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Potentiality and Threats of Avocado Farming in Eastern Hills of Nepal

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Abstract

Innovative and profitable agriculture has become indispensable for the supply of food and nutrients to people as well income generation. Thus, this study deals with the feasibility of commercial avocado farming including the analysis of problems related to this especially in the case of eastern hilly areas of Nepal. This study applied household questionnaire survey, key informant survey, focus group discussions and field observation to collect relevant primary information. Previous research journals, dissertations, books and official records were used as the major sources of secondary data collection. This study covers the entire area of Ward No. 3 of Dhankuta Municipality. Around, 44 percent (223hhs) farm households were selected as a sample out of the total 506 households of this area based on Yamane's sample determination formula (1967).This study proves that the agriculture system can be made profitable and useful through carefully using of new high valued crops. It reveals that avocado is a new commercial crop with maximum potential in the hilly areas of eastern including both challenges and opportunities. Moreover, this study also confirms that the avocado farming is not only a profitable business but also a risky and challenging. The farmers are facing various socio-economic challenges while doing this cultivation. Thus, the conclusion of the study is that the new agricultural activities are not free from challenges so that farmers must be faced patently to achieve success. This conclusion conveys the message that the success achieved only by facing barriers is sustainable.

Keywords: Avocado, barriers, expansion, sustainability and threats.

Introduction

Avocado is one of the most important tropical and subtropical fruit of the world. The botanical name of this fruits is *Persea Americana* belonging to the *Leuraceae* family. In Nepal, its cultivation is still in infant phase. Many people of Nepal are nor familiar with the importance and nutritious aspects of this fruit (Balbase, 2020). It is rich in nutrients like protein, carbohydrates, vitamins, and minerals. It contains an exceptional amount of soluble and insoluble dietary fiber which is known as the best solid food for the babies. Along with this, Avocado consists of oil of poly saturated fatty acid. Avocado calories 200 for 100gm, due to the high amount of calories, it is regarded as the best diet for people who want to gain weight (Basyal, 2020). In this context, (Atreya, 2020) has mentioned: it is also known as '*Butter Fruit'* in Nepalese society. The history commercial farming of this crop in Nepal is not so long but some enthusiastic farmers have been cultivating it in their garden for a long time to fulfill their domestic needs only. The main place of origin of this fruit is considered to be Mexico of Central America. America, Cuba, Mexico, Brazil, Argentina, Israel, Peru, South Africa, Indonesia and Philippines are known as major Avocado producer countries at present. In recent days, its expansion is gradually taking place towards South Asia. Beside this, he mentions that the data on how much area have occupied by Avocado plants in Nepal, how many plants have been planted and how much is the production have not declared yet authentically. He also adds that first of all, around 1978, the government of Nepal imported 5 varieties (Reed, Hass, Topatopa, Ettinger, and Fuerte) of Avocado plants from UK in Kirtipur and Sarlahi Horticulture farms. And it was reached the hilly areas of eastern Nepal by the staff of the then Pakharibas Agriculture Centre and foreign tourists at the same time.

At present, Dhankuta Municipality occupies a leading position in commercial Avocado farming. The third Municipal Assembly of June 22, 2018 has declared the Municipality as the capital of the Avocado. Accordingly, policies have been prepared and various programs have been launched. According to the latest information received so far, 1, 04,500 saplings have been planted within the municipality and 55 Nurseries are in operation. Similarly, Avocados are currently cultivated on 1000.3 hectares within this municipality and the annual production is 2, 84,000 kilograms (Dhankuta Municipality, 2021).

