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Research Paper

Hill Agriculture and Livelihood Security: An Economic Analysis of Cost and Return Structure for Cultivation of Mustard Crop in Jammu District of J&K (UT)

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ABSTRACT

A study was conducted in the Jammu district of J &K (UT) where R.S. Pura and Bishnah development blocks were selected randomly out of 20 development blocks falling in the district. The mustard crop is among the oldest cultivated plants in Civilization. Biologically, the mustard plants belong to Cruciferae and under the genus *Brassica*. The primary data on cost and returns were collected through the survey method by personally interviewing the respondents with the help of a pre-tested questionnaire. For computing the cost and returns, the concepts issued by Commission on Agricultural Costs & Prices (CACP) were used. The per hectare total cost of cultivation of mustard crop was worked out to be ₹ 33746.34, ₹ 36975.67 and ₹ 37678.76 on marginal, small, and medium farms, respectively, with an overall average of ₹ 36523.75 per hectare. The per hectare gross returns for mustard cultivation on marginal, small, and medium farms were ₹ 46094.05, ₹ 51235.01 and ₹ 64747.22 resulting in a cost-benefit ratio of 1:1.50, 1:1.52, and 1:1.89, respectively, over cost C_2. Overall, on all farms, the per hectare gross returns were ₹ 53953.98 with the cost benefit ratio of 1:1.72 over the exact cost.

HIGHLIGHTS

- The overall per hectare total cost of cultivation of the mustard crop was worked out to be ₹ 36523.75 per hectare.
- Per hectare, gross returns were ₹ 53953.98 with the cost-benefit ratio of 1:1.72.

Keywords: Mustard, Cost, CACP, Gross Returns, Cost Benefit ratio

The mustard crop is the second most important oilseed crop in India after soybean. It accounts for nearly 22 percent of the total oilseeds produced in the country. The mustard crop is grown for various uses; like black mustard is mainly used as a spice; the Indian mustard is used for extraction of mustard oil, while white mustard is generally used either for fodder or green manuring purposes. The production in India has been witnessing an increasing trend since the 2001-2014 decade due to the increasing usage of mustard seed oil in food. Moreover, strong domestic demand for mustard seed oil was also one of the reasons for rising in production (Kumar *et al.* 2017). In India, mustard seed is mainly grown in North-Western parts of India. Rajasthan and Uttar Pradesh are the major producing states in the country. The production from Rajasthan is highly monsoon-dependent. The other significant producing states are Madhya Pradesh, Haryana, Gujarat, West Bengal, and Assam

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(Singh *et al.* 2014). Mustard Seed is a *rabi* season crop sown during Oct. – Nov. and harvested during March - April. Marketing season starts in March and ends in February. Rajasthan is the giant rapeseed-mustard growing state and alone contributes 43% of India's total mustard seed production (Mustard crop Survey Report, 2014-15). Due to its low water requirement (80-240 mm), mustard crops fit well in the rainfed cropping system. Mustard is the primary source of income, especially for the marginal and small farmers in rainfed areas. Since these crops are cultivated mainly in the country's rainfed and resource resource-scarce regions, their contribution to livelihood security for the small and marginal farmers in these regions is also significant. Due to the gap between domestic availability and actual consumption of edible oils, India has to resort to the import of edible oils. In Jammu and Kashmir, the total area under the mustard crop is 47611 hectares, with a total production of 250225 quintals and productivity of 525.76 kg/ha (Directorate of Agriculture, Jammu, 2017-18). Keeping the above facts in view, the present investigation was undertaken with the objective of working out the costs & returns for the cultivation of the mustard crop in the Jammu district of J&K (UT).

METHODOLOGY

The present study was conducted in the Jammu district of J & K (UT). A multistage sampling technique was used for the present study, and the Jammu district was purposively selected for the present investigation because it occupies an important place in the production of mustard. As per the information available from District information officer Jammu (2018), out of 20 development blocks falling in the Jammu district, the R.S. Pura and Bishnah development blocks were selected randomly at the first stage of sampling. At the second stage of sampling, 4 villages each from the two selected development blocks were selected randomly to constitute 8 villages. At the third stage of sampling, 10 farmers from each village were selected through a random sampling technique without replacement to constitute a sample size of 80 farmers in total. Both primary, as well as secondary data, were used as per the requirements of the study. The primary data were collected through a survey method by interviewing the mustard growers directly with the help of a pre-tested schedule. For analysis of collecting primary data, the following concepts issued by CAACP were used:

Cost & Returns Concepts

Cost A_1 = Expenditure on casual labor, bullock labor, farm machinery, seeds, fertilizer and manure, plant protection chemicals, irrigation, miscellaneous expenditure (cost of transportation, baskets, and ropes), and interest on working capital + depreciation + land revenue.

