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Impact of Government Intervention in Procurement of Rice on Smallholder Farmers in Subtropics of Jammu

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Abstract

The impact of procurement policy, introduced in the state of Jammu & Kashmir (J&K) in 2010 has been assessed on the rice growers' income. For study, a sample of 100 farmers selling their rice produce at the procurement centres established by the government and a matching sample of 50 farmers selling their market surplus rice in the open market was selected. The difference-in-differences (DD) quasi-experimental design was used to find the impact. The results revealed that for the farmers who sold their produce at the procurement centres, the DD was of ₹ 175/q for the coarse rice variety and of ₹ 77/q for the semi-fine variety compared to the control group. The farmers who chose to sell their produce at the procurement centres had an additional income of ₹ 6725/farmer. The education has been found to be the only socio-economic variable that affects the farmers' decision to sell at of the government procurement centres ($p < 0.05$). The government intervention had thus ended the distress sale by the farmers, broken the monopoly of the private rice traders /millgroups, created market competition and even increased the prices of the Basmati varieties not procured by the government. The study has emphasized on the need of expanding education in the area so that farmers may take informed decisions on selling their produce.

Key words: Foodgrain, procurement policy, marketed surplus rice, difference in differences model, Jammu & Kashmir

JEL Classification: D02, D04, Q18

Introduction

In India, the foodgrain production, which was hovering around 200 million tonnes (Mt) up to 2005-06, reached a high of 244.8 Mt in 2010-11 and was estimated to be over 255 Mt in 2012-13 (MoA, 2013). Since 2007-08, the government procurement of foodgrains, particularly of wheat and rice, has increased substantially. This procurement policy is a part of the national commitment to make the Minimum Support Price (MSP) policy effective. The total foodgrains procurement has increased from 35.5 Mt in 2002-03 to about 62.3 Mt in 2011-12. Rice procurement, which was about 16.4 Mt in 2002-03, was estimated at about 34.2 Mt in 2010-11. As on June 1, 2012, the Food

Corporation of India (FCI) was holding 82.4 Mt of foodgrains, the highest amount ever received. The volume of rice procurement in its total production accounted for about 14.5 per cent in the 1980s, which increased to 16.5 per cent in the 1990s, 30 per cent in 2000 and 33.7 per cent in 2011-12 (Sharma, 2012).

Prior to 2010, the state of Jammu & Kashmir (J&K) had no established policy for procurement of rice and wheat at MSP. In fact, there were reports of distress sale of the marketable-surplus rice even in 2010. This impelled the authorities in the J&K Agricultural Production Department (APD) to intervene and involve the FCI in setting up temporary procurement centres (PCs) in the districts of Jammu, Kathua and Samba. In 2010, rice procurement to the tune of 38485 quintals¹

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¹1 quintal = 0.1 tonne

(q) was achieved. In 2011, the FCI was reluctant to procure the marketable-surplus rice from the state; however, with the efforts of APD, rice was procured in 2011, although the PCs were set up rather late (after mid-November 2011) when most of the farmers had already made distress sale of their marketable-surplus. This resulted in a decreased procurement in 2011, when only 19722 q of rice were procured, a decrease of 48.8 per cent vis-à-vis procurement in 2010. In 2012, despite timely initiatives of the APD, Government of J&K, the procurement process was delayed as late as mid-October due to the indecisive behaviour of the FCI. The APD facilitated and ensured that 13 PCs were established in 2012-2013 by the FCI for rice procurement at the MSP.

The involvement of government in the agricultural sector is all-encompassing and significant. The government policies in research, extension services, infrastructure, commodity and conservation programmes, as well as organizational and structural dimensions are designed to greatly impact agriculture (Ahearn *et al.*, 2002). Certain government policies are designed to directly impact agriculture including those of the procurement policy to smallholders in the Jammu region of Jammu & Kashmir. The present study has been conducted to discern the benefits of the government procurement policy to smallholders in the Jammu region of Jammu & Kashmir. All the 13 PCs established by the APD were selected to study and evaluate the impact of the procurement policy.

