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RESEARCH PAPER

Resource productivity and resource use efficiency in soybean production

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ABSTRACT

Investigation was carried out during the year 2010-11. About 32 soybean growers were randomly selected from eight villages of Udgir tehsil of Latur district of Maharashtra. Cross sectional data were collected from soybean growers with the help of pre-tested schedule by personal interview method. Data were related to soybean output and inputs like area under soybean, hired human labour, bullock labour, machine labour, seed, manure and use of nitrogen, phosphorous, potash and family labour as resources. Cobb Douglas production function was fitted to the data. The results revealed that, regression co-efficient of human labour was (0.129) followed by machine labour (0.024) which was positive and highly significant at 1 per cent level. Regression co-efficients of bullock labour (0.067) and plant protection (0.011) was positive and significant at 5 per cent level. Regression co-efficients of seed, manure, nitrogen and phosphorous were also positive but non- significant. Marginal product of area under soybean was 10.803 q followed by machine labour (0.274 q), bullock labour (0.231 q) and so on. MVP to price ratio with respect to phosphorous was 3.01 followed by that of nitrogen (2.98). Hence, preference might be given to increase the use of phosphorous on priority basis in soybean production.

KEY WORDS : Soybean, Estimates, Marginal product, Intercept, Production

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Soybean [*Glycine max* (L.) Merill] is the most important crop grown in India. It is the richest and cheapest source of high quality protein, mineral, vitamins and fats. It supplies most of the nutritional constituents essential for human growth.

India is the fifth largest soybean producing country in the world. Madhya Pradesh tops with its share of 70 per cent of the total area under soybean followed by Maharashtra (19 %) and Rajasthan (8 %) in the country (Sharma *et al.,* 2006). Soybean was introduced in India in 1970-71, mainly for rich protein and edible oil content. It was introduced in Maharashtra during the year 1984-85. In India, soybean occupied an area about 96.52 lakh hectares with production of 108.11 lakh tonnes and productivity is 1.12 tonnes/hectare. In Maharashtra, area under soybean is 30.59 lakh hectares with production of 36.40 lakh tonnes and productivity is 1.19 tonnes/hectare. It is triple beneficiary crop, which contains 18.20 per cent edible oil, 45 per cent high quality protein and high level of essential of amino acid. It is commonly referred to as one of the most nutritious amongst the beans and also having tremendous industrial potentials. It is rich in unsaturated fatty acid with anticholestrol properties.

Latur district of Maharashtra has favorable climate for soybean as oilseed crop. Hence, soybean is predominant crop in cropping pattern of farmer in the district. The district has medium to heavy soils. The average rainfall of district is 750 mm. In soybean production, area under soybean, human labour, bullock labour, machine labour, seed, manure, nitrogen, phosphorous, potash and family labour are the important resources. In production process, some of the resources are

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either over utilization or under utilization. By keeping in view the resource management in soybean production, the present investigation has been undertaken to determine the resource use efficiency in soybean production.

METHODOLOGY

Multistage sampling design was used in selection of district, tehsil, villages and soybean growers. In first stage, Latur district was selected purposively. In the second stage, Udgir tehsil was selected on the basis of higher area under soybean. In the third stage, eight villages were selected from the tehsil on the basis of higher area under soybean production. The selected villages were namely Belsakarga, Dhondihipparga, Madlapur, Mogha, Mortalwadi, Rawangaon, Tadlapur and Togri. In the fourth stage, four soybean growers were randomly selected from each of the villages. The cross sectional data were collected from 32 soybean growers with the help of pre-tested schedule for the year 2010-2011.The data were related to output as well as use of resources namely area under soybean, human labour, bullock labour, seed, manure and fertilizer and so on. Cobb- Douglas production function was fitted to the data to estimate resource productivity with respect to each of the explanatory variables. The fitted equation was as follows:

$$Y = a\, X_1^{b1} X_2^{b2} X_3^{b3} \ldots\ldots\ldots X_n^{bn} e^u$$

In this functional form 'Y' is dependent variable, 'X_i' are independent resource variables, 'a' is the constant representing intercept of the production function and 'bi' are the regression co-efficients of the respective resource variables. The regression co-efficients obtained from this function directly represent the elasticities of production, which remain constant throughout the relevant ranges of inputs. The sum of co-efficients that is 'bi' indicates return to scale. This function can easily be transformed into a linear form by making logarithmic transformation. After logarithmic transformation of this function is,

