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The Potential of Avocado Farming in Dhankuta: A Historical and Contemporary Analysis

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Abstract

This paper explores the potential hub of avocado farming in Dhankuta Municipality, highlighting its significant income generation for majority households in Nepal's eastern hills. A "hub" in agriculture refers to a central location where a specific crop or industry thrives, serving as a center for production, distribution, and innovation. Dhankuta Municipality is gaining prominence as a key avocado cultivation center due to its favorable climate, fertile soil, and increasing farmer engagement in Nepal. The municipality's transition from small-scale farming to organized commercial production has significantly impacted avocado development.

This paper uses secondary data from various sources, focusing on over 44% of farm households (223 hhs) in Ward No. 3 of Dhankuta Municipality, using Yamane's sample determination formula. Data were collected through household questionnaires, focus group discussions, key informant surveys, and field observations. The finding indicates that Dhankuta has the potential to become a leading avocado farming, processing, and distribution center in Nepal, thereby boosting local economic growth and the broader agricultural sector. The avocado farming in this region has successfully combined challenges and opportunities, encouraging farmers to adopt new technologies and high-value crops. Avocado farming, despite challenges, has proven profitable and suitable for the region, with satisfactory expansion and promising future prospects.

Keywords: Avocado, hub, expansion, inspiration and satisfactory.

Introduction

Avocado is a nutritious tropical and subtropical fruit of the world. In scientific study it is known as *Persea Americana* which belonging to the *Leuraceae* family. The practice of this cultivation in Nepal is still in initial. Besides, this fruit is not so familiar among the Nepalese people (Balbase, 2020). Now this culture is getting more popularity because the local government

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has proclaimed Dhankuta Municipality as the capital of avocado farming in eastern hills of Nepal (Adhakari, 2018). At first time, this fruit existed before 43 years ago in Dhankuta through the initiation of the officers and experts of the then research authorities in Dhankuta who were from UK. They brought it as an extra nutrient supplier fruit from abroad. It is believed that this cultivation spread in this area from the seeds of those fruits (Wagle, 2023). Avocados are juicy, green-skinned fruits that can resemble spheres, pears, or eggs and also known as “Butter Fruit” in Nepalese Society Atreya (2020). Moreover, it has also many advantages related to human health. It is useful to prevent from heart disease, to balance blood pressure, and cholesterol etc. (Basyal,2020).

The local pioneer farmers informed that the history of this tasty and delicious crop in Nepal is not so long. In the early days, some enthusiastic farmers had cultivated it in their garden to fulfill their hobby only. The information received from local agronomists, it is originated and diffused from Mexico of Central America at first. But currently this cultivation is practiced in various countries of the world like America, Mexico, Brazil and Argentina of North and South America. Similarly, this cultivation is also popular in Israel, Indonesia and Philippines of Middle East Asia. Besides, it is also popular among South African people. In recent days, the popularity of this fruit is gradually increasing in Nepal as well. Moreover, the local key informant Mr. N. P. Bhandari has informed that it has not been officially conformed how much area is occupied by Avocado plants and how many varieties and number of plants have been planted in Nepal at present. Along with this, the local pioneer avocado farmer Mr. U.P. Wagle informed that the government of Nepal imported different 5 varieties of this fruits i.e. Hass, Reed, Ettinger, Topatopa, and Fuerte from the UK in 1978 at first time through the initiation of the then Kirtipur and Sarlahi Horticulture Center. He adds that the role of the then Pakharibas Agriculture Center (PAC) official and foreign tourists has seen decisive in its expansion in the eastern hilly region of Nepal.

Now, Dhankuta Municipality has played a leading role for the expansion of commercial Avocado farming in the eastern hilly region of Nepal (Wagle, 2023). The third Municipal Assembly (June 22, 2018) has declared the Dhankiuta Municipality as the capital of the Avocado. Many Policies have been prepared and various programs have also been launched to promote the avocado farming. The latest information provided by the municipality shows that more than 104500 saplings have been planted within the municipality boundary including 55 avocado plant nurseries. Currently, avocado farming area has reached 1000.3 hectare within the municipality and 2, 84,000 kilograms are being produced annually (Dhankuta Municipality, 2021).

One of the crucial actors for encouraging avocado growing in the Dhankuta is Dhankuta Municipality because it has dubbed itself as the capital of avocado for the purpose of promotion of this fruit. It contains various nutrients for both young and old people including remarkable amount of soluble and insoluble dietary fiber. Along with this, it is a great food for weight gainers because their oil is composed of polyunsaturated fatty acids (Khadka, 2024).

