

RESEARCH ARTICLE

PRODUCTION, MARKETING AND ECONOMICS OF CUCUMBER IN PANCHAPURI MUNICIPALITY, SURKHET, NEPAL

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ABSTRACT

Purpose: This study aimed to assess the production, marketing, and economic aspects of cucumber farming in Panchapuri Municipality, Surkhet, Nepal. It sought to explore the challenges faced by farmers and provide insights to improve cucumber production and market access in the region. **Approach:** The research was conducted from June 2nd to June 25th, 2023, involving 80 randomly selected cucumber farmers in Panchapuri Municipality. Data were gathered through semi-structured interviews and focus group discussions with local vegetable growers, cooperative members, and traders. Economic analyses, including the Benefit-Cost (B:C) ratio, were used to determine the profitability of cucumber farming. **Results:** The results revealed that cucumber farming in the study area is quite productive, with an overall yield of 30.02 Mt/ha and a B:C ratio of 1.41, suggesting good profitability. The average price farmers received for their cucumbers was Rs. 70/ kg. However, most farmers were heavily dependent on local collectors for selling their produce, with no evidence of cucumber export beyond the Surkhet district. Major challenges included diseases like powdery mildew and aphids, unstable market prices, and a lack of direct market access. **Conclusions:** The study highlights that cucumber farming in tunnels is a profitable venture in Panchapuri Municipality, but there are significant gaps in the marketing infrastructure. While the government has focused on production through subsidies and support, there is a pressing need to improve marketing efforts. Recommendations include providing better training for farmers, facilitating access to markets, promoting organic certification, and supporting the establishment of plastic houses to enhance cucumber production in the region.

KEYWORDS

B:C ratio, Enterprise, Problems, Productivity, Marketing

1. INTRODUCTION

Agriculture is the major sector of Nepalese economy where 66 percent of the total population, contributes about 36 percent in the GDP. Nepalese farmers are engaged in production of fresh fruits, vegetables, and spice crops. The area, production, and yield of fresh vegetables in Nepal was 289,839 ha, 4,153,157 mt and 14.33 mt/ha (MoALD, 2023). 27% of Nepal's GDP is made up of the agriculture and forestry sector (MoAD, 2020). Due to Nepal's varied topography and wide range of climatic conditions, from tropical to alpine temperate, various vegetables can be cultivated there (CASA, 2020). Of all the crops, vegetables contribute the most to horticultural GDP which is 14.92% (MoALMC, 2018).

Cucumber (*Cucumis sativus* var. *sativus* L.) is a popular member of the Cucurbitaceae family known for its flavor, texture, and medicinal value (Keerthika et al., 2016). It is annual, warm season trailing vine crop, grown throughout the world under tropical and subtropical conditions (Sharma et al., 2018). In Nepal, cucumber is cultivated from Terai to high hills, at altitudes ranging from 100 masl to 1800 masl. It is mainly cultivated for its young tender fruits, which are consumed raw as salad, and by making pickles. The seeds of cucumber are used for oil extraction which is good for body and brain (Mallick, 2022). Along with seasonal production, cucumber is also successfully grown in off season under greenhouse due to its suitability to thrive under high light intensity, high humidity, high soil moisture, temperature, and fertilizers condition (Sharma et al., 2018).

Cucumber has much medicinal importance. It can reduce gastric, acidity and control constipation and help keeping body temperature cool during summer season. Cucumbers are rich in phytonutrients and vitamin K. They are also a very good source of pantothenic acid and Molybdenum. They also contain copper, potassium, manganese, vitamin C, phosphorus, magnesium, and vitamin B1. Cucumbers are a good source of potassium, magnesium, and dietary fiber. Cucumbers contain 96% of water and are low in calories. There are only 15.5 calories in 100 g of cucumber. (Garg, 2023).

