A Comparative Economic Analysis of Cucumber and Bitter Gourd Cultivation in Sultanpur District of Uttar Pradesh, India

ABSTRACT

The present investigation was undertaken to estimate the comparisonof costs and returns for cucumber and bitter gourd production. The specific objectives of this study included the profitability of cucumber and bitter gourd as well as identifying the major constraints faced by cucumber and bitter gourd growers.The study was based on primary data which were collected through personal interviews with the help pre-tested survey scheduled.In which, a multistage stratified purposive cum random sampling technique was used to select the district, block, villages, and respondents. The Results indicated that bitter gourd production was profitable crop in comparison to cucumber. Besides, marginal farms' was shown to be more profitable than small and medium farms according to an analysis of aggregate measures that were calculated for financial efficiency. Moreover, to identify the constraints the Garrett ranking technique was used. From the results, cucurbit farmers faced several issues of managerial, technical, and financial. In which top two most common problems in management & technical faced by them were lack of technical knowledge and unavailability of quality seeds (HYV) and the top two financial problems faced by them were untimely availability of loans and high-interest rates respectively. Major suggestions of cucurbit farmers to overcome these constraints are training being imparted to implement new technologies, credit facilities with low-rate interest by institutional agencies and storage facilities in mandi should be provided to the farmers for their perishable products.

Keywords: Profitability, comparison, cost, return, Garett ranking technique.

Introduction

Agriculture and its allied sectors have been the backbone of the Indian economy. Its contribution to GDP has decreased from 54.19 per cent in 1950-51 to 20.2 per cent in 2020-21 (NSO 2021). This is due to globalization, natural resource depletion, climate change, rapid industrialization, population growth and changing consumer behaviours. Agriculture and allied sectors are experiencing a period of transition all around the world. Now, Indian agriculture must reorganize itself by extending its scope beyond just primary agriculture. As a result, there is a need to reform the farming sector, invest extensively in infrastructure development, enhance access to formal credit, and adopt agriculture policies that are in step with ground reality.

Vegetable demand in developing countries has increased due to population and economic development (Arsanti*et al.*, 2007). India, the world's second largest producer of

fruit and vegetables after China, is generally known as the Fruits and Vegetable Basket (Chari and Madhav Raghavan, 2012; Sudarshan *et al.*, 2013; Nabi and Bagalkoti, 2017). In recent decades, this sector has expandedimportance by contributing a growing share in Gross Value addition of the agriculture and allied sectors. Under the changing agriculture scenario, it has been realized that the horticulture sector is important to the Indian economy (contributes 30.4% to GDP and 33% to GVA of agriculture) (Fedorov and Kuznetsova, 2020; Schenau*et al.,* 2022; Agrawal *et al.,* 2016). Because it is more productive than agriculture, the horticulture sector has emerged as one of the primary drivers of growth (food grains mainly). Horticulture production in India has risen dramatically in recent years. In the past ten years, annual production grew by 4.8%, and the area under horticulture increased by 2.6% (Kumar and Singh, 2020; Jiji, 2020; Saryam and Jirli, 2020). Apart from ensuring the nation's nutritional security, it also creates new jobs, diversification of farm activities, provides raw materials to various food processing industries and increases farm profitability through increased productivity and foreign exchange earnings.

Vegetables contain fibre, carbs, minerals, and vitamins, including fat-soluble vitamins like vitamin A and vitamin D as well as water-soluble vitamins like vitamin B and vitamin C. (Settaluri*et al.,* 2012). These proteins have a great biological value even though they only comprise less than 3% protein. Vegetables additionally have therapeutic qualities. The juices of carrot, cucumber, bitter gourd, cabbage, lettuce, and spinach are a few examples. (Adhiguru*et al.*, 2004; Sharma *et al.*, 2010; Wavdhane*et al.*, 2016).Fruit and vegetable sources of traditional antioxidant elements like vitamin C, beta-carotene, and manganese include cucumbers (Cucumis sativus), which are a valuable source of these nutrients. It also contains approximately 95% water, making it frequently advised as a natural diuretic and useful for bodybuilding (Elum *et al.*, 2016; Maurya *et al.*, 2019).