In a similar context, the studies of Virgo and Subba (1994), Koirala (2006), and Khatiwada (2014), Wagle (2019) have also defined some remarkable changes in the agricultural sector around the Koshi Highway of eastern hills in Nepal. The results of those studies have indicated that high valued commercial crops have replaced to cereal-based subsistence farming through the new combination of various physical, infrastructural and socio- economic factors.

The increasing access of farmers to roads, their self-efforts, the support of GOs and INGOs and market integration, are major drivers to change in the agricultural system of the eastern hills in Nepal. Due to this reason, the avocado farming is existed and expanded in this area which has helped to increases the income of farmers and also has a positive impact on their standard of living (Wagle, 2019). Although it has accepted that this farming has a positive effect on the standard of living of the farmers, it has not yet been systematically studied on how and how much it has been affected through this. Keeping this fact at the focal point, an attempt has been made in this study to analyze this topic through the help of following research queries: why and how did avocado fruit become more popular in this area, what is the current state of its development and expansion and what type of change has it brought in the living standard of the local farmers. On the periphery of these questions, this study has especially explored the following aspects of the topic:

- The development trend of the avocado farming in this area and its major reasons,
- The current situation of avocado cultivation in the study area,
- The changes it brought to the farmers' income.

Methods and Materials

Maximum field survey data are used in this study which were collected in January, 2024. Field observation, household and key informant surveys and focus group discussion were major procedures of the data collection. The household survey was conducted to around 44 percent (223hhs) farm households of the four major settlements namely Lankure, , Nigale, Syaule and Patle using Yamane's sample determination formula (1967 as cited in Adhikari and Pandey, 2019)):

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

Here,

N = Sample size

N = Total size of population

e = Acceptable sampling error

[At the 95 percent confidence level P (e) value is assumed to be 0.0 5]

If, N = 506

Then

$$\begin{aligned}
 n &= \frac{506}{1+506(0.05)^2} \\
 &= \frac{506}{1+506 \times 0.0025} \\
 &= \frac{506}{1+1.27}
 \end{aligned}$$

= 223 Households

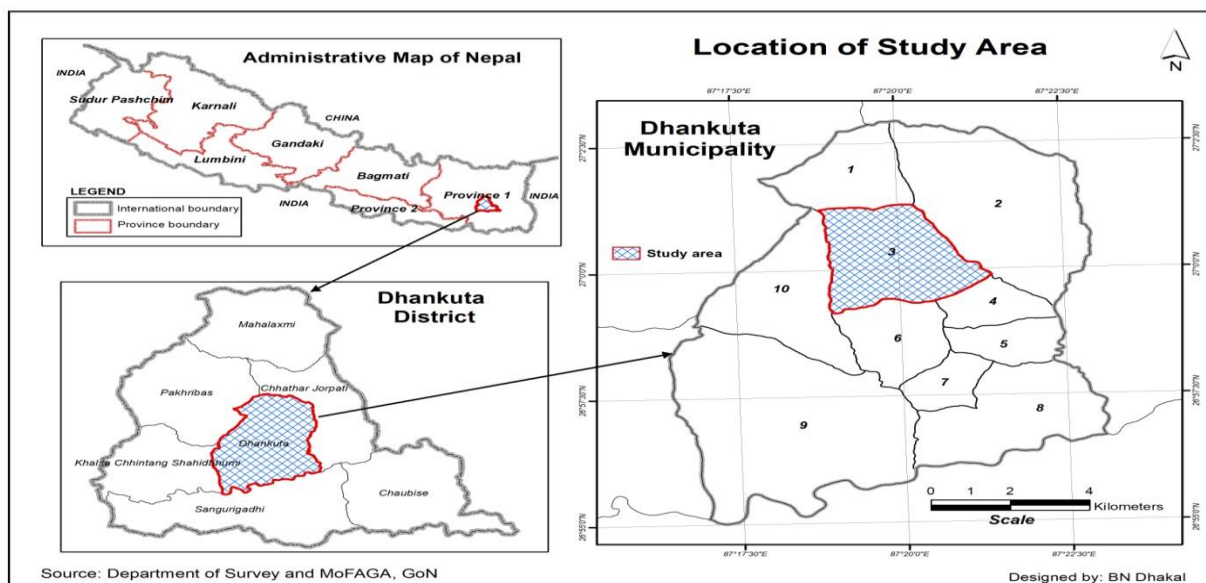
The researcher has made Maximum effort to ensure proper representation from each major settlement for at the period of sample size determination and sample selection. The sample farm households were determined through the use of systematic random sampling method based on the total household number of each major settlements. Similarly, three key informant interviews and two focus group discussion were held to collect information related to the origin and development of avocado fruits in this area. Moreover, an inventory sheet was also used to observe the climatic condition, sources of irrigation and soil types etc.

