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COST STRUCTURE, INCOME, AND PROFITABILITY ANALYSIS OF BLACK GRAM PRODUCTION IN CHHATARPUR DISTRICT, MADHYA PRADESH INDIA

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ABSTRACT

A study has been conducted on cost structure, income, and profitability analysis of black gram production in Chhatarpur district of Madhya Pradesh. Chhatarpur district was selected purposively due to occupies maximum area and production of pulses crop in the Bundelkhand region of Madhya Pradesh. The multistage random sampling was used to acquire sample farmers. Hundred farmers were selected from twenty Black gram growing villages for the research purpose. An average total cost of cultivation of Black Gram production was observed to be Rs. 40307.76/ha. The cost of cultivation increased as size of farm increases. Gross income and Net income from Black gram cultivation were observed Rs. 70911.00 and Rs. 30603.23/ha. which inferred that Black gram is profitable in the study area and farmers take more interest in growing this crop.
Keywords **:** Cost of cultivation, Profitability, Gross income, cost concepts, and Black Gram.

Introduction

Black gram (*Vigna mungo*), also known as urad, and it is a highly nutritious legume crop widely cultivated in South Asia, especially India. It is a key ingredient in various traditional dishes and serves as an important source of protein, dietary fiber, and essential minerals. Black gram is known for its short growth cycle, drought resistance, and soil-enriching properties due to nitrogen fixation. It plays a vital role in sustainable agriculture and food security, especially in semi-arid regions. Total production of black Gram is about 23 lakh tonnes on an area of 40 lakh hectare with the average productivity of 598 kg/ha in 2023-23 in India (Anonymous 2023-24). In Madhya Pradesh Balck gram (Urad) grown on 13.09 lakh hectares with the production of 8.50 lakh metric tonnes and average productivity 649 Kg/ha (Anonymous 2023-24). In Madhya Pradesh, Chhatarpur district share major portion of Balck gram (Urad) production in the total production of Black gram. In this district black Gram grown on 184.57 thousand hectares with the production of 149.50 metric tonnes and average productivity 810.00 Kg/ha. (Anonymous 2022-23).

Materials and Methods

Chhatarpur district was selected purposively due to occupies maximum area and production of pulses crop in the Bundelkhand region of Madhya Pradesh. The multistage random sampling was used to acquire sample farmers. This district has eight blocks namely Badamalahara, Buxwaha, Bijawar, Gaurihar, Chhatarpur (Ishanagar), Lavkushnagar/Laundi, Nowgong, and Rajnagar. At the first stage of sampling, Chhatarpur block was selected purposively, due to comprise maximum area under pulses cultivation in the district. At the second stage of sampling, a list of pulses growing villages from selected block (Chhatarpur) were prepared. out of them 20 villages were selected randomly. At the third stage of sampling, a list of Black gram growing farmers from each selected village was prepared then classified into five major categories on the basis of their land holding i.e. marginal (less than 1ha), small (1-2 ha), semi medium (2-4 ha), medium (4-10 ha) and large (10 ha or above). Then a sample of 20 farmers were selected in each category by simple random sampling technique under proportionate allocation. Thus, in all 100 Black Gram

growing farmers were selected for the research purpose.

Analytical tools

The following standard cost concept was used to analyzed Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1, Cost C_2, and Cost C_3 (Kumar *et al*, 2023)

Cost A_1 = All actual expenses incurred in the crop production.

I. Value of hired human labour
II. Value of owned bullock labour
III. Value of hired bullock labour
IV. Value of owned machine labour
V. Value of hired machine labour
VI. Value of seed /seedling (farm produced or purchased)
VII. Value of manures and fertilizers
VIII. Value of plant protection charges
IX. Irrigation charges
X. Land revenue and taxes
XI. Depreciation on farm building and implements
XII. Interest on working capital

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

Cost B_1 =Cost A_1+interest on value of owned capital asset (Excluding land)

Cost B_2 =Cost B_1 + rental value of owned land and 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% of cost C_2 as managerial cost

Cost of production =

$$\frac{\text{Total Cost} - \text{Value of by Product } ₹/\text{ha}}{\text{Main product(qtl/ha)}}$$

Farm business income = Gross income - Cost A_1

Farm investment income = Farm business income – imputed value of family labour

Net income = Gross income - Total cost (Cost C_3)

Family labour income = Gross income - Cost B_2

$$\text{B : C Ratio} = \frac{\text{Gross income}(\text{Rs./ha})}{\text{Total Cost}(\text{Rs./ha})}$$

Result and Discussion

Per ha costs of different inputs used in Black Gram production

Per ha cost of different inputs used in Black Gram production in the Chhatarpur district was analyzed category wise as well as overall basis and results are presented in the table 1.

