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Cost analysis and profitability of gram in Narsinghpur district of Madhya Pradesh

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Abstract
The study was limited to the Narsinghpur district of Madhya Pradesh. My selection was made deliberately because the gram is the main rabi crop among pulses in the district. Gross yield per gram hectare was observed in small (Rs.38,383), medium (Rs.39,559) and large (Rs.36,945) categories at C_3 cost within the study area. In general, the net yield was Rs./ha at cost A_1/A_2, B_1, B_2, C_1, C_2 and C_3, the trend was on average Rs.60718, Rs.55666, Rs.43780, Rs.53184, Rs.41298 and Rs.38296, respectively. Production cost was highest in large farms (Rs.2743) at C cost. Overall, production cost was estimated at A_1/A_2, B_1, B_2, C_1, C_2 and C_3 cost, Rs.817, Rs.1203, Rs.2120, Rs.1395, Rs.2312 and Rs.2543/quintal. The benefit-cost ratio of one gram to the cost of C3 in small, medium and large farms was 1:2.24, 1:2.26 and 1:2.01 respectively. The average profitability of production in grams per hectare on net farm income is Rs.71,317, family labor income is Rs.43,780, agri-business income is Rs.60,718 and farm investment income is Rs.16,938.

Keywords: Cost of cultivation, profitability, income

Introduction
Gram is the main pulse crop of the Indian subcontinent. India is the world's leading producer of pulses, occupying an area of 22.47 million hectares with an annual production of 300.5 MT during 2016-17. The average yield of legumes is estimated at 890 kg/hectare. Due to uncontrolled population growth, on the one hand, and the lack of increase in the production of legumes, on the other, the per capita availability of legumes in our country is decreasing day by day. In 2011, the availability of legumes per day was reduced to 31.6 grams. The share of agriculture and related sectors in India's GDP declined to 7.1 percent in 2016-17 due to the shift from the traditional agricultural economy to industrial and service sectors. Food grain production has increased from 230.8 million tonnes in 2007-08 to 300.5 million tonnes in 2016-17, despite a decline in the sector's contribution to GDP. The gram is the main legume, grown in the state and marketed throughout the state and country. Therefore, it plays a very important role in the supply and demand side of the state's produce market. While the area covered by the cultivation of chickpeas is 18% of the net planted area of the state. In Madhya Pradesh, Dewas leads the gram area with a 6% share, followed by Raisen (5.9%), Ujjain (5.5%), Ashoknagar (5.5%), Panna (5.0%), Narsinghpur (4.9%), Dhar (4.1%), Sehore (3.7%), Chhatarpur (3.6%), Shivpuri (3.5%), Satna (3.4%), Rajgarh (3.3%), Guna (3.3%), Indore (3.2%), Ratlam (3.1%) along with Others (36.2%) (2014-15, DES, MOA). In Narsinghpur districts, the estimated gram production for the upcoming season will be lower by 20.12% respectively compared to the previous season. In Narsinghpur, the acreage under gram decreased, but due to dry spells and lack of adequate rainfall during the growing and flowering stages, the expected yield rate for the crop has been negatively affected.

Materials and Methods
The study was limited to the Narsinghpur district of Madhya Pradesh. My selection was made deliberately because the gram is the main rabi crop among pulses in the district.
The researcher also knows the farmers in the area well, which can help to gather relevant information. I selected the Chawarpatha block. Grass-growing villages in this block were enumerated from RAEO/Panchayat Secretary's records. Five towns on this list *viz*. Madesur, Singota, Khursuru, Goras, Garha Randomly selected. Producers from selected villages were registered and classified into three size groups based on farm size, that is, small (up to 2 ha), medium (2 to 4 ha) and large (4 ha) of each size group on top of this. 20 farmers from each

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group were selected using the simple random sampling method. A total of 60 respondents were selected for an in-depth study.

Cost concepts
Cost concepts commonly used in farm management studies were followed in this present study. Costs are generated following certain cost concepts.

