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Economics of Gram Farming In Dryland of Solapur District

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Abstract:

Gram (chickpea) is an important pulse crop cultivated in dryland regions of India due to its drought tolerance, low water requirement, and contribution to soil fertility and nutritional security. The present study examines the economics of gram farming in the dryland areas of Solapur district, Maharashtra, with the objective of analysing cost of cultivation, production costs, price realization, profitability, and benefit–cost relationship. Primary data were collected from 50-gram growers across all eleven tehsils of the district using purposive quota sampling. The results reveal that the average total cost of gram cultivation is ₹17,908 per acre, with operational costs accounting for 65.64 percent and fixed costs contributing 32.68 percent. Human labour and machine labour form the major components of operational expenses. Average productivity was observed to be 3.35 quintals per acre, while farmers received an average market price of ₹4,704 per quintal. The gross return per acre was ₹15,735, resulting in a net loss of ₹2,173 per acre and a benefit–cost ratio of 0.88, indicating economic loss under prevailing conditions. Hypothesis testing through a one-sample t-test further confirms that gram cultivation in the study area is statistically not profitable, with significant variation in returns among farmers. The study suggests that profitability can be improved through adoption of improved drought-resistant varieties, efficient input use, mechanization support, better extension services, and improved market access. Despite current economic challenges, gram remains important for dryland farming due to its resilience and nutritional importance. Policy support and productivity-enhancing measures are therefore essential to improve farm income and sustain gram cultivation in drought-prone regions.

Keywords : Gram cultivation, dryland farming, cost of cultivation, profitability, benefit–cost ratio, Solapur district, pulse crop economics.

1. INTRODUCTION:

Gram, commonly known as chickpea or Bengal gram (Cicer arietinum), is one of the most important pulse crops cultivated in India. Gram has been grown in the Indian subcontinent since ancient times and plays a crucial role in the country's food and nutritional security. India is the largest producer and consumer of gram in the world, contributing a major share to global production. Gram is well suited to semi-arid and dryland conditions due to its drought tolerance and ability to grow under limited rainfall, making it an important crop in rainfed agricultural regions. Gram is widely cultivated across several states, with Maharashtra being one of the major producers. The crop is particularly suitable for dryland farming systems where irrigation facilities are limited. Gram requires relatively low water, improves soil fertility through nitrogen fixation, and fits well into crop rotations after kharif crops, making it economically beneficial for farmers in moisture-stress regions. Nutritionally, gram is a rich source of protein, containing about 20–22 percent protein, and serves as a vital protein supplement for the vegetarian population. It is consumed in various forms such as whole grain, split dal, flour (besan), and processed food products. Apart from human consumption, gram straw is also used as nutritious fodder for livestock, adding further economic value to the crop.

Gram is generally cultivated as a Rabi crop, sown during October November after the monsoon season and harvested between February and March. The crop duration typically ranges from 100 to 120 days depending on the variety and climatic conditions. In India, gram occupies a significant share of total pulse area and production, though productivity varies across regions due to differences in rainfall, soil type, and farming practices. Solapur district is predominantly a dryland agricultural region characterized by low and uncertain rainfall, making drought-tolerant crops like gram particularly important for farmers' livelihoods. Gram is cultivated across most tehsils of the district and serves as a major Rabi crop contributing to farm income in rainfed areas. However, variations in yield, input use, market prices, and production costs influence the profitability of gram cultivation. Thus, the present study on the Economics of Gram Farming in the Dryland Areas of Solapur District aims to examine the cost of cultivation, input utilization pattern, productivity levels, price realization, profitability, and cost benefit relationship of gram production in the study area. The analysis will help understand economic viability and provide insights for improving income of dryland farmers through efficient gram cultivation practices.

2. OBJECTIVES OF THE STUDY:

The main objective of study is to study the economics of Gram farming in dryland of Solapur district and specific objectives of the present study are as follows-

1. To analyse the cost of Gram Production in the area under study.
2. To study the prices for Gram Production in area under study.
3. To study the profitability of Gram Production in the area under study.
4. To estimate the benefit cost ratio of Gram production in study area.

