**Economic Perspectives on Walnut Production and Trade in Darchula District of Nepal**

**ABSTRACT**

The research was conducted to study the production and marketing of walnuts in the Shailyashikhar rural municipality of the Darchula district of Nepal. A field survey was carried out to gather information from walnut producers and traders. Semi-structured questionnaires were used to collect the primary data from 80 households using a simple random sampling technique. Secondary information was collected via journals, research articles, reports of the Agriculture Knowledge Center (AKC), and statistical information on Nepalese agriculture published by the Ministry of Agricultural Development (MoAD), Central Bureau of Statics (CBS), and Department of Agriculture (DoA). The total cost of walnut production was found to be NRs 29,228.35 per hectare. The mean B:C ratio was 1.743, which means the production of walnuts is likely to succeed in a long-term business. Land used for walnut production was found to have increased over the past 5 years. The productivity and area under walnut cultivation have been growing in recent years. Due to various problems in the production process and trading system, the return was relatively lower than expected. Lack of sufficient stacking, unavailability of quality seed, lack of irrigation and marketing facilities, marginal land, and incidence of disease and pest were found to be major problems in walnut production and marketing. Walnut cultivation is highly profitable in Shaiylashikhar and can be commercialized on a large scale. Still, proper policies, appropriate production techniques, necessary production inputs, and a systematized trading process should be guaranteed.

## Keywords: *Walnut, Economic, Marketing, Production, Profitability*

## INTRODUCTION

*Juglans regia L.* is a tree species that humans have appreciated since ancient times. Wild stands of *J. regia* have been documented to grow in the temperate and semi-arid mountain areas of Asia (Shigaeva & Darr, 2020). However, recent climate change alterations and its associated problems, particularly drought and heat stress, have affected the production zone (Banjade et al., 2024; Khanal et al., 2024). In Nepal, the total walnut production, area, and productivity are 9,162 metric tons (mt), 2291 hectares (ha), and 4.00 mt/ha, respectively (MoALD, 2023). Mustang, Humla, Jumla, Dolpa, Mugu, Kalikot, Baitadi, Bajhang, Bajura, Darchula, Morang, Saptari, and Udaypur are the prioritized districts for commercial walnut production in Nepal (Kirtipur, 2017). In Nepal, there are two varieties of walnut trees: native hard-shell and soft-shell (Uraguchi & Barrueto, 2018). *J. regia*, a woody plant of economic significance, is widely cultivated in temperate areas for its timber and fruit supply, which have high nutritional value (Zhang et al., 2010). Its importance as a global biodiversity hotspot is highlighted by the presence of numerous wild relatives of domesticated species (Fisher & Christopher, 2007). In mid-hilly regions, walnuts can play a significant socioeconomic role. They support food security and give local farmers a source of income.

The primary walnut polyphenols and their metabolites, ellagitannins, and urolithins, each have anticancer properties (Ros et al., 2018). *J. regia* has been used extensively in traditional medicine for a wide range of conditions, including helminthiasis, diarrhea, sinusitis, stomachaches, arthritis, asthma, eczema, scrofula, skin disorders, and various endocrine diseases like diabetes mellitus, anorexia, thyroid disorders, cancer, and infectious diseases (Nael Abu Taha, 2011). Over the past five years, there has been a consistent rise in the price of walnut imports into Nepal. The domestic production of walnuts could displace imports from nearby nations (Barrueto et al., 2018). The total walnut area, production, and productivity in Sudurpaschim province are 611 ha, 2051 mt, and 3.36 mt/ha, respectively. In Darchula district, the total area, production, and productivity are 163 ha, 336 mt, and 6.20 mt/ha, respectively. On average, the Darchula district has significantly higher walnut productivity of 6.20 mt/ha (MoALD, 2023). Identifying the primary motivating factors for the farmers to cultivate walnuts is necessary. Scientific research on underutilized crops plays a significant role in attaining sustainability, profitability, and diversification in agriculture and in restoring the balance of trade.

