Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(5): 825-829
Received: 28-07-2018
Accepted: 29-08-2018

Vikas Kumar
Student M.Sc. (Ag. Statistics), Department of Agricultural Statistics, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

G Chandrakar
Assistant Professor, Department of Agricultural Statistics, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Correspondence
G Chandrakar
Assistant Professor, Department of Agricultural Statistics, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Use of fertilizer on major crops by farmers in Arang block of Raipur district

Vikas Kumar and G Chandrakar

Abstract
Fertilizer consumption measure the quantity of plant nutrients used per unit of arable land. Fertilizer product covers nitrogenous, potash and phosphorus fertilizers. In Chhattisgarh state, area under net sown has 4800.66 thousand hectare. Major crops are paddy, wheat, jowar, pulses and oil seeds. Paddy is grown in 3756.80 thousand hectare which occupies about 78.25 percent of the net sown area of the state, whereas wheat grown in 177.78 thousand hectare and gram in 356.52 thousand hectare in the state. The average size of holding was 2.77 ha in Arang block. The sample farmers comprised pre-dominantly of other backward caste. Farmers were growing paddy crop in kharif season, gram and wheat in rabi season and paddy in summer season. Tiwara were sowing as an utera and some farmers grown tur in bunds. Paddy crop covered highest cropped area 61.39 percent under kharif season in Arang block. The cropping intensity was found in 162.88 percent.

Keywords: Fertilizer, major crops, farmers, Arang block, Raipur district

Introduction
The use of fertilizer depends largley on the availibility of irrigation facilities and availibility of working capital with the farmers for acquiring the purchase inputs. As the small farmers have inadequate capital base, the non available of adequate credit may be problem in exploiting the production potentials by them. The farmers may also have different attitudes to different crops grown on the farm regarding to application of fertilizer. This may be influenced by the relative profitability of the crops, degree of yield and price risks involved and the personal likings and consumption needs of the farm family. Thus, institutional, financial, and behavioural constraints condition, the farmer's decisions concerning his farm practices in general and use of fertilizer in particular. These constraints must be evaluated for the level of their incidence and their impact of fertilizer use at farm level.

India imports mainly urea, DAP and MOP. The country has almost reached self sufficiency in urea production. As regards DAP, the level of imports was between 1.5 and 2 million tonnes in the 1980s and 1990s. A great deal of DAP capacity came on stream in the early2000s. Consequently, the importation of DAP fell to less than 1 million tonnes after 2000-01. In 2003-04, DAP imports were 0.73 million tonnes. Imports meet the entire MOP requirement as there are no known natural potash deposits in the country. In 2003-04, MOP imports were 2.58 million tonnes in addition, India also imports a small quantity of monoammonium phosphate (MAP) and potassium sulphate (SOP) (65 000 and 10 500 tonnes, respectively, in 2003-04).

In Chhattisgarh State, area under net sown has 4800.66 thousand hectare. Major crops are paddy, wheat jowar pulses and oil seeds. Paddy is grown in 3756.80 thousand hectare which occupies about 78.25 percent of the net sown area of the state where as wheat grown in 177.78 thousand hectare and gram in 356.52 thousand hectare in the state.

The NPK consumption of the State increased to the level of 613074 Mt during 2014-15 showing sharp increase of 162.33 percent over 2000-01 The Nutrient wise consumption shows that potash(K_2O) and nitrogen (N) consumption increased by 167.04 percent and 177.37 percent respectively and phosphate (P_2O_5) consumption increased by 131.97 percent over 2000-01.

Keeping in view, the importance of fertilizer use pattern in development of the state the study entitled "Use of fertilizer on major crops by farmers in Arang Block of Raipur District" were taken:

Materials and Methods
A stratified random sampling has been used for selection of the samples. Arang block have been divided into five strata as their farmer size as marginal, small, semi-medium, medium and large farmer under proportional allocation. Sample sizes were at 95% confidence coefficient with marginal error of 10%.

Results

Profile characteristics of the sample farmers

It can be seen from the Table 1 that, average size of holding was 2.77 ha. It varied from 0.51 ha (marginal farmers) to 6.00 ha (large farmer) The sample farmers comprised predominantly of other backward caste 59.52 percent followed by scheduled tribe 14.28 percent, scheduled caste 14.28 percent and others 11.90 percent. 66.66 percent farmers having below one ha, 21.42 percent between 1- 2 ha. Medium farmers (4-10 ha) found only 2.38 percent in Arang block.