In this context, the studies of various scholars such as Virgo and Subba (1994), Koirala (2006), and Khatiwada (2014) have identified that there are some changes occurred in the

agriculture sector along the Koshi Highway of eastern hills in Nepal. Those studies identify that high valued commercial crop have replaced to cereal-based subsistence farming. The joint role of various physical, infrastructural and socio- economic factors seems to be decisive to create such situation. The establishment of the then Pakharibas Agriculture Research Centre (PAC), increasing access to roads, farmers' self-efforts and market integration, and governmental and non-governmental agencies' supports are drivers to change. As a result, avocado cultivation seems to have existed in this area (Wagle, 2019). However, there is no systematic and detailed study has been done regarding the potentiality and threats of this fruit cultivation in this area yet. Keeping this fact at the center, this study has been forwarded on the basis of such research questions as why and how did avocado fruit become popular in the eastern hilly areas of Nepal, what is the potentiality of this fruit in this area and what are the existing major problems related to this farming.

Based on such research questions, this study has especially explored the following aspects:

- Past and current situation of the avocado farming in the study area.
- The main reasons for the development and expansion this fruits in this area.
- To analyze the existing major problems related to this cultivation.

Method and Materials

Method of Data Collection and Tools

This study is mainly based on field survey data collection in 2022 using household questionnaire survey, field observation, key informant survey and interaction with focus groups. The detail questionnaire survey was conducted to average 44 percent (223hhs) farm households of the four major settlements (Patle, Nigale, Syaule and Lankure) out of total 506 households, using Yamane's sample determination formula (1967 as cited in Adhikari and Pandey, 2018)):

. $n = \frac{N}{1+Ne^2}$

Where,

n = Sample size

N = Total population size,

e = Acceptable sampling error

The sample farm households were determined through the use of systematic random sampling method based on the number of the total farm households in each major settlement. Four key informant interviews and one focus group discussion were conducted to collect

information related to the origin and development of avocado fruits in this area. Besides, an inventory sheet was also used to observe the climatic condition, sources of irrigation and soil types etc.

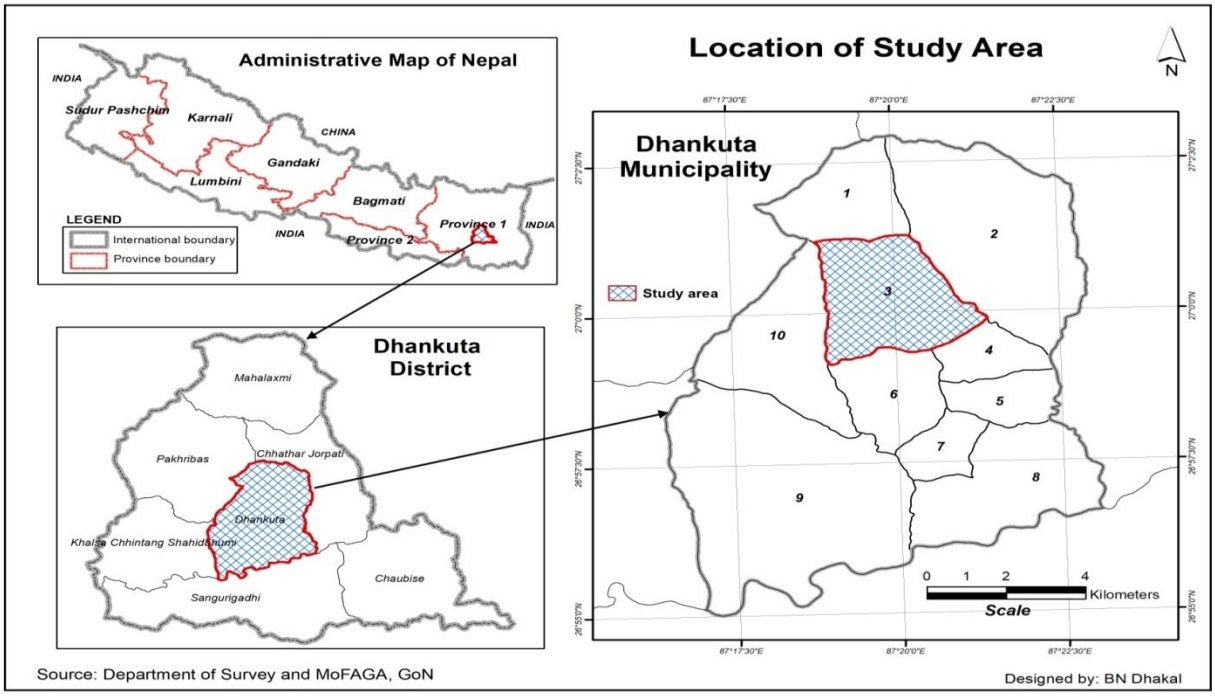
Similarly, secondary data were gathered from official documents, books, journals, google scholar and dissertations. The collected statistical information were processed in SPSS software and analyzed with detail interpretation.