Materials and Methods

Data Collection

The sample was selected using the multistage sampling technique. At the first stage, three districts, viz. Jammu, Kathua and Samba, were selected because PCs were established by the government in these three districts. At the second stage, a sample size of 100 farmers from the experimental group (with government intervention), and 50 farmers from the control group (without government intervention) were selected for the study. All the PCs located in Bishnah, Arnia, R.S.Pura, Sohanjana, Gajansoo, Channu Chak, Pargwal, Khour and Jourian (Jammu district), Ramgarh and Vijaypur (Samba district), and Nagri-Parole-Chanigran and Sanji Morh (Kathua district) were selected for the study. At the third stage, proportional

random sampling without replacement was performed for selecting the farmers from each of these PCs. The sample size for each PC was decided by the proportionate allocation method from the total number of farmers (691) availing the procurement facilities. A sample of 100 farmers was drawn using the random sampling method. For comparison, a sample of 50 matching farmers was selected based on the operational landholding size and history of having cultivated coarse and semi-fine rice varieties in 2012. A total of 66 villages were covered under the present study. The data were collected using the personal interview method in 2012 using a semi-structured interview schedule. The data were analyzed using the SPSS 16.0 computer programme. The "t" test and binary logistic regression model were applied in the study.

Empirical Models

The difference-in-differences (DD) non-equivalent control group design (Table 1) was employed to identify the difference between the experimental group (farmers who sold their marketable-surplus of rice at the PCs) and the control group (farmers who sold their produce in the open market). The DD model was employed to eliminate the in-built, systematic or seasonal effects in the rice sale rate. Besides, the impact of the procurement policy was measured by employing with and without government intervention.

The binary logistic regression analysis was carried out to find the effect of socio-personal and economic variables on the decision to sell marketable-surplus at the PCs. Both enter and forward stepwise methods were used for delineating the independent variables affecting farmers' decision to avail procurement facilities. However, the forward stepwise criterion was followed

Table 1. Difference-in-differences model

	2011	2012	Difference
Experimental group	Y_{t_1}	Y_{t_2}	$\Delta Y_t = Y_{t_2} - Y_{t_1}$
Control group	Y_{c_1}	Y_{c_2}	$\Delta Y_c = Y_{c_2} - Y_{c_1}$
Difference in differences			$\Delta \Delta Y = \Delta Y_t - \Delta Y_c$

where, Y_{t_1} and Y_{t_2} depict the status before and after government intervention, respectively, in the experimental group of farmers, and Y_{c_1} and Y_{c_2} indicate the status before and after government intervention, respectively, in the control group of farmers. $\Delta Y_t - \Delta Y_c = (Y_{t_2} - Y_{t_1}) - (Y_{c_2} - Y_{c_1})$ depicts the impact of procurement policy

to select the best predicting variables. At each step the predictor which contributed the most to prediction was added. For the entry of the predictors into the model, a default value of 10 per cent significance level was adopted. The result of this type of regression can be expressed as per Equation (1):

$$\ln [p/(1-p)] = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \dots b_k x_k \dots (1)$$

where, p represents the probability of the outcome; b_0 is the y-intercept, and x_1 to x_k represent the predictors in the equation.

For validation, the model chi-square value was considered, while Nagelkerke's R^2 was used to determine the variation caused by predictors. The significance of the model indicates that all the independent variables in the model together produce a significant variation in a dependent variable. The nine variables considered are given in Table 2.

Results and Discussion

Descriptive Statistics

The descriptive statistics of the sample farmers, both experimental and control, are presented in Table 3 along with t-values and p-values. It was observed that the farmers who sold their produce at the PCs were younger and more educated than those in the control group and the difference was significant. There was no significant difference in the average landholding size of the experimental and control groups of farmers

($t = 1.290$, $p = 0.199$, d.f. = 148). This was the only variable considered for selecting a sample matching the control because marketing-surplus is landholding-dependent. The average area under rice crop cultivation in the case of the experimental group of farmers (2.84 ha) and the control group (2.23 ha) was same and the difference of 0.61ha was not statistically significant. Out of 150 farm households, only 29 per cent exclusively depended on farm income for their livelihood, whereas 71 per cent had both off-farm and on-farm incomes.

Marketable-Surplus Rice

In 2012, the total procurement of coarse and semi-fine varieties of rice at the PCs was of 19090 q and 17030 q, respectively. The marketable surplus of coarse and semi-fine rice varieties in the total production was 98.2 per cent in the experimental group and 97.6 per cent in the control group of farmers. Compared to 2011 crop season, the marketable surplus in 2012 showed a decrease for the coarse rice, and an increase in the semi-fine varieties in both the groups (Table 4).

