958-59	6254	206.83	151629	120.66
9	1959-60	6255	208.69	152824	123.58
10	1960-61	6561	221.18	152772	131.10
11	1961-62	6758	230.63	156209	130.57
12	1962-63	6899	282.70	156760	130.05
13	1963-64	8155	349.65	156963	129.53
14	1964-65	10030	411.11	159229	129.00
15	1965-66	9937	475.90	155276	128.48
16	1966-67	11574	515.53	157355	127.95
17	1967-68	14578	496.57	163736	127.43
18	1968-69	14909	564.47	159529	126.90
19	1969-70	16358	462.18	162265	126.38
20	1970-71	16821	527.77	165791	125.80
21	1971-72	17105	654.67	165194	128.32
22	1972-73	18772	779.53	162150	130.83
23	1973-74	24836	875.84	169871	133.35
24	1974-75	27057	1010.02	164190	135.86

Contd.

S. No.	Year	GDP in Agriculture (Rs. in crores)	Government Expenditure on Agriculture (Rs. in crores)	Gross Cropped Area (000'ha)	Labour Force in Agriculture (million)
25	1975-76	26651	1315.08	170994	138.38
26	1976-77	27105	1656.26	167280	140.90
27	1977-78	32238	1890.82	172310	143.41
28	1978-79	32815	2207.82	174764	143.93
29	1979-80	33586	1638.30	169657	148.40
30	1980-81	42466	3341.31	173096	148.00
31	1981-82	47736	4102.38	177042	150.96
32	1982-83	50527	4794.42	173396	153.92
33	1983-84	61318	5651.48	180165	156.88
34	1984-85	65181	6810.41	176418	159.84
35	1985-86	69964	4429.92	178831	162.80
36	1986-87	74405	5245.86	176920	165.76
37	1987-88	83594	5751.23	171809	168.72
38	1988-89	109848	6625.10	180109	171.68

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