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Resource Use Efficiency of Major Crops in Karnataka

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ABSTRACT

Agriculture sector remains the largest sector providing means of livelihood in Karnataka. However, the sector faces various challenges. Vagaries of monsoon, labour issues, market problems, non-scientific methods of cultivation etc cause decline in the yield of the crops. One of the problems faced by the farmers is unawareness regarding the resource allocation. Low or increased use of input use, directly affects the yield and income level of the farmers. Thus, the present study aimed at studying the resource allocation in the major crops. The results revealed that plant protection chemicals and fertilisers were over used by the farmers which is declining the returns whereas FYM was underutilised. Thus, by incorporating higher quantity of FYM, bio fertilisers and micro nutrients, the soil quality can be enhanced and the yields levels can also be improved.

Key words: *FYM, Jowar, Bajra, and Pulses (Tur and gram)*

INTRODUCTION

Karnataka is eighth largest state in India by geographical area covering 1.92 lakh sq. km and 6.3 per cent share of the geographical area of the country. The state is consisting of 30 districts and 176 taluks spread over 27,481 villages[1]. Agriculture sector remains the largest sector providing means of livelihood and it's contribution to State GDP is 14.7%. (2014-15). During 2015, average land holding size in the State was 1.55 hectare and average food grain production in the State was around 125 lakh tones. State accounts for about 6% of the total area and 5% in the production of food grains in the country[2]. The state accounts for 59% of the country's coffee production and 47% of the country's ragi production. About 70% of the people live in the villages and 71% of the total work force is engaged in agriculture. The lower slopes of the Western Ghats in Kodagu District, Chikmagalur District and Hassan District produce coffee. Sandalwood comes from the dense forested areas of southern Karnataka. Mysore District is the primary producer of raw silk in India and the world famous Mysore silk agriculture which are manufactured at the Mysore silk factories. Water rich areas of Mandya District, Shimoga District, Dakshina Kannada districts produce most of the sugarcane though cultivation of this crop is wide spread. Jute,

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Jowar, Bajra, and pulses (Tur and gram) and oil seeds are largely grown in the drier areas of northern and north-central Karnataka. Cotton is grown in abundance in Gulbarga and Davangere. The cultivation of these crops is subject to various challenges. Vagaries of monsoon, labour issues, market problems, non scientific methods of cultivation etc cause decline in the yield of the crops. One of the problems faced by the farmers is unawareness regarding the resource allocation. Low or increased use of input use, directly affects the yield and income level of the farmers. Thus the present paper aims at identifying the input level usage in the major crops in Karnataka across dictricts.The crops studied are paddy, cotton, redgram, sugarcane, jowar and groundnut. These crops were selected based on their highest production and area.

MATERIAL AND METHODS

2.1 Sampling

Primary data is collected through cross-sectional survey during 2017/18 production season. Kalburgi, Yadgir, Raichur, Belagavi and Chitradurga of Karnataka were selected for the present study. The selection of districts was purposive based on the area and production as well as intervention of technologies in the study area. The major agricultural crops for the study were selected based on the percentage of area, production and productivity in the state during the 2014-15. Major crops selected such as Rice, Jowar, Red gram (Tur), Cotton, Groundnut and Sugarcane for all seasons for the study and these crops plays important role in the economy of Karnataka state. Thus the total sample size was 612.

2.2 Resource use efficiency

Production function analysis was used as an analytical tool for studying resource use efficiency in the production of selected crops by adopters and non adopters. Cobb-Douglas production function form was tried to establish statistical relationship between selected inputs and net income in crop production. Finally Cobb-Douglas production function was selected as best fit on the basis of economic and statistical criteria. The ordinary least square technique was used to estimate the production function. The function was advocated by Cobb, Charles W. and Douglas, Paul H. The algebraic expression of this function is given by Douglas. The model is specified as

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4} \dots \dots . X_n^{b_n}e^u$$

Where,

Y=

Net income income from production of paddy/cotton/redgram/sorhum/groundnut/sugarcane (Rs per acre)

X1 = Seed (Rs)

X2 = Fertilizer (Rs)

X3 = PPC (Rs)

X4 = FYM (Rs)

X5 = Human labour (Rs)

X6 = Machine labour (Rs)

The coefficient of multiple determinations (R2) was estimated and tested for its significance using F-test. To examine the resource use efficiency, the marginal value products (MVPs) of all those inputs which were found significant were worked out at their geometric mean level. The marginal value product ith input was measured by using following formula:

$$MVP = bi \frac{\bar{Y}}{\bar{X}i} \times Py$$

Where,

$\bar{Y}$ = Net income per acre from selected crops at geometric mean level.