3. HYPOTHESIS:

For the purpose of present research paper researcher has formulated following hypothesis

1. Gram crop is not profitable.

4. RESEARCH METHODOLOGY:

For the study undertaken researcher has used the multistage sampling. For the selection of sample farmers researcher has used the purposive sampling method. For selection of farmers researcher has selected non-irrigated land farmers purposefully and quota sampling method is used to select the gram crop farmer. Therefore, the researcher has used the purposive quota sampling method because there is no exact data of dryland gram farmers in Solapur district. The study was conducted in Solapur district as whole. From Solapur district all 11 tehsils i.e. Pandharpur, Mangalwedha, Malshiras, Madha, Karmala, Akkalkot, Barshi, Mohol, Sangola, Solapur North & Solapur South having maximum area under Gram cultivation were selected. The study was based on primary data. Thus, for present study 50 Kharif Gram growers were selected as per the quota sampling method. These 50 respondents were selected from each tehsil. Data collection was made by preparing separate questionnaire/ interview schedule for Gram producer.

5. RESULT AND DISCUSSION:

5.1. Estimated Cost of Cultivation and Total Cost of Gram in Solapur District

Table 1

Estimated Cost of Cultivation and Total Cost of Gram in Solapur District (Rs. Per Acre)

Sr. No.	Elements of cost	ATC	%	Min.	Max.	SD
1	Human Labour- Hired	1809	10.10	0	6000	1491

Sr. No.	Elements of cost	ATC	%	Min.	Max.	SD
2	Human Labour- Family	3692	20.62	222	12800	3030
3	Bullock Labour - Hired	394	2.20	0	4000	978
4	Bullock Labour - Owned	0	0.00	0	0	0
5	Machine Labour - Hired	1888	10.54	0	10000	1833
6	Machine Labour - Owned	0	0.00	0	0	0
7	Seeds	896	5.00	120	2667	511
8	Fertilizer	948	5.30	0	4400	1034
9	Manure	922	5.15	0	26667	3998
10	Insecticides	591	3.30	0	3000	695
11	Irrigation (Water + Electricity Charges)	234	1.31	0	1333	233
12	Crop Insurance	29	0.16	0	533	85
13	Interest on Working Capital	345	1.93	131	3900	522
14	Miscellaneous	6	0.04	0	120	28
I)	**Operational Cost (1 to 14)**	**11756**	**65.64**	**4518**	**39693**	**6872**
15	Rental Value of Owned Land	4609	25.74	2500	9333	941
16	Rent Paid on Leased land	0	0.00	0	0	0
17	Land Revenue, Cesses & Taxes	102	0.57	0	1251	197
18	Depreciation of Farm Builds & Implements	217	1.21	0	1000	193
19	Interest on Fixed Capital	924	5.16	311	4000	873
II)	**Fixed Cost (15 to 19)**	**5853**	**32.68**	**3810**	**13333**	**1599**
III)	**Total Cost of Cultivation (I + II)**	**17608**	**98.33**	**9588**	**46433**	**7780**
20	Packaging cost	85	0.48	20	400	69
21	Transportation Cost	171	0.96	0	400	90
22	Sales Expenses in Market Committee	43	0.24	0	200	35
IV)	**Selling and Distribution Cost (20 to 22)**	**300**	**1.67**	**40**	**640**	**139**
	Total Cost / Cost of Sales (III + IV)	**17908**	**100.00**	**9721**	**46859**	**7822**

(Source: Field Survey)

