Research Article

AN ECONOMIC ANALYSIS OF CLUSTER BEAN IN BIKANER DISTRICT OF RAJASTHAN

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Abstract- The present study was conducted to analyze the economics of cluster bean crop. The study area was selected on the basis of highest area and production under this crop. The selected area was Bikaner district under cluster bean crop. The present investigation was carried out to study the cost of cultivation by sample farmer of selected cluster bean crop. Cost of cultivation was reported highest on large farms (Rs 15676.58), followed by medium (Rs 14837.42) and small (Rs 14117.08) farms. The major component of cost was utilized in sowing of seed including cost of seed which contributed 20.26 per cent of total cost. The analysis of cost of cultivation showed that on an average, the total cost (Cost C_2) per hectare of cluster bean was Rs 14877.03 for the sample farms of the study area. The cost C_2 was highest on large, farms followed by medium and small farms. On an overall basis, the cost of production per quintal was Rs 3206.76 on sample farms. It was highest on small farms, followed by medium and large farms. On an average, gross income per hectare of cluster bean cultivation was Rs 27368. This was higher on large farms as compared to the medium and small farms. On an overall basis, the net income per hectare of cluster bean cultivation was Rs 11460.45. It was more on large farms as compared to medium and small farms. The return to management per hectare of cluster bean cultivation was Rs 9869.70. The returns per rupee of investment was higher on large farms (Rs1.75) followed by medium (Rs1.70) and small (Rs1.69) farms. The economies of scale are not in favor of small farms mainly due to high cost per unit of output. Therefore, the small farms should use their resources (capital and labour) optimally so that the scale economies tilt in their favor. The shortage of human labour in various operations especially in peak period can be substituted through mechanized farming.

Keywords- Cost, Return, Production, Clusterbean

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Introduction

Guar or cluster bean (*Cyamopsis tetragonoloba*) is native to India and has been cultivated in the country for ages. It has been used traditionally as a vegetable, cattle food and as a green manure crop in agriculture. Commercially, guar gum is the most important derivative of guar seed and is used in a variety of industries such as food processing, oil and gas, paper, textile, cosmetics, mining and explosives. India is the world's largest producer of guar, contributing about 80 per cent of global production. Guar gum has emerged as top value added agricultural product in Indian export market leaving aside main export-oriented commodities like rice, oil cakes and cotton, mainly because of growing demand of petroleum industry. In India, cluster bean is mostly grown in Rajasthan, Haryana, Punjab, Uttar Pradesh and Madhya Pradesh. Rajasthan occupies first position in India both in area and production. It accounts for almost 82.1 per cent area and 70% production in India. Haryana and Gujarat have second and third position respectively. Rajasthan has an area of 46.30 lakh hectare, production of 27.47 M tones with a productivity of 593 kg/ha. [1]. In Rajasthan, guar is mainly grown in Barmer, Churu, Sriganganagar, Nagaur, Jalore, Sikar, Jaisalmer, Bikaner, Jaipur, Jhunjhunu and Alwar districts. Cluster bean occupies a significant place at the national level as well as the state level. Therefore, it is necessary to examine its cost structure and profitability. Looking to the importance of cluster bean crop, the study was undertaken in Bikaner district with the specific objectives to estimate the cost and return in cluster bean cultivation.

Methodology

Bikaner district of North-Western Rajasthan is one of major producing district of cluster bean was selected purposively and on the basis of highest area under cluster bean, Lunkaransar tehsil of Bikaner district was selected for the study. Five percentage villages selected from Lunkaransar tehsil were Mahajan, Hansera, 465 RD, Rojhan, 264.030 RD, Malkisar, and Dheereran. A list of all the cluster bean growers of selected villages was prepared along with size of their operational holding with the help of village patwaries. After arranging the list of farmers in ascending order of area under cluster bean, they were divided into three standard size groups i.e. small, medium and large. The Fifty farmers were selected randomly from selected tehsil. Both primary as well as secondary data were used for the present study. Information regarding various cost components in production of clusterbean crop *viz*., costs of various inputs, quantity through personal interview method on pre-structured data schedule. The study For estimating the cost of cultivation and returns from this crop, various cost concepts (cost A_1, A_2, B_1, B_2, C_1, C_2 and C_3) and income measures (gross income and net income) were used.