Cost A_2 = Cost A_1 + rent paid for leased-in land.

Cost B_1 = Cost A_1 + interest on the value of owned fixed capital excluding land.

Cost B_2 = Cost B_1 + rental value of owned land (net of land revenue) + rent paid for leased-in land.

Cost C_1 = Cost B_1 + imputed value of family labour.

Cost C_2 = Cost B_2 + imputed value of family labour.

Cost C_3 = Cost C_2 +10 percent of cost C_2 on account of the managerial function performed by the farmer.

Land revenue

The land revenue paid by the farmers to the government was considered.

Depreciation

The depreciation on the farm buildings, farm implements, and types of machinery was calculated by using the straight line method for the sake of simplicity.

Rental value of land

The rental value of land was calculated as $1/7^{th}$ of the gross production value, excluding the land revenue.

Variable cost

It included actual expenditure made on human labor, machinery labor, seed, manure, and fertilizers, interest on working capital, and miscellaneous charges.

Fixed costs

It included expenditure on fixed components, viz. rental value of owned land, land revenue, depreciation on implements and farm buildings and interest on fixed capital.

Interest in working capital

Interest in working capital was calculated at the rate of 9.30 per cent per annum for half of the crop season.

Interest in fixed capital

The value of total fixed assets was calculated, and then 9.80 percent per annum interest was considered the total interest on fixed assets.

Gross returns

Gross returns per hectare for the mustard crop were obtained by multiplying the prevalent market price per quintal of the mustard seeds with the quantity produced per hectare.

Farm Business Income

It is also known as profit at Cost A_2. It estimates returns to the farmer for his investment and profit. It was calculated as:

Farm Business Income = Gross returns – Cost A_2

Family Labour Income

It is also known as profit at Cost B. It estimates returns to the farmer for his labor and profit. It was calculated as:

Family Labour Income = Gross returns – Cost B_2

Net Income/Returns

It is also known as profit at Cost C. It was calculated as:

Net Income = Gross returns – Cost C_2

Return over variable cost

Per hectare returns over variable cost from mustard were obtained by subtracting the variable cost incurred per hectare from the gross returns.

Returns over fixed cost

Per hectare returns over fixed cost from mustard were obtained by subtracting the fixed cost incurred per hectare from the gross returns..

Cost -Benefit Ratio (returns per rupee invested)

It was calculated as:

C: B Ratio = Cost C_2 /Gross Income

RESULTS AND DISCUSSION

The cost of cultivation and the returns to different factors of production helps in decision-making about the selection of an enterprise. Hence, different components of cost of cultivation, cost structure, cost concepts, gross returns, and net returns for cultivating mustard crops on selected farms in the study area were worked out and presented in Tables 1, 2, 3, and 4.

Cost-structure wise cost of cultivation:

The cost structure for the mustard crop is presented in Table 1. Expenditure on hired labor, family labor, machine labor, seed, manure and fertilizers, and plant protection chemicals was the important operational cost component. Similarly, the rental value of owned land, land revenue, interest on fixed capital (excluding land), and depreciation on implements and farm buildings were the major components of fixed cost. The results in Table 1 revealed that the per hectare total cost of cultivation of mustard crop was higher in the case of medium farms (₹ 37678.76) as compared to small (₹ 36975.67) and marginal farms (₹ 33746.34) with an overall average of ₹ 36523.75 per hectare. The variable cost on marginal, small, and medium farms was ₹ 21531.73, ₹ 21669.55 and ₹ 21790.59 per hectare, respectively, with an overall average of ₹ 21912.19 per hectare.

