

# *Study Report on Geographical Indication, Center of Origin of Indigenous and Local Fruit Crops of Nepal*



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# *Foreword*

Mandarin orange is among the most cultivated, renowned, and favored fruit crop of Nepal. It is commercially grown in more than 48 districts across the country. In the fiscal year 2080/81, the National Center for Fruit Development conducted a study on the Geographic Indication and the center of origin of Nepal's indigenous and local fruit crops for which mandarin orange was chosen for a detail study. This initiative followed the recommendations from the previous year's workshop, which focused on facilitating the "varietal registration program of fruit crops" in Nepal. At that moment when the Ministry of Agriculture and Livestock Development was preparing to declare mandarin orange as the national fruit of Nepal, it was deemed fitting to select mandarin orange for this study.

This book presents the district profiles of mandarin oranges from six selected districts. It covers the study's methodology, notable findings, survey report results, and future recommendations from a closed group and a validation workshop conducted post- field study. The book also includes the names and contact numbers of farmers with old trees in their orchards across the different study districts. Additionally, detailed articles about each district are featured in the compendium on Mandarin oranges, published following the 14th National Horticulture Seminar held on April 24-25, 2024, in Kirtipur, Kathmandu.

I extend my heartfelt gratitude to all the senior horticulturists of the Nepal Horticulture Society for their valuable insights, the experts from the National Gene Bank NARC, especially Dr. Bal Krishna Joshi and his team for their technical support, Department of Agriculture, Warm Temperate Horticulture Center, Kirtipur, PMAMP and AKC offices of all the study districts for their human resources and other support. I also thank Ms. Yam Kumari Shrestha, Senior Horticulture Development Officer and all the staff of the National Centre for Fruit Development for the support. Special thanks goes to the survey team members who generated the primary data and prepared the survey report of the six different districts.

Lastly, I extend my gratitude to the team responsible for preparing the district profiles for the six different districts, particularly Mr. Surya Prasad Baral, Senior Horticulture Officer, Ms. Manita Tamang and Ms. Kabita Acharya, Horticulture Officers. Special thanks to Ms. Shiva Aryal, Agriculture Extension Officer, for her dedicated work as the member secretary in preparing the Mandarin district profiles and bringing this study into this concise book form. I hope this book will shed light on the work done so far towards obtaining the geographical indication (GI) tag for the mandarin oranges and will be helpful in achieving this goal in the near future. This will also serve as a model for other fruit crops which are eligible for the GI tag.

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# *Abbreviations*

%	Percentage
@	At the rate
ADO	Agriculture Development Office
AKC	Agriculture Knowledge Centre
Cm	Centimetre
CTV	Citrus Tristeza Virus
FGD	Focal Group Discussion
Ft	Feet
FYM	Farmyard Manure
GI	Geographical Indication
Ha	Hectare
HRS	Horticulture Research Station
i.e.	That is
ITK	Indigenous Technical Knowledge
Kg	Kilogram
KIS	Key Informant Survey
m	Meter
m <sup>2</sup>	Square meter
Masl	Meter above sea level
MOALD	Ministry of Agriculture and Livestock Development
MS-Excel	Microsoft-Excel
Mt	Metric ton
mt/ha	Metric ton per hectare
NARC	Nepal Agriculture Research Council
NCFD	National Centre for Fruit Development
no.	Number
PIU	Project Implementation Unit
PMAMP	Prime Minister Agriculture Modernization Project
PP	Plant to Plant
RR	Row to Row
Rs.	Rupees

# ***Study report on Geographical Indication, Center of Origin of Indigenous and Local Fruit crops of Nepal***

## ***1.0 Introduction***

Citrus, particularly mandarin orange, is the primary fruit crop targeted for commercialization in the mid-hill and hilly regions of Nepal. Mandarins, classified under the distinct species *Citrus reticulata* Blanco, are characterized by thin, loose peel, bright-colored pulp, excellent flavor, and easy-to-peel rind (Parashar et al., 2022). In Nepal, mandarin oranges are grown across approximately 28,451 hectares of land, producing 1,98,779 metric tons with a productivity of 9.99 metric tons per hectare as of the fiscal year 2022/23 (MoALD, 2023).

The mid-hill region, situated between 800 to 1500 meters altitude, possesses a comparative advantage in citrus cultivation, especially mandarin and sweet oranges. These fruits are cultivated extensively across mid-hill areas, spanning latitudes 26° 45' to 29° 40' N and longitudes 80° 15' to 88° 12' E in Nepal.