Variable Cost/ Operational Cost of Gram -

In Gram production human labour cost is the major variable cost. Hired Human labour cost incurred was Rs. 1809 (10.10%) per acre, and family labour cost incurred was Rs. 3692 (20.62%) per acre. Family labour cost is more as compared to hired human labour cost. Hired Bullock labour cost incurred was Rs. 394 (2.20%) per acre and there was no owned bullock labour cost because the farmers have not owned the bullock labour. Hired machine labour cost incurred was Rs. 1888 (10.54%) per acre and there was no owned machine labour cost because the farmers are not owned the machine labour. Seeds cost incurred was Rs. 896 (5.00%) per acre for Gram production. Fertilizer cost incurred was Rs. 948 (5.30%) per acre. In case of Gram production manure cost incurred was Rs. 922 (5.15%) per acre. Insecticides cost incurred was Rs. 591 (3.30%) per acre. Irrigation cost incurred was Rs. 234 (1.31%) per acre which includes water and electricity charges. In Urad production crop insurance cost incurred was Rs. 29 (0.16 %) per acre. Interest on Working capital cost incurred was Rs. 345 (1.93%) per acre and miscellaneous cost incurred was Rs. 6 (0.04%) per acre in the sample study area. The average total operational or variable cost incurred was Rs. 11756 (65.64%), minimum cost incurred was Rs. 4518,

maximum cost incurred was Rs. 39693 per acre and standard deviation was 6872 in the sample study area. So, from the variable cost analysis it was observed that human labour cost (30.72%) and machine labour cost (10.54%) was the major components of operational or variable cost.

Fixed Cost of Gram-

In the case of Gram production rental value of owned land is the major component of fixed cost. Rental value of owned land cost incurred was Rs. 4609 (25.74%) per acre in sample study area. There is no cost of rent paid on leased land because in sample area no any farmer was taken land on lease. Land revenue, cesses and taxes cost incurred was Rs. 102 (0.57%) per acre. Depreciation of farm builds and implements cost incurred was Rs. 217 (1.21%) per acre. Interest on fixed capital cost incurred was Rs. 924 (5.16%) per acre. The average total fixed cost of Urad cultivation incurred was Rs. 5853 (32.68%), minimum cost was Rs. 3810, maximum cost was Rs. 13333 per acre and standard deviation was 1599. So, from the analysis of fixed cost it was observed that rental value of owned land (25.74%) was the major component of cost in case of fixed costs. It was also observed that there was no cost of rent paid on leased in land because all the selected farmers have their own land. Land revenue, cesses and taxes cost (0.57%) was very less in fixed costs.

Total Cost of Cultivation of Gram-

The average total cost of cultivation of Gram was Rs. 17608 (98.33%), minimum cost was Rs. 9588, maximum cost was Rs. 46433 and standard deviation was 7780. Out of total cost of cultivation operational cost was Rs. 11756 (65.64%) and fixed cost was 5853 (32.68%).

Selling and Distribution Cost of Gram-

This table shows the marketing cost of per acre Gram production. The packaging cost was incurred Rs. 85 (0.48%) per acre in drought area of Solapur district. Majority of the Urad farmers sale their production at local markets (block and district market) the transportation cost from farm to local market was Rs. 171 (0.96%) per acre. The average sales expenses in market committee (portage, weigh & other cost) incurred was Rs. 43 (0.24) per acre. The average total selling and distribution cost of Gram was Rs. 300 (1.67%), minimum cost was Rs. 40, maximum cost was 640 per acre in study area and standard deviation was 139.

Total Cost /Cost of sales of Gram-

In Gram farming, per acre average total cost or cost of sales was (total cost of cultivation + total marketing cost) Rs. 17908, minimum cost was Rs. 9721, maximum cost was Rs. 46859 and standard deviation was 7822 in the study area. The share of variable cost in total cost or cost sales was Rs. 11756 (65.64%), fixed cost was Rs. 5853 (32.68%) and selling and distribution cost was Rs. 300 (1.67%). From this table it was observed that per acre cost of Gram production was Rs. 17908.