The variable cost was found to be higher in the case of medium farms (₹ 21790.59/ha) as compared to small (₹ 21669.55/ha) and marginal farms (₹ 21531.73/ha), and for overall farms, it was ₹ 21912.19/ha. The fixed cost was also found to be highest in medium farms (₹ 12462.83/ha) as compared to small (₹ 11944.70/ha) and marginal farms (₹ 9146.76/ha). Percentage shares of variable costs were found to be higher than those of fixed costs in all of the farms the mustard crop. A managerial cost which depends on both variable and the fixed costs was also found to be higher in the case of medium farms, and this was noted to be ₹ 3425.34 per hectare. Cost of cultivation of medium farms was noted to be highest in all of the three size categories. These were ₹ 33746.34 per hectare in marginal, ₹ 36975.67 per hectare in small and ₹ 37678.76 per hectare in medium farms, respectively. For overall farms, it was ₹ 36523.75/ha.

Table 1: Item-wise cost of cultivation of mustard on sampled farms under study area (₹/ha)

Items		Marginal	Small	Medium	Overall
(A) Variable Cost					
Human labour	Family	5986.67	4445.59	3865.49	4822.49
	Hired	3565.87	4782.80	5223.00	4479.03
	Total	9552.54	9228.39	9088.50	9301.53
Machine labour	Owned	0.00	2816.22	4228.19	2393.40
	Hired	6793.82	4052.60	2591.48	4575.59
	Total	6793.82	6868.82	6819.67	6968.99
Seed		517.07	505.81	871.66	654.22
Manures & Fertilizers		3347.80	3716.56	3619.00	3622.19
Irrigation		0.00	0.00	0.00	0.00
Plant protection chemicals		0.00	0.00	0.00	0.00
Interest on working capital		939.82	944.86	948.54	955.43
Miscellaneous Expenditure		380.68	405.11	443.23	409.83
Total variable Cost (A)		21531.73	21669.55	21790.59	21912.19
(B) Fixed Cost					
Rental value of owned land		7500.00	7500.00	7500.00	7500.00
Depreciation on implements and farm building		1219.51	3886.75	4247.22	3130.34
Land revenue		0.00	0.00	140.00	140.00
Interest on fixed capital (excluding land)		427.25	557.95	575.61	520.88
Total fixed cost (B)		9146.76	11944.70	12462.83	11291.22
(C) Managerial Cost					
Managerial Charges (10% on VC & FC)		3067.85	3361.42	3425.34	3320.34
Total Cost (A+B+C)		33746.34	36975.67	37678.76	36523.75

Table 2: Operation-wise cost of cultivation for mustard crop on sampled farms under study (₹/ha)

Operations	Marginal	Small	Medium	Overall
Land preparation	5823.57	5854.94	5980.04	5925.78
Sowing	1265.04	1397.99	1638.23	1565.80
Manures and fertilizers	4843.34	4872.97	4971.15	4895.77
Intercultural operations	2084.23	1980.89	1886.34	1968.55
Harvesting	6195.10	6212.72	5923.00	6190.97
Interest on working capital	939.82	944.86	948.54	955.43
Miscellaneous expenditure	380.68	405.11	443.23	409.83
Total (i to vii)	**21531.73**	**21669.55**	**21790.59**	**21912.19**

Operation-wise cost of cultivation

The operation-wise cost of cultivation includes various components, viz. land preparation, sowing, manure and fertilizers, intercultural operations, and harvesting, which came under variable costs. The results in the Table 2 showed the operation-wise cost of cultivation of the mustard crop. The calculated average figures for land preparation operation stood at ₹ 5823.57/ha, ₹ 5854.94, ₹ 5980.04 and ₹ 5925.78 per hectare for marginal, small, medium, and all farms, respectively, while that on sowing operation stood to ₹ 1265.04, ₹ 1397.99, ₹ 1638.23 and ₹ 1565.80 per hectare on marginal, small, medium, and all farms, respectively. The expenditure on the application of manures and fertilizers was seen to be standing at ₹ 4843.34, ₹ 4872.97, ₹ 4971.15 and ₹ 4895.77 per hectare for marginal, small, medium, and all farms, respectively. Intercultural operations fetched the expenses to the tune of ₹ 2084.23/ha, ₹ 1980.89/ha, ₹ 1886.34/ha, and ₹ 1968.55/ha for marginal, small, medium, and all farms, respectively, whereas the operation of harvesting accounted for expenses to the extent of ₹ 6195.10/ha, ₹ 6212.72/ha, ₹ 5923.00/ha and ₹ 6190.97/ha for marginal, small, medium, and all farms.