Table 1: General characteristic of sample farmers in Arang block

S.N.	Particular	Sample Farmers				
		Marginal	**Small**	**Semi-medium**	**Medium**	**Total**
1.	Total no. of farmers	28 (66.66)	9 (21.42)	4 (9.52)	1 (2.38)	42 (100)
2.	Average Size of house holding	0.51ha.	1.67ha.	2.91ha.	6.00ha.	2.77ha.
3.	Education of farmers					
	a. Illiterate	15 (53.57)	4 (44.44)	2 (50)	- -	21 (50)
	b. Primary	5 (17.85)	2 (22.22)	1 (25.00)	- -	8 (19.04)
	c. Middle	3 (10.71)	1 (11.11)	1 (25.00)	- -	5 (11.90)
	d. Higher	4 (14.28)	1 (11.11)	- -	1 (100)	6 (14.28)
	e. Graduate	1 (3.57)	1 (11.11)	- -	- -	2 (4.76)
	Total	28 (100)	9 (100)	4 (100)	1 (100)	42 (100)
4.	Caste wise house hold a. OBC	18 (64.28)	4 (44.44)	2 (50.00)	1 (100)	25 (59.52)
	b. ST	3 (10.71)	2 (22.22)	1 (25.00)	- -	6 (14.28)
	c. SC	4 (14.28)	1 (11.11)	1 (25.00)	- -	6 (14.28)
	d. others	3 (10.71)	2 (22.22)	- -	- -	5 (11.90)
	Total	28 (100)	9 (100)	4 (100)	1 (100)	42 (100)

Note: Figures in parentheses indicate percentage to total.

Cropping pattern

Farmers in Arang block taking crops mainly paddy in kharif, gram and wheat in rabi and few farmers were paddy in summer season. Tiwara were sowing as an utera and some farmers grown tur in bunds. Paddy crop covered highest cropped area 61.39 percent in kharif season, yet it decreased and come down on 2.34 percent in summer season. The cropping intensity was found in 162.88 percent. (Table 2)

Table 2: Cropping pattern of the sample farmers in Arang block

S.N.	Crop Season	Marginal	Small	Semi-Medium	Medium	Total
1.	Kharif : Paddy	19.59 (53.45) (37.49)	15.04 (62.56) (28.78)	11.62 (67.47) (22.23)	6 (83.33) (11.48)	52.25 (61.39) (100)
2.	Rabi: Gram	10.14 (27.66) (54.39)	5.30 (22.04) (28.91)	2.80 (16.26) (15.02)	0.40 (5.55) (2.14)	18.64 (21.90) (100)
	Wheat	6.92 (18.88) (56.62)	3.70 (15.39) (30.27)	0.80 (4.64) (6.54)	0.80 (11.11) (6.54)	12.22 (14.35) (100)
3.	Summer: Paddy	0 (0) (0)	0 (0) (0)	2 (11.61) (100)	0 (0) (0)	2 (2.34) (100)
4.	Total operated area	19.59	15.04	11.62	6	52.25
5.	Total cropped area(A+B+C)	36.65 (100)	24.04 (100)	17.22 (100)	7.20 (100)	85.11 (100)
6.	Cropping intensity (%)	187.08	159.84	148.19	120.00	162.88

Note: Figures in parentheses indicate percentage to total.

Crop wise Expenditure on Fertilizer use

It is evident from Table 3 that farmers of Arang block used more fertilize 18.83% of fertilizer expenditure to the cost of cultivation on paddy crop followed by wheat 15.91% and gram 12.74% . In paddy crop, maximum fertilizer expenditure was incurred (Rs. 6097.87 per ha.) of medium farmer which accounted for about 16.26% of the total cost of cultivation followed by Rs. 5785.86 per ha. of marginal. Minimum expenditure was recorded for medium farmers of Rs. 5225.36 per ha. In case of gram maximum expenditure observed in small farmers 3247.01 Rs. / ha accounted 14.52% to total to the total cost of cultivation. Minimum was observed in

marginal farmers 2467.20 accounted 11.14% to the total cost of cultivation. Small farmer used only nitrogen and phosphorus for cultivation of gram. In wheat maximum expenditure was observed 17.54% (5294.85 Rs. /ha) to the cost of cultivation of marginal farmer and minimum recorded 14.78% (4675.20 Rs. ha) to total cost of cultivation.