Along with the primary data, this study has also used secondary data as per the need to complete the study. The official documents, books, journals and dissertations are the major sources of the such data. The collected statistical information are processed and analyzed with appropriate format and detail interpretation as far as possible. Likewise, the study has adopted mixed approach (both quantitative and qualitative) in order to prepare detailed paper. Moreover, the maximum effort of researcher is to fully follow the research ethics throughout the research period.

Study Area

The absolute location Dhankuta Municipality extends from $87^{\circ}16' 16/585''$ to $87^{\circ} 22' 58/528''$ east longitude and $26^{\circ} 55' 4/88''$ to $27^{\circ} 2' 56/461''$ north latitude. The altitude ranges from 250 to 2144 masl. It is divided into the sloppy hilly area and the flat basin area from geographical perspective. In general, it is known as the area of temperate monsoon climate where the maximum temperature (28.6°c) is found in July and August. The lowest temperature falls in December (5.8°c). Most of the rainfall occurs in the summer season and the average rainfall of this season is 150 cm. majority of the people of this municipality are engaged in agriculture and only few seem to be involved in other activities. Administratively, it is divided into 10 wards and the total number of population is 34156 (18026 female and 16130 male) (Dhankuta Municipality, 2020).

The relative location of this municipality is the mid-hilly region of eastern Nepal. The northern and eastern parts of the municipality are interlinked with Chhathar Jorpati rural Municipality. Similarly, the western border is connected with Pakharibas Municipality. And the southern border has touched the Sangurigadhi Rural Municipality of the municipality. It has covered an area of 110.80 square kilometers (Dhankuta Municipality, 2018).

Figure: 1*Location of the Study Area*

The major focus area of the study is ward no. three which is located almost in the centre of the municipality. It extends in 7.2 square kilometers where most of the land is made of sloppy terrain. The census of 2011 shows that the total population of this ward is 2048. Along with this, this area is known as the settlement of Kshetri, Brahman, Rai, Tamang and Dalit. Cereal crops, vegetables and fruits are major varieties of the farming (Dhankuta Municipality, 2018).

Results and Discussion

Avocado Farming in Dhankuta

The previous studies reflect that the farmers of Nepal became familiar with avocado fruit around 1978 at first. Five varieties of avocados (Reed, Topatopa, Ettinger, Hass and Fuerte) were brought to Kirtipur Horticulture Center at that time (Atreya, 2020). The key informant Mr. Jivan Rai informs that large number of the commercial avocado farming in Nepal is found in mid-hills of eastern Nepal i.e. Dhankuta and Ilam. Similarly, the local JTA Mr. R.K. Saha says that tropical and sub-tropical climates including enough rainfall are more favorable for avocado farming. These characteristics are found in the mid-hilly area in eastern Nepal, so the avocado cultivation has flourished in this area. During the period of discussion, the local pioneer avocado farmer Mr. K.B. Thapa remarks that the taste and texture of avocado depends on the cultivated and Hass is the most widely appreciated variety of avocado in the eastern hills of Nepal.

Although avocado farming in the eastern hills of Nepal has flourished recently but it had introduced in this area around 43 years ago. Still only few farmers are familiar with this farming technique. Therefore, till now this cultivation seems to be limited only Dhankuta and Ilam

districts of eastern Nepal. Recently, the attraction of farmers towards this farming is gradually increasing in those areas where the similar geographical situation can be found (Wagle (2023)). At the same time, the local Health Officer Mr. B. R. Bhandari, informs that avocado is rich in vitamins, protein, carbohydrates and minerals etc. and the oil content consists of polyunsaturated fatty acid. And it was introduced in the eastern hills of Nepal around the 1980s from the then Pakharibas Agriculture Center (PAC). While providing this information, he also says that that the British experts including other foreign members of this office used to import this fruit from Britain to make themselves healthy and fit. Through their association, the Nepalese employees of this office were gradually becoming familiar with this fruit. Moreover, the discussion with local elite farmers and key persons on January 5, 2024 has made clear that initially, this cultivation was limited only to domestic purposes but now it has taken commercial shape with the help of various institutions.