# **MATERIALS AND METHODS**

## 2.1 Description of the study area

Darchula district was purposely selected for the study, as this is the central hub for walnut production in Nepal. This district occupies a 20-ha area under pole-type walnut cultivation. Due to the suitable climate for walnut production, the cost of production also cuts a bit compared to other regions of Nepal. The latitude and longitude of the Darchula district are 290 84’24” N and 800 84' 24" E, respectively. The climate of the Darchula district varies widely from subtropical to alpine. Most of the parts in the north, having an alpine environment, remain under snow. In the southern part and valleys, the climate is subtropical. Mid-hills have a temperate climate. The average maximum temperature is 18.6 °C, and the minimum is 7.7 °C. The average rainfall is 2129 mm.



## Fig 1. Map of Nepal showing the research site

## 2.2 Sampling procedure and data collection

A simple random sampling method was used for surveying households, and 80 households were selected. Primary data was collected from farmers through face-to-face interviews and focus group discussions. The household survey was conducted in the proposed area using a simple random sampling method, and 80 households were selected using a structured questionnaire. Before the questionnaire, field observation was done in the study area. Secondary data was collected from various sources, such as published journals, articles, research papers, proceedings of different NGOs and INGOs, reports of AKC, Statistical Information of Nepalese Agriculture published by the Ministry of Agricultural Development (MoAD), Nepal Agricultural Research Council (NARC), Central Bureau of Statics (CBS), and Department of Agriculture (DoA).

## 2.3 Data Analysis

The collected data from both primary and secondary sources were edited, coded, processed, and analyzed using Statistical Package for Social Science (SPSS) and Microsoft Office Excel. Descriptive statistics like mean, standard deviation, percentage, and frequency were used to describe socioeconomic and farm characteristics.

# **Results and Discussions**

## 3.1 Walnut production and input materials

In the survey, the maximum walnut production per season was found to be 3200 kg. Maximum walnut production per tree was found to be 200 kg. The cultivation material was sapling. All the respondents faced problems in the procurement of saplings. In the survey, 85% of farmers were reported to get their saplings from India, and only 11% of saplings were obtained from the district nursery. If this could be exceeded, farmers would be much more benefited, and the cost of production could be minimized.

## 3.2 Purpose of walnut cultivation

The figure shows that the primary purpose of walnut cultivation is to have a suitable cultivation environment compared to other crops. Out of total production, 57% was cultivated due to its favorable condition, 15% because of ease of cultivation than other crops, 9% of walnut was grown because of reasonable market price, and another 2% was cultivated due to less biotic and abiotic stress problem, and 8% due to less labor required and 9 % of walnut was cultivated for home consumption.

## Fig 2. Purpose of walnut cultivation

## 3.3 Problems related to walnut cultivation

Late fruiting is a significant problem in walnut cultivation. Similarly, Hailstorm and quality sapling ranked 2nd and 3rd, whereas hardshell fruits and irrigation ranked 4th and 5th.

## 3.4 Major disease and pest and their management

The major problem in the study area was walnut blight. Out of total cultivated walnuts, it is mainly affected by walnut blight followed by anthracnose. Similarly, walnut production was affected by borer, followed by walnut husk fly. From the study, it was found that the majority of farmers had no idea about pest management. Producers had no idea about pest management. However, some educated and well-skilled households had used cotton with kerosene oil dipped and applied it to infestation areas for pest management.

## 3.5 Cost of production and gross income

The average cost incurred in production was NRs 9363.25 per ropani. 10.40 % of the cost was incurred in land preparation, 11% of the cost was incurred in FYM, and 4.33% of the cost was incurred in stalking of walnuts. Urea, potash & DAP represent a smaller portion of the total cost at 0.89%, 0.97%& 2.00%, respectively. Similarly, 10.47%, 11.99%, %, 12.97%, 13.97%, 7.19%, and 14.05% were incurred in planting, mulching, weeding, cleaning, storage, transportation, irrigation, and sapling costs, respectively. The cost is distributed on various practices where the major cost was incurred in the procurement of saplings, which is 14.05%, followed by post-harvest costs.