Study Area

Dhankuta Municipality lies in the mid-hilly region of eastern Nepal. The northern and eastern borders of the municipality are connected with Chhathar Jorpati rural Municipality. Similarly its western border is linked with Pakharibas Municipality and Sangurigadhi Rural Municipality is located on the southern border of the municipality. Geographically, it lies on the southern slopes of the Mahabharata Mountain range and covers an area of 110.80square kilometers (Dhankuta Municipality, 2018). It extends from $87^0$16' 16/585" to $87^0$22' 58/528"east longitude and 26^0 55' 4/88" to 27^0 2' 56/461" north latitude. The altitude ranges from 250 to 2144 masl. Geographically, it is divided into the sloppy hilly area and the flat basin area where the maximum temperature (28.6^0c) is found in July and August. The lowest temperature falls in December (5.8^0c) and the average temperature of the winter season is around 12^0 Celsius. Most of the rainfall occurs in the summer months and the average rainfall during these months is 150 cm. administratively, this municipality is divided into 10 wards (Dhankuta Municipality, 2020).

Figure 1

Location of the Study Area



Ward No. 3 of this municipality is the core area of the study which is located almost in the center with an area of 7.2 square kilometers. Most of the land is made of sloppy terrain and most of the land is using for cereal and cash crops production. Besides, it is known as the settlement of Kshetri, Brahman, Rai, Tamang and Dalit (Dhankuta Municipality, 2018).

Discussion and Results

Potentiality of Avocado Farming in Eastern Nepal

This research makes clear that avocado farming is a new fruit farming concept in the Nepalese context however, this farming was started before 43 years in the country and only few farmers are familiar with this farming technique yet. So far, its commercial cultivation seems to be limited in small area like Dhankuta and Illam districts of Koshi Province of Nepal. But recently, the attraction of farmers towards this farming is gradually increasing where there is suitable climate and possibility of farming. According to local fruit experts, avocados are rich in protein, carbohydrates, vitamins and minerals while the oil content consists of polyunsaturated fatty acid.

As informed by local key informant Mr. Uddhab Wagle, avocado farming in this area started in 1980 from the then Pakharibas Agriculture Center. He adds that British experts and

other foreign staff of this office used to buy this fruit from abroad as a nutritious fruits at that time. The Nepalese experts and employees who involved in this office were gradually becoming familiar with new fruit due to the closeness of their foreign staffs and expanded in this area through them. The group discussion organized with the local elite farmers and key informants on March 3, 2022have concluded that it was limited to domestic use only in the beginning. But in recent days, it has gradually taken a commercial form with the help of various governmental and non-governmental organizations.