Analytical framework

Cost of cultivation: The cost of cultivation of clusterbean crop was worked out by using various cost concepts defined below [2].
Cost A1: It includes:
Value of hired human labour, value of hired and owned animal labour, value of

hired and owned machine labour, value of seed (both farm seed and purchased), value of manures (owned and purchased) and fertilizers, depreciation on fixed assets, irrigation charges, land revenue, interest on working capital and miscellaneous expenses.

Cost A2 : Cost A1 + rent paid for leased in land.
Cost B1 : Cost A1+ interest of fixed capital (excluding land)
Cost B2 : Cost B1 + rental value of owned land + rent for leased in land.
Cost C1 : Cost B1 + imputed value of family labour.
Cost C2 : Cost B2 + imputed value of family labour.
Cost C3 : Cost C2 + 10 per cent of cost C2 as management cost.
The cost of production will be worked out by using following formula:

$$\text{Cost of production (Rs/ha)} = \frac{\text{Cost of cultivation (qt./ha)}}{\text{Quantity of main product (qt./ha)}}$$

Estimation of return
Following income measure was used to work out the net return of Cluster bean cultivation in the study area.
Gross income: Synonymous with the value of output (both main and by-product) evaluated at harvest prices.

$$GI = Qm \times Pm + Qb \times Pb$$

Where, GI = Gross income
Qm = Quantity of main product
Pm = Price of main product
Qb = Quantity of by- product
Pb = Price of by- product
Net income = Gross income - Cost C_2 (Total cost of cultivation)

Result and Discussion
Resource use pattern
The use of inputs and the adoption of various cultural practices in the cultivation of cluster bean crop on the sample farms in the study area were presented in the [Table-1]. The field preparation for sowing of cluster bean crop in the study area starts in the month of May. On an average, 2.00 preparatory tillage operations were done to prepare the fields. The farmers prepared their fields with the help of

tractor. The seed rate used was 23.26 kg, 25.03 kg and 27.07 kg per hectare on small, medium and large farming's, respectively. The average quantity of seed used was 25.12 kg per hectare by the sample farms. Quantity of chemical (Rhizobium culture) used was 7.05, 7.48 and 9.41 gm per kg seed on small, medium and large size farming holding. The average quantity of chemical (Rhizobium culture) used was 7.98 gm. per kg seed. The FYM applied to the field was 16.05, 17.23 and 18.35 tonnes per hectare on small, medium and large size holdings, respectively. The average quantity of FYM used was 17.21 tonnes per hectare by the sample farms. Quantity of chemical fertilizer used was 17.44, 19.25 and 21.86 kg per hectare on small, medium and large size group of farms. The average quantity of chemical fertilizer used was 19.52 kg per hectare. On an average, one weeding was done manually during growing season of cluster bean crop by the sample farmers. On an average, 0.43 irrigations were given to the cluster bean crop by sample farmers using canal.

Table-1 *Resource use pattern in cluster bean on different land size holdings (per hectare)*

S. No.	Input	Size of holdings			Overall Average
		Small	Medium	Large	
1	Preparatory tillage (No.)	2.00	2.00	2.00	2.00
2	Seed (kg)	23.26	25.03	27.07	25.12
3	Seed treatment (g/ Kg seed)	7.05	7.48	9.41	7.98
4	FYM (Tonnes/ha)	16.05	17.23	18.35	17.21
5	Fertilizers(kg./ha)	17.44	19.25	21.86	19.52
6	Hoeing/Weeding (No.)	1.00	1.00	1.00	1.00
7	Irrigation (No.)	0.55	0.45	0.30	0.43

Labour use pattern
The various operations performed by family labour, hired labour and machine labour are given in [Table-2]. The overall operations, 43.22, 33.80 and 21.91 man hours per hectare of family labour, 5.09, 17.83 and 29.90 man hours per hectare of hired labour and 6.97, 7.75 and 8.41 hours per hectare of machine labour was used by the small, medium and large farmers, respectively. On an average for various operations about 32.98 man hours family labour, 17.61 man hours causal hired labour and 7.71 hours machine labour was used in the Bikaner district in cluster bean cultivation.

