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A STUDY ON ECONOMICS OF APPLE NURSERY GROWERS IN THE DOLPA DISTRICT, NEPAL

Apurba Paudel[1,2*], Rajan Khanal[1,2], Sangam Ghimire[2], Laxman Chand Thakuri[2]

[1]Institute of Agriculture and Animal Science, Kirtipur, Nepal.

[2]Agriculture and Forestry University, Chitwan, Nepal.

*Corresponding author

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ABSTRACT

This research was conducted to compute the economics of the nursery business, identify opportunities and constraints, and evaluate the current nursery management practices of nurseries located in Thulibheri Municipality, Tripurasundari Municipality, and various rural municipalities. All nurseries registered with Agriculture Development Office (ADO), Dolpa were selected purposively for the study. Primary data were collected through Focus Group Discussions (FGD), Household Surveys, Key informant interviews (KII), and telephone surveys using an interview schedule. Major constraints to sapling production included high initial costs for rootstock seeds and a lack of quality propagating materials. Additionally, damage during transportation and difficult road conditions were significant marketing concerns. Climate suitability and land availability were the most influential factors for the nursery business in the area. Farmers used Edimayal and crab apple as rootstocks, while red delicious was the dominant scion variety. Most farmers grew scions for grafting on their own farms. All farmers sold their saplings at district price rates, with most of the produce utilized within the district. Notably, 71.29% of the total produce was marketed through agricultural-related offices, from which farmers obtained subsidized saplings. The overall benefit-cost (BC) ratio of the nursery business was found to be 2.01, and the internal rate of return (IRR) was 31.36%, which is greater than the prevailing interest rate. Despite existing constraints, the nursery business was found to be profitable. It is recommended that farmers and related stakeholders carry out nursery operations in plastic houses rather than in open fields and invest in other infrastructure to develop the nursery business in the study area.

Keywords: Nursery, Apple, Saplings, Cost, Benefit

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INTRODUCTION

Agriculture is still the mainstay of the Nepalese economy. About 70% of the country's area is covered by hills and mountains (Karki, 2002). Agriculture in Nepal has long been based on subsistence farming, particularly in the hilly and Himalayan regions. The agricultural sector contributes 23.13% to the GDP (Statista, 2021) and is the most prioritized sector in the national economy of Nepal. Fruits are an essential part of the agricultural sector, contributing 14% of the total GDP in Nepal (Subedi et al., 2018). Apples contribute about 4.2% of the total fruit production and occupy 5.08% of the total fruit area in Nepal (ABPSD, 2017).

Apple (*Malus domestica*) is commercially the most important temperate fruit and ranks fourth among the most widely produced fruits in the world, after banana, orange, and grape (FAO, 2016). It is one of the most important species among temperate climate fruits. It is estimated that the apple's motherland is the South Caucasus, including Anatolia (Örmeci & Aşkin, 2017). Current experiences with apple cultivation indicate that Jumla and Mustang are the most successful districts in Nepal in terms of productivity and quality of apples produced. Looking back into the history of improved apple cultivation in Nepal, it was first initiated in 1937 during the Rana regime when improved varieties of apple saplings were imported from Japan and Italy and planted at various locations in the Kathmandu Valley. However, these introduced apple varieties did not grow satisfactorily and disappeared without record and documentation. Records on apple development reveal that the systematic apple development program in the country commenced with assistance from the Government of India in the 1960s (Project et al., 2005). In Nepal, apples are cultivated in the mid and high hills, from the easternmost area to the far western zone of the country. Apples are a high-value cash crop envisaged by the Government of Nepal for agricultural development in the mountainous rural areas (Atreya & Kafle, 2016). Commercial orchards can be found in Jumla, Humla, Mugu, Dolpa, Mustang, Baitadi, Rasuwa, Sindhupalchok, Kavre, and Solukhumbu, among others. In the 1970s, different varieties of apples were introduced from India, including Golden Delicious, Red Delicious, Royal Delicious, Rich a Red, Jonathan, Benoni, McIntosh, Cox's Orange Pippin, and Granny Smith. The Delicious varieties have performed better in Nepal than others and were preferred for further expansion due to their good size, flavor, attractive color, juiciness, sweetness, and longer storability even under natural conditions (Project et al., 2005). Apples are a major source of income for the people living in Karnali Province. They are the principal fruit crop in terms of area, production, and household economy in the remote mountain districts of Nepal (Atreya & Kafle, 2016). The largest productive areas under apple cultivation in Karnali Province are found in Jumla District (1,154 ha), Mugu (470 ha), Dolpa (412 ha), Kalikot (650 ha), and Humla (518 ha) respectively (MoALD, 2017). Apples are a prominent and prioritized high-value cash crop in the high hills of Nepal (Khadka, 2018). Apples are consumed worldwide in greater quantities than any other temperate tree fruit, such as peaches and pears (Lynch, 2010),

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and more than 7,500 varieties of apples are grown globally, most of which are consumed fresh (Subedi et al., 2018). Poor soil fertility, climatic factors and disease and pest are major problems faced by the farmers of apple growing areas in Nepal (Ghimire & Kafle, 2014). Increasing temperature in the mountainous regions of Nepal have a bad indicator for lowering the cultivation practices of apple and leads to declination of its production, so major concerns are needed for those regions for sustainability of apple farming in Nepal (Manandhar et al., 2014).

A nursery is an important place for raising and caring for plants until they are ready for transplantation. The nursery growing conditions in Dolpa are primarily open field, with a limited number of high-tech nurseries operating in the entire district. Farmers mostly use local indigenous sources of rootstock found in Karnali, such as Edimayal, Surkhilo, and crab apple. They rarely use dwarfing rootstock varieties of the MM series. Some nurseries bring saplings from Manang, Mustang, and Jumla, which are then sold to farmers or transplanted on their farms.