In addition, the pioneer avocado farmer Mr. Khem Thapa mentions that this farm technology seems to have gained popularity only after the beginning of the 21st century through the joint efforts of various governmental and non-governmental agencies like Agricultural Research Station Pakharibas (ARSP) and Dhankuta Municipality etc. He says more clearly that Dhankuta district was famous for exporting juicy and sweet orange among consumers in the eastern Terai and also in adjoining Indian markets like Bihar and West Bengal. Once a synonym of orange production in eastern hills of Nepal, Dhankuta, now, is turning to a brand new fruit avocado. Moreover, the current chairman of Dhankuta Municipality Ward-3 Mr, Bikas Ghimire informs that Dhankuta Municipality has been promoting commercial avocado farming since five years. It has taken a lead in this entrepreneurial endeavor of agro forestry. In this context, the mayor of Dhankuta Municipality Mr. Chintan Tamang says:

> Dhankuta Municipality has given emphasis to promote commercial avocado farming for the last 10 years. However, Dhankuta is famous for orange production, nowadays; the production of oranges is decreasing by miserable situations like climate change and diseases. The Municipality has adopted avocado as an alternative commercial crop after the suggestions of agricultural experts to compensate for the possible losses of income from orange farming. In this situation, avocados can commercially produce due to the favorable soil and climate of this area. The local farmers considered avocados as an alternative crop to sustain their production and income. Thus, Dhankuta Municipality has also decided to support the promotion of avocado farming in a commercial manner.

Along with this, Financial Officer of the municipality Mr. Bikash Adhikari has informed that Municipality imported 4,000 avocado saplings and distributed to local farmers at the beginning stage. Later on, Municipality established its own avocado nursery for distributing

avocado seedlings. And around 25,000 avocado saplings were distributed to 500 farmers of all 10 wards of the municipality. According to Mr. Adhikari, 13,358 avocado trees are giving fruits, 14,000 are being matured to give fruits and 104,500 saplings are planted recently throughout the municipality. Now, the capacity to produce 200,000 plus kg of avocado annually has been developed in this municipality and the production is expected to grow by three percent per year. In this context, he adds that because of increasing production of avocado day by day in the district, Dhankuta Municipality has decided to establish a factory for avocado products. Besides, the Municipality is promoting to produce cosmetic items, juice, alcohol and lots more profitable products with avocado as raw material.

In addition, various studies make clear that avocado farming in Nepal started around 1978 at first. Atreya (2020) has mentioned that five varieties of avocados were introduced at Kirtipur horticulture center namely Reed, Topatopa, Ettinger, Hass and Fuerte at beginning. The agricultural engineer Mr. Jivan Rai informs that most of the commercial avocado farming in Nepal is found at organic farms in mid-hilly regions like Dhankuta and Illam. He says that avocado farming is better in tropical and sub-tropical areas and needs more rainfall, so mid-hilly areas in eastern Nepal would be the best places for this farming. The taste and texture of avocado also depends on the region where it is grown. This analysis makes clear that the potential for commercial avocado cultivation in this area is abundant.

Expansion of Avocado Farming in Eastern Hills of Nepal

Atreya (2020) mentions that most of the people of Nepal are not yet fully familiar with the multifold utility of avocado fruit, although its cultivation is gradually increasing especially in the eastern hilly areas of Nepal. Similarly, the view of Wagle (2019) in this matter is that the use of such new farm technologies in this area seems to be continuing since the beginning of the twenty- first century which has had a positive effect on the living standards of the farmers. The study of Allan (1986) identifies that the construction of physical infrastructures (roads, tracks, and bridges), has brought miraculous changes in the land use pattern of the Alpine region in Europe. These are mainly concerned with the degree of accessibility between mountains and lowland areas which reflects the successful human manipulation of the great range in environmental conditions found in mountain habitats (as cited in Khatiwada, 2014). Virgo and Subba (1994) finds some major changes in land use pattern of eastern hills through the use of