Notable mandarin orange landraces in Nepal include Manakamana local, Banskharka local, Dullu local and Khoku local, which are highly valued in the market. Studies indicate that Khoku local oranges have been cultivated in the Khoku area of Dhankuta district since prehistoric times (Gautam et al., 2011). While citrus cultivation in Nepal dates back to ancient times, commercial cultivation began only after 1970 (Regmi et al., 2020).

Geographical Indication (GI) tags are important form of long-term protection provisioned in the Trade Related Aspects of Intellectual Property Rights (TRIPS) agreement of the World Trade Organization (WTO). Nepal boasts significant agrobiodiversity due to its climatic variation, with more than 100 agricultural products holding potential for GI tags. However, none of these products have been registered as GIs in Nepal. GI protection, focusing on product reputation, origin integrity, and market value, presents an opportunity for mandarin oranges in Nepal (Regmi, 2020). Although there is a policy provision for GI in Nepal, the legal registration system is still under development by the Ministry of Industry, Commerce, and Supplies (Joshi et al., 2017). A GI tag is a sign or a symbol used on products which have a specific geographical origin and possess unique qualities conferred to them by that geographical location. The qualities, characteristics or reputation of the product should essentially be due to the place of origin (WIPO).

The absence of extensive documentation on native fruits and fruit varieties in Nepal has deprived the country of the right to obtain GI and Center of Origin status for many of its native fruits. Documenting mandarin oranges from various regions of Nepal can provide scientific evidence of their historical presence, introduce Nepal's oranges internationally, and serve as a framework for obtaining GI status in the future.

This paper primarily focuses on collecting and studying primary data to accelerate efforts in documenting and preserving traditional knowledge, heritage varieties, and farming practices associated with mandarin oranges in Nepal's major pocket areas.

## ***2.0 Methodology***

This study employed a comprehensive research methodology comprising literature review, related consultation, interactions and meetings outcome and surveys.

### ***2.1 Site selection***

Farmer's household surveys, market surveys, consumer surveys, key informant surveys (KIS), focus group discussions (FGDs) were conducted in the six prominent orange districts of the country (listed below). However, the study site selection inside the district was made in accordance to the consultation provided by the government service provider organizations like Prime Minister Agriculture Modernization Project (PMAMP), Agriculture Knowledge center (AKC), and local level government organizations on the basis of their production, presence of old orchard and emerging new ones, recognition as orange pockets. Focus group discussions (FGDs) in Gulmi district was also conducted as per the recommendation from the Arghakhanchi district.

Table 1. Districts selected for the study

<b><i>S. N.</i></b>	<b><i>Name of Province</i></b>	<b><i>District</i></b>
1	Koshi	Dhankuta and Sankhuwasabha
2	Gandaki	Kaski and Parbat
3	Lumbini	Arghakhanchi
4	Karnali	Dailekh



The specific site selection for the study in different districts are as mentioned below.

Table 2. Specific sites selected for the study

<i>S.N.</i>	<i>District</i>	<i>Selected site for study</i>
1	Dhankuta	Sipting-3 and Sahidbhumi-4
2	Sankhuwasabha	Mangtewa and Khadbari rural municipality
3	Kaski	Syastri and Chyarpe region, Rupa rural municipality and Kristi-Dopare, Pokhara metropolitan city
4	Parbat	Banskharka, Jaljala rural municipality
5	Arghakhanchi	Simle and Pokharathok -2 of Panini municipality and Sakindhara - 6 of Malarani Municipality.
6	Dailekh	Dullu municipality word no. 6 and 11

## ***2.2 Data Collection***

### ***2.2.1 Literature review and outcome of the consultation meeting***

Extensive literature review was conducted to gather background information and insights on Mandarin oranges cultivation, market trends, and consumer preferences. Also some decisions like selecting the prominent orange district was made based on the outcome of series of meetings held with the senior experts from Nepal Horticulture Society.

### ***2.2.2 Farmer's Household Surveys***

A structured survey was administered to Mandarin orange farmers in at least two prominent pocket areas in each district, 20-40 household per pocket were surveyed. A total of 240 farmers (male: 180 and female: 60) participated in this survey.



*Figure 1. Farmer surveys in Arghakhanchi district*

### ***2.2.3 Market Surveys and Consumer Survey***

Five market surveys and five consumer surveys were conducted to gather information on market dynamics, pricing, and consumer preferences regarding Mandarin oranges in each district.