METHODS AND METHODOLOGY

Study Area

The study area is located at 28°43'N to 29°43'N latitude, and 82°23'E to 83°41'E longitude. This research was carried out in all the nurseries registered in the ADO Dolpa office that consists 31 total apple nurseries in the district.

Population, Sampling Frame, Sample and Sampling Procedure

From the raw data, there were total number of 31 nurseries registered under the agriculture development office (ADO) Dolpa, carrying out apple sapling and rootstock producing business till FY 2077/78. All of these nurseries were purposively selected for the survey. The nurseries were widespread around the Dolpa district in various wards of Thulibheri, Tripurasundari Municipality and other Rural Municipality. For the price survey, cost and income data of all the nurseries were taken.

Data Collection

The inventory list of farmers recently registered in ADO Dolpa carrying out apple nursery business was entered in an excel sheet. Similarly, all the 31 nurseries were selected for the price survey.

Primary Data Collection

Household Survey

Household survey was conducted by a face-to-face interview using a well-structured pretested interview schedule. A total of 31 apple nursery farmers of the study area were interviewed for primary data collection.

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Interview Schedule

A preliminary study was carried out before the main survey to collect various socio-economic, demographic, geophysical conditions of the study sites. This information was used in preparing interview schedule.

Pre-testing of the Interview Schedule

Pretesting, also known as Piloting, and was used to assess the clarity of the prepared interview schedule and its suitability to the participants. It helps to assess the needed time, the possible obstacle that could arise, or check if there are some technical errors. For this, 5% of the total sample population was pretested and it is not counted in the main report.

Finalization of the Interview Schedule

The interview schedule was finalized after pretesting with the 5% of the total sample population, the necessary correction was made and incorporated into the final interview schedule.

Focus Group Discussion (FGD)

A group of 7 people was involved and the time for FGD was about 45-90 minutes. FGD was done in Shu and Jiu village. FGD group was done inclusively and its operation was participatory. FGD moderators ensure participation of all in the group and prevent the domination of any person or group.

Checklist

Checklist was prepared to validate and check the accuracy of data given by other respondents in FGD.

Key Informant Interview (KII)

KII were taken from Local resource persons, progressive farmers, social workers, the staff of PMAMP-PIU, Dolpa, and agriculture-related organizations as well as members of Rural Municipality, political leaders, and other concerned stakeholders on the concerned subject matter. The information collected will be reliable and contextual.

Secondary Data

The secondary information was obtained through reviewing different journal article, publications of the Department of Agriculture, Ministry of Agriculture Development (MoAD), Central Bureau of Statistics (CBS) Nepal Agriculture Research Council (NARC), Manuals of PIU, Agriculture Knowledge Centre (AKC) /Agriculture Development Office (ADO) in Karnali of the respective district.

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Data Analysis Techniques

The qualitative and quantitative data gathered were coded, and entered in Excel/ SPSS software. The data were analyzed to draw meaningful inferences by using SPSS and MS-Excel software. Descriptive statistics, mean comparison, frequency distribution, trend analysis was done to analyze the data.

Problem Indexing

Indexing was used in the ranking of different nursery and disease and pest problems. Indexing was computed by using the following formula given by Miah (1993).

$I_{prob} = \Sigma (S_i F_i)/N$

Where,

I_{prob} = Index value for intensity

Σ = Summation

S_i = Scale value of i^{th} intensity (I = 0 to 10) where 7 problems were selected.

F_i = Frequency of i^{th} response

N = Total number of respondents

Benefit-cost Ratio

It is a discounting measure of economic analysis. The purpose of benefit-cost ratio analysis is to find out whether the investment made on the resources will yield a reasonable return to the resources engaged. BCR compares the benefit per unit of cost. Thus, BCR calculated by using the following formula:

$B/C = \sum Bt\,[1/(1+i)^t] / \sum Ct\,[1/(1+i)^t]$

Where,

$\sum$= Summation

Bt = Gross income at single period t^{th} year

Ct= Total cost at single period t^{th} year

I= Discount rate

t= time in the year

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Net Present Value (NPV)

NPV is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. NPV is used in capital budgeting and investment planning to analyze the profitability of a projected investment or project.

$NPV = \sum Bt\ [1/ (1+i)^t\ ] - \sum Ct\ [1/ (1+i)^t\ ]$

Where,

$\sum$= summation

Bt = Gross income at single period t^{th} year

Ct= Total cost at single period t^{th} year

I= Discount rate

t= time period in year

Internal Rate of Returns

The internal rate of return is a discount rate that makes the net present value (NPV) of all cash flows from a particular project equal to zero. It refers to the earning power of the project i.e. this project can pay an interest rate only below the IRR. If IRR is more than the discount rate project is acceptable whereas if IRR is less than the discount rate project is rejected.

IRR= LDR+DTDR [NPV at LDR/Absolute sum of NPV at UDR and LDR]

Where,

IRR= Internal rate of return

LDR= Lower discount rate

UDR= Upper discount rate

DTDR=Difference between two discount rate

Payback Period

The payback period refers to the period it takes to recover the cost of an investment. It doesn't consider the discounting factor. It is the non-discounting measure of project appraisal.

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RESULT

Production Constraints

Major Problems in Production of Apple Saplings

Problems were ranked preferentially and high initial cost of seed for rootstock was ranked at first whereas lack of small equipment and machinery was ranked at last and other problems ranking is as shown in the table below.

Table 1: Problems ranking in production of apple saplings.

