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National Academy of Agricultural Science (NAAS)
Rating : 3. 03

Resource Use Efficiency of Groundnut (*Arachishyogaea* L.) Cultivation in Raigad District of Konkan Region [M.S.]

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Abstract: *The study was conducted to measure resource use efficiencyof groundnut cultivation in Raigad district of konkan region. For this study 120 groundnut cultivators were selected randomly from two tahsils viz., Mahad and Poladpur of Raigad district.The farmers were grouped into small, medium, large group and at overall level. The resource efficiency in groundnut cultivation was studied by using Cobb-Douglas production function. The analysis revealed that there was significant contribution of seed (X_1), FYM (X_2), phosphorous (X_4) and human labours (X_7) in yield of groundnut at overall level. The coefficient of multiple determination (R^2) was 0.8565, 0.8785, 0.9714 and 0.8931 in small, medium, large and at overall level respectively which indicates that 85.65 per cent, 87.85 per cent, 97.14 per cent and 89.31 per cent variation in crop yield at small, medium, large and at overall level respectively.The sum of elasticity coefficient was 0.98714, which was less than one indicated decreasing return to scale. The MVP to factor price P_X ratio were more than one for seeds (11.8374), FYM (16.6652) and Bullock pair (2.8922) indicated underutilization of these resources in cultivation of groundnut. Whereas, the MVP to P_X ratio was less than one for Nitrogen (0.6217), Phosphorous (-1.3460), potash (-5.4069), irrigation (-3.8151) and human labour (-0.5716) indicated excess utilization of these resources in cultivation of groundnut.*

Keywords: *Groundnut, Resource use efficiency, Return to scale.*

INTRODUCTION

Groundnut (*Arachishypogaea* L.) is one of the important oilseed crop in the world today. The major groundnut-producing countries of the world are India, China, Nigeria, Senegal, Sudan, Burma and the USA. Out of the total area of 18.9 million hectares and the total production of 17.8 million tons in the world, these countries account for 69 per cent of the area and 70 per cent of the production. Groundnut is a major oilseed crop in India accounting for 45 per cent of oilseed area and 55 per cent of oilseed production in the country. India has been producing groundnut since it was introduced in Asia in the 16th century.

The groundnut is generally distributed in the tropical, sub-tropical and warm temperate zones. The principal groundnut growing states in India are Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu and Maharashtra, which accounts for more than 85 per cent of the Indian production as well as an area. The rest of the area and production is distributed mainly in the states of Rajasthan, Orissa, Uttar Pradesh and Madhya Pradesh.

Besides economic benefits, groundnut became a popular crop because of its feasibility of cultivation under wide range of weather and soil conditions. It is grown both as irrigated and rainfed. Because of this, it is drought tolerant as compared to other crops. Groundnut is widely accepted crop in the arid and semi-arid regions. Arid and semi-arid regions together contribute 55 per cent area and 45 per cent production of India.

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MATERIAL AND METHODS

The maximum area under groundnut cultivation is concentrated in Raigad district of *Konkan* region therefore; Raigad district was selected purposively for the study, therefore Mahad and Polad purtahsils from Raigad district were selected purposively on the basis of maximum area under groundnut cultivation as per secondary data obtained from office of the TAO (Taluka Agriculture Officer), Mahad and Poladpur.

For the selection of villages, the list of villages, growing groundnut along with area is prepared by referring revenue records of both tahsils. Then five villages from each tahsils were selected randomly. From the selected villages, the lists of groundnut cultivators were obtained from the revenue records of the selected villages. From each selected villages, a sample of twelve (12) groundnut cultivators was selected randomly. Thus the final sample was consisted of 10 villages and 120 groundnut cultivators from both Mahad and Poladpurtahsils. The data were collected by personal interview with using pre-tested schedules for groundnut cultivators. The log linear forms of Cobb-Douglas type of production function was fitted to find out the factors influencing on the yield of groundnut and to know the resource productivity and resource use efficiency in groundnut production.

Functional Analysis

The empirical evidences from previous studies suggest that amongst the many mathematical function log linear form of Cobb-Douglas type of production function is the most appropriate one for the resource productivity and resource use efficiency.

The Model

The following form of Cobb-Douglas production function was used.