Cucumber grows in wide varieties of soils from sandy loam soils to clay soils with good drainage. Soil pH between 5.5 and 6.7 is favorable for optimum growth. The cucumber seed is sown by the method of dibbling at a distance of 1.5 m to 2.5 m (row to row) x 60 cm to 90 cm. (Plant spacing). Two to three cucumber seeds are sown in each pit. Layout in Ring & basing method is preferred. 40 to 50 cartload well decomposed Farmyard Manure (FYM) should be added at the time of soil preparation. 25 kg P/ha, 25kg K/ha, 50 kg N and ½ N and full phosphorus as well as potassium should be given at the time of sowing cucumber seeds while the remaining half N should be given 30 days after sowing of seeds. The main disease in cucumber farming is Powdery mildew (Agri-Farming, 2023).

The current area under cucumber cultivation in Nepal is 10309 ha with the total productivity of 15.48Mt/ha out of which Surkhet contains 218 ha of area with the total productivity 17.16 Mt/ha (MoALD, 2023).

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The most cultivated variety of cucumber in Nepal is Bhaktapur local and other varieties cultivated are Beli, Dynasty, Kheera, Malini and Ninja (Khanal and Dhakal, 2020). Cucumber is one the most important vegetable crops in our country, the area coverage, total production, and productivity are very low as compared to neighboring countries. Statistic shows that large quantities of vegetables worth millions are imported in Nepal each year. (ABPSD, 2018).

2. MATERIALS AND METHODS

2.1 Selection Of Study Area

The study was conducted in Panchapuri Municipality, Surkhet district, located in Karnali province of Nepal. Panchapuri is situated in the mid-western region of Nepal at 28° 47' 31" N latitude and 81° 23' 10" E longitude with an altitude of 780 m above sea level. This area receives annual rainfall of about 186.58 mm with maximum temperature 34.6°C and minimum of 21°C. The ideal relative humidity range for cucumbers was 60-70% RH. During nighttime humidity may be higher 70-85% RH. In terms of VPD that's 0.75-1.35 kPa during the day, and 0.35-1 kPa overnight inside the tunnel. This area was purposely selected as this is the vegetable zone of PMAMP, Surkhet. This area was also preferred as this is one of the major cucumber-producing regions of the Surkhet district. The total area of Panchapuri municipality is 329.9 square kilometers and the total population of this municipality was 32,231 as per Nepal census, 2011. This municipality has total 11 wards.

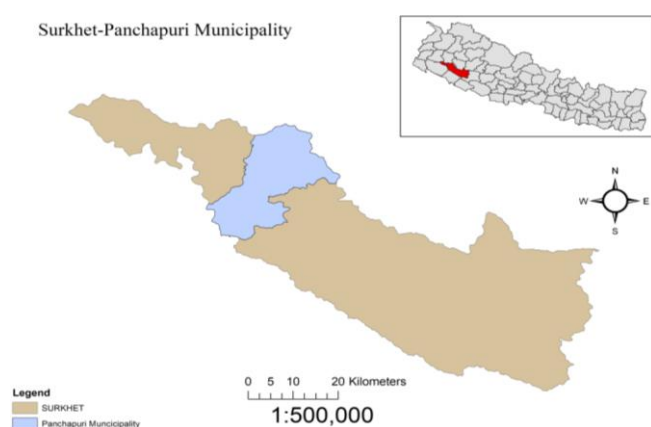


Figure 1: Map of Surkhet District showing study area

2.2 Selection of sample size

A survey of 80 households was conducted using a simple random sampling method. The sample size was determined considering total population and time constraints. Farmers of different locations were chosen, and field survey was conducted at major cucumber producing areas of Panchapuri municipality.

2.3 Data and Data Types

The study was mostly carried out by gathering primary data, with some secondary data support.

2.3.1 Primary Data

Primary data was collected through household surveys using a pre-tested questionnaire, and additional data was gathered through focus group discussions.

2.3.2 Secondary Data

Secondary data was obtained from Ministry of Agriculture and Livestock Development (MoALD), PMAMP Surkhet, relevant articles, HICAST library. Different journals, articles, online papers, thesis, and network surfing were done for the secondary data.

2.4 Methods and techniques of data analysis

Data was entered using MS-Excel, where it was tabulated and analyzed. The data was converted into the standard units such as land in hectare, weight in kilogram and liquid in liter. Statistical tools such as mean and percentage were used for data analysis, and the results were presented in tables and graphs.