S.N.	Major problems	Index value	Rank
1	High initial cost of seed	0.95	I
2	Lack of quality propagating material	0.83	II
3	Diseases and insects	0.70	III
4	Lack of technical knowledge, trainings and support	0.52	IV
5	Lack of market	0.34	V
6	Lack of irrigation and fertilizer	0.33	VI
7	Lack small machinery and equipment	0.24	VII

Disease and Insect Damage

Among various disease papery disease was found to be causing major damage in the nursery it does 51.61% of the total damage done by diseases in the nursery followed by powdery mildew (38.7%) and apple scab (9.67%) per year. Apple Wolly aphid was found to be causing 54.83% of the damage in the nursery annually which is most among the insects followed by white grub 29% and apple root borer 16.12% as shown in Figure 1 below.

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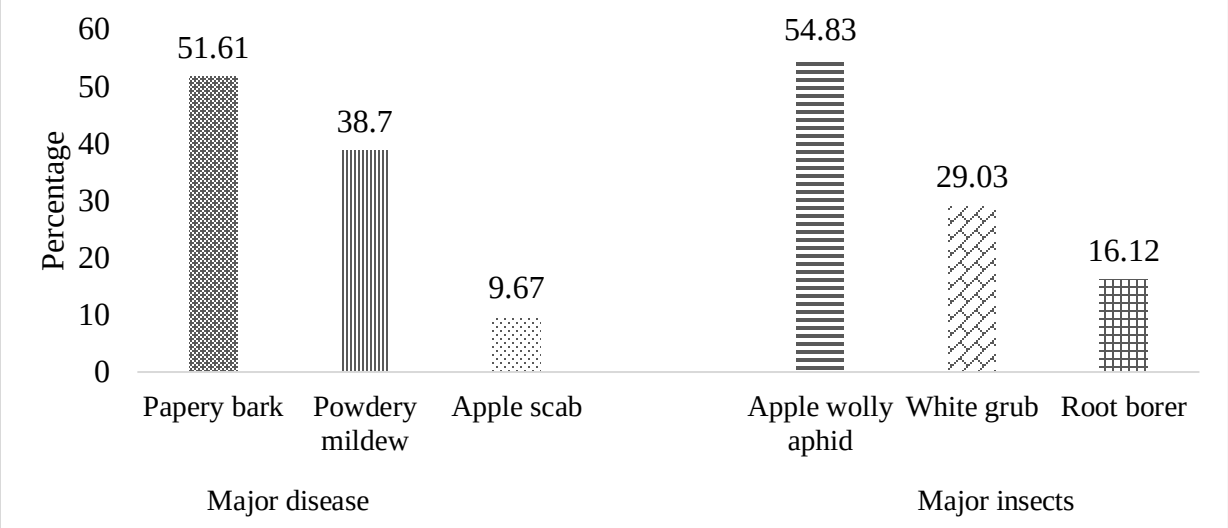
Figure 1: Diseases and insects damage propertion in the nursery in the study area.



Marketing constraints

For ranking of problems in marketing of the apple saplings, damage during transportation was ranked at first whereas the problem of middlemen was ranked at last and rest of the problems ranking is as shown in the Table 2. Farmers have to face the problem of damage during transportation due to the difficult road structure, the rural people mostly use horse/mule as the means of transportation for taking the saplings to the destination also due to lack of quality packaging materials and packing techniques damage during transportation was found most peculiar problem of the study area.

Table 2: Problems in marketing of the apple saplings.

S.N.	Major problems	Index value	Rank
1	Damage during transportation	0.95	I
2	Transportation problem due to difficult road	0.83	II
3	Lack of quality packaging materials	0.70	III
4	Unavailability of labor for loading/unloading	0.52	IV
5	Lack of price information and organized market	0.34	V
6	Price variation	0.33	VI
7	Middleman	0.24	VII

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Influencing Factors

Land availability and suitable climate was found to be the most influencing factor whereas availability of inputs was the least influencing factor for farmers to carry out nursery business in the study area, this was also found out by preferential ranking and rest of the other influencing factor with their ranking is as shown in the table below.

Table 3: Influencing factors for carrying out nursery.

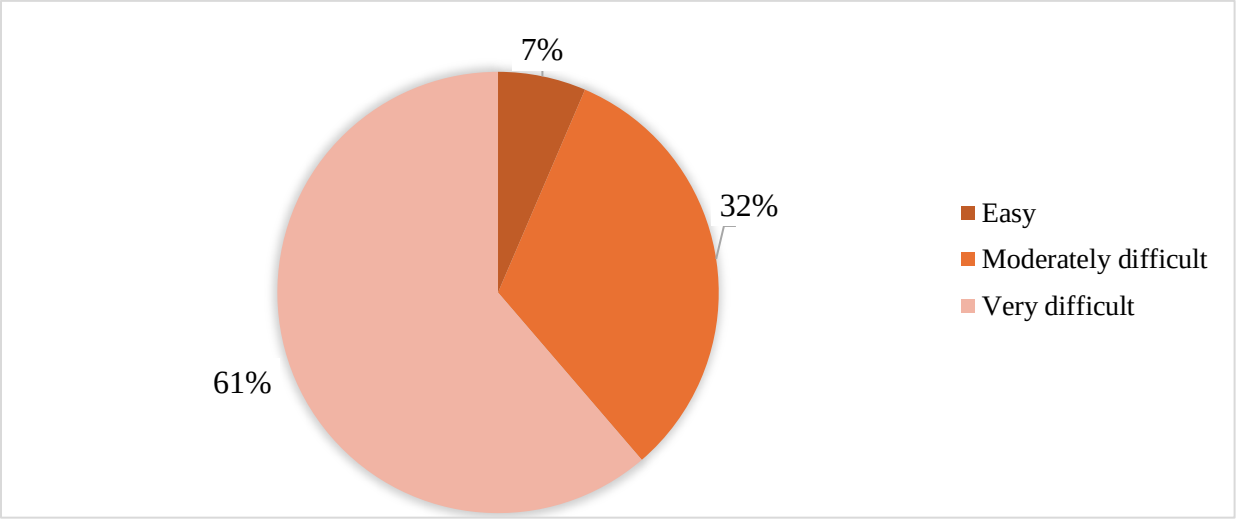
S.N.	Influencing factors	Index value	Rank
1	Land availability and suitable climate	0.95	I
2	Good returns	0.81	II
3	Market demand	0.66	III
4	Govt. subsidies and extension services	0.46	IV
5	Neighbor influence	0.35	V
6	Availability of inputs	0.27	VI

Management Practices

Access to Seeds of the Rootstock

For 6.45% of the respondents the access to seed was easy, 32% of the respondents find moderately difficult to access the seed and for about 61% of the respondents the access to seed was very difficult that was due to high cost of seed for rootstock and transportation problems as shown in Figure 2 below.

