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Costs and Returns of Mungbean in the Nagaur District of Rajasthan

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ABSTRACT

The present investigation was undertaken with a view to work out the costs of and returns from mungbean in the Nagaur district of Rajasthan. A random sample of 100 mungbean cultivators was selected for the study. Both primary and secondary data were used for the study. The primary data were collected from the selected mungbean cultivators, using personal interview method on pre-structured data schedule for the year 2015-16. On the selected farmers an average total cost of cultivation (cost C_3) per hectare of mungbean was ₹ 31776.07 on large farms and ₹ 32092.8 on marginal farms. Overall gross income, family labour income, farm business income, net profit and cost of production were estimated at ₹ 50901, ₹ 26370, ₹ 36526, ₹ 21889 per hectare and ₹ 4534 per quintal. Return per rupee from mungbean cultivation was ₹ 1.77 per rupee invested on large farms and ₹ 1.45 per rupee invested on small sized farms with overall per rupee returns of ₹ 1.60.

Highlights

- An average total cost of cultivation per hectare of mungbean was lower on large farms while return per rupee was higher on large farms than small farms.

Keywords: Cost of production, gross income, mungbean, Return per rupee, cost concept

India is the largest producer (25%), consumer (27%) and importer (14%) of pulses in the world (Mohanty and Satyasai 2015). Pulses are one of the cheapest sources of protein for human consumption in India. The World Health Organization recommends the consumption of 80 grams per capita of pulses every day for India. There has been a multi-decadal mismanagement of pulse production in India with rice and wheat taking a bigger share of land. India therefore, needs a pulses revolution. Mungbean comes third after chickpea and pigeanpea among pulses crops. It occupies 40.70 lakh hectares and contributes 19.01 lakh tonnes in pulse production in the country during 2017-18 (Anonymous, 2017-18). In Rajasthan, total area under mungbean was 17.19 lakh hectares with the production of 12.22 lakh tonnes and productivity of 515 kg/ha during 2017-18 (Anonymous, 2017-18). In Nagaur, total area under mungbean was 2.56 lakh hectares with the production of 1.80 lakh tonnes and productivity of 509 kg/ha during the year 2017-18 (Anonymous, 2017-18).

Mungbean [*Vigna radiata* L.) R. Wilczek is known with different common names *viz.*, mungbean, green gram and celera bean. Mungbean is a major edible legume crop in India. The grains contain approximately 25-28% protein, 1.0-1.5% oil, 3.5–4.5% fiber, 4.5–5.5% ash and 62–65% carbohydrates

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on dry weight basis. Productivity of pulses can be increased through adoption of improved technology. Seeds, manures, plant protection measures, fertilizers, irrigation, human labour and tractor power are most important crucial inputs for increasing agricultural production in India. Costs in agriculture play a significant role in making the farm sector economically viable and feasible under the pressure of continuous rise in input prices affecting the profitability of the crop enterprises. Mungbean cultivation is labour-intensive pulse crop and it requires high dosages of manures and fertilizers (Rao and Tripathi 1979; Khunt and Desai 1996). The main constituent of the cost of cultivation of Mungbean is manures and fertilizers, followed by cost on family labour, hired labour and machine labour. Thus, the farmers should have to be motivated to diversify to more remunerative cropping patterns instead of the traditional, less profitable ones (Singh 1995). Similar types of results were reported by (Sharma *et al.* 2000; Maurya *et al.* 2001). This mechanism needs to be critically examined for formulating policies in relation to costs and output prices for understanding the income path in the farm sector. As such there is a need to study the costs of and returns from mungbean crop (Chatterjee *et al*. (2014).

MATERIALS AND METHODS

Among pulses, mungbean crop occupies first place in term of area and production in the rajasthan. Nagaur district occupies first place in terms of area and production of mungbean therefore, it was selected purposively for the study. A list of all the tehsils growing mungbean were obtained from district Headquarter. From this list two tehsils; namely Nagaur and Jayal were selected randomly.

Separate lists of all the villages growing mungbean were obtained from the selected tehsil Headquarters; from these lists six villages namely Goa Khurd, Bhakrod and Sinod (from Nagaur tehsil) Igyar, Bodwa and Nradhana (from Jayal tehsil) were selected randomly for the study. Thus, a sample of 100 farmers out of 1004 farmers from all five size group from the six villages was selected on random basis.