Impact of Procurement Policy

In 2012, the difference in the selling prices of rice between experimental group and control group was found significant (Table 5). The experimental group of farmers earned ₹ 157/q more for their marketable-surplus of coarse rice, which was statistically significant ($t = 14.442$, $p = 0.000$, d.f. = 69). They also earned significantly higher returns of ₹ 101/q for the

Table 2. Variables used, their coding and units

Dependent variable	Code/Units
Sold rice at procurement centre (Y_1)	1- if sold at the procurement centre, 0-if sold in open market
Independent variable	Code/Units
Age (x_1)	Years
Education (x_2)	Number of years of formal education completed
Distance from nearest market (x_3)	km
Distance from procurement centre (x_4)	km
Landholding size (x_5)	ha
Possession of a telephone/mobile phone (x_6)	1 for having telephone/mobile phone, 0 otherwise
Off-farm employment (other than farming) (x_7)	1 for having off-farm employment, 0 otherwise
Experience in farming (x_8)	Years
Social participation (x_9)	1 for member of any organization, 0 otherwise

Table 3. Descriptive statistics of the sample rice farmers in Jammu division

Particulars	Experimental farmers (n=100)	Control farmers (n=50)	t-value	p-value	d.f
Average age (years)	47.2 (±11.6)	52.3 (±10.8)	2.576	0.011	148
Average education (years)	9.4 (±2.9)	7.8 (±4.1)	2.671	0.008	148
Average operational landholding (ha)	3.69 (±3.7)	2.85 (±3.8)	1.290	0.199	148
Farm size* (% farmers)					
i. < 1 ha (marginal)	13	24			
ii. 1-2 ha (small)	22	32			
iii. 2-4 ha (semi-medium)	30	20			
iv. 4-10 ha (medium)	35	24			
Total area under rice crop in 2012 (ha)	284.15	111.55			
Average area under rice crop in 2012 (ha)	2.84 (±2.25)	2.23 (±2.80)	0.309	0.143	148
Average distance from nearest market (km)	4.6 (±5.4)	5.5 (±6.8)			
Average distance from procurement centre (km)	2.8 (±3.1)	2.1 (±1.6)			
Experience of rice cultivation (years)	23.6 (±11.8)	27.2 (±12.7)	1.713	0.089	148
Average family size (No.)	7.9 (±3.7)	7.8 (±4.3)	0.104	0.918	148

Note: Figures within the parentheses are the standard deviation, *Land categorization source: MoA (2001)

Table 4. Marketable-surplus rice in the experimental and control groups of farmers

(in quintals)

Rice variety	Marketable-surplus (Experimental group)		Marketable- surplus (Control group)	
	2011	2012	2011	2012
Coarse varieties (Common grade)	5281.1	4575.1	1681.5	856.6
Semi-fine varieties (Grade A)	3190.7	4657.0	1229.5	1686.5
Basmati	723.9	400.5	300.0	428.5
Sharbati (Long grain non-basmati rice)	168.5	292.5	48.0	180.3
Total	9364.2	9925.1	3259.0	3151.9

semi-fine variety of rice, which was (₹ 1278) also statistically significant ($t = 14.385$, $p = 0.000$, d.f. = 96) (Table 5). The difference in the market prices of Basmati rice (₹ 116/q) and long grain non-Basmati rice (₹ 24/q) between the experimental and control groups was not significant (Table 5). This finding clearly reveals that the farmers in the experimental

group benefitted significantly from the procurement of the coarse and semi-fine rice produce at MSP.

Difference-in-differences between Experimental and Control groups

To overcome the seasonal effect on selling price, the difference-in-differences (DD) model was

Table 5. Economic benefits of government intervention to farmers in selling rice in Jammu, 2012

(Selling price ₹/q)

Rice variety	Experimental group	Control group	Difference
Common/coarse rice	1250 (±0.00)	1092 (±14.41)	158** (t=14.442) (p=0.000) d.f=69
Semi-fine rice	1278 (±7.65)	1177 (±58.72)	101** (t=14.385) (p=0.000) d.f=96
Basmati rice	2079 (± 235.11)	2194 (±192.75)	-115 (t=1.233) (p=0.231) d.f=21
Sharbati rice (Long grain non- Basmati rice)	1346 (±118.08)	1322 (±83.92)	24 (t=0.506) (p=0.619)d.f=19

Note: Figures within the parentheses are standard deviations

Table 6. Difference in differences in market prices of rice varieties procured by Food Corporation of India

(₹/q)

