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Assessing the constraints in groundnut cultivation using the Friedman test: A case study in Hardoi district, Uttar Pradesh

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Abstract

The average cost of cultivating groundnuts per hectare is Rs.50315.45, with marginal farms paying the highest costs. The highest costs are for irrigation, labor, and tractors, with irrigation being the most expensive. Tractor fees, manures, fertilizers, seed, and other expenses account for 7.48, 6.74, 11.56, and 7.30 percent of total costs. Family labor negatively correlates with farm size growth. Medium farms report the highest gross income, followed by small and marginal farms. Farmer polls reveal several agricultural limitations, including uncertainty in market prices after harvesting; grazing animal problems, lack of irrigation facilities, high labor wages, and transport problems.

Keywords: Cost and return, Friedman's test, gross income

Introduction

Groundnut (*Arachis hypogaea*), is a major oilseed crop in India, ranking first in terms of area and second in terms of production after soybean. China leads the world in groundnut production with 17.57 million tonnes, followed by India with 6.73 million tonnes, Nigeria with 4.45 lakh tonnes, Sudan with 2.83 million tonnes, and the United States with 2.49 million tonnes, accounting for 36.01, 13.79, 9.12, 5.80, and 5.11 percent of total global production of 48.80 million tonnes in 2019-20. According to the second advance projections 2022-23, the Government of India groundnut production is anticipated to be 85.82 lakh tonnes, up from 84.34 lakh tonnes in 2021-22. Source: www.agricoop.gov.in

Gujarat is leading in groundnut production with 36.76 lakh tonnes followed by Rajasthan (18.95 lakh tonnes), Madhya Pradesh (9.61 lakh tonnes), Tamil Nadu (4.47 lakh tonnes), Karnataka (2.57 lakh tonnes) and Telangana (0.10 lakh tonnes). (4.62 lakh ha). They are strong in proteins, healthy fats, vitamins, and minerals, making them both a required food source and a valuable cash crop. Groundnuts are processed into a variety of products including oil, butter, flour, and snacks. To make one liter of groundnut oil, 2.5 kg of groundnuts are needed. Approximately Rs. 90 per kg is spent on the purchase and processing of the groundnut. In U.P. Groundnut Production 1.00 lac tonnes, and 0.88 lac tonnes during 2018-19 and 2019-20 respectively. For selection of samples farmers, two districts (Mainpuri and Etah) were selected.

Hardoi is also a standing groundnut -producing district in Uttar Pradesh. The district's wheat area was reported to be 7300 hectares in 2019-20, with a production of 70010 q/ha. The yield per hectare was 9.59 q/ha. Wheat productivity in Hardoi district is significantly lower than national productivity, indicating that there is still room to improve this input output ratio's productivity in the district.

Material and Methods

Data collection

This empirical investigation of resource use efficiency has made extensive use of primary data. The schedules that have been pre-structured and pre-tested have been used to gather the farmers from the community. The population sample was drawn using a multi-stage stratified random sampling technique. By selecting the Hardoi district on purpose, the sampling process has begun.

First, a list of each of the 19 blocks in Hardoi district of Uttar Pradesh was created, along with an average ranking for groundnut farming. Two Block Kothawan & Kachhauna which has the most groundnut-growing land, was specifically chosen for this investigation. Thereafter, a list of all the villages in the Kothawan & Kachhauna Block was created and placed in ascending order of the area planted with crops. From these lists a sample of 100 respondents were drawn following the proportionate allocation to the different categories. Under marginal farmers category 54, small farmers 35 and medium farmers 11 have occurred out of hundred samples.

Period of Enquiry

The data pertained to agriculture year 2023-2024 estimation of costs and returns

Cost A1: It includes costs and kind expenses actually incurred by cultivators which are as follows:

- Wage of hired human labour
- Charges for bullock labour

$$\chi^2 r_1 = \frac{12}{Nn(n+1)} \times \sum R_1^2 - 3N(n+1) \text{ at } df = n - 1$$

Where,

N= Number of respondent.

n= Number of constraints

$$\sum R_1^2 = \text{row rank summed up in each column squared and then added}$$

Results and Discussion

Structure of costs and income

For the data analysis, various cost concepts such as cost A1, A2, B1, B2, C1 and C2 were explored. Similarly, for the sample farms, several income measures such as gross income, net income, farm business income, family labour income, and farm investment income were determined. The expenses of producing groundnut and the input: output relationship have also been calculated using other costs.