Separate lists of all the mungbean growing cultivators of the selected villages were prepared based on the information provided by the patwari, agriculture supervisor and other revenue officials. Then a representative sample of producer/farmer was selected taking 10 per cent farmers from each village. These farmers were categorized into five groups viz., marginal (0.51-2.00 ha), small (2.01-3.00 ha), semi-medium (3.01-5.00 ha), medium (5.01-7.00 ha) and large farmers (7.01-11.00 ha) based on the cumulative square root frequency method of stratification. Both primary and secondary data were used for analysis. The primary data were collected from the selected mungbean cultivators, using by personal interview method on pre-structured data schedule for the year 2015-16. The secondary data were collected from various Publications and Records of Agriculture Statistics Cell, Nagaur district, Directorates of Economics and Statistics, Directorate of Agriculture, Krishi Pant Bhawan, Govt. of Rajasthan, Jaipur and its websites (www.rajsthankrishi.gov.in) for 41 years (1974-75 to 2014-15).

ANALYSIS OF DATA

After collection, the data were compiled, tabulation and analyzed according to the selection categories of sample farm and using varies statistical tools were used.

Costs and returns structure

The costs of and returns from mungbean was analyzed separately for the farmers to examine the economics of crop production. The cost concepts used for estimating costs, gross returns and net returns in respect of mungbean crop are given below:

Cost concepts

Costs were computed by following certain cost concepts and items of costs (all measured in monetary terms) as discussed below:

Cost A_1:

(i) Value of hired human labour
(ii) Value of hired bullock labour
(iii) Value of owned bullock labour
(iv) Value of owned machinery
(v) Hired machinery charges
(vi) Value of seed (both farm produced and purchased)

(vii) Value of manures (both farm produced and purchased)
(viii) Value of fertilizers
(ix) Value of insecticides and pesticides
(x) Irrigation charges
(xi) Depreciation on farm buildings and implements
(xii) Interest on working capital
(xiii) Insurance premium
(xiv) Land revenue
(xv) Miscellaneous expenses

Cost A_2: Cost A_1 + rent paid for leased-in land

Cost B_1: Cost A_1+ interest on fixed capital (excluding land)

Cost B_2: Cost B_1+ rental value of owned land + 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 per cent of cost C_2 as management cost

Interest on fixed capital

Interest on present value of fixed assets (excluding land) such as implements, machinery and buildings were calculated at the rate of 12 per cent per annum as per the rate charged by the banks.

Interest on working capital

Working capital or variable cost included the expanses on cash cost items like seeds, manure, fertilizers, chemicals, labour (family labour plus hired labour), repair and maintenance of machinery and machines hired for operations. The actual prices paid out by the farmers for these items were taken in to account. The interest on variable cost, excluding owned resources like family labour, was also considered as variable cost and was calculated at the rate of 7 per cent per annum as per the rate charged by the banks. The interest was calculated for half the length of crop production period (*i.e.*, for 3 months).

Rental value of owned land

It was calculated on the basis of prevailing rates in the sample villages which was one fifth of the gross product.

Land revenue

Land revenue actually paid to revenue department was considered.

Depreciation

It is a decline in the value of a given asset as a result of use, wear and tear, accidental damage and time obsolescence. Depreciation was computed on items of fixed capital like farm buildings, irrigation structure and machinery such as thresher and other items excluding tractor because tractor and its accessories were evaluated as hired items. Depreciation was computed on minor agricultural implements used in crop production. Depreciation on an asset was calculated using the straight line method:

$$\text{Depreciation} = \frac{\text{Purchase price of an asset} - \text{Junk value}}{\text{Expected life of the asset in year}}$$

Cost of production (per quintal)

Cost of production find out by using following formula:

$$\text{Cost of production per quintal} = \frac{\text{Total Cost (Cost } C_2\text{)/ha}}{\text{Yield/ha}}$$

Operational cost (O.C.)

It is the variable cost that varies with the level of production. It was expressed as:

OC = Cost A_1 – Land revenue – Depreciation + Family labour charges

Overhead cost (O.H.C.)

Overhead costs or fixed costs were the sunk costs which had no bearing on the size of production. These were calculated by subtracting variable costs from the cost C_2 In other words,

OHC = Cost C_2 – Variable costs

Income measures

For working out profitability of mungbean cultivation in the study area following income measures was worked out:

Gross income

Synonymous with value of output (both main product and by-product) evaluated at harvest prices. Symbolically:

$GI = Q_m \times P_m + Q_b \times P_b$

Where,

GI = Gross Income

Q_m = Quantity of main product

P_m = Price of main product

Q_b = Quantity of by-product

P_b = Price of by-product

Returns over variable cost

It is the net return over variable cost which was worked out by deducting all items of variable cost from gross income.

