Role of Commercial Cucumber on Income Generation in Kathmandu Valley

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ABSTRACT

The study was conducted to assess the commercial cucumber production and its role in income generation in Kathmandu Valley. In the study area chemical inputs were widely applied with (92.38%) using insecticides, (57.14%) using fungicides and (38.10%) were using both chemical and bio-pesticides. In terms of irrigation majority farmers depended on canal (42.46%) and tube well (35.24%) while the drip irrigation method was limited. Regarding productivity, the average cucumber yield was 740 kg per ropani and average net income was Rs 2070 resulting in a benefit cost ratio exceeding 1. Pest and disease infestation, high input cost, fluctuating market price, limited irrigation facilities and middle men exploitation were major problem in cucumber production in study area. To address these challenges, farmers must practice use of balanced input through Integrated Nutrient Management and Integrated Pest Management farmers must be trained on record keeping and benefit cost analysis for better decision making.

Keywords: Input use, pest and disease management, productivity, varieties, yield

INTRODUCTION

Being an agrarian country, Nepal has a huge potential of producing different vegetables at different regions round the year, besides various cereal, pulses and other cash crops. A vegetable is herbaceous plant, or portion of a plant that is eaten whole or in part, raw or cooked, generally with an entree or in a salad but not as a desert (Welbaum, 2015). Cucumber (*Cucumis sativus* L.), an extensively cultivated vegetable plant, belongs to the "Cucurbitaceae" family (Khanal et al., 2020). Cucumber appears to have originated in Asia, where people have grown it for sustenance for around three thousand years (Subedi et al., 2024). It is grown in almost every part of the country in an annual pattern. It is annual, warm season

trailing vine crop, grown throughout the world under tropical and subtropical conditions (Chhetri et al., 2024). In Nepal, it 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. Cucumber is a cash generating crop for poor farmers residing near the markets and roads and is extensively grown in low to high hill of Nepal (Dahal and Dahal, 2022). Spring-summer is considered as the normal season while the rest of the year (rainy to early-spring) is regarded as the off-season. During off season it is successfully grown under greenhouse due to its suitability to thrive under high light intensity, high humidity, high soil moisture, temperature, and fertilizers condition (Chhetri et al., 2024). Off-season greenhouse cultivation has further boosted its demand and profitability. Cucumber holds a significant economic importance with the potentiality of income generation through year round production, by cultivating during off season under plastic house (Subedi et al., 2024). It contributes by enhancing household income, livelihood, improving nutrition and promotes cucumber farming in Nepal, particularly in Kathmandu valley where the demand is high. The total area under cucumber cultivation is 10,309 ha, with production 159,625 mt and productivity 15.48 mt/ha (MoALD, 2023). Out of which Kathmandu valley, contains 505 ha of area, with production 11,223 mt and productivity 67.61 mt/ha (MoALD, 2023).

Price behavior was a problem for the farmer with the major marketing problems being price fluctuation, unawareness of price, and middlemen intervention. Import of large quantities of vegetables is also one of the constraints for cucumber production. Furthermore, diseases and pests, high price of inputs, irrigation problems, climatic uncertainty, and insufficiency of needed inputs are the major bottlenecks for cucumber production. Meanwhile, lack of marketing information, uncertainty in selling price, unmanaged marketing extension services during marketing are challenges faced by farmers for cucumber production (Khanal et al., 2020). Though it has economic and nutritional potential, limited studies have been conducted on cultivation practices and its economic scenario. Therefore this study is important as it provides insight into cucumber production to income generation and also identifies the research gap on production practices and market opportunities. It provide base for policy makers, development agencies for developing strategies and policy making. This study benefits the farmers by providing better understanding the cultivation practices and its profitability, researchers to fill the research gap.

MATERIALS AND METHODS

The study was carried out in selected sites within the Kathmandu valley, focusing on three districts Kathmandu, Lalitpur and Bhaktapur. Kathmandu valley is in the Bagmati province in the central region of Nepal and lies at an elevation of approximately 1,300 meters above sea level. It experiences both sub-tropical and temperate climate which favor both seasonal and off- seasonal vegetable production, including cucumbers. These districts were specifically chosen due to their significant engagement in commercial cucumber farming, availability of semi-urban and peri- urban agricultural land and access to local and regional market.