Figure 2: Access to seed of rootstock to respondents in the study area.



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Type and Source of Rootstock for Nursery

From the study it was found that both the rootstocks type i.e., Edimayal and crab apple were found to be used in somewhat similar proportion, i.e., 51.61% and 48.38% respectively. Surkhilo the other rootstock option that is available indigenously in Karnali of Nepal was not used by any farmer in the Dolpa district which is also called as raees in local language.

Majority of the farmers which accounts for 77.41% import the seeds for rootstock from other districts, 6.45% of farmers collect the seeds from their community forest, whereas 3.22% of the farmers bring seeds from other source, other source here indicates that they buy seed from India and rest of other is as shown in the Figure 3.

Figure 3: Type and source of rootstock for nursery in the study area.

Access to Scion and Source of Scion for Grafting

Access to scion was easy to 70.96% of the nursery growers and rest of the others find this moderately difficult and the farmers either bring scion for grafting from Neighbor farm or they grow in their own farm which accounts for 45.16% and 54.83% respectively as shown in Figure 4.

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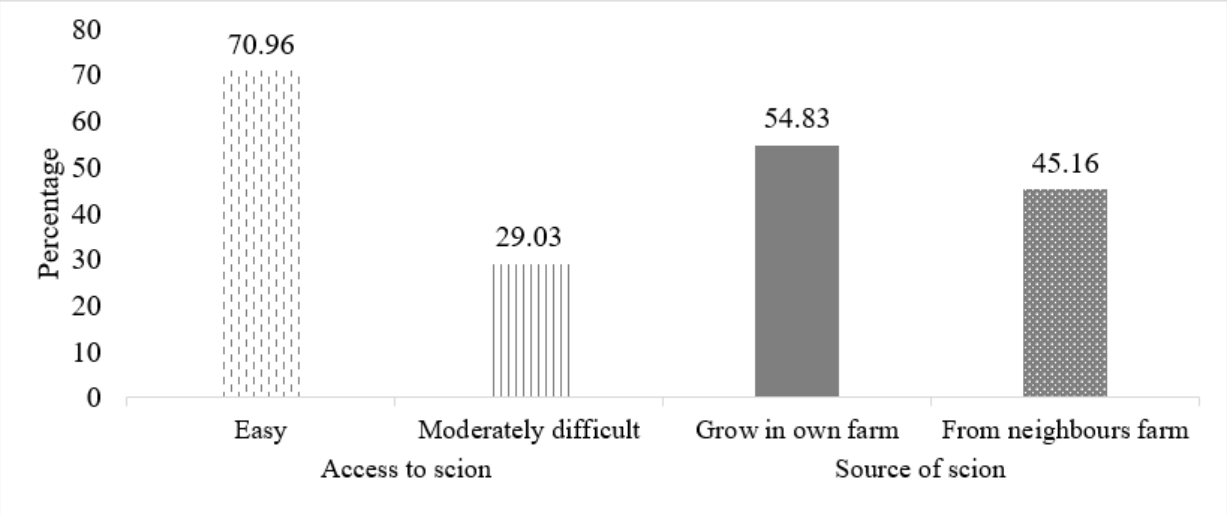
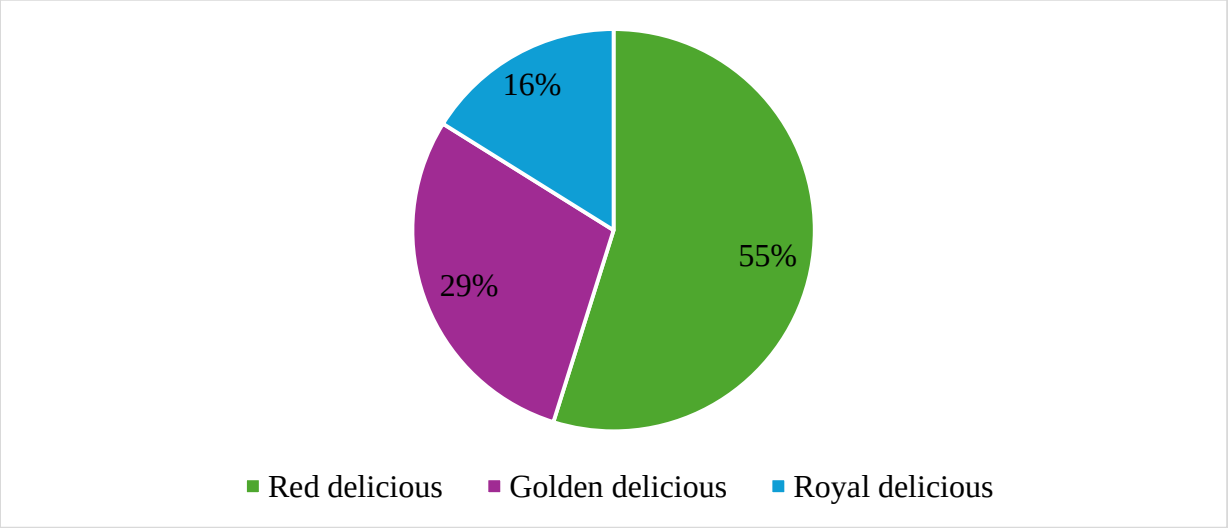
Figure 4: Access to scion and source of scion for grafting in the study area.