### ***2.2.4 Key Informant Surveys (KIS)***

KIS was conducted with at least three experts, including the chairperson of rural municipality, chiefs / staffs of the AKC, PMAMP /other agricultural offices of each study district.

### ***2.2.5 Focus Group Discussions (FGDs)***

FGDs were held with 10-15 farmers, including elderly individuals, in all district. Additionally, FGDs were conducted in Naya Gaun, Gulmi district, as per the recommendation stemming from surveys conducted in Arghakhanchi district.



*Figure 2. Focus group discussion on Arghakhanchi and Gulmi districts*

### ***2.2.6 Quality Testing: (Organoleptic and brix testing)***

Similarly, the taste profile or organoleptic test of oranges from the study areas was evaluated using a 6-point hedonic scale (1, 2, 3,.....6) about 11- 12 number of people were involved in Quality Testing. Brix content testing was performed on oranges from different locations to assess their sweetness levels.



Figure 3. Quality Testing held at Kirtipur office on mandarin orange samples from different districts

### 2.2.7 Data Analysis

Data collected from surveys and tests were compiled and computed using Excel for analysis. Six articles one each of the six different districts related to GI are set to be published in the Orange Compendium of the 14<sup>th</sup> National Horticulture Seminar jointly organized by National Center for Fruit Development and Nepal Horticulture Society.

## 3.0 Interesting Findings

### A) Some Folk songs related to Mandarin

- ✓ Jagat Bahadur Panta: local farmer of Dullu-11, Kalbhairav shared us an interesting folk song related to suntala:  
 "सुन्तला चुकिलो हुन्छ ।  
 ल्याउ बेलौती खान्छु ।  
 बिदा देउ र जान्छु ।  
 माया देउ र पाकेटमा हाल्छु ।"
- ✓ Farmers; Shashi Bahadur Khatri; permanent resident of Kalbhairav Toraya; Dullu-11 shared an old folk tale about mandarin as;  
 "बाहिरी भन्दा भित्रि मिठो, धन्न सुन्तलिय, सन्तलियको बोक्रा खाँया, मन त अन्तलिय ।"
- ✓ Famous mandarin related ukhantukka are composed by the farmers in Dullu. Some of them are:  
 "हेर्दा सून भन्दा कम छ, रोगहरुसँग लड्ने दम छ ।"  
 "स्वास्थ्यको साहारा, सुन्तला नै आहारा ।"

- ✓ Songs: local dohori related to mandarin orange in Dhankuta, "खाउं त भने सुन्तला पानी, सुन्तला पानी; नखाउँ भने दुवैको ज्यान जानी, नरौउ मायालु .....
- ✓ Mahesh Kumar Bista: Dullu 6, addressed a fact, "नौमुलेको जात्रा पैसा दाना सुन्तला ।" as during the period of Dullu regime, Jatra (Street festival or carnival) used to be celebrated in Naumule where a single mandarin orange (Suntala) could be purchased for one paisa (a penny).



*Figure 4. Seven generation old mandarin tree found in Gulmi district and Farmer were producing mainly seedling in Gulmi district.*





*Figure 5. More than 300 years old trees found in Dhankuta, the tree on the right from Mr. Dhan Bahadur Rai's orchard.*



*Figure 6. More than 160 years old trees found in Arghakhanchi district at Dhadhiram Gautama's orchard.*

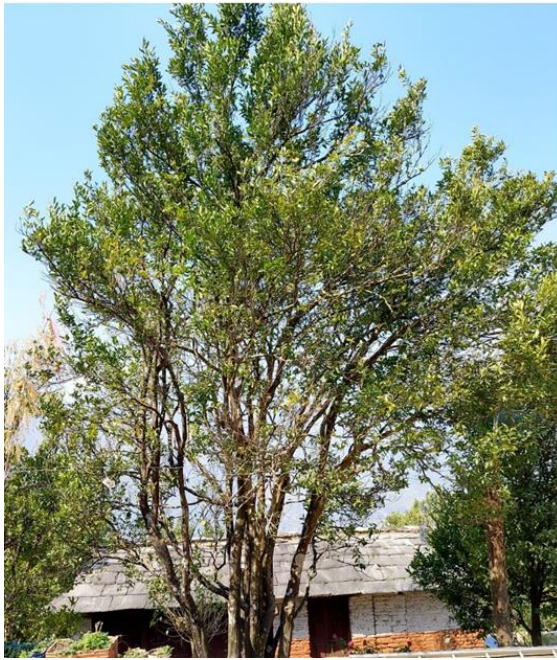
## ***B) Logic behind naming “Suntala “for mandarin orange at the place of origin***