Sampling technique and sample size

The study adapted purposive sampling method to select the respondents who were involved in cucumber production and could provide relevant information. This method was chosen as it allows conscious selection of farmers who meet certain criteria aligned with study objectives. A total of 105 farmers were interviewed within the study area. This number was particularly chosen for uniform representation across the three districts of the Kathmandu valley, with 35 farmers from each district i.e. Kathmandu, Lalitpur and Bhaktapur. This approach allowed the study to represent variation in farming practices across the valley while keeping the sample size manageable for collecting and analyzing the data. The farmers were selected based on certain criteria. Small scale farmers, cultivating on less than 10 ropani of land, engaged in commercial cucumber production and having at least one year of experience were the basis of criteria. These criteria assured the study focused on farmers with practical knowledge and consistent involve in cucumber production.

Data collection and analysis

Data was collected through combination of primary and secondary sources. Primary data were collected through structured interviews and questionnaire with selected participants. These tools were designed to gather detailed information on cucumber cultivation practices, input use, market price and yield. Secondary data were source from existing literature, government reports, and websites.

Descriptive statistics, such as mean, standard deviation, minimum, and maximum values, charts and graphs were computed by using Excel. Pearson correlation analysis was conducted using SPSS, focusing on the association of income, and

yield per ropani with key agricultural inputs such as seed rate, urea, DAP, potash, and average fertilizer use.

Additionally, an Excel Benefit-Cost Ratio (BCR) analysis was conducted to assess the economic viability of cucumber farming. By contrasting total revenue with total production costs, the BCR offers information about return on investment. The BCR is computed using the following formula:

Benefit Cost Ratio: Total Income / Total cost

A BCR value greater than 1 indicates that the farming activity is economically viable and profitable, while a value less than 1 suggests a loss.

Cropping Intensity (CI) = Gross cropped area / Net sown area X 100

CI Index = CI Index Low (150-250), Moderate (300), High (400)
Garret's ranking technique

To prioritize constraints faced by citrus farmers, Garrett's Ranking Technique (Garrett, 1961) was employed. Respondents ranked identified problems in order of perceived severity. Ranks were converted into percentage scores using:

$Percentage\ score = 100\ Rij - 0.5/\ Nj$

Where:

Rij= Rank given for the ith factor by the jt[h] respondent

Nj= Number of factors ranked by the jth respondent

Using Garrett's conversion table, percentage positions were transformed into scores (Garrett and Woodworth, 1969). Mean scores for each factor were calculated, ranked, and interpreted to identify the most critical constraints

RESULTS AND DISCUSSION

Socio- demographic and farm characteristics

The study revealed that among total respondents, 53.33% of the respondents were male, while 46.67% were female. The majority of respondents were under 41-50 (40.95%) followed by 31-40 (40%), 20-30 (7.62%) and above 60 (0.95%). This indicates that majority of the respondents fall between economically active age

group. Majority of the respondents i.e. 97.14% were primarily engaged in agriculture and remaining 0.95% was involved in other occupation. Out of the total respondents, 14.29% were illiterate, 36.19% and 30.48% had completed primary and secondary level education, and 15.24% had attained higher level education whereas only 3.81% had completed graduate-level education. The majority of farmers, 63.81%, cultivated cucumber on plots of less than 2 ropani. 24.76% cultivated between 2-4 ropani, while only 11.43% had cucumber cultivation on holdings larger than 4 ropani.

Table 1. Demographic status of respondents

Demographic characteristics	Category	Percentage
Gender	Male	53.3
	Female	46.7
Age group	20-30	7.62
	31-40	40
	41-50	40.95
	51-60	10.48
	Above 60	0.95
Occupation	Agriculture	97.14
	Abroad	1.90
	Others	1
Education	Illiterate	14.29
	Primary	36.19
	Secondary	30.48
	Higher	15.24
	Graduate	3.81
Total land under cucumber cultivation	2-4	24.76
	4+	11.43
	Less than 2	63.81

Cucumber production season

The majority of the respondents i.e. 93.3% had cultivated cucumber during spring-summer season indicating, it was the primary season for cucumber production. Conversely, only 6.67% of farmers had grown cucumbers during both the rainy and spring-summer seasons, indicating that very few farmers continued to grow cucumbers outside of the main growing season. These findings are consistent with the previous study. Spring-summer is considered as the normal season while the rest of the year (rainy to early-spring) is regarded as the off-season (Dahal and Dahal, 2022). Cucumber is widely cultivated during the summer season in low to mid hills as the main season crop and during the winter

under a plastic house as an offseason crop (Subedi et al., 2024). Overall, the findings showed that the study area's for cucumber production was highly seasonal, with the spring and summer being the most common growing seasons.