The study makes that this farming system has started gaining popularity at the beginning of the 21st century through the partnership of various agencies i.e. Agricultural Research Station Pakharibas (ARSP), Krishi Gyan Kendra (Dhankuta and Terrhathum) and Dhankuta Municipality etc. related to governmental and nongovernmental sectors. Besides, the local intellectuals inform that Dhankuta was once famous for exporting orange towards the Terai and most of the urban areas of Nepal including adjoining Indian markets such as West Bengal and Bihar states. But recently, the identity of Dhankuta has changed into avocado exporter.

In this regard, the chairman of Dhankuta Municipality Ward-3 Mr. B. Ghimire informs that the main thrust of the municipality is to promote the commercial avocado farming in municipal premises for the last five years. Similarly, highlighting this context further, the mayor of Dhankuta Municipality Mr. C. Tamang says in response to the question why Dhankuta Municipality emphasized on the promotion of commercial avocado farming instead of famous local production orange? He has the answer:

"while looking for alternatives of traditional farming, agricultural experts have suggested that avocado farming is suitable for the soil and climate of Dhankuta and it may be a better alternative to sustain the agriculture of the municipality so Dhankuta Municipality has emphasized on the promotion of avocado farming. Now, we are coming up with a good plan for the avocado farming promotion with detailed project report (DPR) to inspire private firm for commercial operation (Dhankuta Municipality, 2012).

Development and Expansion

The study of Allan (1986)) illustrates that the existence various physical infrastructures i.e. roads, tracks, and bridges has brought miraculous changes in the land use pattern of the Alpine region in Europe. Those are mainly concerned with the degree of accessibility between mountains and lowland areas and reflects the successful human manipulation of the great range in environmental conditions found in mountain habitats (as cited in Khatiwada, 2014). Similarly, Virgo & Subba (1994) have found some crucial changes in land use pattern of eastern hills of

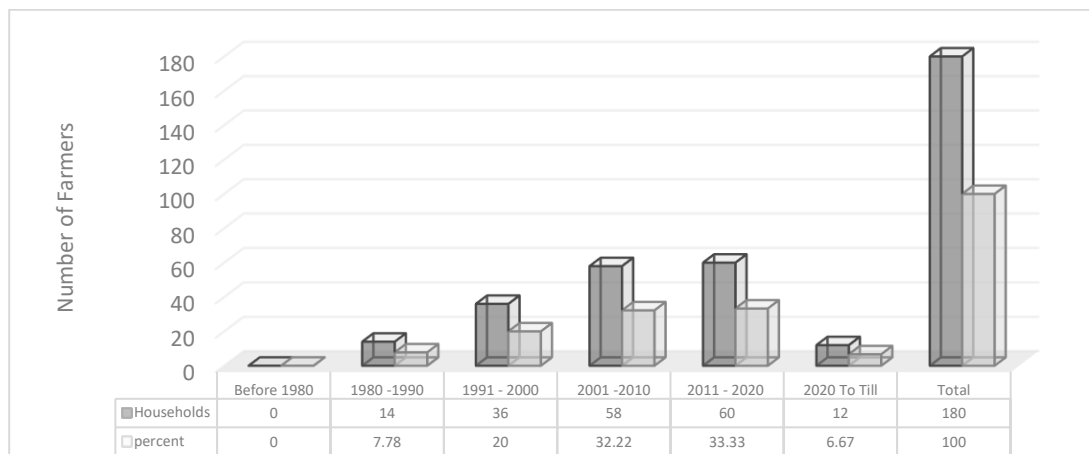
Nepal through the use of new agricultural technologies, market integration, and ease of movement after the completion of Koshi Highway in 1990.

Moreover, majority of the people in Nepal are still unknown with the multi-purpose use of this fruit, however the cultivation of avocado is gradually increasing in the eastern hilly areas of the country (Atreya, 2020). The positive impact on the living standards of the farmers has seen due to the development and expansion of this fruit in this area (Wagle, 2019). The use of high value fruits has brought some mentionable changes in cropping pattern of the eastern hills its continuity is still there but the intensity does not seem to be the same (Wagle, 2022).