Cost A_1: It is the actual paid out cost by the farmers,

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

Cost B_1: Cost A_2 + interest on value of owned fixed capital assets (excluding land),

Cost B_2: Cost B_1 + rental value of own land (net of land revenue),

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_1 to account for managerial input of the farmer.

Profitability concepts
1. Farm bossiness income = Gross income-Cost A_1/A_2
2. Family labour income = Gross income- Cost B_2
3. Net income = Gross income – Cost C_3
4. Farm investment income = Farm business income-Imputed value of family labour
5. Cost of production $= \dfrac{\text{Total cost of cultivation} - \text{By product}}{\text{Yield}}$

Results and Discussion
1. Cropping pattern
The data presented in table 1 show the cultivation pattern of the farmers included in the sample. Respondents estimated the maximum area devoted to Rabi, Kharif and Zaid crops on average (47.07%, 40.14% and 12.78%). Therefore, it can be concluded that gram and wheat were the important crops in the Rabi season of the study area in view of the land area and soybean and rice in the Kharif season.

Table 1: Cropping pattern of gram cultivators sampled farmers (ha)

Particulars	Small	Medium	Lage	Average
a) Soybean	0.81 (64.29)	2.18 (67.08)	2.56 (59.81)	1.85 (63.14)
b) Paddy	0.25 (19.84)	0.46 (14.15)	0.74 (17.29)	0.48 (16.38)
c) Urard Moong	0.18 (14.29)	0.32 (9.85)	0.4 (9.35)	0.3 (10.24)
d) Arhar	0 (0)	0.04 (1.23)	0.15 (3.5)	0.06 (2.05)
e) Other Kharif crop	0.02 (1.59)	0.25 (7.69)	0.43 (10.05)	0.23 (7.85)
Total Kharif	1.26 (100/37.06)	3.25 (100/41.3)	4.28 (100/40.26)	2.93 (100/40.14)
a) Wheat	0.66 (41.77)	2.29 (60.58)	2.44 (47.2)	1.8 (51.28)
b) Gram	0.58 (36.71)	0.8 (21.16)	1.35 (26.11)	0.91 (25.93)
c) Lentil	0.02 (1.27)	0.16 (4.23)	0.49 (9.48)	0.22 (6.27)
d) Sugarcane	0.32 (20.25)	0.53 (14.02)	0.89 (17.21)	0.58 (16.52)
Total Rabi	1.58 (100/46.47)	3.78 (100/47.98)	5.17 (100/46.73)	3.51 (100/47.07)
Moong /Urard	0.56 (100)	0.85 (100)	1.79 (100)	1.07 (100)
Total zaid	0.56 (100/16.47)	0.85 (100/10.71)	1.79 (100/13.01)	1.07 (100/12.78)
Gross cropped area	3.4/100	7.88/100	11.24/100	7.51/100
Cropping intensity (%)	215	208	217	214

(Figures in parenthesis are the percentage to particular season and in Medium graph to gross cropped area)

The area under soybean maximum (67.08%) for medium-sized respondents, even then, was (64.29%) for small-sized respondents and minimum (59.81%) for large-sized respondents. Therefore, it can be concluded that it was more or less the same for small, medium and large size respondents. Urad (3.10%), moong and other crops were also grown in small portions (10.24, 2.05 and 7.85%) in the kharif season. Overall, soybean (63.14%) was found in the Kharif season, followed by rice (16.383%), urad/moong (10.24%), arhar (2.05%) and other kharif areas (7.85%), respectively (fig. 1).