- ✓ The name "Suntala" for mandarin oranges originates from the fruit's golden color, which resembles the color of gold. Approximately 2,000 years ago, Chinese travelers also referred to mandarin oranges as "golden fruit."
- ✓ According to Min Bahadur Karki and Kamala Ghimire:  
In the past, oranges were grown along the edges of fields, and during the fruiting season, they created layers and layers of golden fruit on the hilly terraces. When viewed from above, these layers resembled "suuñ" (the Nepali word for gold) and "tala" (the Nepali word for layers). Over time, the combination of these words led to the fruit being called "suntala." (Meaning Mandarin Oranges)
- ✓ According to Mitra Bahadur Rai of Dhankuta:  
There is an ancient tale that says a farmer once sold his gold jewelry and used the money to plant mandarin trees. After the trees bore fruit, he sold the mandarins and was able to buy back the same amount of gold jewelry he had sold. In Nepali, "sun" means gold and "tola" is a unit of measurement for gold. Because of this comparison to gold, the fruit was called "SUNTOLA," which eventually evolved into the word "Suntala." (Meaning Mandarin Oranges)

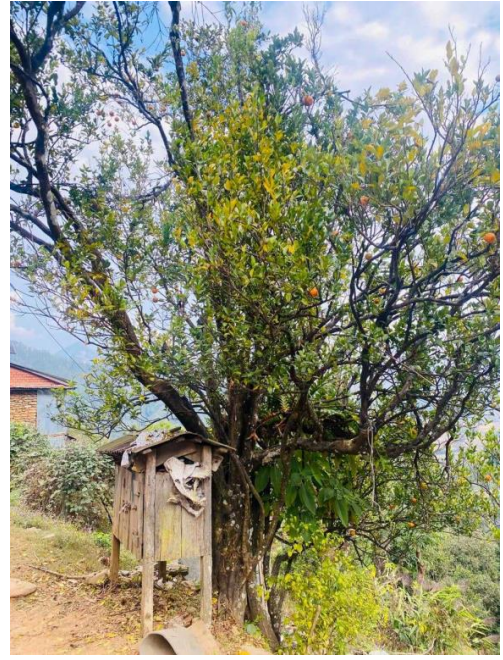


*Figure 7. 55 years old mandarin plant found in Top Bahadur Rai's orchard in Mangtewa, Sankhuwasabha district*





*Figure 8. More than 100 years old mandarin plant found in Banskharka, Parbat*



*Figure 9. More than 110 years old mandarin plant found in Syastri, of Kaski district*

### ***C) Origin***

- ✓ According to the farmers orange saplings have existed since prehistoric times in the jungles of Khoku. These wild saplings were later domesticated by farmers. The Bantawa Rai community of Dhankuta introduced mandarin oranges from the Khoku jungle to their fields, and from there, they were distributed to other parts of the country.
- ✓ According to Farmers from Dullu-6, Chhimdi, local mandarin seedlings were first brought from jungles and riverbanks of that area and were later domesticated.



*Figure 10. Pictures of oranges from Dullu, Dailekh*

#### ***D) Festivals***

- ✓ In 2072 BS orange festival was celebrated at Sahidbhumi- Khoku.
- ✓ Rai community make wine of oranges for the Orange festival (Papani) which is celebrated every year in Dhankuta district.
- ✓ Suntala is used as offering in different types of festivals like Thuloekadashi, Maghe Sankranti, Satyanarayan puja, Shreepanchami etc.



*Figure 11. Focus group discussion in Khoku and survey team members with Khoku oranges.*





*Figure 12. Team discussing with Kristi area farmer about TSS % of mandarin measured by Refractometer.*



*Figure 13. Survey team with mandarin traders in Pokhara wholesale market.*



*Figure 14. Farmer Daan Bahadur Rai and Indra Bahadur Rai's wife with ancient mandarin plant and survey team in Dhankuta.*