The table depicted that, an average total cost of cultivation of Black Gram production was observed to be Rs 40307.76/ha. Across the categories total cost of cultivation of Black gram production was found to be maximum Rs. 44176.54/ha on a large farm, followed by Rs. 41238.33/ha on a medium farm, Rs. 39894.73/ha on a semi medium, Rs. 38692.04/ha on small farm and Rs. 37537.18 marginal farm, which indicates that the total cost of cultivation of Black Gram production increase as the size of the farm increased because large farmers spend more money on variable inputs as compared to other size of groups.

On an average cost A_1 of Black Gram production was observed Rs 20980.52/ha which was highest on large farm (Rs. 24353.01/ha) followed by medium (Rs. 21773.31/ha), semi medium (Rs. 20624.45/ha), small (Rs. 19583.39/ha) and marginal farm Rs. 18568.45/ha. In the component of cost A_1 highest cost share by machinery labour (Rs. 3751.12/ha) which inferred that majority of the farmers use more machinery labour for their farming operations like field preparation and threshing. After machinery labour charges, plant protection chemical was sharing maximum cost (Rs. 3270.50) followed by irrigation charges (Rs. 2729.99/ha), cost of seed (Rs. 2392.44/ha), hired human labour charges (Rs. 2272.95/ha), cost of fertilizers (Rs. 2157.47/ha), and cost of manure (Rs. 1432.41/ha), whereas interest on working capital, depreciation charges and land revenue were observed to be Rs.1080.41, Rs.1743.22 and Rs.150 per ha respectively. In the total cost of Black gram (Rs. 40307.76/ha), interest on fixed capital, rental value of own land, imputed value of family labour and managerial cost were share Rs. 2359.90/ha, Rs. 10500.00/ha, Rs. 2803.00/ha, and Rs. 3664.34/ha, respectively. The imputed value of family labour declined as size of farm increased. (Finding is confined with Patel *et al*, 2020). The cost A_1 and A_2 were same indicated that leasing pattern is not adopted in the study area. B_1, B_2 C_1, C_2, and C_3 were observed Rs. 23340.43/ha, Rs. 33840.43/ha, Rs. 26143.42/ha, Rs. 36643.42/ha and Rs. 40307.76 Respectively.

Table 1: Per ha costs of different inputs used in Black Gram production (Rs/ha)

Particulars	Marginal	Small	Semi Medium	Medium	Large	Average
Hired human labour charges	1780.25	2052.47	2358.48	2497.64	2675.90	2272.95
Machinery labour charges	3258.44	3560.99	3661.43	3887.31	4387.45	3751.12
Cost of manure	1581.42	1467.34	1385.22	1380.98	1347.07	1432.41
Cost of Fertilizer	1758.19	1860.74	1972.18	2317.06	2879.20	2157.47
Cost of seeds	2066.04	2215.80	2396.07	2480.65	2803.63	2392.44
Irrigation charges	2422.19	2591.88	2632.22	2734.25	3269.42	2729.99
Plant protection chemical charges	3188.22	3068.46	3258.55	3386.42	3450.87	3270.50
Interest on working capital	963.29	1009.06	1059.85	1121.06	1248.81	1080.41
Depreciation on farm machineries/implements	1400.41	1606.65	1750.45	1817.94	2140.66	1743.22
Land revenue	150.00	150.00	150.00	150.00	150.00	150.00
COST A_1	**18568.45 (49.46)**	**19583.39 (50.61)**	**20624.45 (51.69)**	**21773.31 52.79)**	**24353.01 (55.12)**	**20980.52 (52.05)**
Rent paid for lease in land	0.00	0.00	0.00	0.00	0.00	0.00
Cost A_2	18568.45	19583.39	20624.45	21773.31	24353.01	20980.52
Interest on fixed capital	2014.83	2139.83	2352.33	2534.60	2757.93	2359.90
B_1	20583.28	21723.22	22976.78	24307.91	27110.94	23340.43
Rental value of own Land	10500.00	10500.00	10500.00	10500.00	10500.00	10500.00
Cost B_2	31083.28	32223.22	33476.78	34807.91	37610.94	33840.43
Imputed value of family labour	3041.43	2951.36	2791.16	2681.48	2549.55	2803.00
Cost C_1	23624.71	24674.58	25767.94	26989.39	29660.49	26143.42
Cost C_2	34124.71	35174.58	36267.94	37489.39	40160.49	36643.42
Managerial cost	3412.47	3517.46	3626.79	3748.94	4016.05	3664.34
Cost C_3	**37537.18 (100)**	**38692.04 (100)**	**39894.73 (100)**	**41238.33 (100)**	**44176.54 (100)**	**40307.76 (100)**