Table-2 *Operation-wise labour use pattern on different size holdings (hours/ ha)*

Operation	Small			Medium			Large			Overall average		
	FL	HL	ML	FL	HL	ML	FL	HL	ML	FL	HL	ML
Preparatory tillage	-	-	3.20	-	-	3.41	-	-	3.73	-	-	3.45
Sowing	1.35	-	1.10	1.11	.26	1.42	.26	1.31	1.23	0.91	0.52	1.25
FYM	2.6	0.06	-	1.21	1.05	-	.82	1.04	-	1.54	0.71	-
Irrigations	1.31	0.60	-	1.06	1.31	-	1.20	1.27	-	1.19	1.06	-
Plant protection Chemical	2.27	.51	-	1.81	1.12	-	1.01	1.93	-	1.70	1.19	-
Fertilizer	1.32	.30	-	.66	1.21	-	.78	1.18	-	0.92	0.90	-
Weeding	11.20	1.19	-	11.21	2.23	-	9.37	4.11	-	10.59	2.51	-
Harvesting	18.63	2.03	-	14.02	7.92	-	5.58	16.5	-	12.74	8.82	-
Threshing	2.51	.20	1.57	.71	2.13	1.63	.89	1.54	2.07	1.37	1.29	1.75
Transportation	2.03	0.2	1.10	2.01	0.6	1.29	2.00	1.02	1.38	2.01	0.60	1.26
Total	43.22	5.09	6.97	33.80	17.83	7.75	21.91	29.90	8.41	32.98	17.61	7.71

FL = Family labour; HL = Hired labour and ML = Machine labour

Cost of cultivation
Various costs incurred in the cultivation of cluster bean on sample farms on different size holdings are presented in [Table-3]. On an average, the total cost per hectare of cluster bean cultivation was Rs14877.03 in the Bikaner district. It was Rs14117.08 on small, Rs14837.42 on medium and Rs15676.58 on large holdings farmers. Sowing of seed and seed value was the most important component of the cost in all the categories. Out of the total cost, it accounted for 20.26 per cent. It was 19.77 on small farm, 20.24 on medium farms and 20.72 on large farms. Machine labour was the second most important component in all the categories. It accounted for 12.95 per cent of the total cost.

The comparative estimates of different costs incurred in cluster bean cultivation for different size groups are given in [Table-4] and its revealed that cost A1, on an overall basis, was Rs 7918.78. It increased with the increase in size of holding because of better resource endowment and higher use of hired labour on medium and large farms. Cost A2 was same as cost A1 because no farmer had leased-in land. Cost B1 and B2 were worked out to be Rs 8877.03and Rs14877.03 respectively. The costs C1 and C2, on overall basis, were worked out to be Rs. 9907.54 and Rs. 15907.54 respectively. Cost C3, which also includes managerial cost, was worked out to be Rs17498.30 per hectare

Cost of production

The cost of production per quintal of cluster bean on different cost concepts basis is given in [Table-5]. It is evident from the table that the overall cost of production per quintal of cluster bean was Rs3206.76 on cost C2 basis. The cost of production per quintal was highest on small farms i.e. Rs 3249.52 followed by medium and large farmer i.e., Rs 3230.42 and Rs 3140.36 respectively because of the two productions in comparison to medium and large farms.