Functional form

$$Y = b_0 x_i^{bi} e^u$$

Where,

Y = Per farm yield of groundnut in quintal

b_0 = Intercept term or Constant

x_i = Explanatory/Independent variables

bi = Regression coefficient of respective variables

e^u = Error term

X_1 = Seed (kg)

X_2 = F.Y.M (kg)

X_3 = Nitrogen (kg)

X_4 = Phosphorous (kg)

X_5 = Potash (kg)

X_6 = Irrigation (hrs)

X_7 = Human labour (days)

X_8 = Bullock labour (pair days)

b_1 to b_8 = Production elasticities (Regression coefficients) of respective resources (X_1 to X_8)

In this functional form 'Y' is the dependent variable and $X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8$ are independent variables were considered on per farm basis. The regression coefficients obtained from this function are also called as elasticities of production. The sum of coefficients of regression *i.e.*, b_1, b_2, b_3, b_4, b_5, b_6, b_7 and b_8 indicate returns to scale.

Estimation of MPP and MVP

The MPP of different input was estimated by taking 1st order partial derivative of output (Y) with respect to concerned input appearing in production function.

$$Y = b_0 x_1^{b1} x_2^{b2} x_3^{b3} x_4^{b4} x_5^{b5} x_6^{b6} x_7^{b7} x_8^{b8} e^u$$

MPP of x_1 is,

$$Dy/Dy_1 = b_0 b_1 x_1^{b1-1} x_2^{b2} x_3^{b3} x_4^{b4} x_5^{b5} x_6^{b6} x_7^{b7} x_8^{b8} e^u$$

$$Dy/dx_1 = b_i \frac{Y}{\bar{X}_i}$$

(i) Marginal physical product (MPP)

$$MPP_{xi} = b_i \frac{Y}{\bar{X}_i}$$

Where,

dy/dx_1 = *MPP* of X_1 input

b_i = Production elasticity's of i^{th} input

$\bar{Y}$ = Geometric mean of output

$\bar{X}i$ = Geometric mean of i^{th} input

(ii) Marginal value product (MVP)

MVP_{xi} = Price per unit of output.

(iii) Marginal factor cost (MFC)

MFC = Price per unit of the input.

Resource Use Efficiency

After estimating the MVP, the resource use efficiency of different resources is judged with the help of MVP to factor price (*Px*) ratio as under,

MVP/MFC = 1 Optimum use of resource,

MVP/MFC < 1 Excess utilization of resource,

MVP/MFC > 1 Underutilization of resource

RESULTS AND DISCUSSION

Resource Use Productivity

The resource productivity in groundnut cultivation was studied by using Cobb-Douglas type production function as described in methodology

The regression coefficient of C.D. function along with its standard errors and coefficient of multiple determination are given in Table 1.

Table 1 revealed that there was significant contribution of seed, FYM, phosphorous and human labours in yield of groundnut at overall group. The coefficient of multiple determination was 0.8565, 0.8785, 0.9714 in small, medium, large groups respectively, while it was 0.8931 at overall level which indicates that 85.65 per cent, 87.85 per cent, 97.14 per cent and 89.31 per cent variation in crop yield at small, medium, large groups and at overall level respectively was explained by the independent variables included in the study.

Resource Use Efficiency

To see whether the resources used in groundnut production were allocated properly or not, the allocative efficiency with respect to different resources were studied with the help of MVP to factor cost ratio and the results are presented in Table 2 for small, medium, large and overall group.

It was seen from the Table 2 that, among the inputs used for production of groundnut, which have positive and significant influences at the overall level, the MVP to factor price P_X ratio were more than one for seed (11.8374), FYM (16.6652) and Bullock pair (2.8922) indicated under utilization of these resources in cultivation of groundnut. Whereas, the MVP to P_X ratio was less than one for Nitrogen (0.6217), Phosphorous (–1.3460), potash (–5.4069), irrigation (–3.8151) and human labour (–0.5716) indicated excess utilization of these resources in cultivation of groundnut.