Cucumber (*Cucumis sativus* L.) (2n=14) belongs to the family of Cucurbitaceae, a member of the Cucumis genus. The cucumber is known to be originated from Southern Asia, but istoday grown in most countries (Grumet*et al.*, 2021; Yang and Sagar, 2022). Asia is responsible for more than half of global cucumber production. Turkey, Iran, Uzbekistan, Japan, and Iraq were regarded as Asia's largest cucumber producers (Khan *et al.*, 2015). Cucumber has spread beyond Indian borders since that pivotal moment over 4000 years ago, passing through Ancient Greece, Rome, Europe, the New World, and China on its way to becoming the world's fourth most widely cultivated vegetable. (Lutfa*et al.*, 2019)

Cucumber is also referred to as pepino, cetriolo, gherkin, gurke, krastavac, concombre, hunggua, kiukaba, khira, kiukamupa, and kukamba. It's a summer season (temperature between 18 and 24 °C) short duration (90-100 days) crop that matures quickly. It is used as a cooling food in summer (Khan *et al.,* 2015; Xanthopoulou*et al.,* 2022). Cucumber grows best on light, heavy, well-drained soil with an abundance of organic matter. Cucumber plants are naturally monoecious, which means they have separate male and female flowers. (Bai and Xu, 2013; Swamy, 2017).

Around the world, particularly in tropical and subtropical regions, the bitter gourd, alsoknown as karela (*Momordicacharantia*L., Cucurbitaceae), iswidelycultivated (Kandangath*et al.*,2015;Halder*et al.,* 2018; Fan *et al.,* 2019). It is widely farmed throughout India, taking about 0.08 million hectares and producing 0.82 million tonnes(NHB 2014; Sharma *et al.,* 2016; Halder *et al.,* 2018). Bitter gourd, gets its name from the Latin word "Momordica," which means "to bite," due to the grooved edges of its seed, which appear to have been chewed. It is a major summer vegetable crop cultivated for its immature tuberculate fruits with a distinctively bitter taste. Iron, calcium, phosphorus, and vitamin B are all abundant in the fruit.The general objective of this research was to asses the comparative profitability of cucumber and bitter gourd production. However, the following specific objectives were spelt out.

- To compare the costs and returns of cucumber and bitter gourd production.
- To evaluate the constraints faced by the producer during the cucumber and bitter gourdproduction process.

MATERIAL AND METHODS:

Data Collection:

The study was based on input and output data collected from Dubeypur block respondents. A multistage purposive cum random sampling strategy was used to choose respondents. Inthe outset of this exercise, the Sultanpur district of Uttar Pradesh was purposefully chosen.At the second stage, the block namely Dubeypur was selected purposively from theselected district. In the final stage, five villages were selected from Dubeypur block (Ahimane, Amhat, Chakarpur, Navadashahakpur, Saurmau village) isbased on the higher cucumber and bitter gourd growing villages. In the final stage, 100 respondents

were selected randomly through proportionate allocation to the population. Finally, 100 respondents i.e., 66 marginal, 23 small and 11 medium were selected for this study.

Period of Enquiry:

The data pertained to theagriculture year 2021-2022 estimation of costs and returns.

Measures of cost concepts:

The cost concept approach is widely used in India for evaluating crop profitability in production. The cost concepts in brief, are Cost A_1, A_2, B_1, B_2, C_1, C_2, and Cost C_3.

Cost A_1: This cost includes actual expenditure incurred in cash and kind.

1. Value of hired human labour and machinery labour.
2. Value of seed (both forms produced and purchased).
3. Value of manure (owned and purchased).
4. Value of insecticides, pesticides and chemical fertilizer.
5. Deprecation on implements, farm machinery and farm buildings.
6. Irrigation charges.
7. Land revenue, and other taxes.
8. Interest in working capital.
9. Miscellaneous expenses.

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 (including land).

Cost B_2: Cost B_1 + rental value of owned land.

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 % of C_2 (managerial cost).

Measures of farm profit:

Gross Income: Yield in quintals× Price per tonne

Net Income: Gross Income – Cost C

Farm Business Income: Gross Income - Cost A_2 or Net Income + imputed value of family labour

Family labour income: Gross Income - Cost C

Farm investment income: Net Income + Rental value of owned land+ Interest on fixed capital

Benefit-cost ratio: Cost C / Gross Income (Shende and Meshram, 2015; Nirmala and Muthuraman, 2016).

