DOI: 10.15740/HAS/AU/12.2/270-273

Agriculture Update

Volume **12** | Issue 2 | May, 2017 | 270-273

Visit us : *www.researchjournal.co.in*

e ISSN-0976-6847

RESEARCH ARTICLE :

Resource productivity and resource use efficiency in soybean production

D.B. PAWAR, K.V. DESHMUKH AND P.U. KAUTHEKAR

ARTICLE CHRONICLE :
Received :
12.01.2017;
Revised :
30.03.2017;
Accepted :
13.04.2017

SUMMARY : Investigation was carried out during the year 2014-15. About 48 non-residential farms were randomly selected from sixteen villages of two tehsils in Parbhani district of Maharashtra. Data were related to soybean output and input like area under crop, hired human labour, bullock labour, machine labour, seed, nitrogen, phophorus, potash, plantprotection and family human labour. The result revealed that, partial regression co-efficient of area under crop was 0.385 followed by that hired human labour was (0.110) and family human labour (0.165) which were positive and singficant at 1 per cent and 5 per cent level, respectively. Patrial regression co-efficient of bullock labour, manchine labour, phosphorus and potash were positive but non-significant. Marginal product of area under soybean was 5.399 quintals followed by that of bullock labour (0.370q), machine labour (0.220 q) and family human labour (0.142 q). MVP to price ratio with respect to family human labour was 2.16 followed by bullock labour (1.70) and machine labour (1.34). Optimum use of area under soybean was found to be 1.94 hectares and optimum use of phosphorus was 60.24 kg.

How to cite this article : Pawar, D.B., Deshmukh, K.V. and Kauthekar, P.U. (2017). Resource productivity and resource use efficiency in soybean production. *Agric. Update*, **12**(2): 270-273; **DOI : 10.15740/HAS/AU/12.2/270-273.**

KEY WORDS :
Soybean, Resources productivity, Resource use efficiency, Optimum resources

Author for correspondence :

D.B. PAWAR
Department of Agricultural Economics, College of Agriculture (V.N.M.K.V), PARBHANI (M.S.) INDIA

See end of the article for authors' affiliations

BACKGROUND AND OBJECTIVES

Soybean, Resource productivity, Resource use efficiency, Optimum resource use. Soybean [*Glycine max* (L.) Merill] is known as golden bean in India. Glycine is derived from the Greek word glykus and probably refers to sweet tuber. Soybean is the number one oilseed crop of the world. The major soybean growing states are Madhya Pradesh, Maharashtra, Uttar Pradesh, Rajasthan, Karnataka and Gujarat. India is considered as a secondary centre of domestication for soybean. Soybean can be processed into many food products but solvent oils extraction has been the main industry whereby crude oil and de-oiled case are produced. Area under soybean was 55.46 lakh during 2014. Soybean oilseed production during 2014 was 8700 (1000 MT). India imported 4.40 million tonnes of edible oil. Soybean has a great potential as an exceptionally nutritive and very rich protein food. Soybean also contains about 20 per cent oil with an important fatty acid, lecithin and Vitamin A and D. Soybean was introduced in Maharashtra during the year 1984-85. It becomes popular because of its short durational nature (90-110 days) with higher

productivity as compared to other pulses and oilseed crop. In Maharashtra soybean is grown in 38.704 lakh hectares with average productivity of 12.55 quintals per hectares against the national average of about 10.79 quintal. In Maharashtra Buldhana district rank first in area 4.21 lakh hectares while Yavatmal rank first in production 5.39 lakh MT during the year 2014-15.

RESOURCES AND METHODS

Sampling design :

Multistage sampling desing was adopted for selection of district, tehsils, villages and non-residential farms. In the first stage, the Parbhani district was purposively selected of non-residential farms. In the second stage, Parbhani and Punra tehsils were selected on the basis of higher area under non-residential farm. In the third stage eight villages were selected from the each tehsils on the basis of higher area under non-residential farms. From Parbhani tehsil villages were namely Mirkhel, Pandhari, Paralgavan, Pingli, Porjawala, Raipur, Shirshi Bk., Tadlimbla and Aherwadi, Deolgaon, Dhanora, Khadala, Khujada, Makhani, Navki and Phulkalas were selected from Purna tahsil. In the fourth stage, from each village, the list of non-residential farmers along with their holding sizes was obtained. Three non-residential farmers were randomly selected from each of the villages. In this way, from sixteen villages, 48 farmers were selected for the present study. The data were related to area under soybean, hired human labour, bullock labour, machine labour, seed, nitrogen, phosphorus, potash, plant protection and family human labour. Cobb-Douglas production function was fitted to the data to estimate resource use efficiency with respect to each of the explanatory variables. The fitted equation was as follows.