Varieties

During the study it was found that most of the respondents preferred using hybrid variety i.e Gorkha hybrid F1 (47%) and Brishma hybrid F1 (21%). 20% preferred using Bhaktapur local, 10% were using both hybrid and local and remaining other were found using Karma variety. When compared with previous studies, the present findings partly contrast with (Subedi et al., 2024), who reported that the majority of farmers (66.7%) cultivated Bhaktapur local cucumber, while Karma, Kamini, Pusa long green, Malini, and other varieties were grown by smaller proportions. Similarly, (Khanal and Dhakal, 2020) reported that 70% of farmers preferred Bhaktapur local, with only 5% using hybrids such as Dynasty, Beli, Kheera, Malini, and Ninja, and 25% using both types.
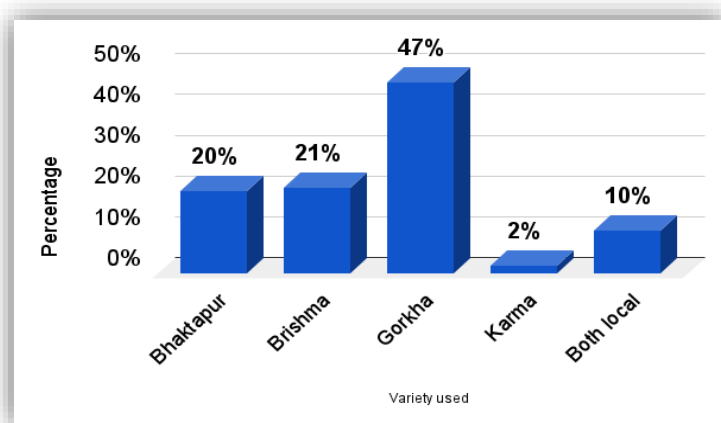

Figure 1. Varieties used by the respondents

Irrigation

From the study it was reported that 42.86% relied on tube well and 35.24% on canal irrigation. Drip irrigation was adopted by 21.90%. This suggested that while some farmers had adopted advanced drip irrigation techniques, the majority still depend on conventional method.

In contrast to these findings, Chhetri et al., (2024) reported that 100% of the respondents were cultivating cucumber inside tunnel using 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. These differences may be due to several factors such as high initial cost of drip irrigation installation could be major barrier for small holder farmers in the present study. Additionally, the perceived need to invest in modern systems is diminished by the ease of access to canal irrigation and tube wells.

Nutrient source

Among the total respondents, (81.90%) used both chemical fertilizers and organic manure. 15.24% used only organic manure. However, only 2.86% of respondents reported use of chemical fertilizers, indicating that the study area did not typically rely solely on synthetic inputs.

Previous research reported that 8% of them used only organic manure, 2% of them used only chemical fertilizers and 90 % of them used both organic manure and chemical fertilizers (Gautam, 2021). Such similarities highlight that integrated nutrient management has become a widely adopted practice among cucumber growers in Nepal, mainly due to its balanced benefits for both crop yield and soil health. Similarly, (Thakuri, 2023) reported that 92% fertilizer usage rate further highlighting the widespread of integrated practices.