Garrett's ranking technique:

To achieve this goal, the Garrett Ranking Technique was used to identify the most significant constraints that influence theproduction of cucumber and bitter gourd (Singh *et al.,* 2021; Lashram*et al.,* 2022). Initially, the farmers' ranks were converted to percentage positions using the following formula:

$$Percent\ Position = \frac{100\ (R_{ij} - 0.5)}{N_j}$$

Where,

R_{ij} = Rank given for i^{th} preference by j^{th} farmer

N_j = Number of preferences ranked by j^{th}farmer

The percent position of each rank was translated to scores using the Garrett table. Individual respondent scores were added together and divided by the total number of respondents whose scores were combined for each constraint. As a result, the mean score for each limitation was sorted by arranging them in descending order. (Dhanavandan, 2016; Aleeswari*et al.*, 2019; Agrawal and Banerjee, 2019; Upadhyay *et al.*, 2021).

RESULT AND DISCUSSION

Economics of Cucumber and Bitter gourd Cultivation:

The different cost concepts like cost A_1/A_2, cost B_1, cost B_2, cost C_1, cost C_2 and cost C_3 were considered for the analysis of the data. Similarly, the various income measures such as gross income, net income, farm business income and family labour income were also calculated for the sample farms. The cost of cultivation of cucumber and bitter gourd ₹/quintal and the input-output relationship has also been worked out on the basis of different costs.

Comparative analysisof cost & return for Cucumber and Bitter gourd:

Due to per hectare gross return of producing bitter gourd being higher than that of producing cucumber, BCR(undiscounted) was higher in bitter gourd than cucumber.Then according to the size of farm, Thetotal variable cost of cucumber and bitter gourd was observed as maximum in medium thefarm ₹61603.23 and₹69377.86 followed by small (₹58529.43 and₹65722.82) and marginal (₹53989.4 and ₹59896.05).The cost of cultivation of cucumber and bitter gourd was observed higher on medium farms ₹ 85624.72 and ₹ 95893.93 mainly due to maximum investment on total working capital as compared to small farms ₹ 84372.09 and ₹ 93180.72 and marginal farms ₹ 82600.00 and ₹ 90382.84, respectively. The cost of production of bitter gourd was observed higher on medium farms ₹ 624.11 mainly due to maximum investment in total working capital as compared to small farms ₹ 611.78 and marginal farms ₹ 602.07 respectively, but in Cucumber was observed higher on marginal ₹ 514.23 followed by small₹512.62 and medium ₹ 509.94. The yield of cucumber and bitter gourd was observed higher on medium farms at 167.91 and 153.65 followed by small farms at164.59 and 152.31 and marginal farms 160.63 and 150.12 respectively.Benefit-cost ratio (undiscounted) forbitter gourd and cucumber is highest in marginal farms1.37and 1.21 because they have less than 1 ha ofland so they can't grow more than 2 crops at that time they fully devoteand fully utilized the land followed by small (1.31 and 1.19) and medium farm (1.25 and 1.15), respectively.

From the above discussion it was considered that bitter gourd cultivation is relatively moreprofitable than cucumber cultivation.

Table 1: Per hectare costs of different inputs used in cucumber and bitter gourd production on different size groups of sample farms (₹/ha.)

S. No.	Particulars	Name of Crop	Size Group of Farms			Overall Average
			Marginal	Small	Medium	
1.	Human Labour	Cucumber	**19667.01** (23.81)	**20162.21** (23.90)	**20371.05** (23.79)	**19858.35** (23.83)
		Bitter gourd	**21164.14** (23.42)	**21873.74** (23.47)	**22610.21** (23.58)	**21486.42** (23.45)
a.	Family Labour	Cucumber	**12019.32** (14.55)	**8949.87** (10.61)	**6991.84** (8.17)	**10760.32** (12.91)
		Bitter gourd	**12951.71** (14.33)	**9476.59** (10.17)	**8241.87** (8.59)	**11634.35** (12.70)
b.	Hired Labour	Cucumber	**7647.69** (9.26)	**11212.34** (13.29)	**13379.21** (15.63)	**9098.03** (10.92)
		Bitter gourd	**8212.43** (9.09)	**12397.15** (13.30)	**14368.34** (14.98)	**9852.07** (10.75)