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + \ldots\ldots + b_n \log X_n + u \log e$$

The equation fitted was of the following formula:

$$Y = a\, X_1^{b1}.X_2^{b2}.X_3^{b3}.X_4^{b4}.X_5^{b5}.X_6^{b6}.X_7^{b7}.X_8^{b8}.X_9^{b9}.X_{10}^{b10}$$

where,

Y = Estimated soybean production in quintals per farm

a = Intercept of production function, bi = Partial regression co-efficient of the respective resource variable (i=1, 2,…,10), X_1 = Area under soybean in hectares per farm, X_2 = Human labour in man days per farm , X_3 = Bullock labour in pair days per farm, X_4 = Machine labour in hours per farm, X_5 = Seed in kg per farm, X_6= Manure in quintals per farm, X_7= Nitrogen in kg per farm, X_8= Phosphorous in kg per farm X_9= Potash in kg per farm and X_{10}= Plant protection in liter per farm (Chamak *et al.*, 1978).

ANALYSIS AND DISCUSSION

The findings related to elasticity of production, marginal production and resource use efficiency in soybean production were obtained and are presented as follows.

Elasticity in soybean production:

Regression co-efficients with respect to various explanatory variables calculated and are presented in Table 1. Regression co-efficient of human labour was as elasticity with 0.129 which was positive and highly significant at 1 per cent level. It inferred that if 1 per cent increased in use of human labour over its geometric mean, it would lead to increase in soybean production by 0.129 per cent. Similarly, regression

Table 1 : Estimates of Cobb-Douglas production function in soybean production

Sr. No.	Independent variable	Regression co-efficient (bi)	Standard error (SE)	't' value	Geometric mean (Xi)	Marginal product (q)	Marginal value product (Rs.)	Price of input (Rs.)	MVP to price ratio
1.	Area under soybean (ha/farm)	0.354	0.244	1.4490	1.43	10.803	22146.10	8543.62	2.59
2.	Human labour (man day/farm)	0.129	0.052	4.031**	58.72	0.096	196.80	120	1.64
3.	Bullock labour (pair day/farm)	0.067	0.028	2.39*	12.61	0.231	473.55	315	1.50
4.	Machine labour (hours/farm)	0.024	0.009	2.684**	3.82	0.274	561.00	350	1.60
5.	Seed (kg/farm)	0.062	0.044	1.409	113.3	0.023	47.15	30	1.57
6.	Manure (q/farm)	0.006	0.005	1.200	4.72	0.055	112.75	100	1.12
7.	Nitrogen (kg/farm)	0.012	0.007	1.636	27.80	0.019	38.95	13.04	2.98
8.	Phosphorus (kg/farm)	0.020	0.011	1.714	24.27	0.036	73.80	23.75	3.01
9.	Potash (kg/farm)	-0.004	0.003	-1.333	18.00	-0.009	-18.45	9.33	-1.97
10.	Plant protection (liter/farm)	0.011	0.058	2.105*	2.70	0.177	362.85	180	2.01

Intercept (log a) ---------- 4.528
F value ----------- 7.753**
R2 -------------0.810
Return to scale (Σbi) --------0.681

Note: Geometric mean of $(\overline{Y})$ soybean production was 43.64 q per farm and price was 2050/q