Table 3: Fertilizer expenditure on sample farmers under different crops in Arang block

Farmer	Crop	Fertilizer expenditure (Rs./ ha)				Average cost of cultivation (Rs./ ha)	% of fertilizer expenditure to total cost of cultivation
		N	P_2O_5		K_2O		
		Total					
Marginal	Paddy	1435.56	3162.56	1187.74	5785.86	38811.40	14.91
	Gram	306.28	2160.93	-	2467.20	22141.40	11.14
	Wheat	1386.01	2958.98	949.86	5294.85	30179.44	17.54
Small	Paddy	1398.67	2893.08	1118.14	5409.88	4155.72	14.41
	Gram	318.35	2258.40	670.26	3247.01	22356.67	14.52
	Wheat	1079.17	2382.33	1213.70	4675.20	31640.00	14.78
Semi-medium	Paddy	1453.95	2678.88	1092.52	5225.36	39073.33	13.37
	Gram	259.00	2456.91	-	2715.91	24166.67	11.24
	Wheat	1392.13	2764.03	611.63	4767.78	30000.00	15.89
Medium	Paddy	1586.35	2764.02	1747.50	6097.87	37500.00	16.26
	Gram	582.75	2764.02	-	3346.77	23750.00	14.09
	Wheat	1036.00	2764.02	1048.50	4848.52	31250.00	15.52
Total	Paddy	5874.53	11498.54	5145.90	22518.97	119540.45	18.83
	Gram	1466.38	9640.26	670.26	11776.90	92414.74	12.74
	Wheat	4893.31	10869.36	3823.69	19586.36	123069.44	15.91

Consumption Pattern of Fertilizers

Table 4 presented fertilizer use by marginal farmers in Arang block. It is seen that marginal farmers were using on an average 110.85 kg N, 65.79 kg P_2O_5 and 42.47 kg K_2O in one hectare with an average productivity 4209.78Kg/ha for paddy crop. Percentage gap of fertilizer were found 10.85% in N, 9.65% in P_2O_5 and 6.17% in K_2O. In wheat crop during rabi season average fertilizer were used 107.02 Kg N, 61.55 kg P_2O_5 and 33.97 kg K_2O.and productivity observed 1651.38 kg in one hectare. Percent gap of fertilizer were 7.02% in N, 2.58% in P_2O_5 and -15.07% in K_2O.Which showed that farmers were used less potassium for cultivation of wheat. In case of Gram, farmers were used only N and P_2O_5 as an average 23.65 kg and 44.95 kg in one hectare and productivity was 1607.67 kg / ha. Percent gap of fertilizer were observed 18.25% in N and 12.37% in P_2O_5 respectively.

Table 4: Fertilizer use by the marginal farmers and Productivity of crops in Arang block (kg/ha)

Crop		N	P	K	Productivity
Paddy	Mean	110.85	65.79	42.47	4209.78
	C.V	25.23	18.29	18.03	27.81
	Standard Error	5.28	2.27	1.44	221.26
	Minimum	74.28	53.75	30	1225.60
	Maximum	225	112.5	73.17	8750
	Skewness(β_1)	2.85	2.57	2.48	1.57
	Kurtosis(β_2)	10.27	7.93	9.20	9.24
	Recommended dose	100	60	40	-
	% gap of fertilizer	10.85	9.65	6.17	-
Wheat	Mean	107.02	61.55	33.97	1651.38
	C.V	19.22	22.49	29.38	18.20
	Standard Error	5.31	3.57	2.57	77.64
	Minimum	53.75	37.5	18.75	1333.33
	Maximum	143.33	87.5	50	2500
	Skewness(β_1)	-0.98	-0.13	0.43	1.92
	Kurtosis(β_2)	2.57	-0.12	-0.47	3.79
	Recommended dose	100	60	40	-
	% gap of fertilizer	7.02	2.58	-15.07	-
Gram	Mean	23.65	44.95	-	1607.67
	C.V	30.93	30.96	-	20.64
	Standard Error	1.63	3.11	-	74.22
	Minimum	15	30	-	1250
	Maximum	43.47	79.54	-	2608.69
	Skewness(β_1)	1.73	1.47	-	1.63
	Kurtosis(β_2)	2.98	1.49	-	3.35
	Recommended dose	20	40	20	20
	% gap of fertilizer	18.25	12.37	-	-