Type of Scion Used for Grafting

Red delicious (55%) was the major scion used by the nursery growers in the study area followed by golden delicious (29%) and royal delicious (16%). These are also the major varieties found all over Karnali province since long time.

Figure 5: Type of scion used in nursery in the study area.



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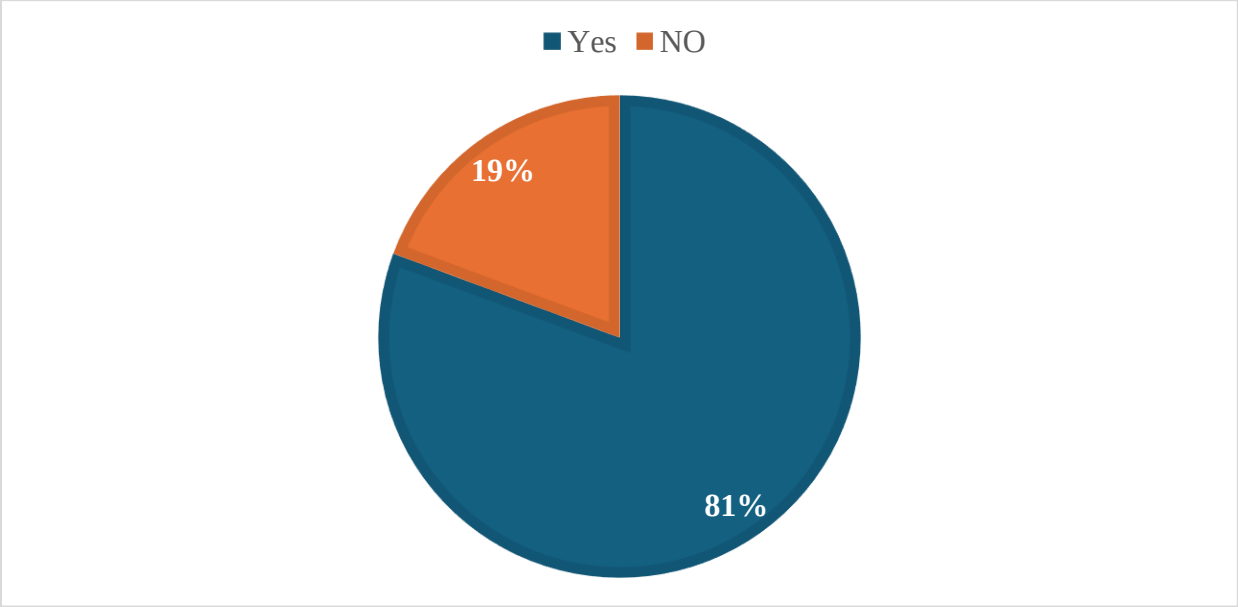
Training on Sapling Production, Subsidy Taken and Source of Subsidy

Majority of the respondents i.e., 81% had taken some kind of training for sapling production and rest of the others had not taken any kind of trainings regarding the business as shown in Figure 6 below.

Figure 6: Training on sapling production in the study area.



The figure given below indicates that 77.41% of the respondents had taken subsidy for running their nursery business and the source of subsidy was mainly ADO Dolpa. 54.83% of the respondents had taken subsidy from ADO Dolpa and 22.58% from recently established PIU of PMAMP i.e., apple zone, Dolpa.

Figure 7: Subsidy taken for nursery and source of subsidy in the study area.

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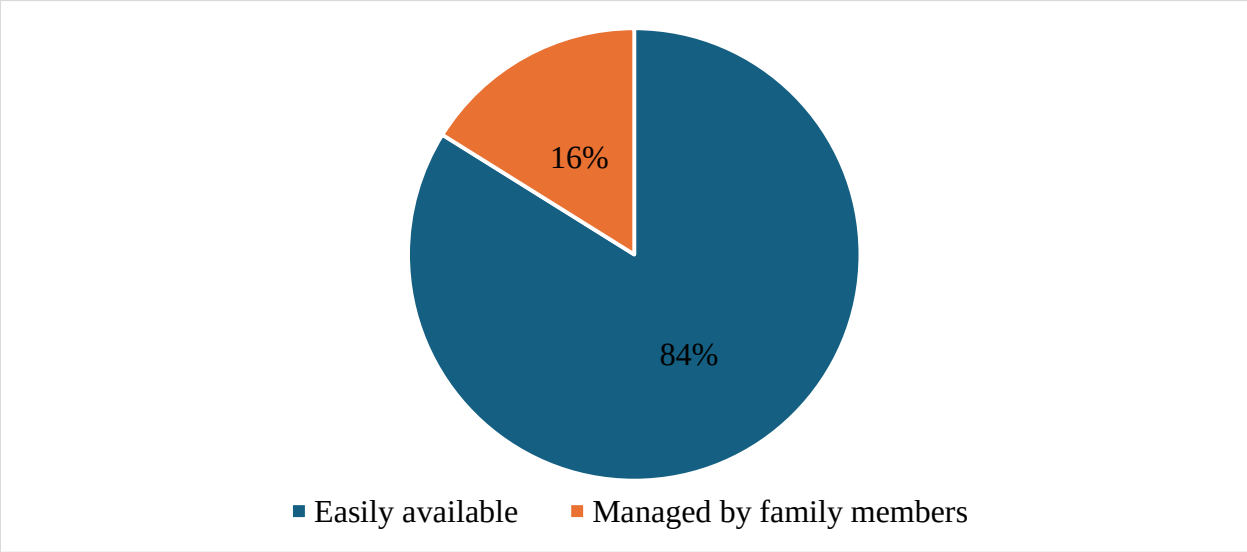
Labor for Loading and Unloading

As shown in the figure below labor for loading and unloading of saplings was easily available to 84% of the respondents and for other respondents loading and unloading was managed by the family members.