Table-3 *Cost of cultivation of cluster bean (Rs/ ha)*

Cost components	Size of holdings			
	Small	Medium	Large	Overall
Machine labour	1742.50 (12.34%)	1937.50 (13.05%)	2102.50 (13.41%)	1927.50 (12.95%)
Hired labour	159.06 (1.12%)	557.18 (3.75%)	934.37 (5.96%)	550.20 (3.69%)
Imputed value of family labour	1350.62 (9.56%)	1056.25 (7.11%)	684.68 (4.36%)	1030.52 (6.92%)
Including value of seed	2791.20 (19.77%)	3003.60 (20.24%)	3248.40 (20.72%)	3014.4 (20.26%)
FYM	482.03 (3.41%)	514.32 (3.46%)	557.26 (3.55%)	517.87 (3.48%)
Chemical Fertilizers	140.66 (0.99%)	180.44 (1.21%)	216.66 (1.38%)	179.25 (1.20%)
Plant Protection chemicals	70.84 (0.50%)	93.98 (0.63%)	119.34 (0.76%)	94.72 (0.63%)
Irrigation charges	57.60 (0.40%)	61.39 (0.41%)	69.89 (0.44%)	62.96 (0.42%)
Depreciation	322.26 (2.28%)	356.64 (2.40%)	406.62 (2.59%)	361.84 (2.43%)
Land revenue	40 (0.28%)	40 (0.26%)	40 (0.25%)	40 (0.26%)
Interest on working capital	110.15 (0.78%)	125.26 (0.84%)	183.14 (1.16%)	139.52 (0.93%)
Interest on fixed capital	850.16 (6.02%)	910.86 (6.13%)	1113.72 (7.10%)	958.25 (6.44%)
Rental value	6000 (42.50%)	6000 (40.43%)	6000 (38.27%)	6000 (40.33%)
Total	14117.08 (100%)	14837.42 (100%)	15676.58 (100%)	14877.03 (100%)

Table-4 *Cost of cultivation per hectare of cluster bean on different cost concepts basis (Rs/ ha)*

Cost	Small	Medium	Large	Overall Average
Cost A$_1$	7266.92	7926.56	8562.86	7918.78
Cost A$_2$	7266.92	7926.56	8562.86	7918.78
Cost B$_1$	8117.08	8837.42	9676.58	8877.03
Cost B$_2$	14117.08	14837.42	15676.58	14877.03
Cost C$_1$	9467.70	9893.67	10361.26	9907.54
Cost C$_2$	15467.70	15893.67	16361.26	15907.54
Cost C$_3$	17014.47	17483.04	17997.39	17498.30

Table-5 *Cost of production of cluster bean on different farm size holdings (Rs/qt)*

Cost	Size of holding			Overall average
	Small	Medium	Large	
Cost A$_1$	1526.66	1611.08	1643.54	1593.76
Cost A$_2$	1526.66	1611.08	1643.54	1593.76
Cost B$_1$	1705.26	1796.22	1857.30	1786.26
Cost B$_2$	2965.77	3015.73	3008.94	2996.81
Cost C$_1$	1989.01	2010.90	1988.72	1996.21
Cost C$_2$	3249.52	3230.42	3140.36	3206.76

Productivity and profitability of cluster bean

The productivity of cluster bean and gross returns on sample farms are given in [Table-6]. The table revealed that on an overall basis, yield of cluster bean was 4.9633 quintals per hectare. The yield was highest (5.21 quintals) on large farms, followed by medium farms (4.92quintals) and small farms (4.76 quintals) which indicated that as the size of holding increased, the yield of cluster bean also increased. *Gaddi et al.,* 2002 also found similar findings. The gross returns also increased with increase in the size of holding [3].