2.5 Economics analysis

2.5.1 Cost of production

The cost is the value of the inputs that have been used to produce something. The cost of production was calculated to find out the profit from the cucumber production. For analyzing the cost of production, variable cost and fixed cost of cucumber production were calculated. Variable cost includes cost of seeds, fertilizers, irrigation, labors, harvesting, transportation etc. Fixed cost includes depreciation of equipment such as doko, crate etc. was calculated. The cost of cucumber production was calculated by using the following equation.

$$TC = TVC + TFC \quad (1)$$

Where, TC = Total cost

TVC = Total variable cost

TFC = Total fixed cost

2.5.2 Benefit- Cost Ratio (BCR)

Benefit cost analysis will be done by calculating the total variable cost and gross returns from the cucumber cultivation. Cost of production was calculated by addition of all variable costs in the production process. Gross return was calculated by obtaining income from product sale. Hence, benefit cost ratio was calculated by using formula:

$$B:C \text{ ratio} = \text{Gross Return} / \text{Total Cost}$$

Where,

Gross Return = Total quantity of cucumber sold * average price

Total Cost = Total Variable Cost + Total Fixed Cost

2.5.3 Marketing margin

The difference between the farm gate price and retailers' price is the marketing margin which was calculated by using formula.

$$\text{Marketing margin} = \text{retailer's price} - \text{farmgate price}$$

2.5.4 Producer's share

Producer's share is the price received by farmer expressed as a percentage of the retail price, i.e., the price paid by consumers. It will be calculated by using following formula,

$$\text{Producer's share} = (\text{Producer's price} \div \text{retailer's price}) \times 100$$

2.5.5 Problem ranking

Problems related to the production of cucumber was ranked with the use of index. Scaling techniques which provide the direction and extremity attitude of the respondents towards any proposition (Miah, 1993) was used to construct index.

The formula given below was used to find the index for intensity of production problems faced by farmers

$$I_{\text{prob}} = \sum \frac{S_i f_i}{N} \quad (2)$$

Where,

I_{prob} = index value for intensity of problem

$\sum$ = summation

S_i = i^{th} scale value

f_i = frequency of i^{th} importance given by the respondents

N = total number of respondents

3. RESULTS AND DISCUSSION

3.1 Socio-Economic information

The majority of the respondents were under 30-40 age group (37.50%) followed by 40-50 (33.75%), 50-60 (21.25%), 20-30 (7.50%) respectively. Among the 80 respondents, 57.5% were male whereas 42.5% were female respondents. Among the respondents in the study area 91.25% were married and 8.75% were unmarried. The majority (38.75%) of the respondents had 5-10 years of experience. Out of the total respondents,

17.50% respondents were able to do common reading and writing, 25% were educated up to primary level, 31.25% had completed their secondary level and 17.5% had higher level education whereas only 8.75% of them had university level education. Most of the respondent's income was relied on agriculture only (57.5%) followed by government services (20.00%). Business occupied 11.25%, 6.25% by remittance and least 5% by private sector.

3.2 Cultivation Information

3.2.1 Years Of Experience

The study revealed that 38.75% of farmers have 5-10 years of cucumber farming experience. During this time period modern technologies and innovations were introduced which attracted the farmers in cucumber production. 37.5% have 1-5 years of cucumber farming experience which shows that more farmers are involved in cucumber production recently due to increase in subsidies projects and more profits in agribusiness. 23.75% have more than 10 years of cucumber farming. These farmers had also changed the cultivation practices than before. Adoption level of new innovations was high.

3.2.2 Other Crops Cultivated

The farmers in the study area were also practicing other crops cultivation. 70% of them were cultivating field crops such as rice, wheat, maize etc. while 21.25% of them were involved in vegetable farming, vegetables like cabbage, cauliflower, tomato, chilli etc. and 8.75% were involved in mustard cultivation.

3.2.3 Method Of Cultivation

All the respondents of the study area were cultivating cucumber from seed and seedling.

3.2.4 Variety

In the study area, it was found that most of the respondents were using local variety i.e., Bhaktapur local (70%) for cultivation as they were easily available and cheap. 30% of them were using Pyramid Dynasty F1 Hybrid Cucumber Seed. Other locals were using Chia Tai F1 Hybrid Cucumber – Ninja-179 and Saloni F1 hybrid cucumber variety.