2.	**Machinery/ Tractor Charges**	**Cucumber**	**11509.81** (13.93)	**11748.08** (13.92)	**12011.37** (14.03)	**11619.78** (13.94)
		Bitter gourd	**11997.86** (13.27)	**12324.34** (13.23)	**12621.77** (13.16)	**12141.58** (13.25)
3.	**Seed Cost**	**Cucumber**	**10294.26** (12.46)	**10491.91** (12.44)	**10756.48** (12.56)	**10390.56** (12.47)
		Bitter gourd	**13414.62** (14.84)	**13762.71** (14.77)	**14110.39** (14.71)	**13571.22** (14.81)
4.	**Manure and Fertilizer**	**Cucumber**	**12079.61** (14.62)	**12273.24** (14.55)	**12319.74** (14.39)	**12150.56** (14.58)
		Bitter gourd	**12634.24** (13.98)	**12807.47** (13.74)	**13174.51** (13.74)	**12733.51** (13.90)
5.	**Irrigation**	**Cucumber**	**7160.47** (8.67)	**7419.67** (8.79)	**7589.14** (8.86)	**7267.24** (8.72)
		Bitter gourd	**7628.59** (8.44)	**8191.63** (8.79)	**8498.28** (8.86)	**7853.76** (8.57)
6.	**Plant Protection**	**Cucumber**	**5297.56** (6.41)	**5384.19** (6.38)	**5547.29** (6.48)	**5344.96** (6.41)
		Bitter gourd	**6008.31** (6.65)	**6239.52** (6.70)	**6604.57** (6.89)	**6127.08** (6.69)
7.	**Total working capital**	**Cucumber**	**53989.40** (65.36)	**58529.43** (69.37)	**61603.23** (71.95)	**55871.13** (67.04)
		Bitter gourd	**59896.05** (66.27)	**65722.82** (70.53)	**69377.86** (72.35)	**62279.21** (67.97)
8.	**Interest on working capital**	**Cucumber**	**2159.58** (2.61)	**2341.18** (2.77)	**2464.13** (2.88)	**2234.85** (2.68)
		Bitter gourd	**2395.84** (2.65)	**2628.91** (2.82)	**2775.11** (2.89)	**2491.17** (2.72)
9.	**Rental value of owned land**	**Cucumber**	**6000.00** (7.26)	**6000.00** (7.11)	**6000.00** (7.01)	**6000.00** (7.20)
		Bitter gourd	**6000.00** (6.64)	**6000.00** (6.44)	**6000.00** (6.26)	**6000.00** (6.55)
10.	**Interest on fixed capital**	**Cucumber**	**922.61** (1.12)	**881.42** (1.04)	**781.45** (0.91)	**897.61** (7.08)
		Bitter gourd	**922.61** (1.02)	**881.42** (0.95)	**781.45** (0.81)	**897.61** (0.98)
11.	**Sub-Total**	**Cucumber**	**75090.91** (90.91)	**76701.90** (90.91)	**77840.65** (90.91)	**75763.91** (90.91)
		Bitter gourd	**82166.22** (90.91)	**84709.74** (90.91)	**87176.30** (90.91)	**83302.34** (90.91)
12.	**Marginal Cost @ 10% of sub-total**	**Cucumber**	**7509.09** (9.09)	**7670.19** (9.09)	**7784.07** (9.09)	**7576.39** (9.09)
		Bitter gourd	**8216.62** (9.09)	**8470.97** (9.09)	**8717.63** (9.09)	**8330.23** (9.09)
Grand Total		**Cucumber**	**82600.00** (100.00)	**84372.09** (100.00)	**85624.72** (100.00)	**83340.30** (100.00)

	Bitter gourd	**90382.84** (100.00)	**93180.72** (100.00)	**95893.93** (100.00)	**91632.57** (100.00)