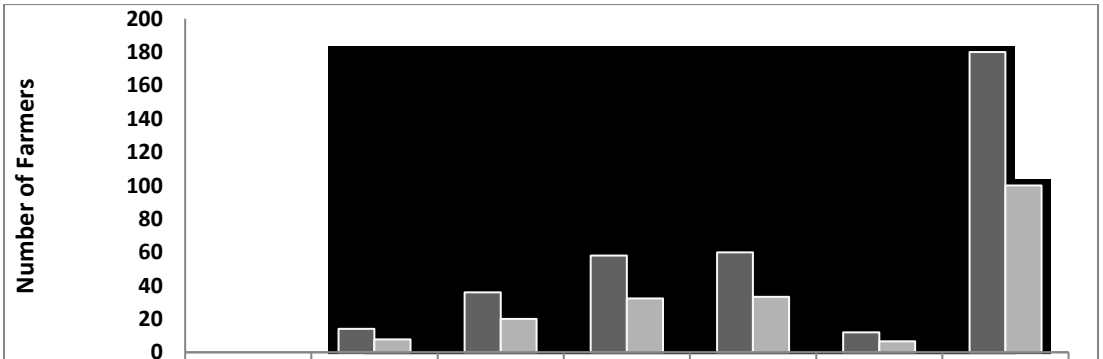
new agricultural inputs, market integration, and improved accessibility due to construction of Koshi Highway from 1978 to 1990.In this situation, Wagle (2022) has remarked:

> The use of improved seeds and high value fruits has brought some major changes in land use pattern of this area and its continuity seems to be continuous but the intensity of expansion does not seem to be the same. This study has established the belief that the cultivation of high yielding nutritious fruits can quickly gain popularity among the farmers. The growing popularity of avocado farming in this area is a vivid example of this finding (p. 4).

In this context, local elite farmer Mr Gopal Wagle informs that the credit for introducing avocado farming in this area goes to Mr. Uddhab Wagle, former account officer of the then Pakharibas Agriculture Center(PAC)who is a permanent resident of neighboring ward-6. In 1983, he brought home two seeds of avocado fruit form the PAC and planted them in his orange garden; one of those trees is still bearing fruit. He also says that looking at the adoption history of avocado farming in this area, it seems that a significant progress has achieved within a period of 43 years. The data acquired from the field survey has also made this fact clear. It shows that 7.78 percent (14hhs) framers started to cultivate avocado fruit in the decade from 1980 to 1990. After this, it has been gradually gaining popularity and seems to reach a high point up to 2020 and it has continued till now. At present, nearly 81 percent (180hhs) farmers of this area are involved in this farming in one way or another (Figure 2).

Figure 2

Diffusion of Avocado Farming in the Study Area [Before 1980 - 2022] (In Households)



	Before 1980	1980 -1990	1991 - 2000	2001 -2010	2011 - 2020	2020 To Till	Total
Households	0	14	36	58	60	12	180
percent	0	7.78	20	32.22	33.33	6.67	100

Source: Field Survey, September 2022

The statistics of this figure indicate the potential of the avocado farming in this area is hopeful however, the answer regarding with sustainability is still unanswered. According to the majority participants of the focus group discussion, the sustainability depends on the practice and awareness of the farmers.

The next important fact is that some practices regarding with this farming system have continued till now while some practices have definitely changed. In this regard, some mentionable answers have achieved from the focus group discussion held on March 2022. First of all, the participants mentioned that it was kitchen garden farming at first but now it is gradually taking a commercial form. They added that the farmers were not so enthusiastic to invest their capital in this sector in the past but they are gradually increasing their investment for the expansion management of this farming. In addition, the attention of national level industrialists is also increasing towards the promotion of this farming system at present. Some industries related to this farming are being established with the investment of such entrepreneurs at the local level. All participants seem to agree on this matter that its market is also becoming wider than before due to the market integration resulting from the development of various physical infrastructures. Along with this, most of the farmers and consumers of this area are gradually becoming familiar regarding the multipurpose properties of this fruit. Moreover, the diffusion of this farming system depended only on the efforts of the local farmers in the past but the involvement of various governmental and non-governmental organizations is gradually increasing at present.

In conclusion, this farming system is definitely gaining popularity embracing some changes in the current situation and it is also more profitable as compared to other crops.