5.2. Estimated Cost of Production of Gram in Solapur District:

Table 2

Estimated Cost of Production of Gram in Solapur District

(Rs. Per Quintal)

Sr. No.	Elements of cost	ATC	%	Min.	Max.	SD
1	Human Labour- Hired	540	10.10	0	2667	631
2	Human Labour- Family	1103	20.62	45	9000	1469
3	Bullock Labour - Hired	118	2.20	0	1667	368
4	Bullock Labour - Owned	0	0.00	0	0	0

Sr. No.	Elements of cost	ATC	%	Min.	Max.	SD
5	Machine Labour - Hired	564	10.54	0	3000	631
6	Machine Labour - Owned	0	0.00	0	0	0
7	Seeds	268	5.00	60	1000	250
8	Fertilizer	283	5.30	0	1733	388
9	Manure	276	5.15	0	5000	1099
10	Insecticides	177	3.30	0	1400	279
11	Irrigation (Water + Electricity Charges)	70	1.31	0	400	78
12	Crop Insurance	9	0.16	0	200	31
13	Interest on Working Capital	103	1.93	29	1300	187
14	Miscellaneous	2	0.04	0	40	8
I)	**Operational Cost (1 to 14)**	**3512**	**65.64**	**983**	**18334**	**3112**
15	Rental Value of Owned Land	1377	25.74	733	4800	983
16	Rent Paid on Leased land	0	0.00	0	0	0
17	Land Revenue, Cesses & Taxes	30	0.57	0	250	51
18	Depreciation of Farm Builds & Implements	65	1.21	0	225	57
19	Interest on Fixed Capital	276	5.16	64	1600	345
II)	**Fixed Cost (15 to 19)**	**1749**	**32.68**	**866**	**6600**	**1249**
III)	**Total Cost of Cultivation (I + II)**	**5260**	**98.33**	**2040**	**24934**	**4192**
20	Packaging cost	25	0.48	10	100	14
21	Transportation Cost	51	0.96	0	200	32
22	Sales Expenses in Market Committee	13	0.24	0	50	10
IV)	**Selling and Distribution Cost (20 to 22)**	**89**	**1.67**	**20**	**270**	**39**
	Total Cost / Cost of Sales (III + IV)	**5350**	**100.00**	**2115**	**25004**	**4196**

(Source: Field Survey)

Variable Cost/ Operational Cost of Gram-

In Gram production human labour cost is the major variable cost. Hired Human labour cost incurred was Rs. 540 (10.10%) per quintal, and family labour cost incurred was Rs.1103 (20.62%) per quintal. Family labour cost is more as compared to hired human labour cost. Hired Bullock labour cost incurred was Rs. 118 (2.20%) per quintal and there is no owned bullock labour cost. Hired machine labour cost incurred was Rs. 564 (10.54%) per quintal and there is no owned machine labour cost incurred due to farmers have not owned machines. Seeds cost incurred was Rs. 268 (5.00%) per quintal for Gram production. Fertilizer cost incurred was Rs. 283 (5.30%) per quintal. In case of Gram production manure cost incurred was Rs. 276 (5.15%) per quintal. Insecticide's cost incurred was Rs. 177 (3.30%) per quintal. Irrigation cost incurred was Rs. 70 (1.31%) per quintal which includes water and electricity charges. In Gram production crop insurance cost incurred was Rs. 9 (0.16%) per quintal. Interest on Working capital cost incurred was Rs. 103 (1.93%) per quintal and miscellaneous cost incurred was Rs. 2 (0.04%) per quintal in the sample study area. The average total operational or variable cost incurred was Rs. 3512 (65.64%), minimum cost was Rs. 983, maximum cost was Rs. 18334 per quintal and standard deviation was 3112 in the selected study area. So, from the variable cost analysis it was observed that human labour cost (30.72%) and machine labour cost (10.54%) were the major

components of operational or variable cost. Cost of miscellaneous (0.04%) and crop insurance (0.16%) were very less in case of Gram production.