* and ** indicate significance of values at P=0.05 and 0.01, respectively

co-efficient of machine labour was 0.024 which was also positive and highly significant at 1 per cent level. It showed that when increase in use of machine labour by 1 per cent, it would cause to increase soybean production by 0.024 per cent. In next order, regression co-efficient of bullock labour indicated 0.067 which was significant at 5 per cent level. When use of bullock labour increased by 1 per cent, it would cause to increase in soybean production by 1 per cent at its geometric mean. Similarly, regression co-efficient of plant protection was 0.011 which was also positive and significant at 5 per cent level. When use of plant protection was increased by 1 per cent, it lead to increase in soybean production by 0.011 per cent. The regression co-efficient of area under soybean was highest as 0.354 but it was positive and non-significant. Similarly, regression co-efficients of seed, manure, nitrogen and phosphorous was also positive but non-significant. On the contrary, regression co-efficient of potash was negative (-0.004) which was non-significant. Coefficient of determination (R^2) was 0.810 which indicated that the variation was explained due to variation in all independent variables. It was clear that, each explanatory variable on its own was very important but together they explained significantly part of variation in soybean production. The sum of partial regression co-efficients was 0.681 which indicated decreasing return to scale. These results are in conformity to results obtained by Pant and Nagar (2005), with respect to elasticity of production.

Marginal productivity in soybean production:

Regarding resource productivity, marginal product with respect to area under soybean was 10.803 quintals. It implied that addition of 1 hectare of land to geometric mean, gave the additional yield of soybean in 10.803 quintals. In next order, marginal product of machine labour was 0.274 quintal. It inferred that addition of 1 hour of machine labour, lead to additional product of soybean by 0.274 quintal. Similarly, marginal product of bullock labour was 0.231 quintal which indicated that additional of 1 pair of bullock labour give 0.31 quintal of soybean in production process. It was clear that, addition of 1 litre of plant protection gave additional yield of soybean by 0.177 quintal. Addition of 1 kg of nitrogen and 1 kg of phosphorous gave the additional yield of 0.019 and 0.036 quintal, respectively. The results were in close correspondence with findings obtained by Singh *et al*. (1983) and Jawanjal (2001).

Resource use efficiency in soybean production:

In regard to resource use efficiency, MVP to price of phosphorous was highest as 3.01 followed by that of nitrogen (2.98), area under soybean (2.59), then plant protection (2.01) and so on. It inferred that in soybean production, priority was given to increase the use of phosphorous, followed by nitrogen, area under soybean and plant protection. In other words, the phosphorous, nitrogen, areas under soybean and plant protection were under utilization resources in soybean production. It was clear that profit was maximized, if the marginal value product of the factor was equal to the marginal cost of the factor. Thus, manure showed the ratio of 1.12 which tends to unity. In other words, manure resource was efficiently used in soybean production followed by that of bullock labour (1.50), seed (1.57) and machine labour (1.60). On the contrary MVP to price ratio of potash was negative as -1.97. It inferred that, there was excess use of potash in soybean production. Hence, there was need to reduce the use of potash in soybean production. These results were in agreement with the earlier results obtained by Bahadur *et al.* (1998) and Kalyankar *et al.* (1990).

REFERENCES

Bahadur, T., Parhasarthy, P.B. and Reddy, K.S. (1988). Resources use efficiency in dry farming. *Agric. Situ. India*, **63**(1): 29-31.

Chamak, J.S., Singh, A.J. and Sidhu, D.S. (1978). Resource use efficiency in Punjab. *Agric. Situ. India*,**34**(4): 211-216.

Jawanjal, P.J. (2001). Resource productivity and efficiency in cotton cultivation in Buldhana district. M.Sc (Ag.) Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, M.S. (INDIA).

Kalyankar, S.P., Rajmane, K.D. and Sudke, A.D. (1990). Farm resource use in different size group of land holding. *Maharashtra J. Agri. Econ.*, **3**(1): 36-37.

Pant, D.C. and Nagar, B.L. (2005). Resource use efficiency in Rajasthan. *Indian J. Agric. Econ.*, **60**(3):542-543.

Saini, G.R. (1969). Resource use efficiency in agriculture. *Indian J. Agric. Econ.*, **24** (2): 1-18.

Sharma, H.O., Soni, S.N. and Khare, P. (2006). Determinants of adoption of soybean production technology by cultivators at different regions of India. *Agric. Situ. India*, **63**(10): 671-675.

Singh, R.K., Singh, R.P. and Singh, N.K. (1983). Resource productivity on dry land farms of Ranchi District, Bihar. *Econ. Affairs*, **28**(4): 650-653.