Rice varieties	Experimental group				Control group		DD (Col. 5-Col. 2) - (Col.7-Col.6)
	2011		2012		2011	2012	
	Farmers who sold in open market (without)	Farmers who sold at PC (with)	Farmers who sold in open market (with)	Farmers who sold at PC (with)	Farmers who sold in open market (without)	Farmers who sold in open market (without)	
Coarse rice varieties	915 Sem=14.09 (n=33)	1080 Sem=0.00 (n=27)	0.00 (n=0)	1250 Sem=0.00 (n=50)	933 Sem=19.39 (n=31)	1093 Sem=16.97 (n=21)	175** (t=4.329) d.f=62
Semi- fine rice varieties	1014 Sem=10.83 (n=29)	1110 Sem=0.00 (n=22)	0.00 (n=0)	1278 Sem=0.91 (n=72)	990 Sem=24.42 (n=21)	1177 Sem=11.52 (n=26)	77 (t=0.905) (d.f=61)

Note: PC= Procurement centres set up by the government Figures within the parentheses are standard deviations, n= number of farmers

employed. The results showed that the DD between the experimental and control groups of farmers were statistically significant only in the case of the coarse rice varieties. For the coarse varieties the DD was ₹ 175/q (t=4.329 d.f.=62) and for semi-fine varieties,

it was ₹ 77/q (t = 0.905) (Table 6). There was no significant DD in the average market price of the semi-fine varieties. The impact had been indirect, as the procurement policy had pushed the rice prices up in the 2012-2013 marketing season.

Table 7. Difference in differences in market prices of rice varieties not procured by Food Corporation of India

₹/q

Rice variety	Experimental group		Control group		DD (Col. 3 - Col. 2) - (Col. 5 - Col. 4)
	2011 Farmers who sold in open market (without)	2012 Farmers who sold in open market (without)	2011 Farmers who sold in open market (without)	2012 Farmers who sold in open market (without)	
Basmati	1836 (±252.52) Sem=59.52	2079 (±235.11) Sem=62.84 (n=14)	1796 (±192.75) Sem=62.30 (n=11)	2194 (±192.75) Sem=64.25 (n=9)	-155.00 (t=1.701) d.f=14
Sharbati	1181 (±201.00) Sem=50.00 (n=16)	1346 (±118.08) Sem=32.75 (n=13)	1100 (±141.42) Sem=70.71 (n=4)	1322 (±83.92) Sem=29.67 (n=8)	-57.00 (t=0.008) d.f=10

The experimental and control groups of farmers had also earned better prices for their marketable surplus of Basmati and long grain non-Basmati rice (Table 7), although the increase was not significant. In the experimental group, the prices of the common grade, semi-fine, Basmati and Sharbati varieties increased in 2012-2013 by 36.5 per cent, 26.0 per cent, 13.2 per cent and 14.0 per cent, respectively over the 2011-2012 marketing season. The control group also showed an increase in the prices of the common grade (coarse), semi-fine, Basmati and Sharbati varieties in the 2012-2013 marketing season by 17.2 per cent, 18.9 per cent, 22.2 per cent and 20.2 per cent, respectively, over that of the 2011-2012 marketing season. Moreover, the experimental group of farmers benefited by 14.4 per cent and 8.8 per cent, respectively, by selling their marketing surplus of coarse and semi-fine varieties at the PCs during the marketing season of 2012-2013.

Overall, the government intervention had certainly benefited the farmers in selling their marketable surplus rice in 2012-2013. However, when we compared the results of with/without and the DD models, we observed an interesting finding. Table 5 reveals a significant difference in the rates between the experimental and control groups of farmers in both the coarse (₹ 157/q) and semi-fine (₹ 101/q) rice varieties. On the other hand, Table 6 shows that when the rates were compared by the DD model, a difference of ₹ 175/q in the coarse rice between the experimental and control groups of farmers was significant, while

the difference of ₹ 77/q for the semi-fine rice varieties was statistically non-significant.

In 2011-2012, the mean sale price at which the experimental group of farmers sold their coarse rice in the open market was ₹ 916/q, whereas the PC rate was ₹ 1080/q. But in 2012, none of the farmers in the experiment group sold their rice in the open market because the MSP of ₹ 1250/q was higher than the open market price. Thus, the experimental group of farmers was able to earn additional income of ₹ 335/q in 2012-2013 as compared with their earnings in 2011-2012. In the control group of villages, the farmers sold their rice at ₹ 933/q in 2011-2012 and at ₹ 1093/q in 2012-2013, showing a definite increase of ₹ 160/q in 2012-2013 when compared with their earnings in 2011-2012. This implies that the earlier difference of ₹ 335/q (with/without) was not entirely due to the effect of the PCs.