Economics of Groundnut

The per hectare cost on various input factors in groundnut production was worked out and its details presented in the Table 1. This Table indicated that on an average per hectare cost of cultivation of groundnut was found Rs.50315.45 The cost of cultivation was experiential on marginal farm (Rs.49295.92) followed by small farm (Rs.51083.74) and medium farm

- Hired labour charges of implements and machinery
- Cost incurred on manures and fertilizers
- Seeds
- Plant protection / intercultural chemicals
- Irrigation charges
- Land revenue
- Depreciation, and
- Repair charges on farm assets.
- **Cost A2:** Cost A1 + Rent paid for leased in land.
- **Cost B1:** Cost A2 + Interest on owned fixed capital assets.
- **Cost B2:** Cost B1 + Rental value of owned land.
- **Cost C1:** Cost B1 + Imputed value of family labour.
- **Cost C2:** Cost B2 + Imputed value of family labour.
- **Cost C3:** Cost C2 + 10% of cost C2 (managerial cost)
- **Gross Income** = Value of total output.
- **Net Income** = It is computed by deducting cost C3 from gross income.

Analytical Tools Friedman's Test

The responses to these constraints were recorded on a three point continuum of 'most severe, severe and not severe' with the respective weightage of 3, 2 and 1. Plausible constraints were selected on the basis of primary data as per the schedule prepared, reconnaissance was also done in the study locale. Nonparametric test i.e. Friedman two-way ANOVA by ranks test, as elucidated by (Tripathi, 2014) was also used. To identify the most severe constraints among the six broad constraints faced by oilseeds farmers by using the following formula:

(Rs.52875.84).

The total cost on marginal farm was maximum due to heavy outflow on irrigation and human labour. The study further open that in case of small farm, cost incurred on irrigation was (6.18 percent) followed by human labour (23.62 percent) and medium farm cost incurred on irrigation (6.96 percent) and tractor charge (7.60 percent).

The further distribution of the costs on overall farm average showed the maximum expenditure on irrigation i.e. (6.43 percent) followed by human labour charge (23.47 percent). The expenditure on overall, tractors charges, manures and fertilizers, seed, plant protection, to 7.48, 6.74, 11.56, and 7.30 percent, respectively. of the total costs of cultivation. It was observed that hired labour, machinery charge, seeds, manure & fertilizers, irrigation showed positive relationship with the increase in the farm size while family labour showed the negative relationship with increase the farm size.

Table 1: Per hectare costs of different inputs used in Groundnut production (Rs.)

S. No.	Particulars	Size Group of Farms			Overall Average
		Marginal	Small	Medium	
1	Human Labour	11644.99 (23.62)	11952.81 (23.40)	12138.56 (22.96)	11807.02 (23.47)
	a. Family Labour	7064.35 (14.33)	6684.86 (13.09)	6267.92 (11.86)	6843.92 (13.60)
	b. Hired Labour	4580.64 (9.29)	5267.95 (10.31)	5870.64 (11.10)	4963.10 (9.86)
2	Machinery Charges/ Tractor Charges	3680.52 (7.47)	3810.22 (7.46)	4020.92 (7.60)	3763.36 (7.48)
3	Seed Cost	5692.42 (11.55)	5858.64 (11.47)	6290.96 (11.90)	5816.44 (11.56)
4	Manures and Fertilizers	3268.47 (6.63)	3496.47 (6.84)	3680.62 (6.96)	3393.61 (6.74)
5	Irrigation	3046.28 (6.18)	3390.85 (6.64)	3680.86 (6.96)	3236.68 (6.43)
6	Plant Protection	3480.96 (7.06)	3844.00 (7.52)	4080.86 (7.72)	3674.01 (7.30)
7	Total working capital	30813.64 (62.51)	32352.99 (63.33)	33892.78 (64.10)	31691.12 (62.98)
8	Interest on working capital @ 4%	1232.55 (2.50)	1294.12 (2.53)	1355.71 (2.56)	1267.64 (2.52)
9	Rental value of owned land	12000.00 (24.34)	12000.00 (23.49)	12000.00 (22.69)	12000.00 (23.85)
10	Interest on fixed capital	768.29 (1.56)	792.65 (1.94)	820.45 (2.00)	782.5536 (1.91)
11	Sub-Total	44814.48 (90.91)	46439.76 (90.91)	48068.94 (90.91)	45741.32 (90.91)
12	Marginal Cost @ 10% of sub-total	4481.45 (9.09)	4643.97 (9.09)	4806.89 (9.09)	4574.13 (9.09)
	Grand Total	49295.92 (100)	51083.74 (100)	52875.84 (100)	50315.45 (100)

