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RESEARCH PAPER

Evaluation of Cost, Returns, and Constraints in Ridge Gourd Cultivation: A Friedman Test Analysis in Hardoi District, Uttar Pradesh

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Abstract

The study reveals that ridge gourd production costs vary significantly, with human labour being the most significant cost. Medium-sized farms have higher yields, gross incomes, and net profits, while marginal farms have the lowest. However, marginal farms are more efficient in input utilization. Ridge gourd cultivation is profitable across all farm sizes, with an average net income of Rs. 78,244 per hectare. However, growers face constraints such as unstable market value, high input costs, pest and disease management, market fluctuations, transportation issues, high seed costs, and lack of knowledge and training.

KEYWORDS:
Output Ratio, Cost and Returns, Friedman

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Introduction

Ridge gourd, (Luffa acutangula L.) also known as ribbed gourd or angled luffa, is a popular vegetable crop that belongs to the Cucurbitaceae family. It is widely cultivated throughout India, both commercially and in home gardens, for its immature fruits which are used as a cooked vegetable. the origin of ridge gourd is not known, but it is believed to be native to South Asia or Africa. It is commonly grown across India. Ridge gourd thrives in warm, humid climates with temperatures between 25-35°C. It prefers well-drained, fertile sandy loam soils with a pH between 6.0-7.0. Several high-yielding ridge gourd varieties have been developed, including Arka Sumeet, Arka Sujat, Pusa Nasdar, CO 1, and Green Gold. These varieties can produce fruits in 45-90 days and yields of 10-30 tons per hectare. Ridge gourd is typically grown using a trellis or bower system to support the vines. Proper soil preparation, seed treatment, irrigation, and fertilization are important for

achieving good yields. The immature ridge gourd fruits are used as a cooked vegetable, providing dietary fiber, vitamins, and minerals. The mature dried fruits can also be used as a natural sponge or scrubber. Ridge gourd is valued for its medicinal properties as well. Uttar Pradesh occupies the second place in area, accounting for about 12.1% of total vegetable production during 2012-13.the production of ridge gourd in Uttar Pradesh was 427.81 tonnes for the year 2020-21.Uttar Pradesh is a significant producer of ridge gourd, ranking second in area under vegetable cultivation and contributing over 400 tonnes to the state's annual ridge gourd production. Hardoi district is located in the Central Zone of Uttar Pradesh, which had an average ridge gourd production of 10.55 metric tons per hectare in 2018-19.Uttar Pradesh Horticulture Department, the district-wise production of ridge gourd (turai) in Hardoi district for the year 2019-20 was 805.4 metric tons.

Material and Methods:

The collection of primary data was done on different factors with the help of the survey method for the agricultural season of 2023–2024. A total of 100 ridge gourd (turai) farmers from 10 villages were selected from one blocks, namely Kothawan. from Hardoi District. The farmers were classified into the following land size groups i.e.

- Marginal (below 1 ha),
- Small (1-2ha),
- Medium (2-4ha).

To work out the cost of cultivation, the standard method was adopted, which includes costs A A/A_2, cost B_1 cost B_2, cost C_1. C_2 and C_3. Income measures including farm business income, family labor income, net income, farm investment income, and B-C ratio were calculated with the help of their respective formulas.

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 (Verma, 2024) was also used. To identify the most severe constraints among the six broad constraints faced by Ridge gourd (turai) farmers by using the following formula:

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

Where,

N= Number of respondent.

n= Number of constraints

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

Results and Discussion:

Economics of Ridge gourd (turai):

Costs and returns of Ridge gourd (turai) per hectare on sample farms have been worked out and presented in this section. The different cost concepts were used for ridge gourd (turai)

Inputs:

For inputs estimates, the various factors which enters into cost have been considered such as human labour (both family and hired), machinery charges, seed, manures & fertilizer, irrigation, plant protection, interest on working capital, rental value of land, interest on fixed capital and 10% covered managerial cost against C2.

production. Per hectare output was estimated and valued as gross income, net income, and family labour income. Thus, measures of farm profits were represented as farm business income.

Cost of cultivation of Ridge gourd (turai):

Per hectare costs on various input factors in Ridge gourd (turai) production were worked out. The details of input costs are shown in Table 4.1.1

The analysis of per hectare costs for ridge gourd production across different farm sizes reveals significant variations in input expenses. Human

labour was the most substantial cost, averaging Rs. 14,249.23 per hectare, constituting 23.02% of the total expenditure, with family labour costs being highest for marginal farms. Machinery charges and seed costs showed a gradual increase with farm size, averaging Rs. 3,956.36 (6.39%) and Rs. 5,840.44 (9.43%) per hectare, respectively. Manures and fertilizers averaged Rs. 5,265.81 (8.51%), while irrigation costs were Rs. 4,747.68 (7.67%) per hectare. Plant protection expenses were the lowest, averaging Rs. 4,182.01 (6.76%). Total working capital averaged Rs. 38,241.53 (61.78%), and the interest on this capital was Rs. 1,529.66 (2.47%). The consistent rental value of owned land was Rs. 15,000.00 (24.23%), and the interest on fixed capital averaged Rs. 1,505.02 (2.43%). The overall grand total cost per hectare was Rs. 61,903.84, highlighting the significant cost burden on ridge gourd growers and the need for efficient cost management to enhance profitability.