Fertilizer used by the respondents

Among all the respondents, 43 farmers did not use urea, while the majority did so in small to moderate amounts. Of them, 33 used between 5.1 and 10 kg, 17 used between 1 and 5 kg, and only two farmers used more than 20 kg. With 40 farmers using 1–5 kg and 5.1–10 kg per ropani, respectively, DAP was widely used; only 18 farmers did not use it at all. In contrast, only 37 farmers used potash, 39 used 1–5 kg, and 24 used 5.1–10 kg per ropani. These findings are consistent with the previous study where I was reported the recommendation of 5–6 kg of DAP, 10 kg of urea, and 2-3 kg of potash per katha, or roughly 3.5 kg of DAP, 7 kg of urea, and 2 kg of potash per ropani (Dahal and Manandar, 2020). The current study demonstrates that farmers' application of DAP (5.1–10 kg per ropani) and urea (5.1–10 kg per ropani) typically falls within or near the recommended range when compared to the previous study recommendations.
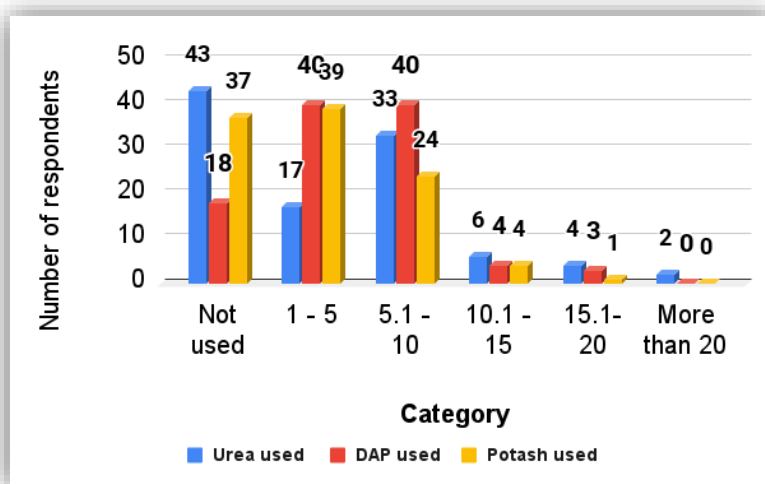
Figure 2. Fertilizer used by the respondents

Pesticides use

In the study area, 61.90% found using solely chemical pesticides whereas 38.10% of farmers reported using both chemical and biological pesticides, indicating that some level of integrated pest management was practiced but the overall adaption of bio pesticides was limited.

The present study is consistent with (Baral and Gyawali, 2025) findings where they reported that 100 % respondents used chemical pesticides while 68% reported using both chemical and biological (bio) pesticides for disease and pest management which consistent with my present findings. This study further reported that commercial vegetable farmers showed greater affinity towards chemical pesticides over bio-pesticides.

Chemical pesticides

Among the respondents, it was found that 92.38% of respondents reported using insecticides from which most of the respondents i.e. 36% used Chloropyrifos 50% + Cypermethrin 5% while other different insecticides were used by smaller proportion of respondents. Similarly 57.14% of farmers used fungicides. It was found that the most common fungicide used was Mancozeb 64% + Cymoxanil 8% WP.

This result aligned with study of (Baral and Gyawali, 2025), who noted that fungicides and insecticides are the two major used pesticides in vegetable production. From the (Maharjan, 2020) findings insecticides were most used (68%) and fungicides (22.33%) in cucumber farming, In contrast to Maharjan's finding, the percentage of farmers using pesticides in the current study is significantly higher.

Price of cucumber

The average price of cucumber paid by wholesaler was Rs 45/kg, retailer Rs 85/kg and consumer Rs 100/kg.

These findings are consistent with (Subedi et al., 2024) who also reported the average price of cucumber. In their study the average sales price of cucumber for producers was found to be Rs. 35.17 while for retailers, it was found to be Rs. 94.60.

Satisfaction level regarding market price

The study portrayed that 24.8% were satisfied with the market price whereas majority of respondents i.e. 75.24% were dissatisfied. It was due to fluctuating market price and middlemen exploitation. The study conducted by (Chhetri et al., 2024) 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.

Production

The average production was 740 kg per ropani. From the study area, it was found that 71.43% of farmers reported a moderate yield of cucumbers, ranging from 501 to 1000 kg per ropani. Around 22% produced a low yield of 1 to 500 kg per ropani. Just 6.67% of the farmers produced a high yield of more than 1000 kg per ropani. The moderate range found in the current study is consistent with previous study (Khanal and Dhakal, 2020) where they reported an average production of 850 kg per ropani. In contrast, Chhetri et al., (2024) reported an average production of 30,020 kg per hectare, or about 1,500 kg per ropani. This falls into the high-yield category, which defined as more than 1,000 kg per ropani. These comparisons showed that although the majority of Kathmandu Valley farmers produced

moderate yields, better management techniques or favorable weather conditions could have facilitated for higher yields.