Fig. 1 Different inputs used in different size of farms for cucumber abd bitter gourd production (%)

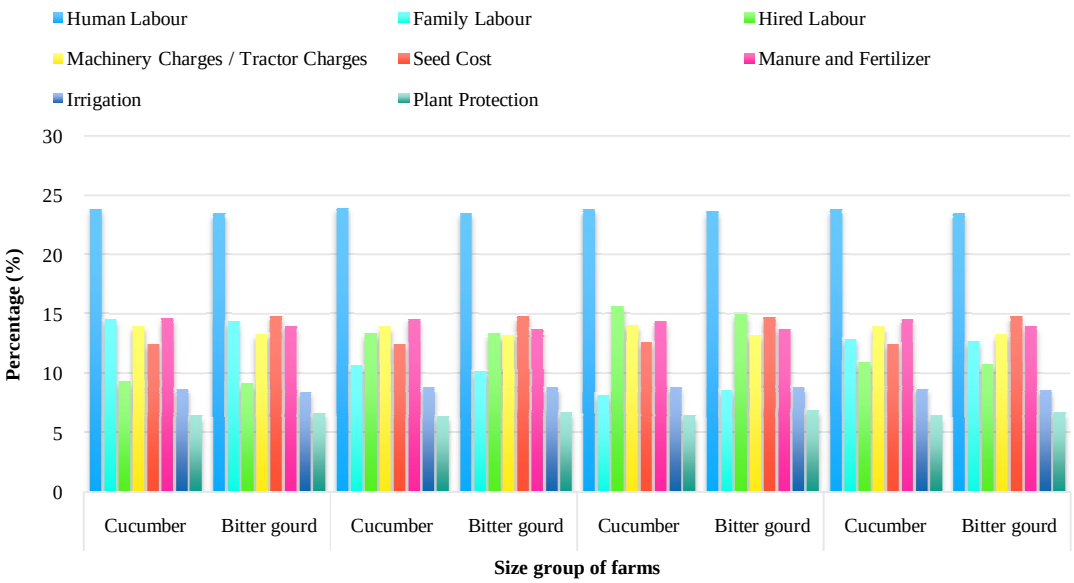


Table 2: Per hectare measures of costs and returns of cucumber and bitter gourd (₹/ha.)

S. No.	Particulars	Name of Crop	Size group of farms			Overall Average
			Marginal	Small	Medium	
1.	Cost A_1/A_2	Cucumber	56148.98	60870.61	64067.36	58105.97
		Bitter gourd	62291.89	68351.73	72152.97	64770.37
2.	Cost B_1	Cucumber	57071.59	61752.03	64848.81	59003.58
		Bitter gourd	63214.51	69233.15	72934.43	65667.99
3.	Cost B_2	Cucumber	63071.59	67752.03	70848.81	65003.58
		Bitter gourd	69214.51	75233.15	78934.43	71667.99
4.	Cost C_1	Cucumber	69090.91	70701.90	71840.65	69763.91
		Bitter gourd	76166.22	78709.74	81176.30	77302.34
5.	Cost C_2	Cucumber	75090.91	76701.90	77840.65	75763.91

		Bitter gourd	82166.22	84709.74	87176.30	83302.34
6.	**Cost C_3**	**Cucumber**	82600.00	84372.09	85624.72	83340.30
		Bitter gourd	90382.84	93180.72	95893.93	91632.57
7.	**Yield (qtl/ha.)**	**Cucumber**	160.63	164.59	167.91	162.34
		Bitter gourd	150.12	152.31	153.65	151.01
8.	**Gross Income**	**Cucumber**	182154.42	184505.39	184029.36	182901.39
		Bitter gourd	214521.48	214909.41	215878.25	214759.95
9.	**Net Income**	**Cucumber**	99554.42	100133.30	98404.64	99561.09
		Bitter gourd	124138.64	121728.69	119984.32	123127.38
10.	**Family Labour Income**	**Cucumber**	119082.83	116753.36	113180.55	117897.80
		Bitter gourd	145306.97	139676.26	136943.82	143091.96
11.	**Farm Business Income**	**Cucumber**	126005.44	123634.78	119962.00	124795.41
		Bitter gourd	152229.59	146557.68	143725.28	149989.57
12.	**Farm Investment Income**	**Cucumber**	113986.12	114684.91	112970.16	114035.09
		Bitter gourd	139277.88	137081.09	135483.41	138355.22
13.	**Cost of production (₹/Qtl.)**	**Cucumber**	514.23	512.62	509.94	513.39
		Bitter gourd	602.07	611.78	624.11	606.73
14.	**Input - Output Ratio**					
a.	**On the basis of Cost A_1**	**Cucumber**	1:3.24	1:3.03	1:2.87	1:3.15
		Bitter gourd	1:3.44	1:3.14	1:2.99	1:3.33
b.	**On the basis of Cost B_1**	**Cucumber**	1:3.19	1:2.99	1:2.84	1:3.11
		Bitter gourd	1:3.39	1:3.10	1:2.96	1:3.28
c.	**On the basis of Cost B_2**	**Cucumber**	1:2.89	1:2.72	1:2.60	1:2.82