Rabi was the main season for farmers in the study area. The surface sown with wheat was maximum (60.58%) in median, followed by the respondents large (47.20%) and small (41.77%). The maximum area under gram cultivation (36.71%) was estimated for the respondents of small farm size, followed by the large one (26.11%) and a 21.16 percent area under cultivation of gram for respondents of large farm size. On average, sugarcane and lentils were also observed in the study area in a small proportion in the rabi season (16.52 and 6.27%) of the respondents. At a general level, wheat (51.28%) was found in the rabi season, followed by gram (25.93%), lentils (6.27%) and sugar cane (16.52%) respectively (fig. 2). The intensity of cultivation in the area under study was observed in 213 percent.
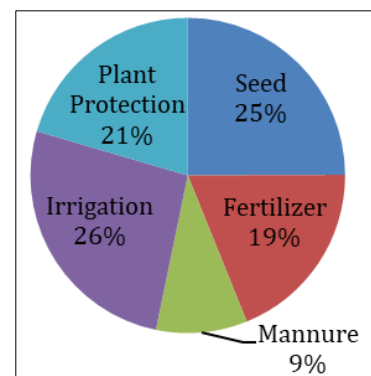

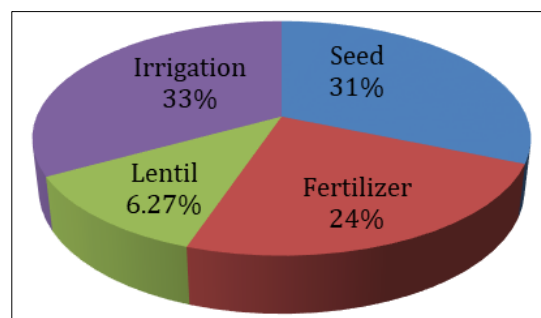**Fig 1:** Cropping pattern in kharif season in narsinghpur district (%)

Fig 2: Cropping pattern in rabi season in narsinghpur district (%)

2. Estimation of the cost of cultivation

An attempt was made to identify the cost of the crop and the benefit obtained from the gram crop. Information on various production costs, profit from gram production in Narsinghpur district (M.P.) and the marketing channel of the gram are studied in this section. Table 2 shows that, on average, the cost of cultivation per gram hectare over A cost, B_1 cost, B2 cost, C_1 cost, C_2 cost and C cost was calculated at Rs.10,598.70/ha, Rs.15,650.70/ha, Rs.27536.81/ha, Rs.18132.84/ha, Rs.30018.95/ha and Rs.33020.85/ha, respectively. The cost of cultivation per hectare of gram was shown at a general level and represented 36.55 percent of the total cost, that is, the energy of the machines (8.41%), followed by family labor (7, 52%), irrigation (4.12%), seeds (3.91%), and rent. labor (3.72%), plant protection (3.21%), fertilizers (2.97%), manure (1.47%) and oxen labor (1.22%) to the total cost of production (fig. 3). While the indirect and fixed cost was observed as a maximum of 63.58 percent of the total cost, that is, the rental value of own land 1/6 (36%), followed by interest on own fixed capital (15.3%), 10 percent of the cost C2 (9.09%), interest on working capital (1.63%) and land income (0.14), respectively.
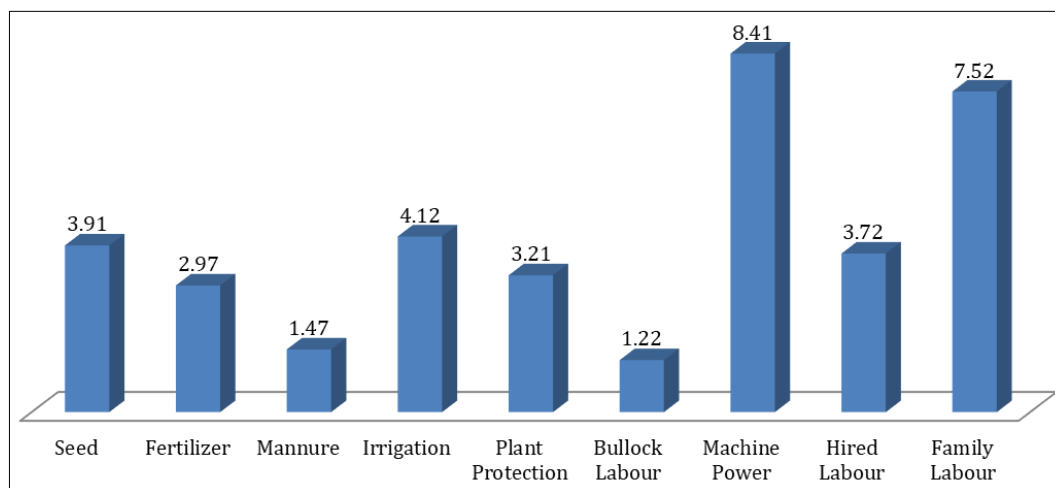