This study confirms that the adoption of high value fruits can quickly improve the quality of life of the farmers and also gain popularity among them. The increasing popularity of avocado farming in this area can be taken as a vivid proof of this statement (Wagle, 2023). In this context, the local key person Mr. N. P. Bhandari informs that the credit for introducing avocado farming in Dhankuta Municipality ward no. 3 goes to Mr. U.P. Wagle, the former employee of the then Pakharibas Agriculture Center (PAC) and pioneer farmer who lives in neighboring ward no. 6. In 1983, he brought home some seeds of avocado fruit and planted them in garden. One of the plants planted then is still bearing fruits. Now, it has expanded broadly and more than 180 farmers have been involving in this activity (Figure 2).

Figure 2

The Development and Expansion of Avocado Farming in Dhankuta Municipality Ward No. 3 [Before 1980 – 2024, in HHS]



Source: Field Survey, January, 2024.

This development and expansion within a period of 44 years can be considered as satisfactory. The field survey data shows in the table indicates that 7.78 percent (14hhs) framers were involved in this cultivation from the period of 1980 to 1990. The statistics have also made clear that the popularity of this fruit farming is increasing highly after that period. Recently, more than 81 percent (180 hhs) farmers of this area are continuing this cultivation as their main occupation.

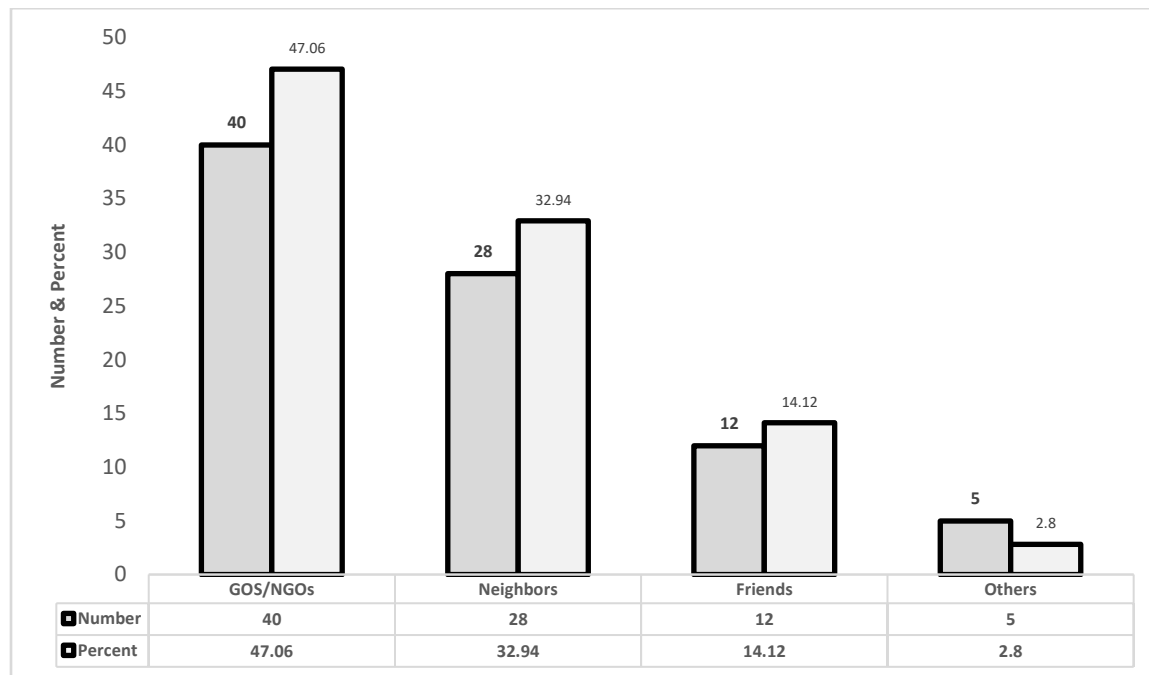
Thus, the conclusion of this analysis is that, the development and expansion of the avocado farming in this area seems to be satisfactory. But looking at the from the past to till now, somethings have definitely changed and something have remained the same.

Sources of Inspiration

The attraction of farmers towards new technologies depends on the sources from which they the get information about this technology at first. If these sources are most reliable and trustworthy for them they will accept those technologies quickly (Wagle, 2019). A similar situation has emerged in this are as well (Figure 3)

Figure 3

Sources of Inspiration towards Avocado Farming



Source: Field Survey, January, 2024.