Fixed Cost of Gram-

In the case of Gram production rental value of owned land is the major component of fixed cost. Rental value of owned land cost incurred was Rs. 1377 (25.74%) per quintal in sample study area. There was no cost of rent paid on leased land because in sample area no any farmer was taken land on lease. Land revenue, cesses and taxes cost incurred was Rs. 30 (0.57%) per quintal. Depreciation of farm builds and implements cost incurred was Rs. 65 (1.21%) per quintal. Interest on fixed capital cost incurred was Rs. 276 (5.16%) per quintal. The average total fixed cost of Gram cultivation incurred was Rs. 1749 per quintal which was 32.68% of total cost. Minimum fixed cost of gram was Rs. 866 maximum cost was Rs. 6600 and standard deviation was 1249. So, from the analysis of fixed cost, it was observed that rental value of owned land (25.74%) was the major component of cost in case of fixed costs. It was also observed that there was no cost of rent paid on leased in land because all the selected farmers have their own land. Land revenue, cesses and taxes cost (0.57%) was very less in fixed costs.

Total Cost of Cultivation of Gram-

The average total cost of cultivation of Gram was Rs. 5260 per quintal which was 98.33% of total cost or cost of sales. The minimum total cost of gram was Rs. 2040, maximum cost was Rs. 24934 per quintal and standard deviation was 4192. Out of total cost of cultivation operational cost was Rs. 3512 (65.64%) and fixed cost was Rs. 1749 (32.68%).

Selling and Distribution Cost of Gram-

This table shows the selling and distribution cost of per quintal Gram production. The packaging cost was incurred Rs. 25 (0.48%) per quintal in draught area of Solapur district. Majority of the Gram farmers sale their production at local markets (block and district market) the transportation cost from farm to local market was Rs. 51 (0.96%) per quintal. The average sales expenses in market committee (portage, weigh & other cost) was incurred Rs. 13 (0.24%) per quintal. The average total selling and distribution cost of Gram was Rs. 89 (1.67%) per quintal, minimum cost was Rs. 20, maximum cost was Rs. 270 and standard deviation was 39 in the study area of Solapur district.

Total Cost /Cost of sales of Gram-

In Gram farming, the average total cost or cost of sales was (total cost of cultivation + total selling and distribution cost) Rs. 5350, minimum cost was Rs. 2115, maximum cost was Rs. 25004 and standard deviation was 4196 in the study area. The share of variable cost in total cost or cost sales was Rs. 3512 (65.64%), fixed cost was Rs. 1749 (32.68%) and marketing cost was Rs. 89 (1.67 %). From this table it was observed that per quintal cost of Gram production was Rs. 5350.

5.3. Gross Returns, Net Return and Benefit-Cost Ratio of Gram:

Table 3

Gross Returns, Net Return and Benefit-Cost Ratio of Gram

(Rs. Per Acre)

Sr. No	Factor	Details	Returns
1.	Gross Return	A) Own Consumption (in quintal)	0.07
		Price (in Rs.)	4550
		Gross Return (output* price)	318
		B) Production Sold (in quintal)	3.28
		Price (in Rs.)	4704
		Gross Return (output* price)	15417

Sr. No	Factor	Details	Returns
		C) Total Production A+B (in quintal)	3.35
		Gross Return (output* price) A+B	15735
2.	Net Return	Total Cost of Production	17908
		Gross Return	15735
		Net Returns (gross return- total cost)	-2173
3.	Benefit-Cost Ratio	Gross Return / Total Cost	0.88

(Source: Field Survey)

In case of Gram farming, productivity of non- irrigated Gram is 3.35 quintal per acre and farmers get averagely Rs.4704 price per quintal at local market. Out of total production own consumption of Gram is 0.07 quintal per acre and production sold is 3.28 quintal per acre. Gross return of Gram is Rs. 15735 per acre out of which Rs. 15417 (97.98%) is from sell of Gram production and Rs. 318 (2.02%) is from own consumption of Gram by farmers. During the filed survey it was observed that farmer keep some Gram production for own consumption but in very less quantity. Net return of Gram production is Rs. (-) 2173. It means that Gram growers have a burden (loss) of Rs. 2173 per acre. The benefit-cost ratio of non-irrigated Gram in sample area is 0.88. It means that farmers have invested rupee 1 in Gram production but they bear 0.12 paise net loss per rupee.