Cost concept-wise cost of cultivation

In order to have a detailed view of the cost of cultivation of the mustard crop, various cost concepts were worked out on a per hectare basis and presented in Table 3, which revealed that the per hectare Cost-A_1 and Cost-A_2 on marginal, small, medium and overall farms were ₹ 16764.57, ₹ 21110.71, ₹ 22312.32 and ₹ 20360.03 respectively as Cost-A_2 was equal to Cost-A_1 because there was no rent paid on leased in land in all the sampled farms of the mustard crop.

Table 3: Concept-wise cost of cultivation of mustard on sampled farms under study area

Particulars	Marginal	Small	Medium	Overall
Cost -A_1				
Casual Labour	3565.87	4782.80	5223.00	4479.03
Farm machinery	6793.82	6868.82	6819.67	6968.99
Seed	517.07	505.81	871.66	654.22
Fertilizer	3347.80	3716.56	3619.00	3622.19
Interest on working Capital	939.82	944.86	948.54	955.43
Depreciation charges	1219.51	3886.75	4247.22	3130.34
Land revenue	0.00	0.00	140.00	140.00
Miscellaneous expenditure	380.68	405.11	443.23	409.83
Total Cost- A_1	16764.57	21110.71	22312.32	20360.03
Cost -A_2				
Cost -A_1	16764.57	21110.71	22312.32	20360.03
Rent paid for leased-in land	0.00	0.00	0.00	0.00
Total Cost- A_2	16764.57	21110.71	22312.32	20360.03
Cost -B_1				
Cost -A_1	16764.57	21110.71	22312.32	20360.03
Interest on fixed capital (excluding land)	427.25	557.95	575.61	520.88
Total Cost- B_1	17191.82	21668.66	22887.93	20880.91
Cost -B_2				
Cost -B_1	17191.82	21668.66	22887.93	20880.91
Imputed rental value of owned land	7500.00	7500.00	7500.00	7500.00
Rent paid for leased-in land	0.00	0.00	0.00	0.00
Total Cost- B_2	24691.82	29168.66	30387.93	28380.91
Cost-C_1				
Cost -B_1	17191.82	21668.66	22887.93	20880.91
Family labour	5986.67	4445.59	3865.49	4822.49
Total Cost- C_1	23178.49	26114.25	26753.42	25703.40
Cost -C_2				
Cost -B_2	24691.82	29168.66	30387.93	28380.91
Family labour	5986.67	4445.59	3865.49	4822.49
Total Cost -C_2	30678.49	33614.25	34253.42	33203.40
Cost-C_3				
Cost -C_2	30678.49	33614.25	34253.42	33203.40
Managerial Cost (10 % of Cost-C_2)	3067.84	3361.42	3425.34	3320.34
Total Cost-C_3	33746.34	36975.67	37678.76	36523.75

However, the values for Cost-B_1 on marginal, small, medium, and all farms were at ₹ 17191.82 per hectare, ₹ 21668.66 per hectare, ₹ 22887.93 per hectare and ₹ 20880.91 per hectare, Cost-B_2 was ₹ 24691.82/ha, ₹ 29168.66/ha, ₹ 30387.93/ha, and ₹ 28380.91/ha, respectively. The per hectare cost-C_1 was ₹ 23178.49 on marginal, ₹ 26114.25 on small, ₹ 26753.42 on medium, and ₹ 25703.40 on all farms. The per hectare Cost-C_2 was ₹ 30678.49 on marginal, ₹ 33614.25 on small, ₹ 34253.42 on medium and ₹ 33203.40 on all farms. After working out the cost of managerial charges, i.e., 10 percent of Cost-C_2, per hectare, the estimates for Cost-C_3 stood at ₹ 33746.34/ha on marginal, ₹ 36975.67/ha on small, ₹ 37678.76/ha. on medium and ₹ 36523.75 /ha on all farms.

