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An Analysis of Pattern and Growth of Fertilizer Consumption in Karnataka State, India

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A B S T R A C T

This article explores the pattern and growth of fertilizers consumption in Dharwad and Davangere district over a period of years. Tabular analysis was used for analysing consumption pattern of NPK fertilizers in Dharwad and Davangere district. Compound growth rate analysis was used to know the growth of NPK consumption over a period of years. The findings of the study indicated that NPK usage pattern in Dharwad district had negative growth rate (-5.77%) over the years (2004-2015). Amongst all the three major nutrients, usage of phosphatic fertilizer showed highest negative growth (-7.70%) followed by nitrogen (-3.95%) and potassic fertilizer (-3.39%). In Davangere district, it was observed that usage of nitrogenous (5.38%) and phosphatic (3.07%) fertilizers had positive growth rates. But, potassic fertilizer showed negative growth rate (-0.66%).It was noticed that farmers using more than Recommended Dose of Fertilizer under irrigated condition in case of maize, Bt cotton, soybean and paddy were high as compared to rainfed conditions.

Introduction

The use of fertilizer depends largely on the availability of irrigation facilities and availability of working capital with the farmers for acquiring the purchased inputs. 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 (Kaushik and Paharia, 2014).

India made impressive gains in the field of agricultural production and harvested a record in food grains production of 230 million tonnes during 2007-08. Introduction of HYV's and hybrid varieties brought optimism about fertilizer response superiority of modern varieties. The total nutrient consumption ($N+P_2O_5+K_2O$) touched level of 264 lakh million tonnes during 2009-10, the highest so far.

Since the rain fed areas, which constitute 70% of the cultivated areas, consume only 20% of the total fertilizers, the government has been taking steps in recent years to increase the consumption of fertilizers in these areas. Even though India is the third largest fertilizer user, average rate of nutrient application is only 85 kg ha^{-1} (Mala, 2013).

The present study was undertaken in the Davangere and Dharwad districts of Karnataka, where the consumption of fertilizers per hectare of cropped area is very high, to examine the pattern and efficiency of fertilizer use in the major crops of the district.

Materials and Methods

Tabular presentation/analysis

This technique was exclusively used for the presentation of fertilizer use in different cropping situations.

Differences in recommended dose of fertilizer used in different cropping situation both in irrigated and rain fed condition.

The number of farmers using recommended, less than the recommended and more than the recommended dose of N: P_2O_5: K_2O was estimated in irrigated and rain fed condition. The quantities of N: P_2O_5: K_2O were calculated by aggregate percentage.

Growth rate analysis

In order to analyze the growth of fertilizer consumption over a period of years compound growth rates were computed using the following model.

$Y_t = ab^t e^u$

Where,

Y_t = dependent variable

a = intercept term

b = (1+r) and 'r' is the compound growth rate

t = time trend

u= error term

The above model in the Logarithmic form is expressed as, Log Y= log a + t log b+ log u

Log a and Log b values were obtained using the ordinary least squares procedures and the R^2 was computed for testing the goodness of fit. Antilog of Log (b -1)* 100 give the per cent growth rate. Significance of the growth rate was tested using 't' test.

Results and Discussion

The findings of the study indicated that NPK usage pattern in Dharwad district had negative growth rate (-5.77%) over the years (2004-2015). Amongst all the three major nutrients, usage of phosphatic fertilizer showed highest negative growth (-7.70%) followed by nitrogen (-3.95%) and potassic fertilizer (-3.39%) (Fig. 1).

The results of compound annual growth rate analysis of NPK consumption in Dharwad have been presented in Table 1. It was found that consumption of NPK decreasing over the period as indicated by negative growth rates.

This was mainly due to variation in the climatic condition in the district, which might have resulted in drastic reduction in consumption of fertilizer. Cost of fertilizer also plays important role in decreasing growth rate of NPK consumption.

NPK consumption of Davangere district was presented in the Table 2. It was revealed that consumption of nitrogenous fertilizer showed the highest growth rate (5.38%) and it was found to be significant at 1 per cent level of significance with R^2 value 0.45 per cent. This might be due to increase area under irrigation in Davangere district, apart from irrigation, technological changes and spread of HYV's had also made significant impact on use of fertilizers. Similar findings were reported by Patil and Pandey (1981) (Fig. 2).