		Bitter gourd	1:3.10	1:2.86	1:2.73	1:3.00
d.	**On the basis of Cost C_1**	**Cucumber**	1:2.64	1:2.61	1:2.56	1:2.62
		Bitter gourd	1:2.82	1:2.73	1:2.66	1:2.78
e.	**On the basis of Cost C_2**	**Cucumber**	1:2.43	1:2.41	1:2.36	1:2.41
		Bitter gourd	1:2.61	1:2.54	1:2.48	1:2.58
f.	**On the basis of Cost C_3**	**Cucumber**	1:2.21	1:2.19	1:2.15	1:2.19
		Bitter gourd	1:2.37	1:2.31	1:2.25	1:2.34
15.	**B:C Ratio**	**Cucumber**	**1:1.21**	**1:1.19**	**1:1.15**	**1:1.19**
		Bitter gourd	**1:1.37**	**1:1.31**	**1:1.25**	**1:1.34**

Constraints faced by the producer during the cucumber and bitter gourd production process:

The major problems faced by cucurbit growers on different sizes of farms in the study area were analyzed and presented in Tables 3 and 4. The response of the sample farms about the problems faced by them has been classified mainly under three categories:

1. Management & technical problems
2. Financial problems

Management and technical problems:

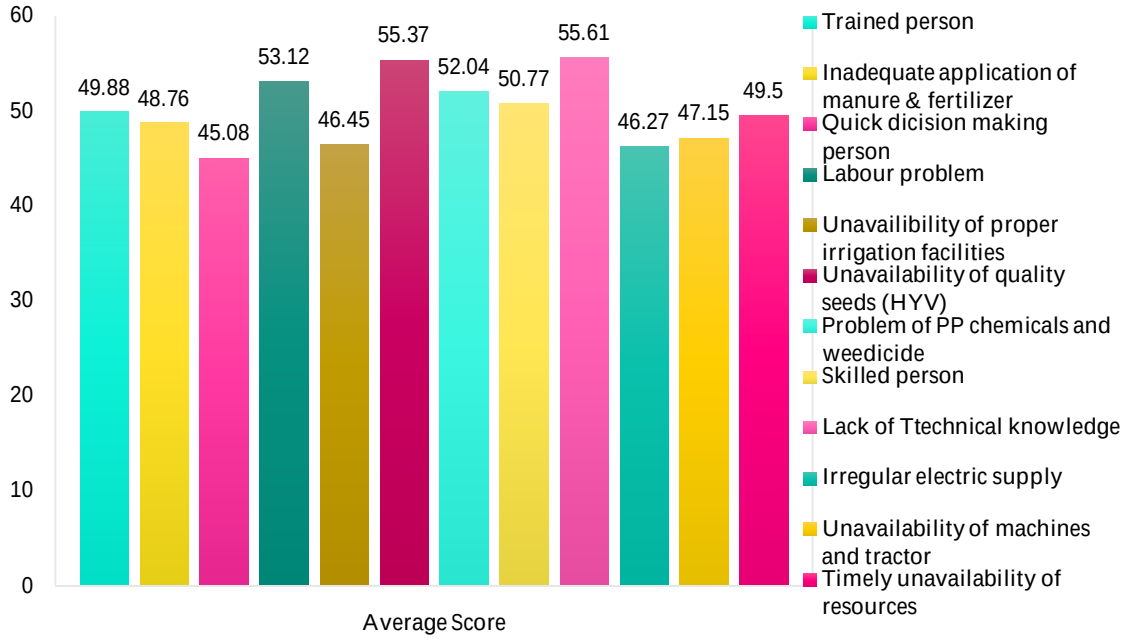
The ranking was done by using Garrett's rank technique for different types of constraints. In the study area, it was observed that cucurbit growers faced different types of managerial and technical problems, as shown in Table 3. From the table, it's revealed that the major management and technical constraint faced by most of the cucurbit growers was the lack of technical knowledge with a score of 55.61 (rank I). The second most important constraint faced by the cucurbit crop growers was the unavailability of quality seeds (HYV) (overall Garrett score 55.37). Keeping this in view, there was a strong need to strengthen extension services for providing information regarding technical knowledge and high-yielding variety amongst the cucurbit growers in the study area. The other most important constraints reported by the cucumber and bitter gourd growers were labour problems overall