Economic profitability

The total average net return from cucumber in the study area was Rs 20702. The average benefit cost ratio was 1.96 (Table 2). The previous study conducted by Tiwari and Belbase, (2024) had reported an average return of Rs 1004430/ha which is approximately Rs 50,225/ropani with an average total cost of Rs 283383/ha (Rs 14,169/ropani). This demonstrates positive net returns. Similarly Chhetri et al., (2024) reported higher returns of Rs 2101400/ha (Rs 105070/ropani) and a B: C ratio of 1.41 which indicates profitability. Both studies confirmed that cucumber farming can generate significant income, but the income in the present study was lower.

Table 2. Benefit cost analysis

Average cost (NRs.)	Average gross return (NRs)	Average net profit (NRs)	B:C
20892	41476	20702	1.96

Correlation analysis

The usage of urea ($r = 0.355$, $p < 0.001$), DAP ($r = 0.341$, $p < 0.001$), and potash ($r = 0.446$, $p < 0.001$) showed a significant positive correlation with income per ropani, while their correlation with yield per ropani was also significant , urea ($r = 0.196$, $p = 0.045$), DAP ($r = 0.515$, $p < 0.001$), and potash ($r = 0.511$, $p < 0.001$) indicating that higher and balanced fertilizer use enhances both productivity and income levels.

These results are consistent with findings from Nawalparasi, where (Acharya et al., 2022) reported that the combined application of FYM and NPK under mulching conditions produced the highest cucumber yield (27.97 t/ha) and the greatest economic return with a benefit–cost ratio of 2.60. Similarly, (Adhikari et al., 2023) found that increasing urea application in Baglung improved cucumber yield, but also emphasized that balanced nutrient application is more effective than nitrogen alone. These studies reinforce the present finding that while urea contributes to productivity, phosphorus and potassium are more critical in determining both yield and profitability.

Table 3. Correlation coefficients for Mean of all variable categories (N= 105)

Particulars		Seed rate / ropani	Urea	DAP	Potash	Avg. fertilizers
Income per ropani	Pearson Correlation	0.055	.355**	.341**	.446**	.472**
	Sig. (2-tailed)	0 .577	<.001	<.001	<.001	<.001
Yield per ropani	Pearson Correlation	-0.127	.196*	.515**	.511**	.479**
	Sig. (2-tailed)	0.195	0.045	<.001	<.001	<.001
** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level						

Note: 20 ropani= 1 ha

Challenges faced by the respondents

On the basis of Garrett ranking, market price fluctuation was the most serious issue (mean score = 77), followed by high labor costs (66) and irrigation problems (67). The least serious limitation on cucumber production was seedling death with mean score 48 ranked fifth while pest attack with mean score 58 ranked fourth.

Table 4. Major challenges faced by cucumber farmers

Problems	Mean score	Rank
Market price fluctuation	77	I
Irrigation	67	II
High labor cost	66	III
Pest attack	58	IV
Seedling death	48	V

Overall the main problems found out during cucumber production included marketing difficulties, unstable market and price fluctuations, irrigation, pest and disease attack. These findings are consistent with (Chhetri et al., 2024) and (Subedi et al., 2024), who also reported unstable market, price fluctuation, irrigation, disease and pests attack as major challenges. The previous studies additionally identified problems such as marketing problem, inadequate infrastructure and high labor cost which were not significant constraint in my study area

CONCLUSION

The canal and tube well irrigation methods were dominant showing the need of modernization in water management. A small number of respondents had adapted drip irrigation method which reflected a low level of adoption of modern and efficient irrigation technologies among cucumber farmers. Farmers largely

depended on chemical inputs such as insecticides and fungicides, with limited use of bio-pesticide. The average benefit cost ratio of cucumbers for 1 ropani was 1.96 which clearly indicated that cucumber production can generate significant returns if managed effectively. However potentiality was often hindered by common problems like pest and disease infestation, fluctuating prices, high input cost, limited advances irrigation technique and middle men exploitation.

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