Table.1 NPK consumption in Dharwad district (2004-2015)

Million Tonnes

Year	N	P	K	Total
2004-5	7216.4	28474	11471	47161.4
2005-6	6113.8	20705.5	10969	37788.3
2006-7	5010.6	16334	10409	31753.6
2007-8	4899.6	16899.5	10822	32621.1
2008-9	4587	17502	9251	31340
2009-10	4548.8	22511	11422	38481.8
2010-11	4538	17201	9690	31429
2011-12	4528	12470	7960	24958
2012-13	4423	11683.5	8261	24367.5
2013-14	4318.6	10899	8563	23780.6
2014-15	4370.8	11291.25	8412	24074.05
CAGR	-3.95618	-7.707	-3.39786	-5.77361
R^2	0.687107**	0.736572**	0.692906**	0.771123**

**significant at 1%

Table.2 NPK consumption in Davangere district (1997-2015)

Million Tonnes

Year	N	P	K	Total
1997-98	24630	13822	8604	47056
1998-99	30320	16685	6850	53855
1999-00	32330	22505	8860	63695
2000-01	44453	25941	9296	79690
2001-02	20100	10700	4150	34950
2002-03	18430	9000	3910	31340
2003-04	38795	27005	10631	76431
2004-05	53549	29299	12173	95021
2005-06	62571	34693	14098	111362
2006-07	43463	26375	9857	79695
2007-08	66115	36068	14778	116961
2008-09	68428	37331	15294	121053
2009-10	46211.6	26268.0	10465.2	82944.78
2010-11	70673.2	20122.39	437.5	91233.09
2011-12	44290.6	23986.7	9243.1	77520.49
2012-13	45695.0	24712.8	9288.8	79696.53
2013-14	67015	22915	10046	99976
2014-15	54777.1	23601.0	7896.1	86274.18
CAGR	5.382	3.076	-0.666	4.239
R^2	0.455433**	0.172014	0.001965	0.334076**

**significant at 1%

Table.3 Pattern of fertilizer use under major crops of Dharwad district

Variable	Category	Maize				Bt Cotton				Soybean			
		Irrigated		Rain fed		Irrigated		Rain fed		Irrigated		Rain fed	
		F	%	F	%	F	%	F	%	F	%	F	%
$N:P_2O_5:K_2O$	< Recommended	8	26.67	25	47.92	6	35.19	15	56.41	3	15.00	6	19.75
	Recommended	5	17.78	3	4.86	1	3.70	4	15.38	4	18.33	8	30.86
	> Recommended	17	55.56	25	47.22	11	61.11	7	28.21	14	66.67	13	49.38
	Total	30		53		18		26		21		27	
	Chi square value	4.588				2.291				17.719**			

** Significant at 1%

Table.4 Pattern of fertilizer use under major crops of Davangere district

Variable	Category	Maize				Paddy		Jowar	
		Irrigated		Rainfed		Irrigated		Rainfed	
		F	%	F	%	F	%	F	%
$N:P_2O_5:K_2O$	< Recommended	11	34.41	17	47.62	20	41.84	36	72.79
	Recommended	6	20.43	6	17.14	7	14.89	8	17.01
	> Recommended	14	45.16	12	35.24	21	43.26	5	10.20
	Total	**31**		**35**		**48**		**49**	
	Chi square value	**31.00****				**-**		**-**	

** Significant at 1%

Fig.1 Pattern of fertilizer use in Dharwad district

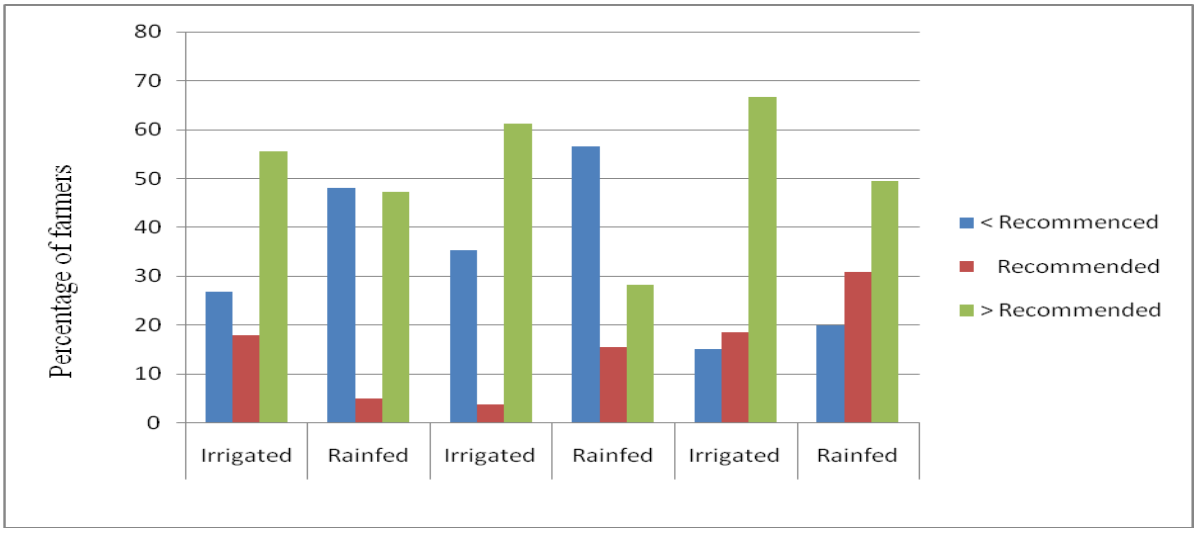
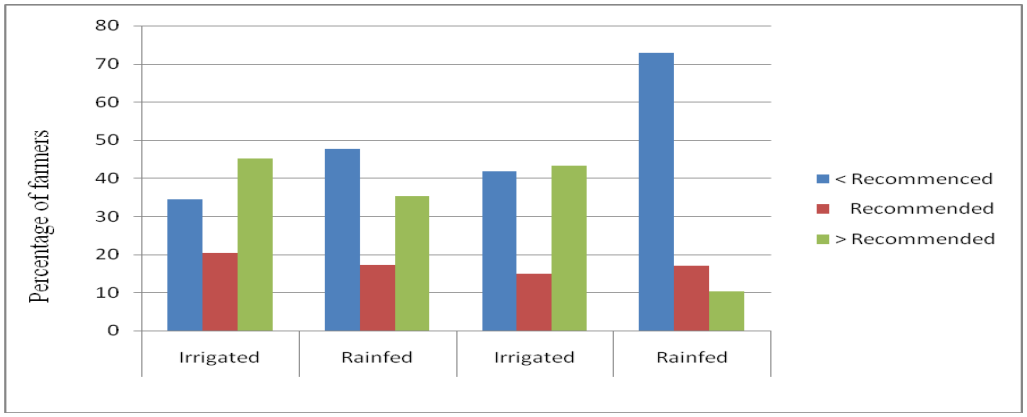