Fig 3: Material and labour cost of gram crop

The comparison of the cultivation cost of the size group showed that the large farms have prepared higher investments per hectare than the small ones. It was due to its investment capacity for the cultivation of crops. It was noted from Rs.36,754/ha for large farms up to Rs.30916.65 for small farms.

Table 2: Cost of cultivation of gram cultivator sample respondents (Rs/ha)

Particular	Small	Medium	Large	Average
Seed (Kg)	1362 (4.41)	1280 (1.08)	1230 (3.35)	1290.67 (3.91)
Fertilizer(Kg)	844.5 (2.73)	932.8 (2.97)	1164 (3.17)	980.43 (2.97)
Manure (qtl.)	562.9 (1.82)	433.21 (1.38)	455.4 (1.24)	483.84 (1.47)
Irrigation (No.)	1570.4 (2.08)	1230.47 (3.92)	1280.64 (3.48)	1360.5 (4.12)
Plant protection (lit.)	882.08 (2.85)	1040.37 (3.31)	1255.22 (3.42)	1059.22 (3.21)
Bullock labour use in pair day's	577.45 (1.87)	325.99 (1.04)	200.33 (0.82)	401.26 (1.22)
Machine power	2756.55 (8.92)	2383.91 (7.53)	3185.78 (8.67)	2775.41 (8.41)
Hired labour days	879.5 (2.84)	1365.95 (4.35)	1437.88 (3.91)	1227.79 (3.72)
Land revenue	45 (0.15)	45 (0.14)	45 (0.12)	45 (0.14)
Depreciation, repairs of implements and machinery	165.29 (0.53)	498.34 (1.59)	746.02 (2.03)	469.28 (1.42)
Total cost	9645.67 (31.2)	9536.07 (30.38)	11100.27 (30.2)	10094 (30.57)
Interest on working capital @5%	482.28 (1.56)	476.8 (1.54)	555.1 (1.8)	504.7 (1.63)
Sub Total or cost A_1/A_2 (1)	10127.95 (32.76)	10012.87 (31.9)	11655.28 (31.71)	10598.7 (32.1)
Interest on owned fixed capital	3673.72 (11.88)	4181.28 (13.32)	7301 (19.86)	5052 (15.3)
Subtotal or cost B_1	13801.67 (44.64)	14194.95 (45.22)	18956.28 (51.58)	15650.7 (47.4)
Rental value of owned land 1/6	11550 (37.36)	11825 (37.67)	12283.33 (33.42)	11886.11 (36)
Subtotal or cost B_2	25351.67 (82)	26019.15 (82.89)	31239.61 (85)	27536.81 (83.39)
Imputed value of family labour	2754.34 (8.91)	2518.39 (8.02)	2173.66 (5.91)	2482.14 (7.52)
Cost C_1 (Cost B_1 + Imputed value of family labour)	16556.04 (53.55)	16712.54 (53.24)	21129.94 (57.49)	18132.84 (154.91)
Cost C_2 (Cost B_2 + Imputed value of family labour)	28106.04 (90.91)	28537.54 (90.91)	33413.27 (90.91)	30018.95 (9091)
10% on cost C_2	2810.6 (9.09)	2853.75 (9.09)	3341.33 (9.09)	3001.9 (9.09)
Total cost or cost C_3	30916.65 (100)	31391.3 (100)	36754.6 (100)	33020.85 (100)

3. Comparative economic of gram

The expenditure incurred in different operations of gram cultivation also taken into consideration and presented in table 3, while calculating the total cost of cultivation *i.e.* labour cost (Human Labour, Bullock Labour, Machine Power), input material (Seed, Manure, Fertilizers, Irrigation and Plant protection), indirect (land revenue & depreciation) and fixed cost rental value of own land, interest on working capital, interest on fixed cost and 10 per cent of C_2.