Fertilizer uses by small farmers in Arang block were presented in Table 5. It is seen that Small farmers were using on average 108.00 kg N, 60.18 kg P_2O_5 and 39.99 kg K_2O in one hectare with an average productivity 4155.72 Kg/ha for paddy crop. Percentage gap of fertilizer were found 8% in N, 0.3% in P_2O_5 and -0.02% in K_2O. This showed that farmers were using less amount of potassium as compare to recommended dose. In wheat crop during rabi season average

fertilizers were used 83.33 Kg N, 49.55 kg P_2O_5 and 30.75 kg K_2O, and productivity observed 1572.61 kg in one hectare. Percent gap of fertilizer were -16.67% in N, -17.41% in P_2O_5 and -23.12% in K_2O, which showed that farmers were used less amount of nitrogen, phosphorus & potassium. In case of gram, farmers were used 24.58 Kg N, 46.98 kg P_2O_5 and 16.98 kg K_2O and productivity observed 1364.81 kg in one hectare. Percent gap of fertilizer were observed 22.90% in N, 17.45% in P_2O_5 and -15.10% in K_2O respectively. This showed that farmers were used very less amount of potash.

Table 5: Fertilizer use by the Small farmers and Productivity of crops in Arang block (kg/ha)

Crop		N	P	K	Productivity
Paddy	Mean	108.00	60.18	39.99	4155.72
	C.V	6.55	3.15	5.27	5.46
	Standard Error	2.35	0.63	0.70	75.64
	Minimum	100	57.5	37.5	3750
	Maximum	115	63.33	45	4500
	Skewness(β_1)	-0.09	0.42	1.75	-0.24
	Kurtosis(β_2)	-2.21	-0.65	4.70	0.05
	Recommended dose	100	60	40	
	% gap of fertilizer	8	0.3	-0.02	-
Wheat	Mean	83.33	49.55	30.75	1572.61
	C.V	24.56	31.03	33.96	7.34
	Standard Error	9.15	6.87	4.67	51.66
	Minimum	57.55	28.75	18.75	1375
	Maximum	107.5	65.71	40	1666.66
	Skewness(β_1)	-0.005	-0.59	-0.57	-1.78
	Kurtosis(β_2)	-1.72	-1.75	-3.21	3.56
	Recommended dose	100	60	40	
	% gap of fertilizer	-16.67	-17.41	-23.12	-
Gram	Mean	24.58	46.98	16.98	1364.81
	C.V	26.68	25.71	23.34	13.35
	Standard Error	2.18	4.02	1.32	60.75
	Minimum	15	38.33	13.33	1000
	Maximum	37.5	75	25	1500
	Skewness(β_1)	0.67	1.92	1.55	-1.12
	Kurtosis(β_2)	0.87	3.52	1.18	0.35
	Recommended dose	20	40	20	
	% gap of fertilizer	22.90	17.45	-15.10	-

Fertilizer use by Semi-medium farmers in Arang blocks were presented in Table 6 It is seen that Semi-medium farmers were using on average 112.27 kg N, 55.72 kg P_2O_5 and 39.07 kg K_2O in one hectare with an average productivity 4625.10 Kg/ha for paddy crop. Percentage gap of fertilizer were found 12.27% in N, -7.13% in P_2O_5 and -2.32% in K_2O. These showed that farmers were using less amount of phosphorus & potassium. In wheat crop during rabi season average fertilizer were used 107.50 Kg N, 57.50 kg P_2O_5 and 21.87 kg K_2O.and productivity observed 1625 kg in one hectare. Percent gap of fertilizer were 7.50% in N, -4.16% in P_2O_5 and -45.32% in K_2O.Which showed that farmers were used very less amount of phosphorus & potassium. In case of gram, farmers were used only N and P_2O_5 as an average 20 kg and 51.11 kg in one hectare and productivity 1281.25 kg / ha . Percent gap of fertilizer were observed 0% in N and 27.77% in P_2O_5 respectively.