(Figure in parenthesis indicate percentage to the total cost)

4.2. Measures of costs and returns of groundnut cultivation in study area

The costs and income per hectare from the cultivation of groundnut crop on different categories of farms were worked out and presented in The Table 2. revealed that, on average cost A/A₂, cost B₁ cost B₂, cost C₁, C₂, and C₃, came to Rs.26114.84 Rs.26897.40, Rs.38897.40, Rs.33741.32, Rs45741.32 and 50315.45 respectively. On an average, gross income was recorded Rs.96729.50 and net income came to Rs.46414.05 On medium farms, gross income was highest, which was recorded Rs.103588.00, followed by small farms Rs.98310.00, and marginal farms Rs.94308.00, respectively.

The net income was highest on small farms Rs.47226.26, followed by medium Rs.50712.16, and lowest marginal Rs.45012.08 On an average family labour income, farm

investment income and farm business income were observed to Rs.57832.10, Rs.70614.66 and 65651.56, respectively. Family labour income was highest on marginal farms followed by small and medium farms & farm investment income was highest on medium farms followed by small and marginal farms and farm business income was highest on marginal farms followed by small farms and medium farms. On an average, cost of production per quintal and yield per hectare were estimated to Rs.3017.62 and 16.68 quintal, respectively.

On an average input output ratio the basis costs A1/A2, B1, B2, C1, and C2 were recorded 1:3.71, 1:3.60, 1:2.49, 1:2.87 and 1:2.11, respectively. On the basis of cost C₂ input output ratio was highest on marginal farms (1:1.91) followed by small (1:1.92) and medium (1:1.96), respectively.

Table 2: Measures of per- hectare cost and profits of Groundnut (Rs.)

Sl. No.	Particulars	Size group of farms			Overall Average
		Marginal	Small	Medium	
1	Cost A1/A2	24981.84	26962.25	28980.57	26114.84
2	Cost B1	25750.13	27754.90	29801.02	26897.40
3	Cost B2	37750.13	39754.90	41801.02	38897.40
4	Cost C1	32814.48	34439.76	36068.94	33741.32
5	Cost C2	44814.48	46439.76	48068.94	45741.32
6	Cost C3	49295.92	51083.74	52875.84	50315.45
7	Yield (qtl/ha.)	16.26	16.95	17.86	16.68
8	Gross Income	94308.00	98310.00	103588.00	96729.50
9	Net Income	45012.08	47226.26	50712.16	46414.05
10	Family Labour Income	56557.87	58555.10	61786.98	57832.10
12	Farm Business Income	69326.16	71347.75	74607.43	70614.66
12	Farm Investment Income	64745.52	66079.80	68736.79	65651.56

13	Cost of production (Rs/Qtl.)	3031.73	3013.79	2960.57	3017.62
14	Input - Output Ratio				
a.	On the basis of Cost A1	1:3.78	1:3.65	1:3.57	1:3.71
b.	On the basis of Cost B1	1:3.66	1:3.54	1:3.48	1:3.60
c.	On the basis of Cost B2	1:2.50	1:2.47	1:2.48	1:2.49
d.	On the basis of Cost C1	1:2.87	1:2.85	1:2.87	1:2.87
e.	On the basis of Cost C2	1:2.10	1:2.12	1:2.15	1:2.11
f.	On the basis of Cost C3	1:1.91	1:1.92	1:1.96	1:1.92

Constraints Production in groundnut.

