Research Article

Costs, returns and resource use efficiency of soybean cultivation in Indore district of Madhya Pradesh

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SUMMARY : The present study entitled cost and returns of soybean cultivation in Indore district of Madhya Pradesh was undertaken to study the costs and returns aspects of soybean. The study covered two blocks and four villages with 80 farmers growing soybean. The sample farmers were stratified in to small (up to 2 hectares) and large (more than 2 hectares). The data pertained to 2009-2010 were collected through survey method with the help of pretested schedules. Conventional and functional analysis was used to analyze the data and to arrive at valid conclusions. The per hectare cost of cultivation of soybean was estimated at Rs.30,740.85, Rs.28,466.26 and Rs.29,587.43 on small, large and pooled farms, respectively and thus exhibiting inverse relationship with the size of the farm. The cost of producing a quintal of soybean showed direct relationship with the size of the holding as it was Rs.1,727 on small farms, Rs.1,848.45 on large farms and Rs.1,793.20 on pooled farms. The net income decreased from Rs.13,342.47 on small farms to Rs.8,986.56 on large farms. The same on pooled farms was Rs.10,999.42.

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BACKGROUND AND OBJECTIVES

Soybean is the most popular and the largest produced oilseed in the world. It constitutes around 55 per cent of the world production of oilseeds and figures around 224.10 million tonnes(2008-2009). The major producing countries of soybean are the United States of America, Argentina, Brazil, China and India. The United States is the world leader in soybean production, accounting for 34 per cent of world production, while Brazil accounts 27 per cent, Argentina 20 per cent, China 7 per cent and India contributes only 4 per cent. Madhya Pradesh is known as the soybean bowl of India, contributing 59 per cent of soybean production followed by Maharashtra with 29 per cent and Rajasthan with 6 per cent contribution. Andhra Pradesh, Karnataka, Chhattisgarh and other parts of India also produce the bean in small quantities. The total production for the year 2008-2009 is estimated at 89 lakh tonnes. Keeping in view the above facts, the present study was conducted during 2009-10 with

the objectives to estimate the costs and returns from soybean cultivation and to analyze the resource use efficiency in the production of soybean.

RESOURCES AND METHODS

A multistage stratified random sampling technique was adopted to select the block, villages, cultivators. Two blocks namely Depalpur and Mhow which stood first and second in terms of acreage under soybean were selected purposively for the present study. From the selected blocks, a list of villages under soybean crop were arranged in the descending order of their acreage. The first two villages from each block with highest were chosen for a detailed study. The selected villages were Agenda and Chander from Depalpur block and Aakvi and Avlai from Mhow block. The list of all the farmers cultivating soybean crop from the four selected villages were obtained from their respective village records. The farmers were stratified into small and large groups on the

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basis of operational holdings as per the criterion adopted by IRDP. These farmers with 2 hectares or less of dry land were considered as small farmers and more than 2 hectares as large farmers. In this classification 2 acres of dry land was considered equal to one acre of wet land in accordance with income generating capacity of dry and wet lands. From each selected village, ten farmers in each size group were selected at random. Thus 40 small and 40 large farmers constituted the sample of the study. The total numbers of soybean cultivators selected for the purpose of study were 80 in number.

OBSERVATIONS AND ANALYSIS

On an average, the total cost of cultivation per hectare of soybean crop was Rs.30,740.85 on small farms, Rs.28,466.26 on large farms and Rs.29,587.43 on pooled farms. The breakup of the total costs into operational costs and fixed costs showed that the operational costs were Rs.19,646.41 (63.90 %), Rs.18,077.14 (63.50 %) and Rs.18,811.43 (63.68 %) while the fixed costs were Rs.11,094.44 (36.10 %), Rs.10,389.12 (36.50 %) and Rs.10,776.00 (36.42 %) on small, large and pooled farms,

respectively. The expenditure towards cattle labour use was Rs.2,030(6.6 %), Rs.406(1.43 %) and Rs.1,184 (4 %) and that of tractor use was Rs.2,285.50 (7.43 %), Rs. 4,193 (14.73 %), Rs.3,237.50 (10.90 %) per hectare on small, large and pooled farms, respectively.Seed was other item of cost in the cultivation of soybean crop amounting to Rs.1,893.78, Rs.1,840.32 and Rs.1,863 per hectare and accounted for 6.16, 6.46 and 6.30 per cent of the total cost on small, large and pooled farms, respectively.Large farmers had spent marginally larger amount of Rs.3,950.16 (13.87 %) while the small farmers Rs.3,690.06 (12 %) per hectare on manure and fertilizers. The same on pooled farms was Rs.3,817.86 (12.90 %) per hectare. The expenditure towards plant protection chemicals was Rs.348.60 (1.13 %), Rs.407.40 (1.43 %) and Rs.386.80 (1.30 %) on small, large and pooled farms, respectively. The per hectare expenditure incurred towards human labour resource service was Rs.7,619.70 (24.78 %) on small farms, Rs.5,014.90 (17.61 %) on large farms and Rs.6,251.30 (21.12 %) on pooled farms. Rental value of owned land, turned out to be the item of highest cost in the cultivation of selected enterprise. It was Rs.9,000,