Return over variable cost = Gross income – Total variable cost

Family labour income (FLI): It is the return to family labour.

F.L.I. = Gross income – Cost B_2

Net income (NI)

It is the net profit after deducting total cost *i.e.* variable and fixed costs from gross income.

NI = Gross income – Total cost (Cost C_2)

Farm business income (FBI): It is the disposal income out of the enterprise and is defined as:

FBI = Gross income – Cost A_1 (cost A_2 in case of tenant operated land)

Return per rupee (RPR)

$$RPR = \frac{\text{Gross Income /ha}}{\text{Total Cost (Cost } C_3\text{)/ha}}$$

RESULTS AND DISCUSSION

Utilization of farm inputs in physical quantity in mungbean

Various physical inputs used in the cultivation of mungbean of sample farms of different size holdings are presented in table 1. That indicates the utilization of machine labour varied from 6.49 hrs/ha on marginal farms to 10.40 hrs/ha on large farms. Overall machine labour utilization was 8.63 hrs/ha which was more than that utilized on marginal, small and semi-medium farms. The more utilization of machine labour on large farms was due to intensive use of tractor intercultural operation.

Utilization of family labour was inversely related to hired human labour. It (family labour) decreased with increase in the size of farms and the hired human labour increased with the increase in the size of farms. Utilization of total human labour was highest (33.04 man days/ha) on marginal farms and lowest (24.68 man days/ha) on large farms. Overall utilization of human labour was estimated at 28.63 man days/ha which was more than that utilized on semi-medium, medium and large farms (Singh *et al*. 2006).

Utilization of farm inputs in monetary terms in mungbean

The utilization of farm inputs in monetary terms in mungbean is presented in table 2. The major component of cost was human labour which accounted for ₹ 7358.52 (25.36 per cent) of the total cost of cultivation. The family labour charges accounted for ₹ 6748.87 the higher on marginal farms to ₹ 1814.9 the lower on large farms with an overall charge of ₹ 4481.56 per hectare. The hired labour charge was estimated to be ₹ 4232.7 the higher on large farms and lowest ₹ 1687.22 on marginal farms with overall charges being ₹ 2877.16 per hectare. Interest on working capital and fixed capital jointly accounted for 1.12 per cent of the total cost. These results were in conformation with that reported by Hedge *et al.* (2013).

Cost of Cultivation

The Table 3 reveals that the cost C_2 was ₹ 29175.27, ₹ 29022.29, ₹ 28994.51, ₹ 28985.32 and ₹ 28886.34 on marginal, small, semi-medium, medium and large farms with an overall cost of ₹ 29012.8. Cost C_3, which includes managerial cost (10% of C_2 cost), was worked out to be ₹ 31914.06 per hectare. These results were in conformation with that reported by Tiwari and More (2012) and Singh *et al.,* (2020).

Net profit from the cultivation of mungbean farms (2015-16)

Net profit from the cultivation of mungbean is

Table 1: Utilization of farm inputs in physical quantity in mungbean (2015-16)

Sl. No.	Inputs \ Farms size	Marginal	Small	Semi- Medium	Medium	Large	Overall
1	Machine labour in hrs/ha						
	A. Tractor	6.49	6.66	6.40	8.61	10.40	7.71
	B. Thresher	0.83	0.85	0.75	0.90	1.28	0.92
	Total machine labour (hrs/ha)	7.32	7.51	7.15	9.51	11.68	8.63
2	Human Labour in man days/ha						
	A. Family Labour	26.43	21.59	20.42	11.96	7.41	17.56
	B. Hired labour	6.61	9.25	8.75	13.46	17.28	11.07
	Total human labour	33.04	30.84	29.18	25.42	24.68	28.63
3	Seed (Kg/ha)	13.61	13.87	14.12	14.31	14.51	14.08
4	Fertilizer in Kg/ha						
	A. Nitrogen	5.12	6.64	6.78	8.60	12.77	7.98
	B. Phosphorus	13.18	17.07	17.45	22.11	32.82	20.53
	C. Total	18.3	23.7	24.13	30.71	45.59	28.51
5	Plant Protection (Lit/ha)	0.42	0.47	0.50	0.62	0.83	0.57
6	Manures (Cart loads/ha)	2.19	1.80	1.66	1.25	1.18	1.62