Sustainability and Popularity of Commercial Avocado Farming

The study has confirmed that geographical factors play an important role to expand the area of avocado farming in the eastern hilly areas of Nepal. In this regard, Mr. Surya Sapkota an agricultural expert of Dhankuta also clarifies that the role of geospatial factors such as favorable temperate climate, enough rainfall and fertile soil texture for avocado farming seems remarkable to diffuse this framing in the eastern hills of Nepal. He also adds that the success and failure of commercial agriculture depends on geographical suitability and adversity. In this context, Wagle (2019) has mentioned:

> The role of geospatial and socio-economic and cultural factors seems to be decisive and crucial to disseminate new agricultural techniques among the various factors. Mainly, it depends on ability of motivators. If the motivator is capable and respectable, he/she is followed by the majority farmers which make diffusion process more effective (p. 29).

In summary, the favorable geospatial characteristic of this area also helps to promote and sustain the avocado farming in this area.

Pathak (2010) identifies the equal effective and decisive role of socio-economic factors to expand new crops in particular area in the similar case of Dhading district. Considering this context, current study has examined the role of such factors to disseminate this farming system in the case of eastern hills of Nepal. The final conclusion of the focus group discussion is that there is also a significant role of various economic factors for the promotion and sustainability of avocado farming in this area. Among those elements, obtaining a reasonable price, high demand in the market, development of organized agricultural market centers, the construction of Koshi highway and other subsidiary roads network, the maximum support of GOs and NGOs and the establishment of avocado-related industries have a high contribution to bring up this farming system at presentation situation.

While exploring the subject in depth, there is a significant role of some other socio-economic elements is also identified to make this farming system popular in this area. The key informant Mr. Jivan Rai remarks that the increasing awareness towards the multipurpose use of this fruit and the curiosity towards the new technologies among the farmers are other key social factors for its development and stability.

In conclusion, the positive combination of geospatial and socio-economic elements is the key factor to the development and expansion of this farming system in the eastern hills of Nepal.

Challenges of Avocado Farming

The previous study of Atreya (2020) identifies that the existing commercial avocado farming in Nepal is a confluence of possibilities and challenges. The result of this study also reflects almost the same situation. In order to continue this farming, farmers are facing many challenges at present. Some of the major challenges obtained from the interaction with stakeholders of this area are listed:

- The technical service and experts are not available on time.

- There is a problem of drought due to lack of adequate rainfall in winter season.
- Lack of avocado processing industries however, some are in process but these are not enough according to demand.
- The problem of skilled man power and labours required for the industry.
- Failure to identify and diagnose the diseases in proper time due to lack of technicians.
- Lack of soil testing facility and its proper treatment.

Despite these challenges, the farmers are getting good returns from this farming at present. But these existing problems are deteriorating the quality of the soil as well as productivity. Thus, some question marks have definitely been raised in the sustainability of this farming system.

Conclusions

The existing avocado farming in the hilly areas of eastern Nepal seems to be full of both challenges and opportunities. But the success of this farming has made farmers realize that agricultural occupation can be made profitable by selecting appropriate crops at the right time. It has also helped to develop new thinking and ideas among the farmers. As a result, the attention of the farmers seems to be maximally focused on the cultivation of high value crops which can be considered as an important achievement. Besides, this farming system is helping to promote commercial relations between the hilly and Tarai regions of eastern Nepal with distinct identity of the hilly region. This study conveys the message that success cannot be achieved by only a new work, one must act in a specific and appropriate technique to get new achievement. Along with this, the study confirms that the commercial avocado farming is not only a profitable business but also a risky and challenging. If the farmers are not able to manage these existing challenges in time, the stability of this farming may be questionable. Thus, another important conclusion of this study is that new knowledge and success can be gained only by facing the challenges and new success is not possible easily. Finally in one sentence, this crop is popular and profitable at the present time and if it is properly managed, its future is also secure.

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