Figure 8: Labor availability for loading and unloading in the study area.



Insect Pest Management

For management of diseases and insects' farmers mostly used cows' urine and locally made bio-pesticide both of which was found to be 32%, followed by Jholmol 23% and neem-based oil 13%. None of the farmers were found using chemical method for management of disease and insects as Karnali is rural part of Nepal along with that Karnali is now regarded as the organic province.

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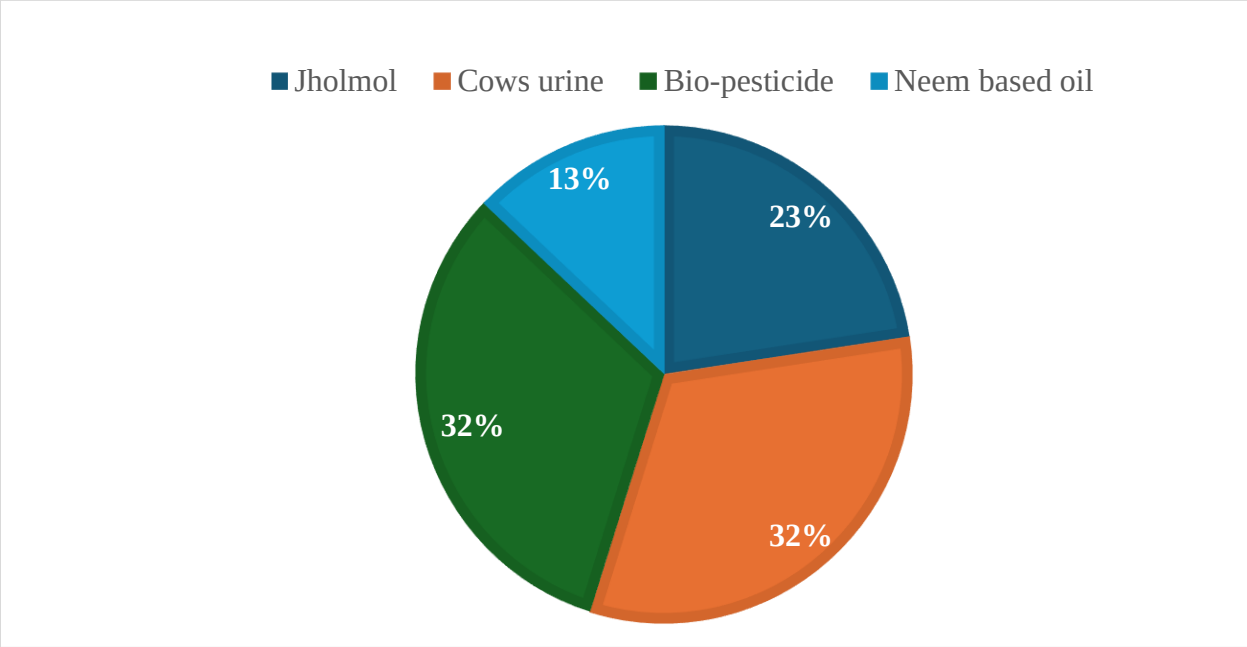
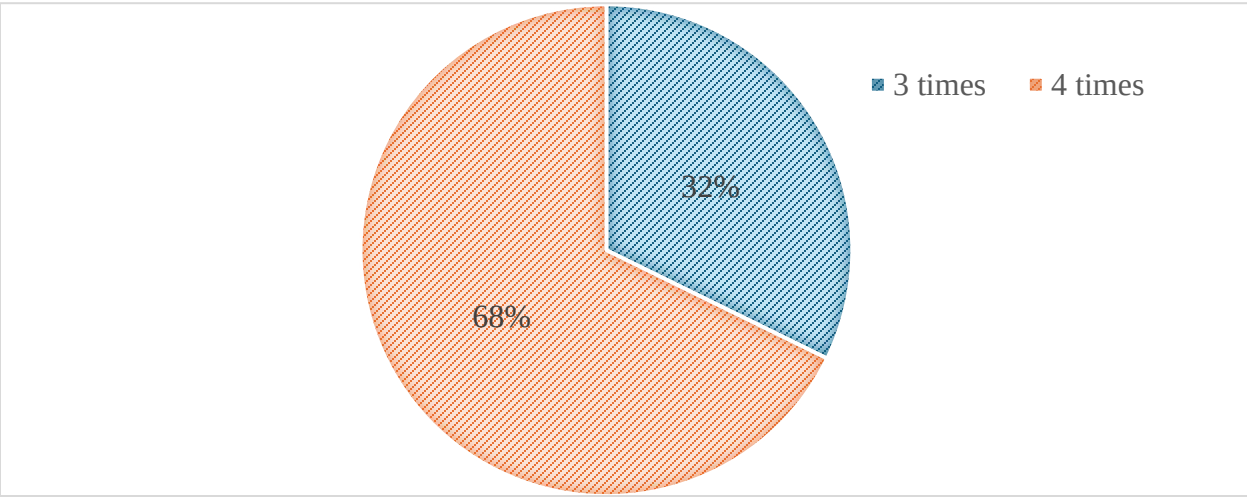
Figure 9: Management practices of disease and insects in the study area.



Sucker Removal

Majority of the nursery growers at least removed the suckers coming out of rootstock for 4 times after grafting until the saplings are ready for transplantation and other portion of respondents removed their suckers for 3 times.

Figure 10: Sucker removal of saplings in the study area.