3.2.5 Source of Seedling

After the discussion with farmers of the study area it was found that 17.5% of farmers were getting seeds as a grant from PMAMP, Surkhet. Most of the farmers 48.75% were buying seed from agro-vet. 18.75% of farmers to be buying seed/seedlings directly from nursery and 15% of them were using the seeds from previous year.

Table 1: Source of seedling		
Source of seedling	No. of respondents	Percentage
Agro-vet	39	48.75%
Nursery	15	18.75%
PMAMP Grant	14	17.50%
Self	12	15.00%

3.2.6 Trainings

As shown in the figure below the 88.75% respondents of the study area had received training about vegetable farming and cucumber cultivation in tunnel given by PMAMP, Surkhet. 11.25% of them had not received training from any kind of producer's organization or government sectors related to vegetable farming.

3.2.7 Subsidy

The study revealed that 41.25% of farmers were able to get subsidy from ASDP and PMAMP, Surkhet. 58.75% of farmers did not get any kind of subsidy from any private or government sectors. These subsidies were in partnership module. Farmers also have to invest 50% of the total investment. Those who were not able to invest in this module did not receive the subsidy.

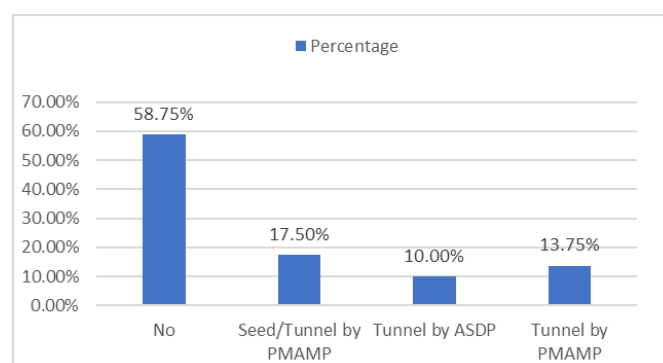


Figure 2: Financial and other kind of support provided by different sectors

3.2.8 Total Land Holdings

In the study area, the average total cultivating land of the respondents was 0.43 ha. The minimum total cultivating land of the respondents was 0.15 ha. The maximum total cultivating land of the respondents was 0.92 ha.

Table 2: Total Cultivating Land Of The Respondents				
Category	Average (ha)	Minimum (ha)	Maximum (ha)	Standard Deviation
Area of Total Land Cultivation (ha)	0.428117	0.152672	0.916031	0.165884

3.2.9 Area Of Cucumber Cultivation

In the study area, the average total area of cucumber cultivating land of the

respondents was 0.06ha. The minimum total area of cucumber cultivating land of the respondents was 0.05ha. The maximum total area of cucumber cultivating land of the respondents was 0.08ha.

Table 3: Total area of cucumber cultivating land of the respondents				
Category	Average (ha)	Minimum (ha)	Maximum (ha)	Standard Deviation
Area of cucumber cultivation(ha)	0.06	0.05	0.08	0.01

3.2.10 Mode of cultivation

In the study area, all of the respondents were cultivating cucumber inside tunnel. The productivity of cucumber was higher inside the plastic tunnel as compared to open field cultivation. Those farmers who were cultivating cucumber in open field were attracted towards tunnel farming. So, it shows the increasing trend of cultivating cucumber inside the plastic tunnel.

In general, cucumber is irrigated with overhead sprinklers, furrow irrigation and drip irrigation systems. In the study area, 100% of respondents were found to be cultivating cucumber inside the tunnel where they were using the drip irrigation system. Drip irrigation system is more beneficial in tunnel as compared to furrow irrigation system as per the respondents of the study area.

3.2.12 Fertilizers Used

In the study area 55% respondents were found using organic fertilizer such as cow manure, buffalo manure, food processing wastes, dung cakes, compost manure etc. and 45% respondents were found using inorganic fertilizer such as urea, DAP, Potash along with organic manure. It was also found that farmers were using spreading and sticking agent which is used

Plastic is partially opened up to 50 cm above the ground on midday during hot dry period to minimize the thermal stress to the crop.