Table 1 : Cost of cultivation of soybean according to farm size and component wise (In rupees per hectare)

Sr. No.	Particulars	Small farms	Large farms	Pooled farms
Operational costs				
1.	Human labour	7,619.70 (24.78)	5,014.90 (17.61)	6,251.30 (21.12)
2.	Owned	4,963.20 (16.14)	1,072.50 (3.81)	3,006.30 (10.16)
3.	Hired	2,656.50 (8.64)	3,832.40 (13.80)	3,245.00 (10.96)
4.	Bullock labour	2,030.00 (6.60)	406.00 (1.43)	1,184.00 (4.00)
5.	Owned	1,598.00 (5.20)	310.00 (1.10)	920.00 (3.10)
6.	Hired	432.00 (1.40)	96.00 (0.33)	264.00 (0.90)
7.	Tractor	2,285.50 (7.43)	4,193.00 (14.73)	3,237.50 (10.94)
8.	Owned	-	3,570.00 (12.54)	1,785.00 (6.03)
9.	Hired	2,285.50 (7.43)	623.00 (2.19)	1,452.50 (4.90)
10.	Seed	1,893.78 (6.16)	1,840.32 (6.46)	1,863.00 (6.30)
11.	Manuresand fertilizers	3,690.06 (12.00)	3,950.16 (13.87)	3,817.86 (12.90)
12.	Manures	2,325.00 (7.56)	2,400.00 (8.43)	2,350.00 (7.94)
13	Fertilizers	1,365.06 (4.44)	1,550.16 (5.44)	1,467.86 (4.96)
14.	Plantprotection chemicals	348.60 (1.13)	407.40 (1.43)	386.80 (1.30)
15.	Weedicide	816.00 (2.65)	1,024.00 (3.59)	960.00 (3.12)
16.	Repairs and maintenance charges	602.77 (2.00)	821.36 (2.88)	720.97 (2.44)
17.	Interest on working capital	360.00 (1.17)	420.00 (1.47)	390.00 (1.31)
18.	Total operational cost	19,646.00 (63.90)	18,077.00 (63.50)	18,811.00 (63.68)
Fixed costs				
1.	Land revenue	125.00 (0.40)	125.00 (0.44)	125.00 (0.42)
2.	Rental value of owned land	9,000.00 (29.28)	8,200.00 (28.80)	8,600.00 (29.04)
3.	Depreciation	889.94 (2.89)	962.32 (3.38)	957.00 (3.20)
4.	Interestonfixed capital	1,079.50 (3.51)	1,101.80 (3.90)	1,094.00 (3.70)
5.	Total fixed costs	11,094.44 (36.10)	10,389.12 (36.50)	10,776.00 (36.42)
6.	Total costs	30,740.85 (100.00)	28,466.26 (100.00)	29,587.43 (100.00)

Note: Figures in parentheses indicate percentage to total

Table 2 : Output and returns per hectare of soybean

Sr. No.	Particulars	Units	Small farms	Large farms	Pooled farms
1.	Yield in physical units				
	Main product	q	17.80	15.40	16.50
	By-product	q	34.93	27.34	31.20
2.	Yield in monetary terms				
	Main product	Rs.	34,888.00	30,262.40	32,381.00
	By-product	Rs.	9,195.32	7,190.42	8,205.60
3.	Gross returns	Rs.	44,083.32	37,452.82	40,586.00
4.	Cost of cultivation	Rs.	30,740.85	28,466.26	29,587.43
5.	Net returns	Rs.	13,342.47	8986.56	10,999.42

Rs.8,200 and Rs.8,600 per hectare accounting for 29.28, 28.30 and 29.04 per cent of the total costs on small, large and pooled farms, respectively (Table 1).

On an average, the yield of main product per hectare was 17.80, 15.40 and 16.50 quintals while the yield of by-product was 34.93, 27.34 and 31.20 q on small, large and pooled farms, respectively (Table 2). The small, large and pooled farms realized a gross income of Rs.44,083.32, Rs.37,452.82 and Rs.40,586.85 per ha, respectively. The net income decreased from Rs.13,342.47 on small farms to Rs.8,986.56 on large farms. The same was Rs.10,999.42 on pooled farms.