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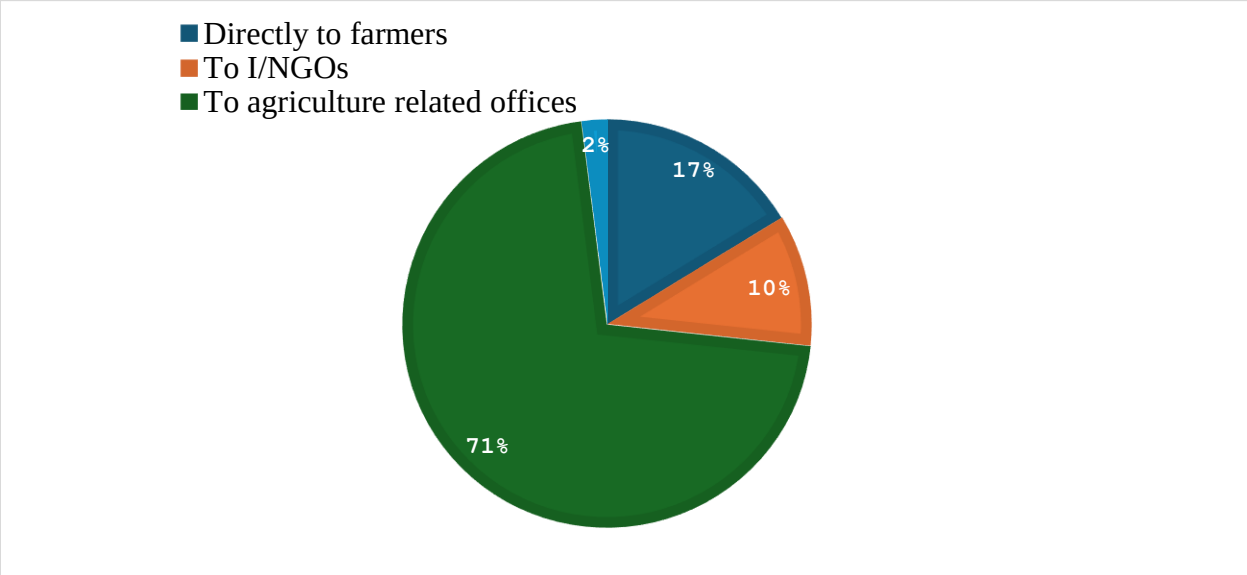
Proportion of the Marketed Saplings to Various Destination

In overall basis of all the nurseries in the study area 71% of the saplings is bought by agriculture related offices like ADO, PMAMP, PIU etc. only 2% of the produce is marketed to other districts, this indicates that majority of the saplings produced are used within the district.

Figure 11: Proportions of the marketed saplings in the study area.



Economic Feasibility

The apple nursery sub-sector gives initial return at the third year of investment, for first two-year nursery growers invest money for various purposes. The detailed cost breakdown of 31 nurseries altogether is given in the table below for first and second year with the gross income obtained in the third year. Here the land tax is ignored as the nursery requires small area and land tax addition will make negligible effect to the economic analysis. Also cost for sprayers and chemical inputs are not included as framers were not found using any chemical inputs in the study area.

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Table 4: Detailed cost breakdown of the whole nursery together of first and second year.

SN	Description	Unit	Quantity	Rate (NRS)	Total (NRS)
I. Input cost for first year					
1	Seeds for rootstock	Kg	6.5	20000	129800
2	FYM	Basket	1022	250	255500
3	Compost	Kg	1600	20	32000
4	Wooden box for stratification	No.	114	500	57000
5	Sand for stratification	Kg	2235	10	22350
6	Labor for sphagnum moss collection	Man days	32.5	1000	32500
7	Lack preparation and seed sowing cost	Man days	120	1000	120000
8	Grafting knife	No.	90	500	45000
9	Secateur	No.	53	500	26500
10	Transportation cost	RS	42	1500	63000
11	Irrigation pipe	meter	8570	1000/100m	85700
Total cost for first year					869350
SN	**Description**	**Unit**	**Quantity**	**Rate (NRS)**	**Total (NRS)**
II. Input cost for second year					
1	Technician for grafting	Man days	65700	10/plant	657000
2	Grafting Tape	No.	208	350	72800
3	FYM	Basket	730	250	182500
Total cost for second year					912300

Table 5: Total income of the third year of nurseries altogether.

SN	Description	Unit	Quantity	Rate (NRS)	Total (NRS)
1	Gross income from saplings	RS	73,000	77/plant	5,621,000
Total income of the third year					5,621,000

Benefit Cost Analysis

From the study the total cost of first year and second year including miscellaneous cost was found to be NRs 1867150. From total production of around 73,000 apple saplings from all the nurseries in the district and calculating the total saplings by the district price rate of Dolpa district for apple sapling the gross income in the third year was found to be NRs 5621000, net profit was calculated

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by subtracting total cost from total gross income and was divide to get the BC ratio of overall nursery business in the study area and it was found to be 2.01 which is greater than 1 that means the business is profitable in the study area.

The minimum and maximum BC ratio was calculated for the ones producing minimum and maximum number of saplings per year respectively and the result is as shown in the figure. The total cost per unit sapling was found to be NRs 25.57.

Table 6: Benefit cost ratio calculation.

SN	Description	Total (Rs)
Cost description		
1	Total cost for first year	869350
2	Total cost for second year	912300
3	Miscellaneous cost for 1st, 2nd, 3rd year	85500
	Total cost	1867150
Income description		
1	Gross income of third year	5621000
Net profit		3753850
B:C ratio		
1	Overall B:C ratio	2.01
2	Minimum B:C ratio	0.56
3	Average B:C ratio	2.01
4	Maximum B:C ratio	4.13
5	Cost per unit sapling (RS)	25.57

Net Present Value (NPV)

Table 7 shows that NPV at 12% discount rate was found to be 2219266077 after the third year this shows NPV is greater than zero means the nursery business is feasible in the study area.

Table 7: Net present value calculation.