$\bar{X}_i$ = Geometric mean level of ith input.

b_i= production elasticity of ith input.

P_y= price of the product

The computed MVP of inputs was compared with their marginal factor cost (MFC) or the opportunity cost of input to draw inferences. The sum of regression coefficients i.e. 'b_i's indicates the nature of returns to scale. The resource use efficiency was separately calculated for adopters and non adopters.

RESULTS AND DISCUSSION

Paddy

The output elasticity co-efficient for FYM was positive and significant among both adopters and non-adopters, whereas machine usage was positive and significant among adopters only indicating that increase in the use of these resources, results in increasing the efficiency of paddy production. Usage of seed and machine labour was negative and significant among the adopters, which shows that decrease in the use of this input would lead to the increase in the efficiency of paddy production. Human labour usage was negative and non-significant among both, adopters and non-adopters showing the over use of these resources. In addition, among non-adopters, fertiliser usage, Plant protection and chemicals (PPC), and human labour was also found to be negative and non-significant. However, among adopters, fertilisers, PPC, was positive and non-significant showing that any further increase in the use of these inputs is not profitable. Seed and machine labour was positive and non-significant for non-adopters. The value of co efficient of multiple determinations was 0.67 and 0.61 for adopters and non-adopters respectively explaining 67 per cent and 6 per cent of the total variation in the net returns of adopters and non-adopters by the variables included in the model (Table 1). Study by Laxmi[5]. also indicated FYM to be significantly contributing to the production of paddy.

The results show that the MVP to MFC ratios of FYM and machine labour was more than one among adopters and non-adopters, indicating the underutilisation of these resources which implies that there is a scope for enhancing the input levels of these resources for increased profit. On the contrast the ratio was less than one for the remaining variables indicating expenditure on these inputs has crossed the optimum level. The sum of elasticity co efficient with 0.46 and 0.63 for adopters and non-adopters respectively indicated that one per cent increase in all the factors of production simultaneously would result in an average increase of net returns by 0.46 and 0.63 per cent respectively for adopters and non-adopters. The results are in line with the results of Hosmani *et al.*[3], and Laxmi and Mundinmani[4].

Cotton

The output elasticity co-efficient for FYM and machine labour was positive and significant mong the adopters whereas among non-adopters, the co-efficient were positive and significant for seed and FYM. This showed that increasing the use of these resources would increase the efficiency in cotton production. Co-efficient for PPC and human labour was positive and non-significant among both adopters and non-adopters. Among adopters, fertiliser was also found to be positive and non-significant which indicates that there is no profit in further increase of these resources. Coefficients for seed was negative and non-significant among the adopters, whereas, among non-adopters, fertiliser and machine labour was negative and non-significant. This shows that these inputs are over used. The MVP to MFC ratio shows that FYM and machine labour was underutilised among the adopters, whereas among non-adopters, seed and FYM was underutilised. Thus, by increasing the use of these resources, higher efficiency in production can be achieved. The R square was 0.78 and 0.69 for adopters and non-adopters (Table 2). Further, the summation of elasticity co efficient indicate increasing returns to scale. Similar results were quoted by Laxmi and Mundinmani[4]. Machine labour was identified as variable significantly contributing to cotton production in a study by Laxmi[5]. However, FYM though positive was not significantly contributing.

Sorghum

The output elasticity co efficient of seed and FYM were positive and significant among the adopters, while, fertiliser was positive and significant among the non-adopters. The increase in the use of these resource would contribute significantly towards the net returns of sorghum production. PPC and machine labour was positive and non-significant among both the categories of farmers showing that it is not profitable to further increase the level of these resources. Among non-adopters, in addition to PPC and fertilisers, FYM was also positive and non-significant. Human labour was negative and non-significant among both the categories of farmers showing the over utilisation of these resources. The MVP to MFC ratios of seed and FYM among adopters, indicate that these resources were underutilised. Whereas among non adopters, fertiliser and FYM were underutilised, thus there exists scope for further increase of these resources. The value of coefficient of determination among adopters and non adopters was 0.87 and 0.78 indicating that 87 per cent and 78 per cent (Table 3) of the variation in the net returns of adopters and non adopters respectively is explained by the variables in the model.