Source: Primary data (2023-2024), figure in parentheses shows % of cost C_3

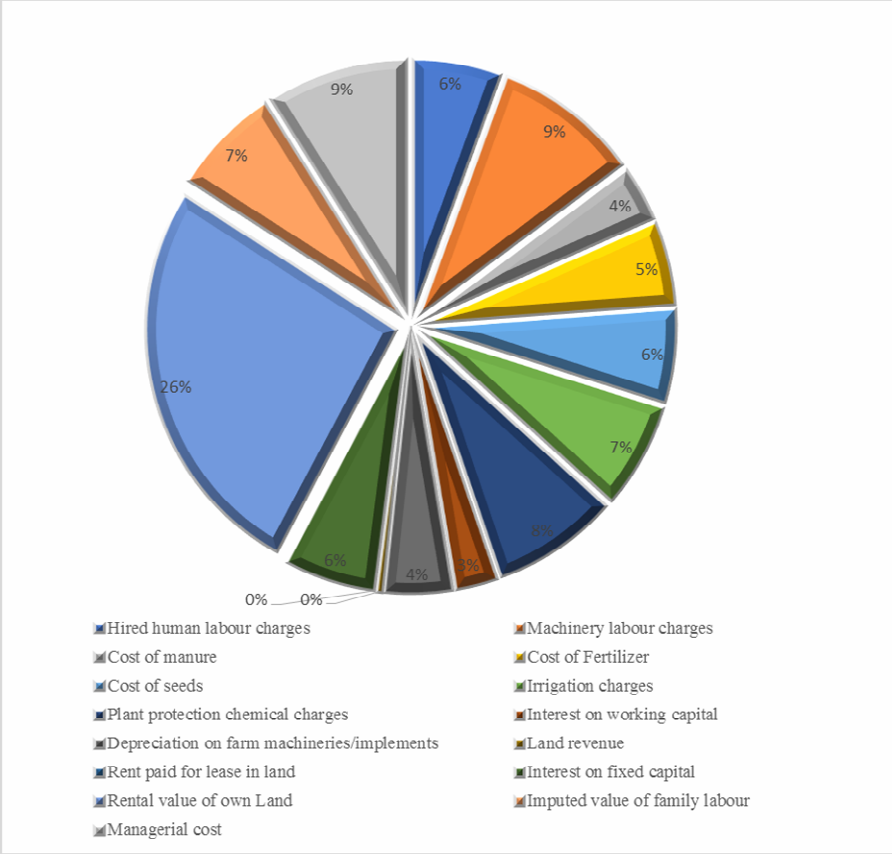

Fig. 1: Percentage of different cost component in the total cost of Black Gram

Profitability of Black gram production at the different size of farms

Profitability of Black gram production in the Chhatarpur district was analyzed and the results are presented in table 2. It was depicted from the table that an average farmer gained a yield of 12.04 qtl/ha at their farm, which was found to be maximum on large farms (13.29 qtl/ha) followed by medium (12.36 qtl/ha), semi medium (12.22 qtl/ha), small (11.42 ha) and marginal farms (10.89 qtl/ha) which indicated that yield of Black gram increased as size of farm increased. (Similar finding was observed by *Ganesh et al* in 2022.) The large farmers were found to be sold their produce at the highest rate (Rs. 6059.55 /qtl) as compared to medium (Rs. 5997.55/qtl), semi-medium (Rs. 5826.42), small (Rs. 5790.25 qtl/ha), and marginal farmers (Rs. 5745.67 /qtl). This is indicated that large category farmers gain maximum prices per quintals due to they sold their produce when price is high and also have better holding capacity, while small and marginal farmers received less price per quintal as compared to large categories farmers because they sold their produce at lower cost due to poor holding capacity and distressed sale of the farm produce by small and marginal farms. The gross income, cost of cultivation, cost of production, net income, farm business income, family labour income, farm investment income, and the benefit-cost ratio at the overall farms level were found to be Rs. 70911.00/ha, Rs. 40307.76/ha Rs. 30603.23/ha, Rs. 3352.04/qtl, Rs. 47570.57/ha, Rs. 34267.58/ha, Rs. 44767.58/ha and 1:1.76 respectively from the cultivation of Black gram in the Chhatarpur district. The gross income from Black gram cultivation was found to be maximum on large farms (Rs. 80531.42/ha) as compared to medium (Rs. 74729.47/ha), semi-medium (Rs. 71198.85/ha), small (Rs. 66124.66/ha), and marginal (Rs. 62570.35/ha). It was also observed from the data that, net income, farm business income, family labour income, farm investment income was found to be maximum on large farms size. The benefit-cost ratio also was found to be highest on large size farms (1: 1.82) as compared to medium farms (1:1.80) semi-medium (1:1.78) small (1:1.71) and marginal size of farm (1:1.67).