Garrett'sscored53.12 (rank III),for the problem of plant protection chemicals and weedicide overall Garrett's mean score 52.04 with rank IV and forskilled person overall Garrett's scored50.77 (rank V). In addition to the above problems, the minor problems faced by also the trained person (rank VI), timely unavailability of resources (rank VII), inadequate application of manure and fertilizer (rank VIII), unavailability of machines and tractors (rank IX), unavailability of proper irrigation facilities (rank X). The farmers further ranked XI higher constraints faced by irregular electric supply and observed Garrett's score of46.27 followed by the quick decision-making person constraints faced in the production of cucumber and bitter gourd Garrett's score 45.08 and therank was XII.

Table 3: Management & technical problems on different size group of farms in the study area

S. No.	Particulars	Percent Position	Garrett Value	Total	Average Score	Rank
i	Trained person	4.17	83	4988	49.88	**6th**
ii	Inadequate application of manure and fertilizer	12.50	73	4876	48.76	**8th**
iii	Quick decision-making person	20.83	66	4508	45.08	**12th**
iv	Labour problem	29.17	61	5312	53.12	**3rd**
v	Unavailability of proper irrigation facilities	37.50	56	4645	46.45	**10th**
vi	Unavailability of quality seeds (HYV)	45.83	52	5537	55.37	**2nd**
vii	The problem of PP chemicals and weedicide	54.17	48	5204	52.04	**4th**
viii	Skilled person	62.50	44	5077	50.77	**5th**
ix	Lack of Technical Knowledge	70.83	39	5561	55.61	**1st**
x	Irregular electric supply	79.17	34	4627	46.27	**11th**
xi	Unavailability of machines and tractor	87.50	27	4715	47.15	**9th**
xii	Timely unavailability of resources	95.83	17	4950	49.5	**7th**

Fig. 2 Average garrett score of management & technical problems



Financial problems:

The second most important constraint faced by cucurbit growers was the financial problem as shown in Table 4. Table revealed that the major constraint problem faced by most of the cucurbit growers wasthe untimely availability of loans with a score of 53.04 (rank I). The second most important constraint faced by the cucurbit crop growers was the higher interest rate (overall Garrett score 52.64). Taking this into consideration, the government takes action to offer credit at a low-interest rate and assist farmers in selling their prior crops at higher prices. The other most important constraints reported by the cucurbit growers were the repayment period is not sufficient overall Garrett score of51.43 (rank III), lack of support the institutional agencies overall Garrett mean score of51.16 with rank IV and bribe for making the KCC overall Garrett score of51.08 (rank V). In addition to the above problems, the minor problems faced also lack of awareness about the benefits of the scheme (rank VI), lack of the proper guideline for getting KCC (rank VII),and delay in disbursement of loans (rank VIII). The farmers further ranked IX higher constraints faced by the illiteracy of farmers and observed Garrett's score of 46.83 followed by the hectic documentation constraints faced in the production of cucumber and bitter gourd Garrett's score was45.99 and rank was X.