Resourse productivity:

Farmers have limited inputs and their goal is to maximize farm income from the resources available with them. Hence, in order to operate the farm business at an optimum level, they make some adjustments in the allocation of their resources. The question that arises is whether the farmers belonging to different size groups respond equally to economic opportunities and make rational use of resources. Keeping this in mind, the present study was carried out to examine the input-output relationship and the resource use efficiency in the production of soybeans. The Cobb-Douglas production function which gave best fit was selected to establish the input-output relationship. The regression co-efficients of different inputs used in the production function were estimated and the results are presented in Table 3.

It is observed from Table 3 that out of four independent variables included in the model, human labour (X_1), manure(X_3) and fertilizers(X_4)were positively significant at 5 per cent level. The regression co-efficients are the elasticity co-efficients of production in Cobb-Douglas production function, as they show percentage response of output to 1 per cent change in input. For example, one per cent increase in the human labour (X_1), manures (X_3) and fertilizers (X_4) would result in an increase of 0.5526, 0.1268,0.0935per cent in the yield of soybeans. The regression co-efficient of tractor power was positively related but found non- significant.

The adjusted co-efficient of multiple determination (R^{-2}) was 0.8948. This indicates that the variables included in the model explained about 89.48 per cent variation in production of soybeans on small farms.

In the case of large farms, the adjusted coefficient of multiple determination was 0.8576 there by indicating that the selected variables explained 85.76 per cent of variation in soybean production. Of the four variables included in the function, the two variables *viz.,* human labour(X_1) and tractor power (X_2) were positively significant at 5 per cent level. This implies that keeping other variables constant, one per cent increase in human labour and tractor power over their respective geometric mean level would result in an increase of 0.7355 and 0.2382 per cent, respectively in the yields of soybeans. The other variable namely manures (X_3) was positively related but found non significant. The variable

Table 3 : Production elasticities of input factors in soybean

Sr. No.	Particulars	Small farms	Large farms	Pooled farms
1.	No of farmers	40	40	80
2.	Constant	-0.3010	-0.1968	-0.3542
3.	Human labour in mandays (X_1)	0.5526** (4.2374)	0.7355** (5.0650)	0.6708** ((7.3794)
4.	Tractor power in hours (X_2)	0.1467^{NS} (1.3598)	0.2382** (2.9578)	0.2421** (3.8721)
5.	Manures in tones (X_3)	0.1268** (2.001)	0.0111^{NS} (0.3291)	0.0255^{NS} (0.9239)
6.	Fertilizers in rupees (X_4)	0.0935** (1.9679)	-0.0093^{NS} (-0.1442)	0.0622** (1.9187)
7.	Adjusted coefficient of multiple determination ($\overline{R}^2$)	0.8948	0.8576	09797

Note : Figures in parentheses indicate' values   NS=Non-significant
** indicates significance of value at P=0.05

fertilizers (X_4) turned out to be negative but non significant.

On pooled farms, the adjusted coefficient of multiple determination (R^{-2}) was 0.9797 there by indicating the selected variables explained 97.97 per cent of variation in soybean production. Of the four variables included in the model, human labour (X_1) tractor power (X_2) and fertilizers (X_3) were positively significant at five per cent level. This implies that keeping other variables constant, one per cent increase in human labour, tractor power and fertilizers over their geometric mean levels would result in an increase of 0.6708, 0.2421 and 0.0622 per cent, respectively in the yield. The other variable manures was positively related but non significant.

The conclusions that could be derived from the above analysis was that human labour, manures and fertilizers on small farms, human labour and tractor power on large farms, human labour, tractor power and fertilizers on pooled farms contributed to the increase in yields. In fact human labour, manures and fertilizers were the major items of cost in the cultivation of soybeans. Similarly Idnani *et al.* (1992) conducted a study on resource productivity and allocative efficiency in soybean production. Pawar *et al.* (2000) also conducted a study on economics of soybean cultivation in Western Maharashtra.

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REFERENCES

Idnani, N.L., Dubey, K.K. and Mishra, B.L. (1992). Resource productivity and allocative efficiency in soyabean production.*Indian J. Agric. Economics,* **47**(3): 490.

Pawar, N.D., Patil, H.N. and Bosale, T.G. (2000).Economics of soybean cultivation in western Maharashtra.*J. Maharashtra Agric. Univ.,* **25** (1) : 52-54.

Singh, Awadhesh, Sharma, R.P., Singh, Vinita (2008). Economics of production and marketing of soybean in block Sonkutch of district Dewas of Madhya Pradesh-A case study. *Agric. Mktg*., **1**(4):23-26

Tirupathaiah, G. and Naidu, M.R. (1993). Costs and returns of *Kharif* groundnut in Vizianagaram district of Andhra Pradesh.*Indian J. Agric. Economics*, **48**(2): 376.

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