$$Y = aX_1^{b1} \ldots\ldots\ldots\ldots X_n^{bn} . e^u$$

In this functional form 'Y' is independent 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 the nature of returns to scale. This function can easily be transformed into a linear form by logarithmic transformation. After logarithmic transformation, this function is,

$$\text{Log } Y = \log a + b_1 \log x_1 + b_2 \log x_2 + \text{------} b_n \log x_n + u \log e$$

For fitting the production function in major crops, twelve inputs variables were considering the problem of multicolinearity in estimating production function. Multicolinearity refers to situation where because of storing interrelationship among the independent variables, it becomes difficult to their separate effects on the dependent variables. Some of the independent variables are not improtant just because the standard errors are high. It might be due to the presence of multicoliniarity are (a) the sampling variances of the estimate co-efficients increases as the degree of collinearity increases between the explanatory variables, (b) estimated co-efficients may become very sensitive to small changes in data that is addition or deletion of a few observations produce a drastic changes in some of the estimates of the co-efficients. The equation fitted was of the following form.

$$\hat{Y} = aX_1^{b_1} . X_2^{b_2} . X_3^{b_3} . X_4^{b_4} . X_5^{b_5} . X_6^{b_6} . X_7^{b_7} .$$

where, $\hat{Y}$ =Estimated yield of the crop (q/farm), a= Intercept of production function, bi=Partial regression co-efficients of the respective variables (i=1,2,3...10), X_1=Area of the crop (ha/farm), X_2=Hired human labour (manday/farm), X_3=Bullock pair (pairday / farm), X_4=Machine labour (hour/farm), X_5=Seed (kg/farm), X_6=Nitrogen (kg/farm), X_7=Phosphorus (kg/farm), X_8=Potash (kg/farm), X_9=Plant protection (L/farm) and X_{10}= Family human labour (manday/farm).

The marginal value of product or resource indicates the addition of gross value of farm production for a unit increase in the 'i'th resource with all resources fixed at their geometric mean levels. The MVP of various inputs is worked out by the following formula.

$$MVP = \frac{b\bar{Y}}{\bar{X}} Py$$

where, b= Regression co-efficient of particular independent variable, $\bar{Y}$ = Geometric mean of particular independent variable, $\bar{X}$ = Geometric mean of dependent variable, Py = Price of dependent variable.

OBSERVATIONS AND ANALYSIS

The findings with respect to elasticity of production, resource productivity, resource use efficiency and optimum resource use were obtained and are presented as follows :

Elasticity of soybean production :

Regression co-efficients with respect to various explanatory variables were calculated and are presented in Table 1. It was observed from the table that partial regression co-efficient of area under soybean was 0.385 which was positive and highly significant at one per cent level. It inferred that when one per cent increased in use of area under soybean over its geometric mean, it would lead to increase production of soybean by 0.385 per cent. Partial regression co-efficient of hired human labour was also positive and significant. When use of hired human labour was increased by one per cent, it would lead to increase soybean production by 0.110 per cent. Similary partial regression co-efficient of family human labour positive and singficant. If the use seed was increased by one per cent, it would lead increased production of soybean by 0.165 per cent partial regression co-efficients of bullock labour, machine labour, phosphorus and potash were positive but non-significant. On the contrary, partial regression co-efficient of nitrogen and plant protection were negatively and significant. Co-efficient of multiple determination (R^2) was 0.844, it means that there was 84.20 per cent effect of all independent variables together on soybean production. Return to scale was found to be 0.642 which indicated that production of soybean was found in decrease returns to scale.

Resource productivity :

Resource productivity could indicate marginal product of individual independent variable. The results revealed that in existing condition area of soybean was 1.58 hectares. Use of hired human labour was 31.64 mandays. Bullock labour and machine labour showed 11.0 and 8.23 hours, respectively. Use of seed was 79.19 kg. In existing condition nitrogen, phosphorus and potash were 64.83 kg, 57.79 kg, 14.95 kg, respectively. Use of plant protection was 1.71 litres. Marginal product of area under crop was 5.399 quintals while bullock labour was 0.370 quintal and marginal product potash was 0.142 quintal.