3.2.11 Irrigation

to stick nutrient on the leaves (water soluble fertilizer).

Fertilizers used:

FYM 2-3 kg/pit, DAP 20 g/pit, MOP 15 g/pit, Oilseed cake 20 g/pit

3.2.13 Reason For Choosing Cucumber Cultivation

Farmers in the study area are cultivating cucumber in every season which has great contribution to economic growth in the study area. 46.25% of the respondents chose cucumber farming as they saw it as good source of economic growth. Suitable climate is also one of the major reasons of choosing the cucumber farming by the 37.5% of respondents. Rest of them 16.25% chose cucumber as easy cultivation.

3.2.14 Major Disease and Pest Incidence

Powdery Mildew was the major disease prevalent in the cucumber. 26.25% were affected by powdery mildew. Least observed disease was Fusarium Wilt, 10% were affected.

Table 4: Appearance of major disease and pest in cucumber

Major disease and pest	Frequency		Percentage	
	Affected	Not affected	Affected	Not affected
Powdery Mildew	21	59	26.25%	73.75%
Mosaic Virus	10	70	12.5%	87.5%
Fusarium Wilt	8	72	10%	90%
Downy Mildew	20	60	25%	75%
Black Rot	13	67	16.25%	83.75%
Cucurbit fruit fly	17	63	21.25%	78.75%
Pumpkin Beetle	20	60	25%	75%
Aphid	15	65	18.75%	81.25%

3.2.15 Control Measures

Almost all the respondents were found using organic fungicides (Trade name: Systematic Fungicide F-7) as a control measure of powdery mildew. Farmers were found using organic method such as jholmol, neem oil, soap water to control aphids.

Alternative control measures include: Adjustment in planting date, Use of resistant varieties, Proper Sanitation, Crop Rotation, Botanical Pesticide, Biological Control (*Trichogramma* and predators).

3.2.16 Harvest And Post-Harvest Practices

Cucumber harvesting is done according to the varieties they cultivate. Bhaktapur local is harvested after 60-65 days, and dynasty is harvested after 42 days. During one cucumber cultivation season, when fruit reaches table use maturity, picking is done three times a week and continued for two months. The amount of labor required for harvesting cucumber is high compared to other food or cash crops. Cucumber harvesting must be done in more than one batch and cannot be done during early morning hours or during periods of rain. Harvesting is done manually with the use of tools such as sickles and cutting knives. Usually, bamboo baskets called Dokos are used for transporting vegetables to local markets. Plastic crates are used to transport cucumber to long distance market.

3.2.17 Major Constraints In Cucumber Production

Table 5 : Major constraints in cucumber production

S. N	Problems	Index value	Rank
	Marketing and unstable market	0.94	I
	Price fluctuation	0.83	II
	Lack of physical infrastructure to reach out market.	0.57	III
	High-cost input	0.52	IV
	Disease and pest attacks	0.42	V

Note: Scale value ranges from 1 to 0, where 1 = most serious, 0.75 = serious, 0.5 = moderate, 0.25 = little bit, and 0 = no problem at all.

3.3 Marketing

3.3.1 Marketing Channel

Cucumber was sold to the nearest market and to the different places within the Surkhet district. The practice of processing and exporting cucumber outside the Surkhet district was not observed. 26.25% of respondents sold the produce to middleman/collectors. 22.50% of respondents sold the produce to the local traders. 21.25% of them sold the produce to the wholesalers and 17.50% of the respondents sold the produce to retailers. Remaining 12.5% of the respondents sold the produce to the consumers directly. The study revealed that majority of respondents sold the produce to the middlemen/collectors and only few of the respondents sold the produce directly to the consumers.