6. HYPOTHESIS TESTING:

Researcher has formulated the hypotheses on the profitability of Gram in area under study. This hypothesis is-

H0 : Gram Crop is not profitable.

H1 : Gram Crop is profitable.

To study the hypothesis Gram Crop is not profitable, Researcher has used the one sample t-test to test the hypothesis and taken test value = 0.

Table 4

Profitability of Gram Crop

	Test value = 0						
Variable	**N**	**Mean**	**SD**	**SE Mean**	**95% Lower Bound**	**T**	**P**
Gram	50	-3667	13437	1900	-6853	-1.93	0.97

The analysis examines whether the gram crop is profitable by comparing the average profit with the test value of zero. The results show that the mean profit is **–3667**, indicating an average **loss per farmer**. The standard deviation of **13437** suggests wide variation in profit and loss among farmers. The standard error mean is **1900**, showing the estimated accuracy of the mean value. The **95% confidence lower bound is –6853**, which also lies below zero, further suggesting that profitability tends toward loss rather than gain. The calculated **t-value is –1.93**, and the **p-value is 0.97**, which is much higher than the commonly accepted significance level of 0.05. The study hypothesis states: **"Gram crop is not profitable."** Since the **p-value (0.97) > 0.05**, there is **no statistical evidence to reject the null hypothesis**. **Decision:** The study Fail to reject the null hypothesis and accept the alternative hypothesis. The study concludes that **the gram crop is not profitable** for the sampled farmers.

7. FINDINGS, SUGGESTIONS AND CONCLUSION:

The study reveals that gram cultivation in the dryland areas of Solapur district involves substantial production costs, with an average total cost of Rs.17,908 per acre. Operational or variable

costs constitute the major portion (65.64%) of total cost, among which human labour alone accounts for nearly one-third of the expenditure, followed by machine labour and input costs such as fertilizers, seeds, and manure. Fixed costs account for 32.68% of total costs, with rental value of owned land being the dominant component. The average productivity recorded was 3.35 quintals per acre, which is relatively low due to dryland conditions and rainfall variability. Farmers received an average market price of Rs.4,704 per quintal; however, total gross return amounted to only Rs.15,735 per acre, which is lower than total production cost, resulting in a net loss of Rs.2,173 per acre. The benefit–cost ratio was found to be 0.88, indicating that farmers incur a loss of about Rs.0.12 for every rupee invested. Hypothesis testing further confirms that gram cultivation in the study area is statistically not profitable, as the mean profit is negative and the null hypothesis could not be rejected. Considerable variation in profit and cost among farmers suggests differences in input use efficiency and production conditions.

To improve the economic viability of gram cultivation in dryland areas, efforts should be directed toward increasing productivity through adoption of improved drought-tolerant varieties, better agronomic practices, and timely crop management. Promotion of mechanization services through custom hiring centres may reduce labour costs, which currently form a major share of expenditure. Farmers should be encouraged to adopt integrated nutrient and pest management practices to optimize input use and reduce unnecessary expenses. Strengthening extension services and farmer training programs can improve resource-use efficiency. Better price support mechanisms and market linkages, including storage facilities and collective marketing through farmer producer organizations, can help farmers secure better price realization. Crop insurance coverage and timely compensation mechanisms should also be strengthened to reduce risk in dryland farming. Additionally, diversification with complementary crops or livestock activities may stabilize farm income.

The study concludes that gram cultivation in the dryland areas of Solapur district is presently not economically profitable due to high cultivation costs, low productivity, and moderate price realization. Operational costs, particularly labour expenses, significantly influence total production cost, while uncertain rainfall conditions further limit yield levels. As a result, farmers incur net losses and obtain a benefit–cost ratio below unity, making gram cultivation economically challenging under current conditions. However, with improved farming practices, cost management, productivity enhancement, and better marketing support, gram cultivation can still remain an important component of dryland farming systems due to its low water requirement, soil fertility benefits, and nutritional importance. Appropriate policy support and efficient production practices are therefore essential to enhance profitability and sustain farmers' livelihoods in drought-prone regions.

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