Table 3: Comparative economic of gram

Particulars	Small	Medium	Large	Average
Material cost	5222 (16.89)	4917 (15.66)	5385 (14.65)	5175 (15.67)
Labour cost	6968 (16.89)	4917 (15.66)	7098 (19.31)	6887 (20.86)
Indirect cost	648 (2.09)	975 (3.11)	1301 (3.54)	975 (2.95)
Fixed cost	18079 (58.48)	18905 (60.22)	22971 (62.5)	19985 (60.52)
Total cost	30917 (100)	31391 (100)	36755 (100)	33021 (100)

It can be seen in the table that the cost of the material was highest in the small (16.89%), medium (15.66%) and large (14.65%) sizes per hectare of the total cost. The total indirect variable cost incurred in small (2.09%), medium (3.11%) and large (3.54%) per hectare of total cost was observed. By categories, it was observed that the labor cost was highest in small (22.54%), medium (21.01%) and large (19.31%) farms surveyed in the studied areas.
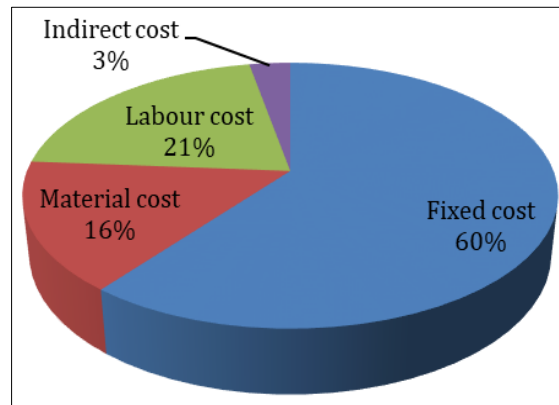

Fig 4: Cost of different aspects under gram cultivation (%)

As the farm size increased from small (58.48%) to large (62.5%) of the total cost. At a general level, the maximum cost invested by gram growers was reported in fixed cost (60.51%), labor cost (20.86%), material cost (15.67%) and indirect cost (2.95%), respectively (Fig. 4).

4. Net return (Rs/ha) of gram
The net yield per gram presented in Table 4 indicates that the gross yield per hectare of gram was observed in the small (Rs.38,383), medium (Rs.39,559) and large (Rs.36,945) categories at C3 cost as per study area. In general, the net yield was Rs./ha at cost A_1/A_2, B_1, B_2, C_1, C_2 and C_3, the trend was on average Rs.60718, Rs.55666, Rs.43780, Rs.53184, Rs.41298 and Rs.38296, respectively.

Table 4: Net returns of gram cultivators sample farmers (Rs./ha)

Particular	Small	Medium	Large	Average
Cost A_1	59172	60937	62045	60718
Cost B_1	55498	56756	54744	55666
Cost B_2	43948	44931	42460	43780
Cost C_1	52744	54237	52570	53184
Cost C_2	41194	42412	40287	41298
Cost C_3	38383	39559	36945	38296

5. Cost of production of gram
The cost per quintal of gram is presented in table 5, for all farm categories, which shows that the yield per hectare was higher in large farms followed by medium and small farms. Production cost was highest in the large size group (Rs.2743), followed by small (Rs.2454) and large (Rs.2433) farms with cost C_3.

Table 5: Cost of production of gram cultivators sample farmers (Rs./Qt)

Particulars	Small	Medium	Large	Average
Cost A_1	804	776	870	817
Cost B_1	1095	1100	1415	1203
Cost B_2	2012	2017	2331	2120
Cost C_1	1314	1296	1577	1395
Cost C_2	2231	2212	2494	2312
Cost C_3	2254	2433	2743	2543
Total yield (q/ha)	12.6	12.9	13.4	13.0

At overall level was estimated at cost A/A2, B1, B2, C1, C2 and C3,Rs. 817, Rs. 1203, Rs.2120, Rs.1395, Rs.2312 and Rs.2543/quintal The operational cost A, was estimated at Rs. 804, Rs. 776 and Rs. 870/Qt for small, medium and large farms respectively.

