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Cost and returns from Chickpea (Gram) cultivation in the Indo-Gangetic plain of Eastern Uttar Pradesh

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Abstract

The present study was conducted to analyze the cost and returns from chickpea (gram) cultivation in the Ballia district of Eastern Uttar Pradesh, located in the Indo-Gangetic Plain. A multistage stratified random sampling technique was employed, covering three Tehsils: Ballia, Bairia and Bansdih with selecting 146 chickpea-growing farm holdings categorized into small (1-2 ha), medium (2-4 ha), and large (>4 ha) size groups. The data revealed that the average variable cost per hectare was highest on small farms (₹25,579.32), followed by medium (₹22,276.74) and large (₹20,652.22) farms, with an overall average of ₹22,836.09. Higher human labour and machinery costs on small farms contributed to this variation. Similarly, the fixed cost was highest on small farms (₹1,441.64), and lowest on large farms (₹1,010.83), bringing the overall total cost of cultivation to ₹23,910.98 per hectare.

The average yield of chickpea was 17.46 quintals per hectare, with the highest productivity observed on small farms (18.35 q/ha). Gross income per hectare was also highest on medium farms (₹78,142.45), followed by small (₹76,656.57) and large farms (₹69,132.46). The net income per hectare averaged ₹50,827.04 and the input-output ratio ranged from 1:1.33 (large farms) to 1:1.58 (medium farms), indicating better resource efficiency on medium-sized farms. The farm business income (FBI) includes net income, unpaid family labour and interest on owned capital—was highest on medium farms (₹57,127.52/ha) and lowest on large farms (₹48,989.74/ha), primarily due to reduced family labour input. Overall, the study concludes that small and medium farms achieved higher productivity and profitability per hectare compared to large farms, although medium farms exhibited better cost efficiency and input-output performance.

Keywords: Farm business income, farm size, chickpea, productivity, profitability, Indo-Gangetic plain, resource efficiency

Introduction

Pulses play a vital role in our nutrition as they are the cheapest source of dietary protein. They are rich in protein, dietary fiber, and essential minerals, while being low in fat. Pulses are high in lysine but deficient in methionine and cysteine. Due to their nutritional value and affordability, pulses are often referred to as the "poor man's meat" (Reddy, 2010). [8] According to IIPS, ORC Macro (2007) [5], 89% of the global population consumes pulses at least once a week, whereas in India, only 35.40% of the population consumes fish and meat weekly. Globally, pulses are cultivated on 78 million hectares, producing around 70 million tonnes with an average productivity of 908 kg/ha (FAO & Agriculture Organization, 2012) [4].

India is the largest producer and consumer of pulses, with about 35 million hectares under pulse cultivation (Directorate of Pulses Development). As per UPAG, the total pulse production in India for FY 2024 was 244.93 lakh tonnes. Uttar Pradesh (U.P.) ranks third in gram (chickpea) production after Madhya Pradesh and Rajasthan. U.P. has 2.31 million hectares under pulses, producing 1.71 million tonnes, with a productivity of 742 kg/ha (Directorate of Economics and Statistics, Department of Agriculture and Cooperation, 2013-14). The major pulses grown in U.P. are pigeon pea, chickpea, green gram, and black gram, which together contribute 76% of the state's total pulse production. Of these, 90% of the pigeon pea, 65% of the chickpea, and 37% of the lentil area fall within India's pulse-growing regions. Despite being the world's largest producer of pulses, India imports 3-4 million tonnes annually. The area under pulse cultivation remains lower compared to other crops. The per capita availability of pulses declined from 61.0 grams per day in 1991 to 32.0 grams in 2010, whereas the minimum dietary requirement is 70 grams per capita per day. To address this, the International Year of Pulses - 2016 was declared by the FAO to promote pulse production and sustainability. Bengal gram (chickpea) is cultivated on approximately 15 million hectares, with a production of over 18.1 million tonnes during 2022-23 (Statista, 2023) [14]. India is the largest producer of chickpea globally, producing 13.75 million tonnes from an average of 10.91 million hectares, with a productivity of 1,012 kg/ha (2022-23).

However, India ranks eighth in chickpea productivity, with Ethiopia leading at 2,072 kg/ha. Chickpea contributes nearly 50% of India's pulse production. The major producing states are Maharashtra (2.63 million hectares), Madhya Pradesh 12.346 million ha., Rajsthan 1.938 million ha and Uttar Pradesh 0.682 million ha. India imports around 8-9 lakh tones of Bengal gram annually from Canada, Australia to meet domestic demand.