Table 6: Fertilizer use by the Semi-Medium farmers and Productivity of crops in Arang block (kg/ha)

Crop		N	P	K	Productivity
Paddy	Mean	112.27	55.72	39.07	4625.10
	C.V	9.53	15.42	8.68	10.03
	Standard Error	5.35	4.29	1.69	232.10
	Minimum	100	43.24	34.09	4000
	Maximum	124.32	62.72	41.66	5000
	Skewness(β_1)	-0.04	-1.62	-1.74	-1.04
	Kurtosis(β_2)	-2.08	2.90	3.26	-0.26
	Recommended dose	100	60	40	-
	% gap of fertilizer	12.27	-7.13	-2.32	-
Wheat	Mean	107.50	57.50	21.87	1625
	C.V	0	0	20.20	10.87
	Standard Error	0	0	3.12	125
	Minimum	107.50	57.50	18.75	1500
	Maximum	107.50	57.50	25	1750
	Skewness(β_1)	-	-	-	-
	Kurtosis(β_2)	-	-	-	-
	Recommended dose	100	60	40	-
	% gap of fertilizer	7.50	-4.16	-45.32	-
Gram	Mean	20	51.11	-	1291.66
	C.V	21.65	21.65	-	14.78
	Standard Error	2.50	6.38	-	110.23
	Minimum	15	38.33	-	1125
	Maximum	22.5	57.5	-	1500
	Skewness(β_1)	-1.73	-1.73	-	0.93
	Kurtosis(β_2)	-	-	-	-
	Recommended dose	20	40	20	-
	% gap of fertilizer	0	27.77	-	-

Selected farmers under medium i.e. land holding 4 -10 hectare was only one. Hence the above Table 7included only fertilizer used by that farmer and corresponding productivity of crops. We observed that Percent of fertilizer in paddy were 22.50% in N, -4.16% in P_2O_5 and 56.25**%** in K_2O respectively. This showed that more doses of phosphorus should be applied to achieve the target. Productivity was found 4833.33 kg per hectare. In case of wheat percent of fertilizer were 20% in N, -4.16% in P_2O_5 and -6.25% in K_2O. Which showed that less P_2O_5 & K_2O were applied by farmers as compared recommended dose Productivity was 1000 kg /ha. Percent gap of fertilizer under gram were observed 125% in N, 43.75% P_2O_5.

Table 7: Fertilizer use by the Medium farmers and Productivity of crops in Arang block (kg/ha)

Crop	Fertilizer use	N	P	K	Productivity
Paddy	By farmer	122.50	57.50	62.50	2500
	Recommended dose	100	60	40	-
	% gap of fertilizer	22.50	-4.16	56.25	-
Wheat	By farmer	80	57.50	37.50	1000
	Recommended dose	100	60	40	-
	% gap of fertilizer	20	-4.16	-6.25	-
Gram	By farmer	45	57.50	-	1250
	Recommended dose	20	40	20	-
	% gap of fertilizer	125	43.75	-	-

Reference

1. Acharya SP, Basavaraja H, Kunnal IB, Mahajanashetti SB, Bhat ARS. Growth in Area, Production and Productivity of Major Crops in Karnataka, Department of Agricultural Economics, College of Agriculture University of Agricultural Sciences, Dharwad - 580 005, India, 2012.
2. Desai DK. Report on fertilizer use Indian Journal Agril, Economics. 1986; 41(3):418-423.

3. Himaytullah. Fertilizer consumption in Pakistan: effect of price decontrol, Sarhad –Journal of Agriculture. 1990. 6(1):29-33.
4. Jaga PK, Patel Y. An Overview of Fertilizers Consumption in India. Determinants and Outlook for 2020-A Review, Int. J. Scientific Engineering and Technology. 2012; 1(6):285-291.
5. Kaushik VK, Pahariya NC. Pattern of fertilizer use on major crops grown in Hissar district of Haryana India Int. J Curr. Microbial. App. Sci. 2014; 3(7):665-672.
6. Kayarkanni S. Fertilizer demand in Tamil Nadu: A macro analysis. Agricultural Situation in India, 2000, 29-32.
7. Kotabe. Changing pattern of fertilizer consumption in Japan. FACE, 1989, 67-79.
8. Kyosti A, Karikallio H. Consumption Patterns and Competition in the World Fertilizer Markets, Pellervo Economic Research Institute Eerikinkatu 28A FIN-00180 Helsinki, Finland, 2009.
9. Mala P. Fertilizer Scenario in India. International Journal of Social Science Interdisciplinary Research ISSN 2277-3630, 2013.
10. Mehmood A, Shereen Z. Fertilizer demand and drought. Economic faires. 2004; 49(3):139-144.