Year	Total cost	Gross revenue (RS)	Discount factor 12%	Discounted cost (RS)	Discounted revenue (RS)	NPV
1	869350	0	0.89	776205.36	0	0
2	912300	0	0.797	727279.97	0	0
3	28500	5621000	0.71	20285.74	4000916.773	2219266077

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Internal Rate of Return (IRR)

Table 8 shows that internal rate of return was found to be 31.36% which is greater than the prevailing interest rate this shows the feasibility of the nursery business in the study area.

Table 8: Internal rate of return calculation.

SN	Higher discount rate (HDR)	Lower discount rate (LDR)	NPV at HDR	NPV at LDR	Absolute sum of HDR and LDR	IRR (%)
1	47	12	-1781650	2219266.77	4013021.89	31.36

Payback Period

Rs 5621,000 is obtained in 365 days of third year

Rs 1 is obtained in 365/5621000 day

Rs 1781,650 is obtained in (365/5621000) *1781650 days of third year

=115.69 days

So Initial two years + 115.69 days

Payback period was found to be 2 years 3 months and 26 days

Sensitivity Analysis

Table 9: Sensitivity analysis when benefit decreases by 20%.

SN	Particulars	1	2	3
1	Total cost	869350	912300	28500
2	Total benefit	0	0	5621000
3	Benefit decreases by 20%	0	0	4496800
4	Discount factor	0.89	0.797	0.71
5	Discounted cost	776205	727103	20285.7
6	Discounted benefit	0	0	3200733
7	BC ratio	0	0	1.1
8	NPV	0	0	1677139

Here, even when total benefit is assumed to be decreased by 20%, NPV is found to be positive.

Hence, our project is not sensitive even if benefit decreases by 20%.

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Table 10: Sensitivity analysis when cost increases by 20%.

SN	Particulars	1	2	3
1	Total cost	869350	912300	28500
2	Total benefit	0	0	5621000
3	Total cost increase by 20%	1043220	1094760	34200
4	Discount factor	0.89	0.797	0.71
5	Discounted cost	931446.4	872523.7	24342.88
6	Discounted benefit	0	0	4000917
7	BC ratio	0	0	1.19
8	NPV	0	0	2172604

Here even the total cost is assumed to be increased by 20%, NPV is found to be positive. Hence, the nursery business is not sensitive even cost increases by 20% in the study area.

Table 11: Sensitivity analysis when total cost increases by 20% also benefit decreases by 20%.

SN	Particulars	1	2	3
1	Total cost	869350	912300	28500
2	Total benefit	0	0	5621000
3	Total cost increase by 20%	1043220	1094760	34200
4	Benefit decreases by 20%	0	0	4496800
5	Discount factor	0.89	0.797	0.71
6	Discounted cost	931446.4	872523.7	24342.88
7	Discounted benefit	0	0	3200733
8	BC ratio	0	0	0.75
9	NPV	0	0	1372420

Here, even if total cost is assumed to be increased by 20% and benefit is assumed to be decreased by 20%, NPV remains positive. Hence the nursery business is not sensitive in the study area even if the total cost increases by 20% and benefit decreases by 20%.

DISCUSSION

Poor soil fertility, climatic factors and disease and pest are major problems faced by the farmers of apple growing areas in Nepal (Ghimire & Kafle, 2014). In Far Western of Nepal, inputs unavailability and poor road facilities are major constraint of apple production (Bajgain et al.,

2024). Lack of proper irrigation, insect pest, poor storage condition, lack of road facilities and marketing are the major problems of apple production in Dolpa district of Nepal (Ojha et al., 2021). Despite the so many constraints apple production was beneficial farming system in Himalayan region of Nepal, the BC ratio of apple orchard over 20 years was found to be 1.90, with internal rate of returns of 33.3% and a payback period after 7.3 years (Chapai et al., 2024). Overcoming the certain problems viz. insect pest damage, poor technical facilities, poor marketing, post-harvest loss, apple farming was found to be a profitable farm enterprise with a benefit-cost ratio of 1.84. in Mustang (Gayak, 2020). Although, the BC ratio of apple growing farmers of Mustang ranges from 1.19-2.68 (Bhandari & Aryal, 2016) whereas the ratio of apple production in Mustang and Jumla were 1.98 and 2.44 respectively (Khadka, 2018). The production of apple in Darchula was found to be economically efficient with 1.88 BC ratio, 22.03% of IRR and 8 years and 8 months of payback period (Pandey et al., 2023).

LIMITATIONS

This survey explored the existing nursery growing and management practices, its economic feasibility, constraints and opportunities in the Dolpa district. Dolpa district is one of the important districts of Nepal for production of apple with climate and land suitability. Also, very less research has been conducted to study the economics of the apple nursery in the remote district of Nepal, hence the research will be helpful for the future entrepreneurs. Since this research has been conducted in one of most remote districts of the country so the conclusion drawn from the study may not be taken generalization for the other areas of the country.

CONCLUSION

The high cost of rootstock seed and the lack of quality propagating materials are major production constraints. For marketing constraints, damage during transportation and difficulties due to poor road conditions are primary concerns. Economic and sensitivity analyses show the feasibility of the nursery business in the study area. The major rootstock used by farmers is Edimayal, and the scion is Golden Delicious.

SUGGESTION AND RECOMMENDATIONS

Further research related to environmental factor affecting on overall production and current supply and demand condition of production are highly suggested for the new innovators and researchers.

CONFLICT OF INTEREST

The author asserts that there are no conflicts of interest related to the publication of this paper.

AUTHORS' CONTRIBUTION STATEMENT

Apurba Paudel designed and conducted the study and drafted the manuscript. Rajan Khanal, Sangam Ghimire and Laxman Chand Thakuri assisted with data collection, analysis, and manuscript preparation, and they also contributed to the final editing and proofreading of the draft.

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