Research Methodology

The present investigation was based on an intensive study of sample holdings (chickpea growers) in Ballia district of Uttar Pradesh, located in the Indo-Gangetic Plains. District Ballia was purposively selected for this study. The technique adopted for the selection of samples was multistage stratified sampling, with tehsil as the primary unit, village as the secondary unit, and farm holding as the ultimate sampling unit. Out of the six tehsils in the district, three tehsils—Ballia, Bairia, and Bansdih—were selected randomly. Subsequently, three villages from each selected tehsil were also selected randomly, resulting in a total of nine villages for the present study. A list of chickpea growers was then prepared for the selected villages in each chosen tehsil. The growers were categorized into three farm size groups: Small (1-2 ha), Medium (2-4 ha) and Large (above 4 ha). Final sampling from each village was done proportionally based on the size group distribution. The number of cases selected for the study is presented in Table No. 01.

Primary data related to inputs, outputs, and other relevant information was collected from the selected farm holdings using pre-structured schedules and questionnaires through the personal interview method.

Table 1: Case selected under different farm size group under different tehsils.

Farm	Tehsils					
	Ballia		Bairia		Bansdih	
	Total	Case	Total	Case	Total	Case
Small	100	30	65	25	83	32
Medium	32	12	38	16	50	16
Large	10	4	12	5	15	6
Overall	142	46	115	46	148	54

Results and Discussion

Both variable cost and fixed cost are included in production of a crop. The variable cost is such cost which changes with change in production like cost of seed, manure and fertilizer, human labour, bullock labour and irrigation cost. The fixed cost includes such cost which does not change with change in production for example, depreciation, repair and interest on implements and machines, farm building and revenue etc.

Variable cost per hectare

In table No.2, It was estimated that the overall average variable cost of gram is Rs. 22836 per hectare from different farm size, it came to Rs. 25579in small, Rs. 22276 in medium and Rs. 20652 in large size groups. It indicates that the cost of cultivation per hectare is more on small farms than on medium and large farms. It is because of that the human labour cost is higher on small farms than on medium and large farms.

In Table-02, the cost of fertilizers and plant protection measures were higher on large farms than on medium and small farms. The cost of machines is also higher on small than medium and large farms. It may be due to use of machine for ploughing, thresing etc. while large farmers have their own machineries as tractors, cultivator, threshing machine, drone and other agricultural implements.

Table 2: Items wise variable cost per hectare on different farm size groups (in Rs.)

Items	Small		Medium		Large Cost		Overall	
	Cost	%	Cost	%	Cost	%	Cost	%
Human labour	9632	37.65	5390	24.19	4801	23.24	6607	28.93
Machine Charge	5938	23.21	4000	17.95	3800	18.39	4579	20.05
Seeds	6805	26.60	8998	40.39	8000	38.73	7934	30.76
Fertilizers	2308	9.02	2164	9.71	2022	9.79	2165	9.98
Plant porotection Chemical	460	0.01	1224	5.49	1430	6.92	3114	11.63
Others	435	1.70	498	2.24	598	2.82	510	2.03
Total	25579	100	22276	100	20652	100	22836	100

Fixed cost per hectare

Table No.3 reveals that in gram the fixed cost per hectare overall average came to Rs. 1074. In case of different farm size, it came to Rs. 1441in small, Rs. 1111in medium and Rs. 2010 in large size group. It indicates that the fined cost per hectare is more on small farm than on medium large farms.

Table 3: Fixed cost per hectare under different farm size group (in Rs.)

Items	Small		Medium		Large		Overall	
	Cost	%	Cost	%	Cost	%	Cost	%
Depreciation	690	47.88	520	46.36	389	38.57	533	49.64
Interest	550	38.19	430	38.73	480	47.58	374	34.82
Repair	200	13.93	160	14.40	140	0.98	167	15.57
Overall	1441	100	1111	100	2010	100	1074	200

Table 4: Cost Components of Chickpea Cultivation across Farm Size Groups

S. No.	Size of group	Variable cost (Rs./ha)	Fixed cost (Rs./ha)	Cost of cultivation (Rs./ha)
1	Small	25579	1441	27020
2	Medium	22276	1111	23388
3	Large	20652	1010	21663
4	Overall	22836	1074	23910

Table 4 reveals that in case of chickpea, the overall total cost of cultivation came to Rs. 23910. Table further indicates that total cost of cultivation was minimum on large farms due to more area devoted for chickpea. The cost of cultivation per hectare in different farms size groups, it came to Rs. 25579, Rs. 22276and Rs. 20652on small, medium and large size group respectively. The cost of

cultivation increase with increase in farm size due to higher variable cost on small farms than on medium and large farms. It was due to hired use of resources by small farms. However, the fined cost per hectare is also more on small farms than medium and large farms.

Table 5: Production of chickpea per hectare (in Rs.)