Fig.2 Pattern of fertilizer use in Davangere district



In case of phosphatic fertilizers it was observed that the P consumption increased over the period with growth rate of 3.07 per cent per annum in Davangere district. Irrigation was the most dominating factor for increasing fertilizer consumption. Apart from this, improved farm technology and management practices were expected to increase future consumption of P fertilizers. The results obtained for consumption of phosphatic fertilizers were in line with Patil and Pandey (1981), wherein they had examined the influence of economic factors on application of phosphatic fertilizer at micro level. The study revealed that irrigation was the most dominating factor for increasing fertilizer consumption.

From the Table 2, it was observed that potassium fertilizer showed decreasing trend with high negative growth rate (-0.66%), this may be due to in recent years farmers were aware of package of practices and balanced nutrition and they were following recommended dosage of NPK fertilizers. In that recommended K dose was very less, because of the fact that potash content in black cotton soil is very high.

Pattern of fertilizer use

From the Table 3 it is concluded that farmers were applying more than the RDF in irrigated condition as compared to rain fed condition. It also clear that more number of farmers were using the more than the RDF than the RDF and less than the RDF in all the three crops. This might be due to spread of high yielding varieties (HYV's), use of fertilizer intensive crops and also because the cropping intensity in irrigated areas was significantly high compared to rain fed condition. The chi square value indicates that there is no association between pattern of fertilizer use and conditions of the crop grown in case of maize and Bt cotton. Whereas in case of soybean the chi square value indicates that there is a significant association between pattern of fertilizer use and condition of the crop grown. The percentage of farmers using the more than the RDF was more in irrigated condition as compared to rainfed situation.

From the Table 4 that the intensity of use of more than the RDF was more in irrigated condition than the rain fed condition in case of maize crop. This might be due to the use of HYV's and availability of irrigation facility. Similar also same findings were also found in the paddy crop. In the case of sorghum crop more number of farmers were using less than or more than the RDF. This might be due to the reason that sorghum crop was grown mainly in rain fed condition and in rain fed condition, the application of fertilizer will be less because of scarcity of water facility. The

chi square value is 31.00 which is significant at 1 per cent level of significance in case of maize crop. It indicates that percentage of farmers using the more than the RDF was more in irrigated condition as compared to rainfed situation.

This study focused on pattern of fertilizer consumption of selected district of Karnataka state. NPK usage pattern in Dharwad district showing negative growth rate over the period (2004-05 to 2014-15).

Amongst all the three major nutrients usage of phosphorous fertilizer showing highest negative growth rate (-7.70%) followed by nitrogenous (-3.95%) and potassium fertilizer (-3.39%). Overall consumption of NPK was also showing negative growth rate (-5.77%). It shows that consumption is decreasing over the period with negative growth rate.

In Davangere district, it is observed that usage of nitrogenous fertilizer (5.38%) and phosphatic (3.07%) fertilizer are showing the positive growth rates. But, in case of pottasic fertilizer, it was reverse trend *i.e.,* consumption is decreasing over the period with negative growth rates (-0.66%).

The findings of this study revealed that levels of NPK usage under irrigated conditions in case of maize, BT cotton and soybean were relatively high as compared to rain fed conditions.

Majority of the farmers using more than the RDF in case of irrigated condition as compared to rainfed condition in case of maize, Bt cotton, and soybean. It is observed that in rainfed condition farmers using the less than the RDF.

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