Table 4: Financial problems on different size group of farms in the study area

S. No.	Particulars	Percent Position	Garrett Value	Total	Average Score	Rank
i	Bribe for making the KCC	5.00	82	5108	51.08	**5th**
ii	Lack of awareness about the benefits of the scheme	15.00	70	5062	50.62	**6th**
iii	The repayment period is not sufficient	25.00	63	5143	51.43	**3rd**
iv	Higher interest rate	35.00	58	5264	52.64	**2nd**
v	Illiteracy of farmers	45.00	52	4683	46.83	**9th**
vi	Delay in the disbursement of loans	55.00	48	4817	48.17	**8th**
vii	Lack of the proper guideline for getting KCC	65.00	42	4904	49.04	**7th**
viii	Hectic documentation	75.00	37	4599	45.99	**10th**
ix	Lack of support from the Institutional agencies	85.00	30	5116	51.16	**4th**
x	Untimely availability of loans	95.00	18	5304	53.04	**1st**

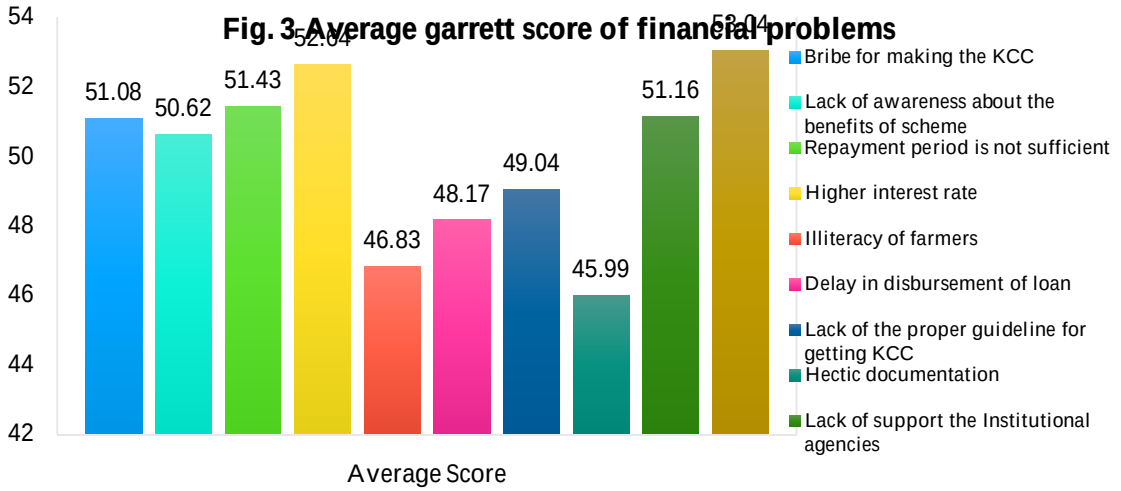


Fig. 3 Average garrett score of financial problems

CONCLUSION

In conclusion, the analysis of different cost concepts and income measures provided valuable insights into the cultivation of cucumber and bitter gourd. The study found that bitter gourd had a higher per-hectare gross return and a higher benefit-cost ratio (undiscounted) compared to cucumber. Medium-sized farms incurred the highest variable costs for both crops, primarily due to greater investment in total working capital. The cost of production was also higher on medium farms, reflecting their larger investment in working capital. On the other hand, the yield of cucumber and bitter gourd was highest on medium-sized farms. Marginal farms demonstrated the highest benefit-cost ratio for both crops, as their smaller land size allowed for focused cultivation.

The analysis also identified key constraints faced by cucurbit growers. The most significant challenges included a lack of technical knowledge and the unavailability of quality seeds, which highlighted the need to strengthen extension services and provide information on high-yielding varieties. Labour problems, plant protection chemicals and weedicide, and the availability of skilled personnel were also major constraints. Financial constraints, such as untimely availability of loans and high interest rates, were significant issues for growers. The study recommended government interventions to address these challenges, including offering credit at lower interest rates and supporting farmers in selling their crops at higher prices.

In summary, the study revealed that bitter gourd cultivation was more profitable than cucumber cultivation. Addressing the identified constraints, particularly improving technical knowledge and addressing financial issues, would enhance the productivity and profitability of cucurbit farming in the study area.

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