The field survey data reflects that governmental and non-governmental organizations play a key role in developing and expanding the avocado farming in this area. After that, the role of neighbors, friend s can also be seen mentionable respectively. The data also shows that there is a lot of variation in the rate of contribution among those sources. If we mention the mathematical statistics, more than 47 percent (40 hhs) farmer have adopted this fruit through the inspiration of GOs and NGOs. Similarly, around 33 percent (28 hhs) from their neighbors, more than 14 percent (12 hhs) from their peers and remaining nearly 3 percent (5 hhs) framers are motivated to cultivate this from other various sources respectively. In conclusion, the GOs i.e. Krishi Gyan Kendra (Dhankuta and Terrhathum) and NGOs like Agricultural Research Station, Pakharibas (ARSP) have a crucial role in the initiation and diffusion of this fruit in this area.

Avocado Farming Area Average Production

The current situation of avocado cultivation in Dhankuta Municipality Ward No. 3 is found there are 4830 trees have been planted in 750 Ropani (Around 38.46 hector) of land. More than 53 percent (2560) plants are bearing fruit out of the total at present and remaining around 47 percent (2270) plants are growing now (Table 1).

Table 1

Current Situation of Avocado Farming and Production

Settlements	Area (in Ropani)	No. of Plants			Production (in Kg)
		Mature	Immature	Total	
Patle	250	720	630	1350	25200
Nigale	85	325	430	755	11375
Syaule	240	795	680	1475	27825
Lankure	175	720	530	1250	25200
Total	750	2560	2270	4830	89600

Source: Field Survey, January, 2024.

The field survey data indicates that there is an average of 27 plants per household and only 14 plants (51.85 percent) are currently bearing fruits among those fruits. The pioneer farmer Mr. K. P. Bhandari informs that the income from this cultivation is also defined as additional income because other annual crops can easily be grown in the same place where it is cultivated. In addition to this, it does not need more labor after a certain period of time and it bears fruit for a long time so the farmers count the income from it as additional income.

Major Reasons for Development and Expansion of Avocado Farming

Geographical factors play an important role to expand the area of avocado farming in the eastern hilly areas of Nepal. The favorable temperate climate, enough rainfall, sloping land including the availability of fertile and suitable soil for avocado cultivation are the major reasons for the success of this fruit farming in the eastern hills of the country (Wagle, 2023). Along with this, this study has also confirmed that due to the active and effective role of the GOs and NGOs, it becomes possible to introduce and expand rapidly in Dhankuta Municipality. In this regard, Mr. S. Sapkota an agricultural expert of Dhankuta also clarifies that the success and failure of commercial agriculture depends on geographical and technological suitability and adversity.

The role of geospatial and socio-economic factors is decisive to disseminate new ideas in the agricultural sector among the various factors. Generally, it depends on ability of the sources of

inspiration. If the motivator is capable and respectable he/she is followed by the majority farmers and that makes diffusion process more effective (Wagle, 2019). Pathak (2010) found similar results in his study in the case of Dhading district of central Nepal.

In his situation, this study attempts to analyze minutely the role of the various socio-economic factors to disseminate this fruit in this area by organizing focus group discussion among the pioneer farmers and key informants. The major conclusions of the discussions are:

- The climatic condition, land structure and soil (mentioned 2.1) are favourable for avocado cultivation in Dhankuta Municipality.
- Easy to sale in reasonable price due to development of organized agricultural market centres and high demand in the market.
- The establishment of avocado processing industries at local level and its universal identity.
- The construction of the Koshi highway links this area with other nearby cities of the country like Dharan, Itahari, Biratnagar, Damak and Birtamod etc. that increased the market access of local agricultural production.
- Farmers and consumers are gradually becoming familiar with the nutrient value and test of this fruit through the development and expansion of transportation and communication facilities.
- A crop that gives fruit easily and quickly and also profitable as compared to other crops.
- Maximum support of local government and other non-governmental organizations to promote this farming system in this area.

Perception of the Farmers towards the Avocado Farming

The perception of the farmers towards the adoption of new crops depends on the return of that crops. They prefer that crop which has a better taste, reasonable price and does not have the problem of market (Wagle, 2019). The opinion of the farmers of this area towards the avocado cultivation also seems to be guided by this notion (Table 2).