It was observed at the small size farm, among the inputs used for production of groundnut, which have positive and significant influences at the small

Table 1
Elasticity of production, standard error and coefficient of multiple determination for production function

Sr. No.	*Resources*		*Small*	*Medium*	*Large*	*Overall*
1.	Seed(kg)	X_1	0.55207**(0.30382)	0.70159*(0.28267)	0.40092*(0.10706)	0.94682*(0.15691)
2.	F.Y.M(kg)	X_2	0.04854(0.12585)	0.40161*(0.13290)	0.31577*(0.12411)	0.33096*(0.06429)
3.	Nitrogen(kg)	X_3	0.03629(0.30503)	0.00694(0.01635)	0.31118(0.21898)	0.01175(0.02473)
4.	Phosphorous(kg)	X_4	–0.00483(0.05395)	0.27315*(0.12687)	–0.1144(0.07398)	–0.09208*(0.04444)
5.	Potash(kg)	X_5	0.06595(0.25729)	0.46349*(0.15779)	0.18284(0.16428)	–0.04238(0.07190)
6.	Irrigation(hrs)	X_6	0.20240(0.13275)	–0.0595(0.07175)	–0.17074(0.21329)	–0.04104(0.06852)
7.	Human Labour(days)	X_7	–0.19235(0.21952)	–0.20093(0.07979)	0.01439(0.04618)	–0.16950**(0.08639)
8.	Bullock labour (pair days)	X_8	0.14857(0.09719)	–0.02447*(0.02929)	0.03908(0.04405)	0.04263(0.03588)
9.	Intercept		4.14624(0.65278)	–0.79346(1.01589)	2.30626(0.74155)	1.98155(1.00570)
10.	R^2		0.8565	0.8785	0.9714	0.8931

(Figures in the parentheses indicates standard error of respective resources)

* Significant at 5 per cent, ** Significant at 10 per cent

Table 2
Regression coefficient, MVP and ratio of MVP to factor cost.

Resources	*Cat. of farm*	*MPP*	*MVP*	*Factor price (P_x)*	*MVP/P_X Ratio*	*Level of res.used*
Seed (kg) (X_1)	S	10.0831	504.1555	71.71	7.0305	Under utilization
	M	12.2393	599.7276	71.73	8.3609	Under utilization
	L	8.1943	401.5229	72.00	5.5767	Under utilization
	O	17.3405	849.6864	71.78	11.8374	Under utilization
F.Y.M (kg) (X_2)	S	0.0197	0.9827	0.47	2.0909	Under utilization
	M	0.2299	11.2635	0.48	23.4656	Under utilization
	L	0.1443	7.0698	0.48	14.7287	Under utilization
	O	0.1633	7.9993	0.48	16.6652	Under utilization
Nitrogen (kg) (X_3)	S	0.5835	29.1740	18.13	1.6092	Under utilization
	M	0.1369	6.7065	18.15	0.3695	Excess utilization
	L	7.6817	376.4022	18.14	20.7499	Under utilization
	O	0.2300	11.2721	18.13	0.6217	Excess utilization
Phosphorous (kg) (X_4)	S	–0.0444	–2.2179	46.53	–0.0477	Excess utilization
	M	3.9925	195.6302	46.52	4.2053	Under utilization
	L	–2.3869	–116.9597	46.54	–2.5131	Excess utilization
	O	–1.2782	–62.6301	46.53	–1.3460	Excess utilization
Potash (kg) (X_5)	S	2.5308	126.5390	19.01	6.6564	Under utilization
	M	21.1342	1035.5775	19.05	54.3610	Under utilization
	L	14.9116	730.6693	19.03	38.3957	Under utilization
	O	–2.0977	–102.7855	19.01	–5.4069	Excess utilization
Irrigation (hrs) (X_6)	S	5.5232	276.1594	12.50	22.0928	Under utilization
	M	–1.2596	–61.7204	12.50	–4.9376	Excess utilization
	L	–4.3460	–212.9524	12.50	–17.0362	Excess utilization
	O	–0.9732	–47.6887	12.50	–3.8151	Excess utilization
Human Labour (days) (X_7)	S	–2.0583	–102.9127	159.19	–0.6465	Excess utilization
	M	–2.2914	–112.2763	159.19	–0.7053	Excess utilization
	L	0.1489	7.2957	159.19	0.0458	Excess utilization
	O	–1.8571	–90.9961	159.19	–0.5716	Excess utilization
Bullock labour (pair days) (X_8)	S	91.4321	4571.6030	438.13	10.4343	Under utilization
	M	–14.8908	–729.6512	438.12	–1.6654	Excess utilization
	L	23.1215	1132.9511	438.12	2.5859	Under utilization
	O	25.8596	1267.1213	438.12	2.8922	Under utilization

(Cat.: Category, MPP: Marginal physical product, MVP: marginal value product, res: – resources).

size farm, the MVP of P_X ratio were more than one for seed (7.0305), FYM (2.0909), nitrogen (1.6092), potash (6.6564), irrigation (22.0928) and bullock pair (10.4343) indicated under utilization of these resources in cultivation of groundnut. Whereas, the MVP to P_X ratio was less than one for phosphorous (–0.0477) and human labour (–0.6465) indicated excess utilization of these resources in cultivation of groundnut.