Redgram

The elasticity coefficient for all the variables among the non adopters show that all the inputs are over utilised. Among adopters, the coefficients for seed, PPC, human labour and machine labour was positive and non significant indicating that it's not profitable to further increase the level of these resources. Fertiliser and FYM was negative and non significant which shows that these resources were over used by the adopters. In the case of non adopters, coefficient for FYM and machine labour was positive and significant indicating the scope for further use of these resources. Co efficient for seed and human labour was positive and non significant whereas fertilisers and PPC was negative and non significant. The co efficient of determination for adopters and non adopters was 0.78 and 0.69 for adopters and non adopters respectively. Increasing returns to scale was observed among both adopters and non adopters. In the case of adopters, increase in one per cent of all factors of production simultaneously would result in an average increase of net returns by 1.67 per cent whereas the increase would be 1.9 per cent among the non adopters (Table 4).

Groundnut

With regard to groundnut, none of the elasticity co efficient were found to be significant among adopters. Coefficients for seed, PPC, FYM and machine labour were found to be positive and non significant among the adopters (Table 5). . This means that any further addition of these resources doesn't increase the efficiency. The coefficients for human labour and fertilizer was negative and non significant showing the over utilisation of these resources. Among the non adopters, co efficient for seed and FYM was positive and significant indicating that there exists scope for further increase in the use of these inputs to enhance the efficiency of groundnut production. The elasticity co efficient for machine labour was positive and non significant which means that further increase in the addition of these resources, will not increase the net returns. Fertilizer, PPC and human labour had co efficient that is negative and non significant which implies that these resources are over used. The MVP to MFC ratios for seed and FYM was greater than one indicating that still there is scope to increase the level of use of these inputs to enhance net returns. Increasing returns to scale was observed among both adopters and non adopters.

Sugarcane

The output elasticity coefficients for fertilisers and machine labour was negative and significant in the case of adopters whereas in the case of non adopters, the elasticity coefficients were negative and significant for seed and machine labour implying that decrease in the use of these resources would enhance the net income of sugarcane production. Positive and non significant elasticity coefficients was seen for seed, PPC and FYM among adopters indicating that there is no additional profit by enhancing the levels of these resources. PPC, FYM and human labour was positive and non significant among the non adopters (Table 6). . Human labour was negative and non significant among the adopters, whereas among non adopters, fertiliser as negative and non significant. The MVP to MFC ratio was greater than one for machine labour among both the categories of farmers. Further both the categories of farmers exhibited increasing returns to scale in sugarcane production

Table 1: Resource use efficiency in the production of paddy

Particulars	Adopters			Non Adopters	
	Parameters	b Coeffecient	MVP/MFC	b Coeffecient	MVP/MFC
Intercept	bo	14.56		7.6	
Seed	b1	- 0.76**	-13.45	0.51	0.71
Fertilizers	b2	0.05	0.38	-0.13	-3.51
PPC	b3	0.45	0.81	-0.46	-0.78
FYM	b4	0.34**	23.44	0.003**	1.05
Human Labour	b5	-0.39	-2.57	-0.30	-1.66
Machine Labour	b6	0.87**	8.87	1.01	6.72
R2		0.67		0.61	
RTS		0.56		0.63	

Source: Calculated using Cobb Douglas production -OLS Models from primary data
Note:*significant at 10%; **significant at 5%; *** significant at 1%

Table 2: Resource use efficiency in the production of cotton

Particulars	Adopters			Non-Adopters	
	Parameters	b Coeffecient	MVP/MFC	b Coefficient	MVP/MFC
Intercept	bo				
Seed	b1	-0.39	-12.3	0.25**	5.36
Fertilizers	b2	0.08	0.05	-0.084	-0.40
PPC	b3	0.83	0.69	1.04	0.28
FYM	b4	0.02**	7.37	0.45***	2.56
Human Labour	b5	1.85	0.5	0.16	0.22
Machine Labour	b6	0.67*	12.67	-0.49	-13.87
R2		0.78		0.69	
RTS		3.06		1.32	

Source: Calculated using Cobb Douglas production -OLS Models from primary data
Note:*significant at 10%; **significant at 5%; *** significant at 1%

Table 3: Resource use efficiency in the production of sorghum

Particulars	Adopters			Non-Adopters	
	Parameters	b Coeffecient	MVP/MFC	b Coeffecient	MVP/MFC
Intercept	bo	4.64		6.2	
Seed	b1	1.09**	111.27	-0.89	-24.9
Fertilizers	b2	-0.01	-0.35	0.05**	1.31
PPC	b3	0.06	0.89	1.25	0.95
FYM	b4	1.98*	87.83	0.79	6.87
Human Labour	b5	-0.04	-0.12	-0.44	-1.03
Machine Labour	b6	0.04	0.79	0.03	0.98
R2		.87		0.78	
RTS		3.12		0.79	