Table 2: Utilization of farm inputs in monetary terms in mungbean crop (₹/ha)

Sl. No.	Farm inputs \ Farm size	Marginal	Small	Semi-medium	Medium	Large	Overall
1	Rental value of land	9299.6 (31.87)	9597.4 (33.06)	10037.6 (34.61)	10734 (37.03)	11232.8 (38.88)	10180.28 (35.08)
2	Machine labour						
	A. Owned	270.35 (0.92)	598.81 (2.06)	1445.33 (4.98)	2860.83 (9.86)	3630.6 (12.56)	1761.18 (6.07)
	B. Hired	3269.09 (11.20)	3151.34 (10.86)	2803.92 (9.67)	1361.04 (4.69)	1006.9 (3.48)	2318.458 (7.99)
	C. Total	3539.44 (12.13)	3750.15 (12.92)	4249.25 (14.65)	4221.87 (14.56)	4637.5 (16.05)	4079.642 (14.06)
3	Human labour						
	A. Family labour	6748.86 (23.13)	6191.89 (21.33)	4613.86 (15.91)	3038.09 (10.48)	1814.9 (6.28)	4481.36 (15.44)
	B. Hired labour	1687.22 (5.78)	2012.29 (6.93)	2739.47 (9.44)	3713.99 (12.81)	4232.7 (14.65)	2877.16 (9.91)
	C. Total	8436.12 (28.91)	8204.18 (28.26)	7353.33 (25.36)	6752.08 (23.29)	6046.6 (20.93)	7358.52 (25.36)
4	Seed	1153.46 (3.95)	1217.09 (4.19)	1245.28 (4.29)	1270.22 (4.38)	1299.3 (4.49)	1237.15 (4.26)
5	Total Fertilizer	415.73 (1.42)	562.43 (1.93)	603.32 (2.08)	789.4 (2.72)	802.1 (2.77)	634.6 (2.18)
6	Total Plant protection	216.89 (0.74)	240.79 (0.82)	269.79 (0.93)	301.7 (1.04)	342.91 (1.18)	274.41 (0.94)
7	Manure (FYM)	4613.09 (15.81)	3385.41 (11.66)	2960.03 (10.20)	2500.22 (8.62)	1968.7 (6.811)	3085.39 (10.63)
8	Depreciation	1129.73 (3.87)	1690.48 (5.82)	1929.02 (6.65)	2112.58 (7.28)	2268.96 (7.85)	1826.15 (6.29)
9	Interest on working capital	132.95 (0.45)	138.92 (0.47)	142.39 (0.49)	144.48 (0.49)	162.17 (0.56)	144.18 (0.49)
10	Interest on fixed capital	238.3 (0.81)	235.44 (0.81)	204.5 (0.70)	158.77 (0.54)	125.3 (0.43)	192.46 (0.66)
	Total	29175.27 (100)	29022.29 (100)	28994.51 (100)	28985.32 (100)	28886.34 (100)	29012.78 (100)

Table 3: Cost of cultivation of mungbean on different size holdings (2015-16) in (₹/ha)

Cost	Marginal	Small	Semi-medium	Medium	Large	Overall
Cost A_1	12888.51	12997.56	14138.55	15054.46	15714.34	14158.68
Cost A_2	12888.51	12997.56	14707.31	15423.03	16709.82	14545.25
Cost B_1	13126.81	13233	14343.05	15213.23	15839.64	14351.14
Cost B_2	22426.41	22830.4	24380.65	25947.23	27072.44	24531.42
Cost C_1	19875.67	19424.89	18956.91	18251.32	17654.54	18832.5
Cost C_2	29175.27	29022.29	28994.51	28985.32	28886.34	29012.8
Cost C_3	32092.8	31924.52	31893.96	31883.85	31776.07	31914.06

presented in table 4indicates that overall gross return, total cost and net profit on mungbean were worked out at ₹ 50901, ₹ 29013 and ₹ 21889 per hectare, respectively. Gross return was highest (₹ 56164) on large farms and lowest (₹ 46498) on marginal farms. Similarly, total costs varied from ₹ 29886 on large farms to ₹ 29175 on marginal farms. Net profit was ₹ 27278 on large farms. It was ₹ 24685, ₹ 21193, ₹ 18965 and ₹ 17323 on medium, semi-medium, small and marginal farms with an overall net profit of ₹ 21889 (Kumar *et al.* 2019).