The groundnut growers faced various types of cost of cultivation problems in the study area. It is presented in Table 3. shows the major constraints an examination of several agricultural restrictions graded by severity, based on a survey of farmers' perceptions. "Uncertain market price after harvesting" is the top ranked concern, with a mean score of 0.700 and an overall rating of I, designating it as the most significant condition. "Problem with grazing animals" ranks second with a mean score of 0.699. "Lack of irrigation facilities" is placed third with a mean score of 0.696, while "High labour wages at harvesting" and "Lack of

storage facility after harvesting" are ranked fourth and fifth, with mean scores of 0.68 and 0.672, respectively. Another significant restraint is the high expense of insecticides, pesticides, and weedicides (rank VII, mean score 0.66). & transit issues (rank VIII, average score 0.65). In contrast, "Application of improper dose of fertilizers and micronutrients" (rank XV) and "Lack of awareness about new technology" (rank XIV) are considered less severe, with mean scores of 0.600 and 0.61, respectively. This detailed ranking aids in identifying critical areas that require intervention to assist farmers.

Table 3: Major constraints faced by the groundnut growers in the study area

Constraints	Not Serious (%)	Serious (%)	Most Serious (%)	Mean (\bar{X})	Friedman Mean Score	Overall Rank
Non-availability of inputs	29.32	32.63	38.05	0.62	7.76	XII
Application of improper dose of fertilizers and micronutrient	26.32	48.63	25.05	0.600	7.61	XV
Unavailability of quality seed timely	32.32	40.34	27.34	0.645	7.96	IX
Lack of knowledge about soil treatment	14.04	48.34	37.62	0.64	7.91	X
High cost of HYV/quality seeds	32.54	28.32	39.14	0.63	7.84	XI
High cost of agricultural equipment	32.45	46.83	20.72	0.67	8.14	VI
High cost of insecticide, pesticide, weedicide	20.34	47.31	32.35	0.66	8.06	VII
Lack of irrigation facilities	52.34	36.32	11.34	0.696	8.28	III
Uncertain market price after harvesting	24.39	56.37	19.24	0.700	8.36	I
Lack of storage facility after harvesting	30.34	45.33	24.33	0.672	8.15	V
High wages of labour at harvesting	62.36	21.42	16.22	0.68	8.21	IV
Transportation problem	46.32	37.42	16.26	0.65	7.98	VII
Lack of family support in adopting technology	44.28	28.36	27.36	0.62	7.74	XIII
Problem of grazing animals	16.62	54.23	29.15	0.699	8.29	II
Lack of awareness about new technology	55.25	34.52	10.23	0.61	7.68	XIV

Conclusions

The average cost of cultivating groundnuts per hectare was Rs.50315.45, with marginal farms paying the highest costs. The highest costs were for irrigation, labour, and tractors. The highest percentage was spent on irrigation, followed by human labor expenses. Tractor fees, manures, fertilizers, seed, and other expenses accounted for 7.48, 6.74, 11.56, and 7.30 percent of total costs. Family labor negatively correlated with farm size growth. The study calculates groundnut crop cultivation costs and income per hectare for different farm categories. The average costs are Rs.26114.84, Rs.26897.40, Rs.38897.40, Rs.33741.32, Rs.45741.32, and Rs.50315.45, respectively. The highest gross income is reported on medium farms, followed by small and marginal farms. Family labor income, farm investment income, and farm business income are also found. The yield per hectare and production cost per quintal are calculated. A farmer poll reveals several agricultural limitations, with uncertainty in market prices after harvesting being the most severe issue. Other issues include grazing animal problems, lack of irrigation facilities, high labor wages, and storage facilities. The high cost of weed killers, insecticides, and pesticides and transport problems are also significant constraints. Improper fertilizer and micronutrient application and lack of knowledge about new technology are less serious issues.

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