Costs and returns structure

The productivity and returns were worked out and presented in table 04, where from it was seen that the yield of the main product i.e., the mustard seed was 11.57 qtl./ha on marginal farms, 12.87 qtl./ha on small farms, 16.15 qtl./ha on medium farms and 13.86 qtl./ha on all farms. The gross returns on marginal farms were at ₹ 46094.05/ha, on small farms were ₹ 51235.01/ha, on medium farms were ₹ 64747.22/ha, and on all farms were ₹ 53953.98 per hectare, respectively. Table 4 also displayed net returns over different costs based on different cost concepts. Net return over different costs for medium farms as higher than the small and marginal farms. The cost-benefit ratio over different costs for medium farms was higher than the marginal and small farms. Gross return was noted to be higher in the case of medium farms (₹ 64747.22/ha.) followed by small (₹ 51235.01/ha.) and marginal farms (₹ 46094.05/ha.) with average returns for all farms at ₹ 53953.98/ha. The cost-benefit ratio was found to be highest in the case of medium farms and lowest in the case of marginal farms. The estimated figures for

Table 4: Yields, Returns and Net returns over various costs (based on cost concept) in mustard cultivation of farmers under study area

Particulars	Marginal	Small	Medium	Overall
Yield (qtl./ha.)	11.57	12.87	16.15	13.86
Gross Return (₹/ha.)	46094.05	51235.01	64747.22	53953.98
Net return over cost (₹/ha)				
A_1	29329.48	30124.30	42434.90	33593.95
A_2	29329.48	30124.30	42434.90	33593.95
B_1	28902.23	29566.35	41859.29	33073.07
B_2	21402.23	22066.35	34359.29	25573.07
C_1	22915.56	25120.76	37993.80	28250.58
C_2	15415.56	17620.76	30493.80	20750.58
C_3	12347.72	14259.34	27068.46	17430.23
Cost- Benefit Ratio				
A_1	1:2.74	1:2.42	1:2.90	1:2.65
A_2	1:2.74	1:2.42	1:2.90	1:2.65
B_1	1:2.68	1:2.36	1:2.83	1:2.58
B_2	1:1.86	1:1.76	1:2.13	1:1.90
C_1	1:1.99	1:1.96	1:2.42	1:2.09
C_2	1:1.50	1:1.52	1:1.89	1:1.62
C_3	1:1.36	1:1.38	1:1.72	1:1.48

the cost-benefit ratio were 1.89 on medium farms, 1.52 on small and 1.50 on marginal farms, and 1.62 on all farms.

CONCLUSION

The cost of cultivation of Mustard crop, various cost concepts were worked out on a per hectare basis and presented in Table 3, which revealed that the per hectare Cost-A_1 on marginal, small, and medium was ₹ 16764.57, ₹ 21110.71, and ₹ 22312.32, respectively, with ₹ 20360.03/ha for all farms. Cost-A_2 on marginal, small, medium, and all farms was ₹ 16764.57/ha, ₹ 21110.71/ha, ₹ 22312.32/ha and ₹ 20360.03/ha, respectively. However, Cost-A_2 was equal to cost-A_1 as there was no rent on leased land in all the three sampled farms of mustard cultivators. Cost-B_1 on marginal, small, medium, and all farms was ₹ 17191.82/ha, ₹ 21668.66/ha, ₹ 22887.93/ha. and ₹ 20880.91/ha. and Cost-B_2 was ₹ 24691.82 /ha., ₹ 29168.66/ha., ₹ 30387.93/ha. and ₹ 28380.91/ha., respectively. The per hectare Cost-C_1 was ₹ 23178.49 on marginal, ₹ 26114.25 on small, ₹ 26753.42 on medium farms and ₹ 25703.40 on all farms. The per hectare Cost-C_2 was ₹ 30678.49 on marginal, ₹ 33614.25 on small, ₹ 34253.42 on medium farms and ₹ 33203.40 on all farms. After working out the cost of managerial charges, i.e., 10 percent of Cost-C_2, per hectare, Cost-C_3 was ₹ 33746.34/ha on marginal farms, ₹ 36975.67/ha on small farms, ₹ 37678.76/ha on medium farms and ₹ 36523.75/ha on all farms. The overall per hectare returns on marginal, small, and medium farms were ₹ 46094.05, ₹ 51235.01 and ₹ 64747.22 with ₹ 53953.98 for all farms. The cost-benefit ratio on the total cost of cultivation was recorded at 1.50 on marginal farms, 1.52 on small farms, 1.89 on medium farms, and 1.62 on all farms.

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