Table 2: Profitability of Black Gram production at different size of farm

Particulars	Size of farms					
	Marginal	**Small**	**Semi Medium**	**Medium**	**Large**	**Overall**
Yield of main Product (qtl/ha)	10.89	11.42	12.22	12.36	13.29	12.04
Price of main Product (Rs./qtl)	5745.67	5790.25	5826.42	5997.55	6059.55	5883.89
Value of main Product(Rs./ha)	62570.35	66124.66	71198.85	74129.72	80531.42	0.00
Production of by product (qtl/ha)	0.00	0.00	0.00	0.00	0.00	0.00
Price of by product Rs./qtl	0.00	0.00	0.00	0.00	0.00	0.00
Value of by product Rs./ha	0.00	0.00	0.00	0.00	0.00	0.00
Gross income (Rs./ha)	62570.35	66124.66	71198.85	74129.72	80531.42	70911.00
Cost of cultivation (cost C_3) Rs./ ha	37537.18	38692.04	39894.73	41238.33	44176.54	40307.76
Net income Rs./ ha	25033.17	27432.62	31304.12	32891.39	36354.88	30603.23
Cost of production Rs./qtl	3446.94	3388.09	3264.71	3336.43	3324.04	3352.04
Farm business income	41987.07	44401.43	48222.07	49821.81	53420.48	47570.57
Family labour income	28445.64	30950.07	34930.91	36640.33	40370.93	34267.58
Farm investment income	38945.64	41450.07	45430.91	47140.33	50870.93	44767.58
B:C Ratio at cost C_3	**1.67**	**1.71**	**1.78**	**1.80**	**1.82**	**1.76**

Fig. 2: Cost of cultivation, Gross income and net income of Black Gram at different size of farm

Input output ratio of Black gram crop over different cost

The input-output (B:C) ratio gives estimates of the return from the investment of one rupee in the production process. The B: C ratio for wheat production over different costs were worked out and the data on the same is presented in table 3. The data on input-output (B: C) ratio indicates that the return from the investment of rupee one in the production of Black gram crop gives more than one rupee return. An average input-output ratio over cost A_1/, A_2, Cost B_1, cost B_2, cost C_1, cost C_2, and cost C_3 were found to be 1:3.38, 1:3.04, 1:2.09, 1:2.71, 1:93, and 1:1.76 respectively. The input-output ratio over total costs was found to be maximum (1:1.82) at large size farm followed by medium (1:1.80) semi-medium (1:1.78) small (1:1.71) and marginal (1:1.67) respectively. The estimated input-output ratio shows that Black gram production was profitable at the overall farm as well as across categories.

Table 3: B: C ratio of Black Gram production over different cost

Size of farm	Marginal	Small	Semi Medium	Medium	Large	Overall
B:C ratio over cost A_1/ A_2	3.37	3.38	3.45	3.40	3.31	3.38
B:C ratio over cost B_1	3.04	3.04	3.10	3.05	2.97	3.04
B:C ratio over cost B_2	2.01	2.05	2.13	2.13	2.14	2.09
B:C ratio over cost C_1	2.65	2.68	2.76	2.75	2.72	2.71
B:C ratio over cost C_2	1.83	1.88	1.96	1.98	2.01	1.93
B:C ratio over cost C_3	1.67	1.71	1.78	1.80	1.82	1.76

Source: Field survey (Primary data 2023-24)