Source: Calculated using Cobb Douglas production -OLS Models from primary data
Note:*significant at 10%; **significant at 5%; *** significant at 1%

Table 4: Resource use efficiency in the production of Red gram

Particulars	Adopters			Non-Adopters	
	Parameters	b Coeffecient	MVP/MFC	b Coeffecient	MVP/MFC
Intercept	bo	3.61		1.54	
Seed	b1	0.03	0.72	0.96	30.62
Fertilizers	b2	-0.17	-6.28	-0.20	-5.77
PPC	b3	0.67	0.95	-0.01	-0.76
FYM	b4	-0.01	-0.30	0.72**	1.35
Human Labour	b5	0.08	0.10	0.34	0.36
Machine Labour	b6	0.07	0.89	0.09**	0.78
R2		0.78		0.69	
RTS		1.67		1.9	

Source: Calculated using Cobb Douglas production -OLS Models from primary data
Note:*significant at 10%; **significant at 5%; *** significant at 1%

Table 5: Resource use efficiency in the production of groundnut

Particulars	Adopters			Non-Adopters	
	Parameters	b Coeffecient	MVP/MFC	b Coeffecient	MVP/MFC
Intercept	bo	8.31		7.20	
Seed	b1	1.38	21.7	1.44**	28.90
Fertilizers	b2	-0.11	-1.81	-0.11	-2.03
PPC	b3	0.56	0.89	-0.02	-0.65
FYM	b4	0.20	1.78	1.56**	8.96
Human Labour	b5	-0.43	-0.39	-0.30	-0.32
Machine Labour	b6	1.20	0.98	0.12	0.98
R2		0.79		0.68	
RTS		2.8		2.69	

Source: Calculated using Cobb Douglas production -OLS Models from primary data
Note:*significant at 10%; **significant at 5%; *** significant at 1%

Table 6: Resource use efficiency in the production of sugarcane

Particulars	Parameters	Adopters		Non-Adopters	
		b Coeffecient	MVP/MFC	b Coeffecient	MVP/MFC
Intercept	bo	3.21		2.22	
Seed	b1	0.98	0.99	-1.2**	0.96
Fertilizers	b2	-0.14**	-19.67	-0.02	-3.02
PPC	b3	0.23	0.78	0.42	0.89
FYM	b4	0.06	0.28	0.89	0.76
Human Labour	b5	-0.45	-1.98	0.6	0.37
Machine Labour	b6	1.6**	7.98	1.23**	1.56
R2		0.64		0.71	
RTS		2.28		1.92	

Source: Calculated using Cobb Douglas production -OLS Models from primary data

Note:*significant at 10%; **significant at 5%; *** significant at 1%

CONCLUSION

The study on resource use efficiency revealed that on the whole, PPCs and fertilisers were over utilised by the farmers in the cultivation of the crops. However FYM was underutilised. Thus the use of FYM can increase the returns among the farmers. There was no much difference in the use of these factors among the adopters and the non adopters. Use of FYM can improve the soil fertility and thereby increasing the production. Due to the excess use of chemicals, the soil would have leached out of nutrients, thus use of FYM, micronutrients and bio fertilisers can improve the soil conditions. Awareness among the farmers regarding the use of these components is needed. Crop specific and region specific recommendations needs to be made. Farmers may be trained on the optimum level of input use. This can help the farmers in reaping higher yield.

REFERENCES

1. GoK., Profile of Karnataka State, Department of Agriculture (2014).
2. GoK., Profile of Karnataka State, Department of Agriculture. (2016).
3. Hosamani, Udaykumar, Basavaraj, H. and Guledgudda, S.S., Cost, returns and resource use efficiency of pesticides in paddy production in Koppal district of Karnataka. *Agric. Situ. India,* **67(4):** 189-192 (2010).
4. Laxmi, N. Tirlapur, and Mundinamani, S. M., Resource use efficiency in cultivation of major crops in Dharwad district, Agriculture Update, **10(2):** 93-99 (2015).
5. Laxmi, N. Tirlapur, An economic analysis of production of major crops in Dharwad district, Thesis submitted to UAS Dharwad. (2013).