The actual economic benefit accruing to the experimental group of farmers due to the establishment of the PCs by the government was ₹ 175/q. However, the presence of the PCs in the area assisted in boosting the rice prices in 2012-2013. As far as the semi-fine varieties were concerned, the results were different when compared with both types of designs (with/without, before/after and DD model). With-without and before/after comparison showed significant economic benefit per quintal sale price between experimental and control groups but DD results were not statistically significant.

With/without a difference in the selling prices of the different rice varieties (Table 5) on extrapolation

for the total procurement in 2012-2013 reflects higher economic returns. The procurement policy definitely generated an additional income of ₹ 6,837 per farmer for the coarse and semi-fine varieties. On extrapolating the benefits based on DD model, the economic impact is evident to the tune of ₹ 6725 per farmer. The study amply confirms that the DD is the stronger quasi-experimental model for assessing the impact of a programme. This design has been employed by Reddy and Suryamani (2005); Mancini *et al.* (2006); Preneetvatakel and Waibel (2006) and Sharma (2011) to measure the impact of agricultural development programmes.

Socio-personal and Economic Factors Impacting Farmers' Decision

The binary logistic model (enter and forward stepwise) was employed to identify the effect of socio-

personal and economic variables on the farmers' decision to sell the marketable surplus produce at the PCs. In enter method, age and squared age of the farmers significantly impacted their decision to sell the produce at PCs. The model applied has a log likelihood value of 167.268 and a chi-squared value of 23.686, which was significant at $p=0.034$ (Table 8).

However, when we applied forward stepwise method, at first step only education variable affected the farmers' decision to sell the marketable surplus produce at the PCs ($p < 0.05$). And at second step, age and education caused variation ($p < 0.10$). However, other variables that included squared age and interaction of age and education were removed. Thus, education was the only variable that significantly affects the farmers' decision to sell their marketable surplus at the PCs. Thus, educated farmers benefited more from the government policy. The results are in line with the findings of Sharma (2011).

Table 8. Factors affecting farmers' decision to sell marketable-surplus at the procurement centres

Variable	Coefficient	S.E.	Wald	p-value	Model summaries
Enter method					
Constant	12.888	6.538	3.886	0.049	-2log likelihood=167.268
Age	-0.435	0.208	4.361	0.037**	Nagelkerke R ² =0.203
Education	0.348	0.440	0.761	0.383	$\chi^2=23.686$
Farm size	0.060	0.062	0.936	0.333	P=0.034
Farming experience	0.025	.026	0.937	0.333	Observations=150
Distance from procurement centre	0.110	.088	1.564	0.211	Predicted %=74
Social participation	0.354	.524	0.456	0.500	
Telephone/mobile	-0.300	0.572	0.275	0.600	
Off-farm employment (government sector)	-0.480	.421	1.302	0.254	
Off-farm employment (private sector)	0.528	0.486	1.179	0.278	
Self employment	0.594	0.499	1.418	0.234	
Age ²	0.003	0.002	3.158	0.076*	
Education ²	0.000	0.012	0.000	0.989	
Interaction of age and education	0.009	0.006	2.176	0.140	
Forward step-wise					
Step 1					-2log likelihood=184.211 R ² = 0.061
Education	0.130	0.051	6.445	0.011**	$\chi^2=6.743$, p=0.009
Constant	-0.439	0.474	0.859	0.354	Predicted %=69.3
Step 2					-2log likelihood=181.09
Age	-0.030	0.017	3.034	0.082*	R ² = 0.088
Education	0.098	0.054	3.239	0.072*	$\chi^2=3.122$, p=0.077
Constant	1.316	1.107	1.412	0.235	Predicted %=68.7

Note: *Significant at $p < 0.10$, **Significant at $p < 0.05$

Concluding Remarks

The government intervention has provided benefits to the rice growers in Jammu & Kashmir by procuring rice at the MSP at its procurement centres and stopping distress sales in the state. The government intervention also benefited the control group of farmers, although these farmers did not avail the facility of PCs for selling their produce. It created a competition in the market, thus fetching a better price for their produce in 2012 as compared to 2011. The smallholding farmers who ensure food security require government security to maintain the prices of their marketable surplus produce.

This study has raised some important issues related to policy, including infrastructure. One, how procurement policy can be implemented efficiently to extend to a wider reach. Two, the PCs need to be made permanent with all basic facilities like concrete flooring, timely payment, winnowing fans, etc. Three, since education has emerged as the main factor in affecting farmers decision to avail government established procurement facilities, there is need of expanding educational facilities in the area and fourth, to quantify the impact of a programme, the DD model is better and more robust, the with/without comparison method does not eliminate either in-built, systematic or seasonal effects.

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