In case of the medium size farm, among the inputs used for production of groundnut, which have positive and significant influences. The MVP

of Px ratio were more than one for seed (8.3609), FYM (23.4656), phosphorous (4.2053) and Potash (54.3610) indicated under utilization of these resources in cultivation of groundnut. Whereas, the MVP to P_X ratio was less than one for nitrogen (0.3695), irrigation (–4.9376), human labour (–0.7053) and bullock pair (–1.6654) indicated excess utilization of these resources in cultivation of groundnut.

At the large size farm, among the inputs used for production of groundnut, which have positive and significant influences at, the large size farm, the MVP of P_X ratio were more than one for seed (5.5767), FYM (14.7287), nitrogen (20.7499), potash (38.3957) and bullock pair (2.5859) indicated under utilization of these resources in cultivation of groundnut. Whereas, the MVP to P_X ratio was less than one for phosphorous (–2.5131), irrigation (–17.0362) and human labour (0.0458) indicated excess utilization of these resources in cultivation of groundnut. This indicated that, farmers in the study area were lacking in commercial attitude in the cultivation of groundnut and they have to reallocate their available resources to increase the profit from cultivation of groundnut by proper management of resources.

CONCLUSION

Among the inputs used for production of groundnut, which have positive and significant influences at the overall level, the MVP to factor price P_X ratio were more than one for seed (11.8374), FYM (16.6652) and Bullock pair (2.8922) indicated under utilization of these resources in cultivation of groundnut. The analysis showed that, there is scope for increasing area under this crop. Similarly there is scope to increase the use of different inputs like seed, FYM, bullock labour days.

References

Gezahagn Kudama (2013), Economic performance of groundnut production in East Hararghe zone of Oromia regional state, *Science, Technology & Arts Research Journal*, Vol. 2(2): 135-139.

Gideon Danso-Abbeam, Abubakari M. Dahamani and Gbanha A-S Bawa, (2015), Resource-Use-Efficiency among Smallholder Groundnut Farmers in Northern Region, Ghana, *American Journal of Experimental Agriculture* 6(5): 290-304.

Hemendra Singh., N.K. Singh and K.C. Bairwa, (2014), Resource-use efficiency in production of groundnut in Rajasthan: An economic analysis, *Annual Agricultural Research New Series*, Vol. 35(1): 92-97.

Kapopo Vincent and MagangaAssa, (2012), Economic Analysis of Groundnut Production in Kasungu District, Malawi: A production Economics Approach, *Munich Personal RePEc Archive Paper* no: 41593: 1-13.

Madaki M.J., I.Y. Abba, G. Auwalu and A. Mary, (2015), Resource Use Efficiency of Groundnut Production In Biu Local Government Area of Borno State, Nigeria, *Research Journal of Agriculture*, Vol. 2: 1-6.

Patil S.M., L.B. Kunnal and G.M. Gaddi, (1997), Resource use efficiency in groundnut production, *Karnataka Journal of Agril. Sciences*, 10(3): 807-810.

Reddy Lokanandha E. and Radhakrishna Reddy, (2014), Resource use efficiency of input factors with reference to farm size in groundnut cultivation in Nellore district of Andhra Pradesh, *International journal of Economics, Commerce and Research*, Vol. 4(2):1-10.

Singh Hemendra, N.K. Singh and D.K. Kardam, (2014), Economic analysis of groundnut crop in Jaipur district of Rajasthan, *Agriculture Update*, Vol. 9(1): 59-63.

Taphee G. B. and A. A. U. Jongur, (2014), Productivity and Efficiency of Groundnut Farming in Northern Taraba State, Nigeria, *Journal of Agriculture and Sustainability*, Volume 5(2): 45-56.

Taru V.B., I.Z. Kyagya, S.I. Mshelia and E.F. Adebayo, (2008), Economic Efficiency of Resource Use in Groundnut Production in Adamawa State of Nigeria,*World Journal of Agricultural Sciences* 4(S): 896-900.

Zekeri M. And I. Tijjani, (2013), Resource use efficiency of groundnut production in Ringim local government area of jigawa state, Nigeria,*Agro search,* Vol. 13(2): 42-50.