Table 4.1.1.Per hectare costs of different inputs used in Ridge gourd production (Rs.)

S. No.	Particulars	Size Group of Farms			
		Marginal (56)	**Small (28)**	**Medium (16)**	**Over all Average**
1	Human Labour	14105.01 (23.17)	14380.81 (22.90)	14538.56 (22.62)	14249.23 (23.02)
	a. Family Labour	8624.37 (14.17)	8084.86 (12.88)	7667.92 (11.93)	8330.33 (13.46)
	b. Hired Labour	5480.64 (9.00)	6295.95 (10.03)	6870.64 (10.69)	5918.90 (9.56)
2	Machinery Charges/ Tractor Charges	3880.52 (6.38)	3990.22 (6.36)	4220.92 (6.57)	3956.36 (6.39)
3	Seed Cost	5692.42 (9.35)	5958.64 (9.50)	6190.96 (9.63)	5840.44 (9.43)
4	Manures and Fertilizers	5068.47 (8.33)	5496.47 (8.76)	5500.62 (8.56)	5265.81 (8.51)
5	Irrigation	4546.28 (7.47)	4890.85 (7.79)	5280.86 (8.21)	4747.68 (7.67)
6	Plant Protection	4080.96 (6.70)	4244.00 (6.76)	4480.86 (6.97)	4182.01 (6.76)
7	**Total working capital**	**37373.66 (61.40)**	**38960.99 (62.09)**	**40212.78 (62.55)**	**38241.53 (61.78)**
8	Interest on working capital @ 4%	1494.95 (2.46)	1558.44 (2.48)	1608.51 (2.50)	1529.66 (2.47)
9	Rental value of owned land	15000.00 (24.64)	15000.00 (23.90)	15000.00 (23.33)	15000.00 (24.23)
10	Interest on fixed capital	1468.29 (2.41)	1525.36 (2.43)	1620.65 (2.52)	1505.02 (2.43)
11	**Sub-Total**	**55336.90 (90.91)**	**57044.79 (90.91)**	**58441.94 (90.91)**	**56276.21 (90.91)**
12	Marginal Cost @ 10% of sub-total	5533.69 (9.09)	5704.48 (9.09)	5844.19 (9.09)	5627.62 (9.09)
	Grand Total	**60870.59 (100.)**	**62749.27 (100.)**	**64286.14 (100.)**	**61903.84 (100.)**

(Figure in parenthesis indicate percentage to the total cost)

4.1.2. Measures of costs and returns of Ridge gourd (turai) crop in study area:

The Table 4.1.2 revealed that, on average Cost A1/A2, Cost B1, Cost B2, Cost C1, Cost C2, and Cost C3. Marginal farms incurred the lowest overall costs across all categories, with Cost A1/A2 at Rs.30,244.24 and Cost C3 at Rs.60,870.59. Small and medium farms had higher costs, with medium farms having the highest expenses, particularly in Cost C3 at Rs.64,286.14. The overall average costs show a consistent increase from Cost A1/A2 (Rs.31,482.99) to Cost C3 (Rs. 61,943.11), indicating a significant investment in inputs and labor as the farm size increases.

Yield per hectare was highest in medium farms (67.16 qtl/ha), followed by small (64.28 qtl/ha) and marginal farms (62.46 qtl/ha), with an overall average yield of 63.72 qtl/ha. Gross income followed a similar pattern, with medium farms generating the highest gross income (Rs. 147,752.00), while marginal farms generated the lowest (Rs. 137,412.00). The overall average gross income was Rs. 140,187.52.

Net income, which is a crucial indicator of profitability, was highest for medium farms (Rs. 83,465.86) and lowest for marginal farms (Rs. 76,541.41), with an overall average net income of Rs. 78,244.41. Family labour income, reflecting the returns to family labor after accounting for all costs, showed a similar trend, with medium farms at Rs. 96,977.98, small farms at Rs. 92,456.07, and marginal farms at Rs. 90,699.47, averaging Rs. 92,195.88 across all farms.

Farm business income, which excludes family labor costs, was highest for medium farms (Rs. 113,598.63) and lowest for marginal farms (Rs. 107,167.76), with an overall average of Rs. 108,704.53. Farm investment income, indicating returns after considering interest on fixed capital, was highest for medium farms (Rs. 106,727.99) and lowest for marginal farms (Rs. 101,687.12), with an overall average of Rs. 102,773.20.

The cost of production per quintal was slightly higher for marginal farms (Rs. 974.55) compared to small (Rs. 976.19) and medium farms (Rs. 957.21), with an overall average of Rs. 972.24. The input-output ratio, which measures the return per unit cost, varied across farm sizes. Marginal farms had the highest ratios for Cost A1 (1:4.54) and Cost B1 (1:4.33), indicating better efficiency in utilizing inputs. However, the input-output ratios generally declined when calculated based on Cost B2, C1, C2, and C3, reflecting the increasing complexity and higher costs associated with larger farm operations. The overall average input-output ratios were relatively stable across different cost bases, indicating consistent returns on investment.