## 4.0 Findings of the survey: Arghakhanchi district

### 4.1 Findings related to farmers household surveys

**Table 3. Overview of Farmers household surveys**

<b>Description</b>	<b>Response</b>
Initial commercially orchard establishment	Since 2023 BS (Panini) and since 2049 BS in (Malarani)
First sapling introduced	Dhurkot municipality Nayagaun, Gulmi
Land type	100% Sloppy
Land preparation	Digging pit, fire on pit and putting fertilizer (Panini ) and in traditional way in Malarani
Lay out	100 % farmer follow standard layout (Panini), 50 % (Malarani)
Pit digging	100 % (Panini) and 50 % farmer follow standard layout (Malarani)
Compost pitting	2±1.1 doko compost per pit (Panini), 1.5±1.9 doko compost per pit (Malarani)
Other fertilizer	542.9±201.4 gm mixture of Urea, DAP, MOP, Zinc, Agricultural lime (Panini), however none other fertilizers are used by farmers from Malarani
Plant to plant distance	5.0±0.0 m (Panini), 4.8±0.8 m (Malarani)
Varieties growing	Mostly local (Raithane)
Sapling types (grafted, seedling)	88 % farmer plant seedlings and 12% farmer plant grafted saplings (Panini), 93 % seedlings and 7% grafted saplings (Malarani)
Planting month	Asar-Shrawan month
Weeding method	Manually
Mulching	Is not practiced
Intercropping	Only 30% farmer in Panini and 60% farmer in Malarani practice intercropping with vegetable crop
Application of fertilizer for manuring	100% farmer make compost and apply chemical fertilizer in Panini, 60% farmer composting and only 5% applying chemical fertilizer in Malarani
Irrigation	100% farmer irrigate on Magh to Jestha in Panini while only 37% irrigate during Falgun to Baishak
Insect pest types and control	Farmers face very less insect pest infestation. Mostly Roger/Pheremon trap and basically clean cultivation are practiced by farmers
Difference between applying chemical fertilizer Vs compost	Yield increased with chemical fertilizer application, quality enhance with composting.

<b>Description</b>	<b>Response</b>
Ripening time	Stars from Mangshir till Magh
Harvest time	Kartik-Magh in Panini while Mangshir-Magh in Malarani
Direct sell/ store	All farmers sell directly to contractor from orchard and the contractor keeps in the cold store
Market	Butwal, Chitwan and Pokhara
Training/ pruning	All farmers follow training/ pruning after harvesting in Panini while Most farmers do not follow training/ pruning after harvesting in Malarani
Average fruit no./plant	574±500 in Panini while 250 in Malarani

## ***4.2 Findings related to Focus group discussion survey***

**Table 4. Overview of Focus Group Discussion surveys**

<b>Description</b>	<b>Response</b>
FGD conducted group	2 groups
No. of male and female participated	90.5% male/ 9.5% female (Panini) 75% male/ 25% female (Malarani)
Year of cultivation	Since 1930 BS in Panini and Since 2023 BS in Malarani
First sapling introduced	Dhurkot municipality Nayagaun, Gulmi
Why named suntala	Suntala was used from ancestral time.
Land covered by mandarin	250 ha in Panini and 100 in Malarani
Household growing mandarin actively	22 in Panini and 20 in Malarani
Variety growing	Local
Sapling exported	Palpa, Butwal, other parts of Arghakhachi district
Benefits of growing orchard	Main economic source of Household
Changes in same variety growing in different geographic locations	Farmer have no Information
Attribute of growing variety	Shining, better color, sweet, juicy and long post-harvest life
Suggestion	Training for pest and disease management, and post-harvest technology Subsidies to actual farmers

### 4.3 Findings related to consumers survey

**Table 5. Overview of Consumer survey**

<b>Description</b>	<b>Response</b>
No. of Respondent	5
Access of getting mandarin in market	Yes
Price of mandarin (season and off season)	Rs 100-150 and 150-250/kg
Choice of Variety in market	local
Location of growing	Arghakhanchi, Gulmi, Palpa, Kaski, Syangja
Qualitative characters of choosing	Sweet, juicy, tasty, thin flesh
Time of availability of mandarin	Kartik-Falgun
Problems	Grading, storage
Suggestions	Produce consistent (big) size oranges, seedless oranges, increase availability

### 4.4 Findings related to market survey

**Table 6. Overview of market survey**

<b>Description</b>	<b>Response</b>
No. of respondent/ traders	5
Experience of selling mandarin	2– 20 years
Most preferred location	Arghakhanchi, Gulmi, Syangja, Palpa
Variety sold	Mostly local, Indian and Chinese
Prioritized location/var. for selling	Arghakhanchi, Gulmi, Syangja, Palpa
Price of mandarin	Rs. 70- 100 per kg / 180-200 per kg (off season)
Easily sold or not	Easily Sold
Distinguishing character	Local variety is tasty, sweet, juicy, thin skin and shinning
Market supplied	Butwal, Chitwan
Storage problems	Not needed, directly sold
Suggestion	Training on post-harvest handling, grading, labelling and tagging
	Support for better storage facility, Post-harvest storage training