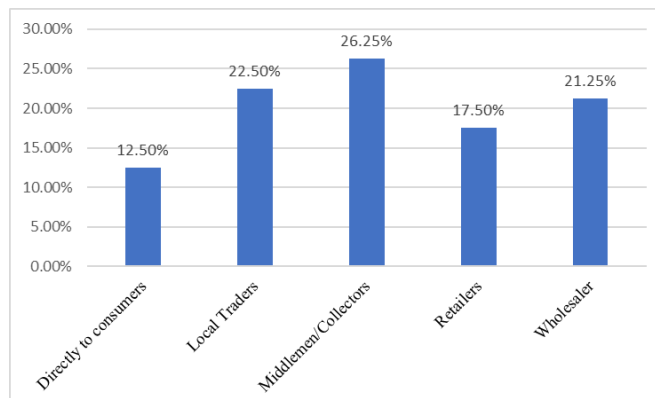


Figure 3: Method of selling the produce

In the study area, different types of marketing channel were observed through which the produced cucumber reached to consumer level from the producer/farmer which is shown below. Channel III was the most used marketing channel of the study area.

Channel I:

Producer → Consumer

Channel II:

Producer → Local Trader → Retailer → Consumer

Channel III:

Producer → Middleman/Collectors → Wholesaler → Retailer → Consumer

Channel IV:

Producer → Local Trader → Wholesaler → Retailer → Consumer

3.3.2 Price Fixing

According to the survey, while discussing with the farmers, it was known that price was set by middlemen, government, and wholesalers directly or indirectly. 43.75% of respondents sold cucumber at the price set by middlemen, 18.75% of respondents sold cucumber at the price set by government and 37.50% of respondents sold cucumber at the price set by wholesalers.

3.3.3 Grading

From the survey it was found that 17.5% of the respondents did grading of cucumber based on their size before selling it to the market and 82.5% of the respondents did not do grading of cucumber before selling it to the market.

3.3.4 Major Purchaser

The study revealed that 100% of the cucumber consumers were within the district. The practice of exporting cucumber outside the Surkhet district was not observed. It is due to the influence of Indian market. Most of the cucumber is imported from India which is much cheaper as compared to the local product. So, consumers prefer Indian product. The market situation of the farmers was that they sold their product in the nearest market or local area *i.e.*, haatbajar and even at long distance at Devkota sabji mandi and Shahi sabji mandi at Birendranagar and Poudel traders at Chhinchu, belongs to different municipalities of Surkhet district.

3.3.5 Distance To The Nearest Market

Respondents of the study area lived in Raga, Rigne, Babiyachaur, Salkot,

Jangala, Chiurikhet, Baraiche etc., and had their nearest market within a range of 6 kilometers. The study showed that 11.25% of the respondents

were at the distance of 2km from the local market while 25% of respondents were at 6km from the reach of their nearest market.

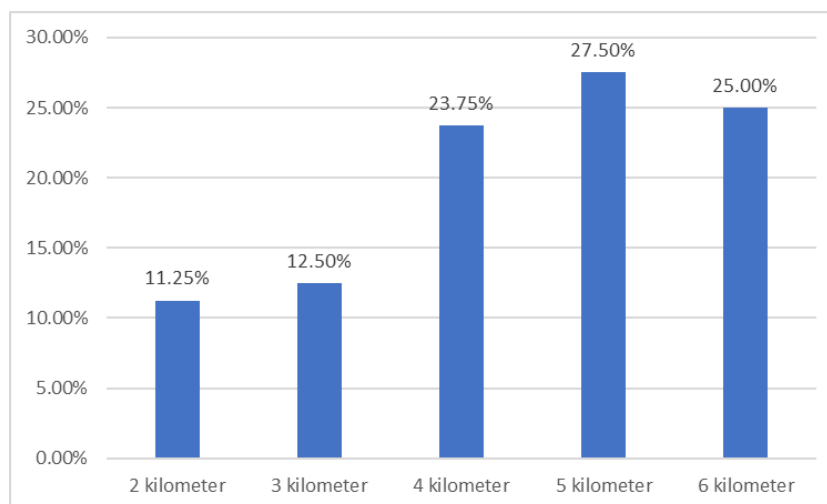


Figure 4: Distance to the nearest market

3.3.6 Price of Cucumber

After focused group discussion and field visit it was known that the price of cucumber was high during off season and low during on season. The

average price of cucumber was Rs 40-50/kg during normal season and the price of cucumber was normally high in off season (i.e., rainy season) which ranged from Rs 80-90/kg.