Table: 4.1.2 Measures of per- hectare cost and profits of Ridge gourd (turai) (Rs.)

S. No.		Size group of farms			
	Particulars	**Marginal**	**Small**	**Medium**	**Overall Average**
1	**Cost A1/A2**	30244.24	32434.57	34153.37	31482.99
2	**Cost B1**	31712.53	33959.93	35774.02	32991.64
3	**Cost B2**	46712.53	48959.93	50774.02	47991.64
4	**Cost C1**	40336.90	42044.79	43441.94	41311.91
5	**Cost C2**	55336.90	57044.79	58441.94	56311.91
6	**Cost C3**	60870.59	62749.27	64286.14	61943.11
7	**Yield (qtl/ha.)**	62.46	64.28	67.16	63.72
8	**Gross Income**	137412.00	141416.00	147752.00	140187.52
9	**Net Income**	76541.41	78666.73	83465.86	78244.41
10	**Family Labour Income**	90699.47	92456.07	96977.98	92195.88
12	**Farm Business Income**	107167.76	108981.43	113598.63	108704.53
12	**Farm Investment Income**	101687.12	102685.48	106727.99	102773.20

13	**Cost of production (Rs./Qtl.)**	974.55	976.19	957.21	972.24
14	**Input - Output Ratio**				
a.	**On the basis of Cost A1**	1:4.54	1:4.36	1:4.33	1:4.46
b.	**On the basis of Cost B1**	1:4.33	1:4.16	1:4.13	1:4.25
c.	**On the basis of Cost B2**	1:2.94	1:2.89	1:2.91	1:2.92
d.	**On the basis of Cost C1**	1:3.41	1:3.36	1:3.40	1:3.39
e.	**On the basis of Cost C2**	1:2.48	1:2.48	1:2.53	1:2.49
f.	**On the basis of Cost C3**	1:2.26	1:2.25	1:2.30	1:2.26

Constraints Production in Ridge gourd (turai):

The table 4.1.3 study reveals several significant constraints faced by ridge gourd growers in the study area. The most critical constraint is the unstable market value after harvest, with a mean score of 0.712 and the highest Friedman Mean Score of 8.36, indicating severe financial risk due to price volatility. High input costs follow closely, with a mean score of 0.645 and a Friedman Mean Score of 8.26, reflecting the substantial financial burden on farmers. Irrigation and water availability, ranked third, with a mean score of 0.696 and a Friedman Mean Score of 8.25, highlights the challenges of ensuring consistent water supply. Pest and disease management and post-harvest losses also emerged as significant concerns, with mean scores of 0.688 and 0.676, and Friedman Mean Scores of 8.21 and 8.14, respectively. These constraints underline the need for effective pest control measures and better post-harvest handling practices. Additionally, market fluctuations, transportation problems, high cost of quality seeds, unavailability of chemicals, and lack of knowledge and training were identified as key issues, each contributing to the overall challenges faced by the farmers. The findings underscore the multifaceted nature of the constraints impacting ridge gourd cultivation, necessitating comprehensive and targeted interventions.

Table 4.1.3 Major constraints faced by the Ridge gourd (turai) growers in the study area

Constraints	Not Serious (%)	Serious (%)	Most Serious (%)	Mean ($\underline{X}$)	Friedman Mean Score	Overall Rank
Knowledge and Training	26.32	48.63	25.05	0.624	7.19	x
High input cost	32.34	41.34	26.32	0.645	8.26	ii
Unavailability of chemicals	15.07	47.34	37.59	0.649	7.91	ix
High cost of HYV/quality seeds	30.54	27.32	42.14	0.723	7.94	viii
Post-Harvest Losses	32.28	46.77	20.95	0.676	8.14	v
Market Fluctuations	20.44	47.34	32.22	0.656	8.06	vi
Irrigation and Water Availability	32.34	46.32	21.34	0.696	8.25	iii
unstable market value after harvest	22.39	54.37	23.24	0.712	8.36	I
Pest and Disease Management	32.34	51.38	16.28	0.688	8.21	iv

Transportation problem	36.32	47.42	16.26	0.664	7.98	vii

Conclusions:

The analysis of per hectare costs for ridge gourd production reveals significant variations in input expenses. Human labour is the most substantial cost, accounting for 23.02% of the total expenditure. Machinery charges and seed costs increase with farm size, while manures, fertilizers, irrigation, and plant protection expenses are the lowest. The overall grand total cost per hectare is Rs. 61,903.84. the study found that medium-sized ridge gourd farms had the highest yields, gross incomes, and net profits, while marginal farms had the lowest. However, marginal farms were more efficient in input utilization, with higher input-output ratios. Overall, ridge gourd cultivation was found to be a profitable enterprise across all farm sizes, with an average net income of Rs. 78,244 per hectare. The study reveals significant constraints faced by ridge gourd growers, including unstable market value, high input costs, irrigation and water availability, pest and disease management, market fluctuations, transportation problems, high seed costs, and lack of knowledge and training.

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