Table-6 *Gross income per hectare of cluster bean on different farm size holdings (Rs/Hec.)*

Size holding	Yield main (qt/ha)	Price/qtl	By product (qt/ha)	Price/qt	Gross income (Rs)
Small	4.76	5100	7.93	250	26258.5
Medium	4.92	5100	8.27	250	27159.5
Large	5.21	5100	8.46	250	28686
Overall average	4.9633	5100	8.22	250	27368

It is evident from the [Table-7] that on overall basis net returns from cost A1, A2, B1, B2, C1, C2 and C3 were Rs19449.22, Rs19449.22, Rs18490.97, Rs12490.97, Rs17460.44, Rs11460.21 and Rs 9869.70 per hectare of cluster bean cultivation, respectively. The net returns increased with increase in the size of the holding. Similar results were obtained while studying the Sesame Cultivation in Punjab [4]. Returns per rupee of investment from cluster bean cultivation on the basis of different cost concepts are given in [Table-8].

Table-7 *Net returns per hectare of cluster bean on different cost concepts basis (Rs/ha)*

Particulars	Size holdings			overall Average
	Small	Medium	Large	
Cost A$_1$	18991.58	19232.94	20123.14	19449.22
Cost A$_2$	18991.58	19232.94	20123.14	19449.22
Cost B$_1$	18141.42	18322.08	19009.42	18490.97
Cost B$_2$	12141.42	12322.08	13009.42	12490.97
Cost C$_1$	16790.80	17265.80	18324.74	17460.44
Cost C$_2$	10790.08	11265.83	12324.74	11460.21
Cost C$_3$	9244.03	9676.46	10688.62	9869.70

It is evident from the table that on an average, the returns per rupee of investment on cost A1, A2, B1, B2, C1, C2 and C3 were Rs3.46, Rs3.46, Rs 3.09, Rs 1.84, Rs 2.76, Rs1.71 andRs1.56, respectively. The returns per rupee of investment on large farms (cost C3 basis) was highest (Rs 1.59) followed by medium farms (Rs1.55) and small farms (Rs 1.54). No major difference was observed in returns per rupees among different size groups [4].

Table-8 *Returns per rupee of investment in cluster bean cultivation in Bikaner district*

Particulars	Size holdings			overall Average
	Small	Medium	Large	
Cost A$_1$	3.61	3.42	3.35	3.46
Cost A$_2$	3.61	3.42	3.35	3.46
Cost B$_1$	3.23	3.07	2.96	3.09
Cost B$_2$	1.86	1.83	1.82	1.84
Cost C$_1$	2.77	2.74	2.76	2.76
Cost C$_2$	1.69	1.70	1.75	1.71
Cost C$_3$	1.54	1.55	1.59	1.56

Conclusions

1. Cost of cultivation of cluster bean showed tendency to increase with increase in the size of holding and per hectare yield was also higher on large farms as compared to medium and small. Therefore, gross returns per hectare of cluster bean cultivation were higher on large farms.
2. The cost of production per quintal was lower on large farms and highest on small farms indicating that the large farms were more efficient due to lower cost per unit of output.

Suggestions

The economies of scale are not in favor of small farms mainly due to high cost per unit of output. Therefore, the small farms should use their resources (capital and labour) optimally so that the scale economies tilt in their favor. The shortage of human labour in various operations especially in peak period can be substituted through mechanized farming. It is well known that the small farmers do not have the economic strength to retain the produce with themselves till the market prices

are favorable. More storage facilities should be constructed at the village level under Gramin Bhandaran Yojana.

Application of research: This research solves the problems of agriculture to get maximum output and profits from the use of available resources that are limited for the wellbeing of the society in general and farming industry in particular.

Research Category: Agriculture Production Economics

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References
[1] Anonymous (2015-16) Directorate of economics and statistics, Pant Krishi Bhawan, Jaipur (Rajasthan) India.
[2] Raju V.T. and Rao D.V.S. (2004) Economics of farm production and management-cost concept, pp.182-183.
[3] Gaddi G.M., Mundinamani S.M. and Hiremath G.K. (2002) An economic analysis. *Agriculture Situation in India*, 56, 517-522.
[4] Grover D.K. and Singh J.M. (2007) *Agriculture Economic Research Review*., 20, 299-313.
[5] Rajput A.M. and Verma A.R. (2000) *Indian Journal of Agricultural Marketing*, 14, 65-72