The information received from the field survey reveals that nearly 53 percent (94 hhs) farmers are willing to expand their avocado farming and commercialize more that current days. But more than 51` percent (48 hhs) farmers lament the scarcity of land to increase cultivation. The remaining nearly 49 percent (46 hhs) informed that they have enough land and they will gradually expand their cultivation area with various spices of avocado which are profitable from business point of view.

Table 2*Perception of the Farmers towards the Avocado Farming*

S.N.	Perceptions	Number of Farmers	Percent
1.	Expanding agricultural land including number of Plants	94	52.22
2.	Emphasis more on Commercialization rather than expanding agricultural land and number of plants	75	41.67
3.	Explore options for reducing the agricultural land and the number of Plants	11	6.11
Total		180	100

Source: Field Survey, January, 2024.

Similarly, more than 41 percent (75 hhs) farmers say that they do not have additional land to expand their farming, but their aim is to promote its commercialization by searching new market, using advanced varieties and establishing new avocado based industries.

The opinion of the remaining around 6 percent (11 hhs) farmers is that the avocado farming is not so profitable for them and they are searching an alternative crop. They have added that it is more profitable to cultivate off-season vegetables that fetch higher price than avocado fruit.

This result makes clear that most of the farmers seem to be satisfied with the cultivation of this fruit and also in favor of expanding their farming if they get an appropriate opportunity. Therefore, the future of this farming looks bright till now.

Investment, Production and Income

In order to get the highest return from agricultural crops, the technology used in it is also necessary to be appropriate. Apart from this, the cultivation cannot give the best result (Wagle, 2019). The field survey data in the study reveals that most of the farmers in this area are using the latest technology while cultivating avocado and this has brought a positive change in their standard of living. Nearly 94 percent (169 hhs) avocado cultivator have said that avocado farming has a positive effect on their standard of life. Among them more than 55 percent (94 hhs) farmers are in favor of making their cultivation widespread. In addition, during the focus group discussion, almost all farmers seemed to agree on the following points:

- This fruit is full of various nutrients so it has helped to promote human health
- A distinct and sweet taste sensation
- Maximum increase in income as compared to traditional farming.

The following table shows the the average income received by the farmers through the avocado cultivation currently. It can be considered as a measure of improvement in standard of life (Table 3).

Table 3*Income from the Avocado Farming*

Settlements	Area (in Ropani)	Mature Plants	Production (In Kilogram)	Average Income
Patle	250	720	21600	2376000
Nigale	85	325	9750	1072500
Syaule	240	795	23830	2621300
Lankure	175	720	21600	2376000
Total	750	2560	76780	8445800

Source: Field Survey, January, 2024.

Note: Price 110 per Kg.

The table reveals that the average income of the farmers is Rs. 46921 per households from this fruit per annum. It is not common for ordinary families to have such extra income. Besides, most of the farmers involved in the focus group discussion informed that the annual average expenditure is only Rs. 3000 per plant. If it is considered as a base, it seems that the net annual income of per household is Rs. 43921 from the cultivation of this fruit.

In addition, farmers are getting an average Rs. 11261 per ropani at present from the cultivation of avocado in their farm but the pioneer farmer of this area Mr. N.P. Bhandari has informed that only Rs. 5000 can hardly be obtained from other crops. Now a days, most of the farmers here has also expresses their satisfaction that the quality of life has improved due to additional income. Moreover, almost all the farmers participated in the focus group discussion has informed that this extra income has been playing a crucial role in managing the following areas of their daily life:

- To manage their breakfast and dinner and general daily expenses
- In some cases, it also helps to pay children's fee and arranging their books and stationaries.
- It has also been helping in celebrating festivals and managing common health.

The analysis of these statistical details and qualitative opinions helps to make conclusion that the avocado farming system has certainly played a crucial role in turning the living standard of the farmers of this area in a positive direction.

Conclusions

Dhankuta Municipality has the potentials to develop as a potential hub for the development and expansion of avocado cultivation from the perspective of climate, soil, land structure as well as road and market facility. However, the existing avocado farming in the municipality seems to be full of both challenges and opportunities. The success of this farming system has developed awareness among the farmers that they can get expected benefits if they choose right crops at right time. Along with this, the study also confirmed that avocado farming may be companion farming to improve the quality of life of the farmers. Moreover, the development and expansion of this fruit seems to be satisfactory at present and if it is continued more scientifically, it will become an important source of livelihood for the farmers.

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