Resource use efficiency :

In regards to resource efficiency, it was also evident from the Table 1 that use of family human labour in soybean production indicated MVP to price ratio as 2.16 followed by bullock labour labour (1.70), machine labour (1.34), area under crop (1.22), hired human labour (1.17) and potash (1.12) which were greater than unity. It implied that there was scope to increase these resources in soybean production. On the contrary, in regard to nitrogen

Table 1 : Estimates of Cobb-Douglas production function in soybean production on non-residential farm

Sr. No.	Independent variable	Partial 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	Optimum resource use (Xi)
1.	Area under soybean (ha/farm)	0.385	0.097	3.969**	1.58	5.399	16442.22	13402.75	1.22	1.94
2.	Hired human labour (manday/farm)	0.110	0.037	2.972**	31.64	0.077	234.85	200.00	1.17	37.17
3.	Bullock labour (pairday/farm)	0.184	0.115	1.600	11.00	0.370	1128.50	662.64	1.70	18.76
4.	Machine labour (hour / farm)	0.082	0.054	1.518	8.23	0.220	671.00	500.00	1.34	11.08
5.	Seed (kg/farm)	-0.096	0.094	-1.021	79.19	-0.026	-79.30	60.00	-1.32	---
6.	Nitrogen (kg/farm)	-0.134	0.034	-3.941**	64.83	-0.045	-137.25	13.00	-10.55	---
7.	Phosphorus (kg/farm)	0.041	0.038	1.078	57.79	0.015	45.75	46.00	0.99	60.24
8.	Potash (kg/ farm)	0.007	0.006	1.166	14.95	0.010	30.50	27.00	1.12	17.52
9.	Plant protection (L/farm)	-0.035	0.013	-2.692**	1.71	0.453	-1381.65	500.00	-2.76	--
10.	Family human labour (manday)	0.165	0.082	2.012*	25.68	0.142	433.10	200.00	2.16	55.76

Intercept (log a) ---------- 1.065
F-value ---------- 4.224**
R^2---------- 0.844
Return to scale (Σb_i) ---------- 0.642

Note :- Geometric mean of ($\overline{Y}$) soybean production was 22.16 q per farm and price was Rs. 3050/q

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

and plant protection, MVP to price ratio were negative. Use of nitrogen and plant protection in soybean production was excess.

Optimum resource use :

Result revealed that the variables which indicated positive regression co-efficient were considered and estimated optimum resource use. It was observed that area under soybean was 1.94 hectares; hired human labour could be increased upto 37.17 mandays. Use of bullock labour could be increased 18.76 pairdays. Application of phosphorus could be increased upto 60.24 kg. Potash could be increase upto 17.52 kg. There resources were large scope to increase in soybean production. Similar studies was also conducted by Asmatoddin *et al*. (2009); Bansole (2008); Bhagwat (2008); Jadhav (2008); Kumar and Kumar (2004); Saini (1969) and Tawale (2007 and 2010).

Authors' affiliations :

K.V. DESHMUKH AND P.U. KAUTHEKAR, Department of Agricultural Economics, College of Agriculture (V.N.KM.K.V.), PARBHANI (M.S.) INDIA

REFERENCES

Asmatoddin, M J., Ghulghule, N., Jawale, S.V. and Tawale, J.B. (2009). Resource productivity and resource use efficiency in pulses production on medium farm in Marathwada. *Internat. J. Agric. Sci.*, **5**(2): 359-362.

Bansode, P.S. (2008). Economic analysis of marginal farm in Marathwada region of Maharashtra. M.Sc. (Ag.) Thesis, Marathwada Agricultural University, Parbhani, 93p.

Bhagwat, M.Z. (2008). Economic analysis of small farm in Marathwada region of Maharashtra. M.Sc. (Ag.) Thesis, Marathwada Agricultural University, Parbhani, 102p.

Jadhav, M.S. (2008). Economic analysis of medium farm in Marathwada region of Maharashtra state. M.Sc. (Ag.) Thesis, Marathwada Agricultural University, Parbhani, 108p.

Kumar, S. and Kumar, S. (2004). Resource productivity and retuns from selected foodgrain crops of Himachal Pradesh. *Agric. Situ India*, **61**(7) : 475-485.

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

Tawale, J.B. (2007). Economics of production and marketing of rainfed and irrigated *Rabi* jowar in Osmanabad district. M.Sc. (Ag.) Thesis, Marathwada Agricultural University, Parbhani, 66p.

Tawale, J.B. (2010). Economics of production and marketing of soybean in Latur disrict of Maharashtra. Ph.D. (Ag.) Thesis, Marathwada Agricultural University, Parbhani, 230p.