Figure 5: Price trend of Cucumber

3.3.7 Level of Satisfaction based on Market Price

The study portrayed that 33.75% of the respondents of the study area were satisfied with the market price of cucumber. 43.75% of respondents were neutral about the market price of cucumber and 22.50% of respondents were not satisfied with the market price. According to them they had to sell their cucumber in minimum price and had to face problems due to middlemen.

Total cost for cucumber production can be divided into fixed cost and variable cost.

3.4.1 Fixed Cost

Fixed costs are those expenses that are constant regardless of the size of the business and have little influence on whether production is increased or decreased. Fixed cost included taxes and maintenance cost of machineries used.

3.4 Economics Of Cucumber

Table 6: Fixed cost in cucumber production

S.N.	Description	Unit	Average cost (Rs/ha)
1	Land tax	Rs	1,179
2	Depreciation		
2.1	Farm Equipment	Rs	1,500
2.2	Motor	Rs	14,700
2.3	Sprayer	Rs	1,500
2.4	Power Tiller	Rs	10,240
2.5	Drip Irrigation Set	Rs	33,970
2.6	Tunnel	Rs	10,66,500
	Total	Rs	11,29,589

3.4.2 Variable Cost

Cost associated with inputs that are burned up in just one use of the production process are referred to as variable costs. For example, cost of

labor, seeds, fertilizers etc.

The study revealed that total average variable cost for cucumber production was NRs.3,60,555 for one hectare land.

Table 7: Variable cost in cucumber production

S.N.	Description	Unit	Per unit cost (Rs)	Average cost (Rs/ha)
A.	Labor Cost			
1	Land preparation and seed sowing	Man days	500	26,500
2	Staking	Man days	500	46,000
3	Irrigation	Man days	500	13,000
4	Manuring	Man days	500	26,500
5	Weeding	Man days	500	6,500
6	Harvesting	Man days	500	46,000
7	Transportation	Man days	500	52,500
B.	Material Cost			
1	Seed	g	40	56,880
2	Manure	Doko (1 Doko=15kg)	50	79,000
3	Urea	Kg	117	2,925
4	DAP	Kg	58	3,190
5	Potash	Kg	39	1,560
6	Pesticide	g	30	2,370
Total				3,62,925

$$\begin{aligned} \text{Total cost} &= \text{Fixed cost} + \text{Variable cost} \\ &= 11,29,589 + 3,62,925 \\ &= 14,92,514 \end{aligned} \quad (3)$$

The study showed that the total cost of production of cucumber per hectare was Rs.14,92,514.

3.4.3 Gross Income

Table 8: Gross income in cucumber production		
Average production per hectare (kg)	Average price per kg (Rs)	Total return (Rs)
30020	70	2101400

3.4.4 Benefit Cost Ratio Of Cucumber Production

It was calculated using total cost of production and gross return per unit area.

$$\begin{aligned} \frac{B}{C} &= \frac{\text{Benefit}}{\text{Cost}} \\ &= \frac{2101400}{1492514} \\ &= 1.41 \end{aligned} \quad (4)$$

3.4.5 Marketing Margin

The retailer's price was Rs 100 and the farmgate price was Rs 70, the calculated marketing margin was Rs 30.

4. CONCLUSION

In the study area, 57.50 percent of the respondents directly depended upon the agriculture therefore, it is the main source of their livelihood. Majority of the male were involved in the farming and was the main source of their income. Farmers with small and fragmented land can also generate healthy income which is the main reason of many people in the study area are involved in the cucumber production. The study showed that the average BCR for 1 hectare land was 1.41 which indicated economic feasibility of cucumber production inside the tunnel in the study area. Income generated through cucumber farming was used primarily for meeting household food security, child education, health, and savings.

There were some constraints which were affecting the cucumber production. The main problems in farming aspects were marketing, unstable market, price fluctuation, physical infrastructure to reach out market, disease and pests attack, high cost of inputs. If those problems are solved accordingly, the production of cucumber would have been increased as well as income, and improved livelihood of the farmers. There is an urgent need of addressing these types of problems to get more profit.

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