Table 1. Cost of walnut cultivation per ropani

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Cost item | Average amount (Kg) | Price (NRs.) per kg | Total price NRs. | Contribution to total cost (%) |
| Land Preparation | 3.325 | 555 | 1870 | 10.40 |
| FYM  | 2.79 | 266.62 | 778.13 | 4.33 |
| Urea | 4 | 40 | 160 | 0.89 |
| Potash | 3.5 | 50 | 175 | 0.97 |
| DAP | 4.5 | 80 | 360 | 2.00 |
| Plant Mulching  | 3.35 | 555 | 1882.5 | 10.47 |
| Sapling cost | 46.7 | 53.125 | 2524.5 | 14.05 |
| Weeding cost | 3.88 | 555 | 2155 | 11.99 |
| Cleaning cost  | 3.96 | 555 | 2331.25 | 12.97 |
| Storage & transport | 4.47 | 555 | 2511.25 | 13.97 |
| Irrigation | 3.25 | 552.5 | 1292.5 | 7.19 |
| Total cost |   | 17972.63 | 100% |
| Total production | 98.66 | 296.25 | 29228.25 |   |

The average production of walnuts in a ropani of land is 98.66 kg. So, the average production of walnuts in a hectare of land is 1934.35 kg.

Total income = Rs. 1934.35 \* 500 (Production \* Farm get price)

 = Rs. 9, 67,175

Total cost of production =Rs. 3, 52,540.46 per hectare

Net gross margin= total income – total cost of production

 = Rs. 9, 67,175- Rs. 3, 52,540.46

 = Rs. 6, 14,634.54

The benefit-cost ratio (BCR) of walnut production was found to be 1.743, likely to give the farmers a positive net worth value.

**3.6 Land use trend under walnut production**

Land used for walnut production has increased over the past 5 years. The average land used in 2076 BS was 4 ropani. Similarly, 5 ropani land was used in 2077, and 6 ropani in 2078 BS. The production of walnuts has increased in the last 5 years. This might be due to high market price and demand, low cost of production, and favorable climatic conditions. The average production in 2076 BS was 55 kg, which increased to 75 kg in 2077 BS, and the average production in 2078 BS was 80 kg.

Fig 3. Land use trend for walnut cultivation in the study area.

## 3.7 Problems for walnut marketing

The influence of the Indian market is a significant problem of walnut farming in the study area. No marketing channel ranked 2nd followed by Transportation 3rd rank. Similarly, middleman and low price ranked 4th and 5th, respectively.

## 3.8 Forms of market and market price

Farmers were getting the highest prices from the retailers despite the fact that they don't deal with retailers much due to uneasy access to them. Likewise, farmers were getting higher prices from the local traders, followed by wholesalers. They get the least price when they deal with middlemen and contractors.

Table 2. Forms of market prevalent in the study area

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Forms of market | Unit  | Quantity sold / farmer | Average price per unit (Rs.) | Total amount (Rs.) |
| Local trader | Kg | 72.63 | 500 | 36315 |
| Middleman | Kg | 152.5 | 300 | 45750 |
| Whole seller | Kg | 123.56 | 400 | 49424 |
| Retailer  | Kg | 48.93 | 600 | 29358 |
| Preharvest walnut contractor | Kg | 3.21 | 250 | 802.5 |

##

## 3.9 Credit supply system and organizational support

Most of the respondents had no credit for walnut production. Out of the total respondents, 17% of farmers had no credit, 17 % of the respondents had credit from cooperatives, 17 % had credit from local money lenders, and 16 % had credit from banks. Local government, AKC, and non-governmental organizations have supported packaging, polyhouse development, and irrigation-related training. Different types of supports like improved seeds, fertilizers, collaterals, funds, loans, and marketing assurance could harness the potentiality of farmers to grow and produce more. Suitable supports, including improved seeds, disease-pest management techniques, and durable stakes, must be prioritized first.

Fig. 4. Credit supply system in the study area

# **CONCLUSION**

Walnut is a vital cash-generating crop in Darchula, where mixtures of landraces with different sizes and varieties are harvested and sold in the market. The mean B:C ratio was 1.743, which means walnut farming could be established as a successful agri-business. The productivity and area under walnut cultivation are increasing, but lack of sufficient staking, the incidence of disease and pests, and poor irrigation facilities are major production problems. Twelve percent of the respondents have not received any support from government organizations, but the Agriculture Knowledge Center, Darchula, had a program to provide market assurance. The study concluded that walnut cultivation is highly profitable farming in the context of the Darchula district and can be commercialized on a large scale. Still, necessary production input, appropriate production technique, proper policies, and assurance on transportation should be managed well.

**CONSENT**

All authors have their consent to publish this manuscript in the Asian journal of advances in agricultural research.

**ETHICAL APPROVAL**

Not applicable

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