Net return from Black Gram production under different size of farm

Net return was calculated by deducting total cost (Cost C_3) from gross return and results are presented in table 4. it was noted from the table that an average net return overcast cost A_1, / A_2, cost B_1, cost B_2, cost C_1, cost C_2, and cost C_3 was recorded Rs. 49930.48 Rs. 47570.57, Rs. 37070.57, Rs. 44767.58, Rs. 34267.58 and Rs. 30603.23 per ha respectively. The net return over cost A_1/A_2 found maximum on a large farm (Rs. 56178.41/ha), followed by medium (Rs. 52356.41/ha), semi-medium (Rs. 50574.40/ha), small (Rs. 46541.26 /ha), and marginal size of farm (Rs. 44001.90 /ha. Net return over cost B_1 was found in order of Rs. 41987.07, Rs. 44401.43, Rs. 48222.07, Rs. 53420.48, and Rs. 53420.48 per hectare on marginal, small, semi-medium, medium and large farm size respectively. In case of cost, C_1 net return per hectare was found to be maximum on a large farm (Rs. 50870.93) followed by medium (Rs. 47140.33), semi-medium (Rs. 45430.91), small (Rs. 41450.07), and marginal farm size (Rs. 38945.64/ha). Similar trends also followed in cost C_2 and C_3 in the study area.

Table 4: Net returns from Black Gram production under different size of farm

Size of farm	Marginal	Small	Semi Medium	Medium	Large	Overall
Net return over cost A_1/A_2	44001.90	46541.26	50574.40	52356.41	56178.41	49930.48
Net return over cost B_1	41987.07	44401.43	48222.07	49821.81	53420.48	47570.57
Net return over cost B_2	31487.07	33901.43	37722.07	39321.81	42920.48	37070.57
Net return over cost C_1	38945.64	41450.07	45430.91	47140.33	50870.93	44767.58
Net return over cost C_2	28445.64	30950.07	34930.91	36640.33	40370.93	34267.58
Net return over cost C_3	25033.17	27432.62	31304.12	32891.39	36354.88	30603.23

Source: Field survey (primary data 2023-24)