The gross return was more on large farms because of timely weeding, hoeing, improve seed, harvesting and more availability of capital and machinery on scale of production. The total costs incurred on cultivation of mungbean were higher on marginal farms due to higher use of human labour and farm yard manure. Total costs on cultivation of mungbean were lower on large farms due to high machine labour used, low use of human labour and farm yard manure in Nagaur district of Rajasthan.

Table 4: Net profit from the cultivation of mungbean (2015-16) in (₹/ha)

Sl. No.	Farm size	Gross return	Total cost	Net profit
1	Marginal farms	46498	29175	17323
2	Small farms	47987	29022	18965
3	Semi-medium farms	50188	28995	21193
4	Medium farms	53670	28985	24685
5	Large farms	56164	28886	27278
	Overall	**50901**	**29013**	**21889**

Family labour income, family business income and returns per rupee from the cultivation of mungbean

The table 5 indicates that the overall family labour income, family business income and returns per rupee were estimated at ₹ 26370, ₹ 36526 and ₹ 1.60 per hectare, respectively.

Table 5: Family labour income, Family business income and returns per rupee from the cultivation of mungbean (2015-16) (₹/ha)

Sl. No.	Farm size	Family labour income	Family business income	Returns per rupee
1	Marginal farms	24072	33609	1.45
2	Small farms	25157	34989	1.50
3	Semi-medium farms	25807	35859	1.57
4	Medium farms	27723	38430	1.68
5	Large farms	29092	39744	1.77
	Overall	**26370**	**36526**	**1.60**

The family labour income varied from as low as ₹ 24072 on marginal farms to as high as ₹ 29092 on large farms. Similarly, Family business income was highest (₹ 39744) on large farms and lowest (₹ 33609) on marginal farms.

Returns per rupee were worked out to be ₹ 1.45, ₹ 1.50, ₹ 1.57, ₹ 1.68 and ₹ 1.77 on marginal, small, semi-medium, medium and large farms, respectively. These findings were in conformity with Tawale *et al.* (2011).

Operational costs, overhead costs and costs of production from the cultivation of mungbean on different farms

The table 6 reveals that the overall operational costs, overhead costs and costs of production on ₹ 16814, ₹ 12199 and ₹ 4534 per hectare. Category wise costs of production ranged from ₹ 4993 on marginal farms followed by ₹ 4723, ₹ 4561, ₹ 4277 and ₹ 4115 on small, semi-medium, medium and large farms.

Table 6: Operational costs, overhead costs and costs of production from the cultivation of mungbean (2015-16)

Sl. No.	Farm size	Operational costs (₹/ha)	Overhead costs (₹/ha)	Costs of production (₹/q)
1	Marginal farms	18508	10668	4993
2	Small farms	17499	11523	4723
3	Semi-medium farms	16823	12171	4561
4	Medium farms	15980	13005	4277
5	Large farms	15260	14591	4115
	Overall	**16814**	**12392**	**4534**

The overall cost of production was ₹ 4534, which was less than that on medium and large farms. These findings were in conformity with Tawale *et al.* (2011).

CONCLUSIONS

1. The gross return was more on large farms because of timely weeding, hoeing, improve seed, harvesting and more availability of capital and machinery.

2. All types of farm incomes *viz.*, gross income, family labour income, farm business income, returns per rupee and net profit were higher on large farms than on the marginal farms.
3. The operational costs and costs of production were higher on marginal farms and overhead cost was higher on large farms.
4. Overall machine labour utilization was more on large farms than marginal, small and semi-medium farms due to intensive use of tractor intercultural operation.
5. The utilization of human labour was highest on marginal farms and lowest on large farms. Utilization of machine labour was highest on large farms and lowest on marginal farms indicating that machine labour replaced human labour with the increase in size of the farm.

Additional Comments

- The government should make adequate arrangement for timely supply of necessary inputs at reasonable prices to the growers so as to increase per hectare productivity as well as net returns.
- Bank credit and financial assistance should be available to the individual farmers for increasing the production.
- Training of farmers in the areas of production technology, grading, standardization of produce, quality control and modern method of marketing will prove to be a viable move.
- The government should establish adequate storages at village level for the purpose of orderly marketing of mungbean to benefit both consumers and producers.
- This study was helped the farmers in reducing the cost of cultivation by using appropriate techniques and tools and improve the net return of the farmers in the study area.

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