S. No.	Farm size	No. of farmers	Total are in ha.	Total production	Production per hectare
1	Small	87	106.36	1951.70	18.35
2	Medium	44	123.90	2226.48	17.97
3	Large	15	215.08	3456.33	16.07
4	Overall	146	445.34	7634.51	17.46

Return on farm from cultivation of chickpea

I. Production of chickpea: Table 5 shows that the overall average yield of chickpea per hectare on the farms came to 17.46 quintals and it is being 18.35 quintals, 17.97 quintals, 1607 quintals on small, medium and large size farm respectively. The yield of chickpea was higher on small size field groups.

II. Income per hectare

It is clear from table 6 that the gross income, total cost of cultivation, net income and input-output ratio per hectares in chickpea on different farm size group. Table reveals that the gross income per hectare on small, medium and large size group come to Rs. 76656, hect. Rs. 78142, Rs. 69132 respectively while the overall average value per hectare came to Rs. 74738 It is highest in small farm compared to medium and large farm due to highest yield of gram per hectare on small farms. The overall average input-output from chickpea came to 1:1.43 while it is 1:1.36, 1:1.68 and 1:1.33 on small, medium and large farm size groups respectively. it is highest on medium farms. The return per rupees of investment came more on medium farm.

Table 06: Net income per hectare under different farm size groups (in Rs.)

S. No.	Farm size	Gross income	Total cost of cultivation	Net input per ha	Input-output ratio
1	Small	76656	27020	49636	1:1.35
2	Medium	78142	23388	54754	1:1.58
3	Large	69132	21663	47469	1:1.33
4	Overall	74738	23910	50827	1:1.43

Farm business income per hectare

It includes the net income, value of unpaid family labour and interest on owned field capital and it was estimated and shown in table-7. The table shows that the value of unpaid family labour on small, medium and large size group came to Rs. 2000, Rs. 1600, Rs. 1200 respectively while it was being Rs. 1600 as overall average. The farm business income per hectare overall average came to Rs. 53086. It is being Rs. 52521, Rs. 57127, Rs. 48989 on small, medium and large size group respectively. The farm business income per hectare is lowest on large farm. It is because of less use of family labour on large farm.

Table 7: Farm Business Income per hectare in different farm size groups (in Rs.)

S. No.	Farm size	Net income per hectare	Value of unpaid family labour	Interest owned fined capital	Farm Business income (FBI)
1	Small	44963	2000	885	52521
2	Medium	54754	1600	773	57127
3	Large	47969	1200	320	48989
4	Overall	50827	1600	659	53086

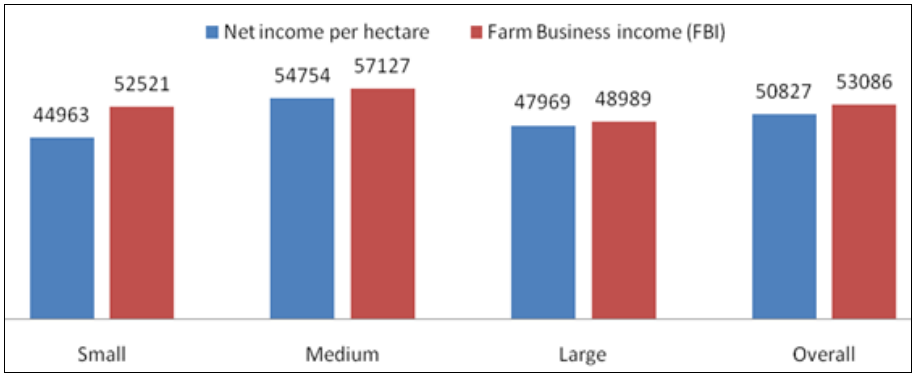

Fig 1: Performance on Net &Farm income in respect to farm size

Conclusion

The present study on the economics of chickpea cultivation in Ballia district of Uttar Pradesh highlights significant variations in cost, productivity, and profitability across different farm size groups. The findings reveal that the total cost of cultivation per hectare decreases with the increase in farm size**,** primarily due to the efficient use of resources and reduced dependency on hired inputs on medium and large farms. However, gross income per hectare was found to be highest on small farms**,** driven by better yields attributed to intensive care and higher labour use. Despite this, thereturn per rupee of investment (input-output ratio) was maximum on medium farms (1:1.58)**,** indicating that medium-sized farms were the most economically efficient among all categories.

In terms of profitability, net income and farm business income per hectare were also highest on medium farms, underscoring their superior performance in utilizing both owned and hired resources effectively. Small farms incurred higher variable and fixed costs, particularly on human

labour and machinery, while large farms benefited from scale but had relatively lower productivity and less utilization of family labour. Thus, the study concludes that medium-sized farms strike the best balance between resource use and returns**,** making them the most profitable and resource-efficient unit for chickpea cultivation in the Indo-Gangetic Plains.

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