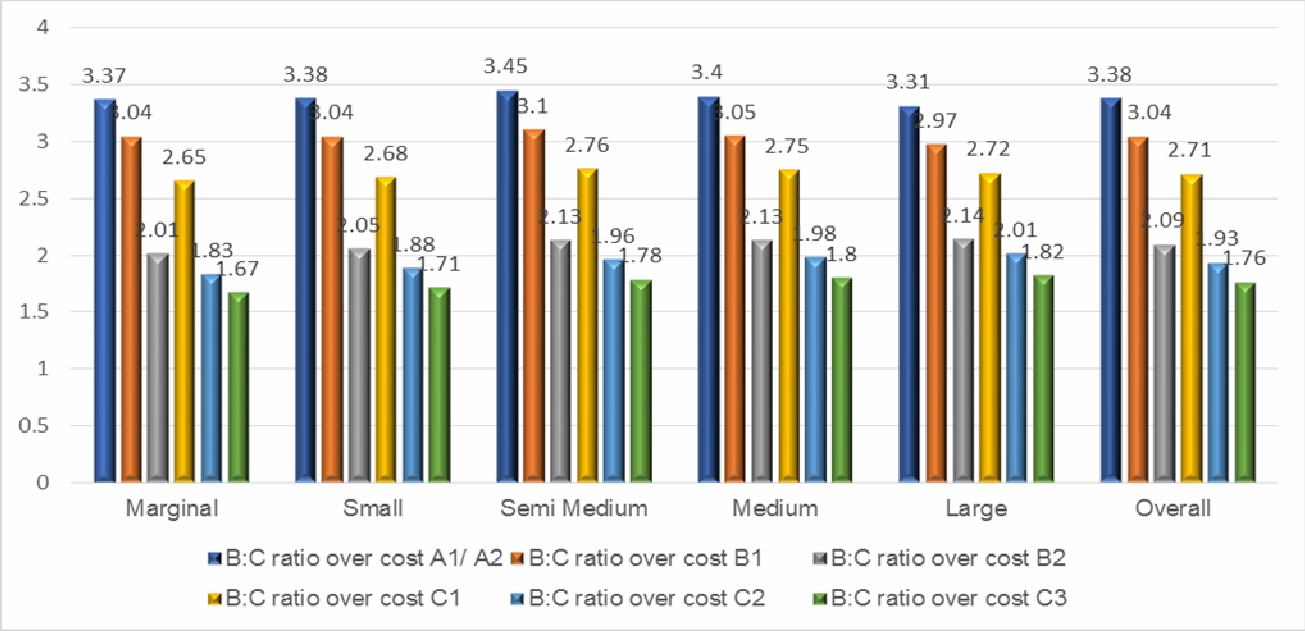

Fig. 3: B:C ratio of Black Gram production over different cost

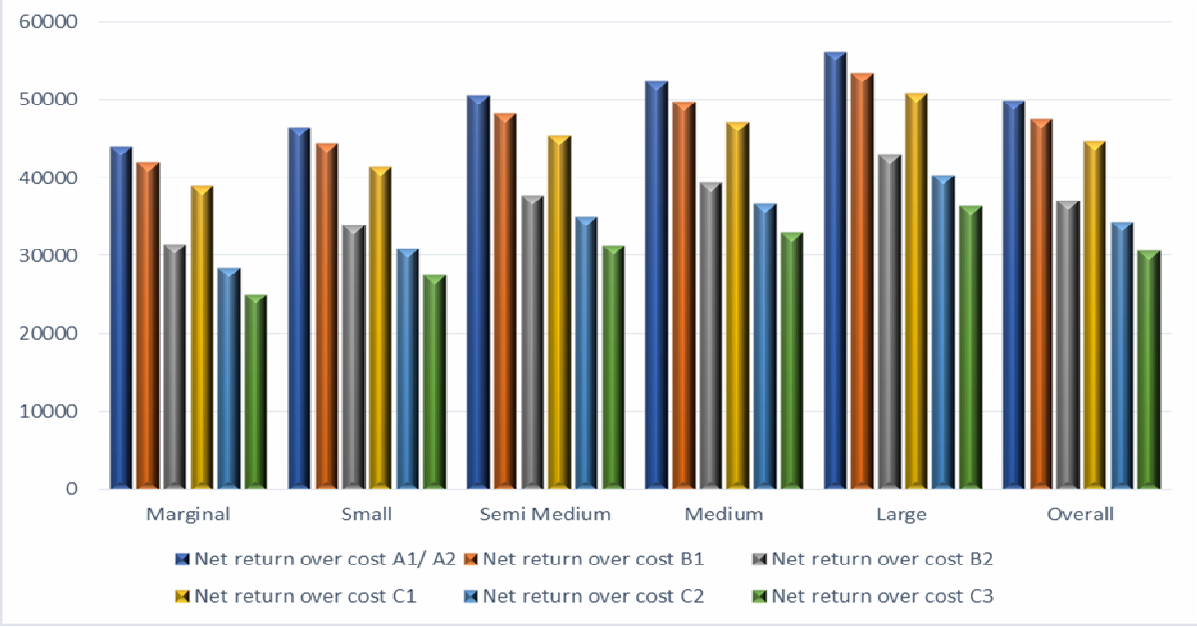

Fig. 4 : Net returns from Black Gram under different size of farm

Conclusion

The study showed that the production of Black gram in the Chhatarpur district of Madhya Pradesh was economical viable because benefit cost ratio observed greater than 1 in the all size of farm and at overall level. Economics of Black gram production was more profitable in large size of farm and medium size of farm as compared to semi medium, small and marginal farm. This study concluded that the investment on machinery labour, and plant protection chemical were major share in the cost A_1 which indicted that Black gram cultivation required more investment on machinery labour and plant protection chemical.

Policy Implications

Appropriate extension services and farmer training on modern pulse production technologies should be provided to pulse growers. Furthermore, it is important to implement an integrated production system that connects advanced production methods with access to credit and effective marketing strategies for major pulse crops.

References

Anonymous (2022-23). Agricultural statistics at a glance, Government of India. Ministry of Agriculture & Farmers Welfare. Department of Agriculture, Cooperation & Farmers

Anonymous (2023-24). ANGRAU-Crop Outlook Reports of Andhra Pradesh Black gram– June to May, 2023-24

Anonymous (2023-24). DES, GoI, Min. of Agri. & FW (DA & FW)

Ganesh, S., More, M.S., Rathod, V.J., Bagde, N.T. (2022). Economic analysis of Black gram in Washim district. *The Pharma Innovation Journal* **11**(12): 5376-5380.

Kumar, R., Sahu, M., Yadav, S. and Lamba, H.K. (2023). A study on economic evaluation of paddy cultivation in the Gwalior District (M.P.). *International Journal of Statistics and Applied Mathematics* 2023; SP-8(5): 695-700

Patel, G., Shrivastava, A. and Sahu, R. (2020). Costs and Profitability of Urd bean on Sample farms. *Int. J.Curr. Microbiol. App. Sci.* **9**(01): 2359-2368.