6. Benefit-cost ratio
The analysis of the cost-benefit relationship of the production of grams was elaborated and presented in Table 6. Farmers got the market price per gram starting at Rs 5,500 in all farm categories. The benefit-cost ratio per gram in small, medium and large farms was 1:2.24. 12.26 and 1:2.01 respectively in the C3 cost. At a general level, the cost-benefit ratio of the gram at cost A/A2, B1, B2, C1, C2 and C, were 1:6.75. 1.4.63, 1:261, 1:3.97, 1:2.38 and 1:2.17. This means that to get a higher yield from farmers and the market price of gram production, as well as productivity per unit, you must improve with HYV and apply farmer-recommended packages and

practices. Production technology improved day by day and the government promoted the production of legumes through many programs and benefit plans. From an economic point of view, technological advance implies an upward shift of the production function, which means that more output is achieved with a given level of inputs, and therefore at a lower cost per unit. Although it is difficult due to the higher cost of labor (manual and mechanical). The hope with bio management may be achievable for all gram-producing agricultural households in the study area.

Table 6: Benefit - cost ratio of gram cultivators sample farmers

Particulars	Small	Medium	Large	Average
Cost A_1	1:6.75	1:7.09	1:6.32	1:6.75
Cost B_1	1:5.02	1:5	1:1.88	1:4.63
Cost B_2	1:2.73	1:2.73	1:2.36	1:2.61
Cost C_1	1:4.19	1:4.25	1:3.48	1:3.97
Cost C_2	1:2.47	1:2.49	1:2.21	1:2.38
Cost C_3	1:2.24	1:2.26	1:2.01	1:2.17
Price received per qu (Rs)	5500	5500	5500	5500

7. Profitability (Rs/ha) of gram
The profitability per hectare of gram production is given (Table 7). The average return of production in grams per hectare on net farm income is Rs.71,317, family labor income Rs.43,780, farm business income Rs.60,718 and farm investment income Rs.16,938. However, income per hectare from family labor and farm investment increased with increasing size, while the income of agricultural enterprises was highest in the group of large farms compared to small and large.

Table 7: Profitability (Rs/ha) of gram cultivators sample farmers (Rs./ha)

Particulars	Small	Medium	Large	Average
Gross return (Rs.)	69300	70950	73700	71317
Family labour income (Rs.)	43948	44931	42460	43780
Farm business income (Rs.)	59172	60937	62045	60718
Farm investment income (Rs.)	15224	16006	19581	16938

Conclusion and Suggestions
Cultivation cost per gram hectare on A cost, B_1 cost, B_2 cost, C_1 cost, C_2 cost and C_3 cost was calculated at Rs.10,598.70, Rs.15,650.70, Rs.27536.81. Rs.18132.84, Rs.30018.95 and Rs.33020.85, respectively. The gross yield per gram hectare was observed in the small (Rs.38,383), medium (Rs.39,559) and large (Rs.36,945) categories at C_3 cost in the study area. At a general level, the net yield of Rs./ha at the cost A/A_2, B_1, B_2, C_1, C_2 and C, the trend was average of Rs.60718, Rs.55666, Rs.43780, Rs.53184, Rs.41298 and Rs.38296 respectively. Production cost was highest in large farms (Rs.2743) at C cost. Overall, production cost was estimated at A_1/A_2, B_1, B_2, C_1, C_2 and C_3 cost, Rs.817, Rs.1203, Rs.2120, Rs.1395, Rs.2312 and Rs.2543/quintal. The cost-benefit ratio of grams in small, medium and large farms was 1:2.24, 1:2.26 and 1:2.01 respectively at C3 cost. The average profitability of production in grams per hectare on net farm income is Rs.71,317, family labor income Rs.43,780, income from farm enterprises Rs.60,718 and farm investment income Rs.16,938.

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