## ***5.0 Findings of the survey: Dailekh district***

### ***5.1 Findings related to farmers household survey***

**Table 7. Overview of Farmers household survey**

<b>Description</b>	<b>Response</b>
Initiation of orchard establishment	150 years ago
First sapling introduced	Dailekh jungle
Land type	Slopy, terrace
Land preparation	Most farmer follow Primary tillage
Pit digging	100%
Compost pitting	Most farmer follow
Plant to plant distance	Most farmers keeping distance of 4-5 meter.
Varieties growing	Widely Dailekh local/ Unshu
Sapling types (grafted, seedling)	Many farmers use seedlings, some also use grafted saplings
Planting month	Ashad-Shrawan
Weeding method	Manually as per need
Intercropping	100% (Ginger, Turmeric, taro leaves, leafy vegetable etc.)
Application of fertilizer for manuring	Not in practice
Irrigation	Rainfed
Insect/pest types and control	Locally available insecticides used for control
Difference in taste b/w chemical fertilizer applied and organic mandarin	Unknown, as no application of chemical fertilizer is done
Ripening time	Starts from Mangsir
Harvest time	Mangsir-Magh
Direct sell/store	Direct sell
Market	Dailekh, Surkhet, Butwal, Bhairahawa, Nepalgunj
Training/Pruning	Diseased/crisscross branches are timely pruned.

## 5.2 Findings related to Focus group discussion survey

**Table 8. Overview of Focus Group Discussion survey**

<b>Description</b>	<b>Conclusion</b>
FGD conducted group	2 groups
No. of male and female participated	13 male/ 1 female
Year of cultivation	150 years ago
First sapling introduced	Dailekh jungle
Why named suntala	Golden color skin
Evidence about suntala	Folk songs and Suntala Jatraa festival
Land covered by mandarin	2500-3000 Ropani
Household growing mandarin actively	350- 400
Variety growing	Dailekh local, Unshu
Sapling exported	Dailekh, Jajarkot, Kalikot, Humla
ITK applied	Ash, weeding, interculture, irrigation, training/prunning bamboo ladder, sack, doko
Positive and negative impact after establishing orchard	PMAMP declared Mandarin zone area, economic status improved
Benefits of growing orchard	Improved social and economic status
Changes in same variety growing in different geographic	Change in taste and growth
Suggestion	Subsidy program needed in fertilizer, saplings, irrigation and other machinery tools , introduction of disease and pest resistant and tolerant varieties of citrus

### ***5.3 Findings related to consumers survey***

**Table 9. Overview of consumer survey**

<b>Description</b>	<b>Response</b>
No. of Respondent	4
Access of getting mandarin in market	Yes
Price of mandarin (season and off season)	Rs 60-90 and 150 per kg
Choice of Variety in market	Dailekh local
Location of growing	Dullu
Qualitative characters of choosing	Sweet, juicy, tasty, thin skin layer
Time of availability of mandarin	Mangshir-Falgun
Problems	Low price in local market
Suggestions	Grading, storage, free sapling

### ***5.4 Findings related to market survey***

**Table 10. Overview of market survey**

<b>Description</b>	<b>Response</b>
No. of respondent/ traders	5
Experience of selling mandarin	7 – 10 years
Most preferred location	Dailekh
Variety sold	Mostly Dailekh local in season, Indian and Chinese in offseason
Prioritized variety for selling	Dailekh local
Price of mandarin	Rs. 60- 80 per kg / 160 per kg
Easily sold or not	Easily
Distinguishing character	Dailekh local is tasty, sweet, juicy, thin layer skin, shinning like gold, organic and long post-harvest life.
Market supplied	Surkhet, Dailekh, Nepalgunj, Butwal, Bhairahawa
Storage	Direct sell
Problems	Commission to wholesaler, grading, labelling
Suggestion	Support for proper postharvest handling facilities like precooling, grading, sorting, packing and transportation and marketing facilities.

## 6.0 Findings of the survey: Dhankuta district

### 6.1 Findings related to farmers household survey

**Table 11. Overview of Farmers household survey**

<b>Description</b>	<b>Response</b>
Initiation of orchard establishment	1825 BS
First sapling introduced	Khoku jungle
Land type	Slopy, plain, terrace
Land preparation	Most farmer follow Primary tillage
Lay out	Few farmers practice orchard lay out
Pit digging	62%
Compost pitting	100%
Plant to plant distance	Most farmers keeping distance of 4-5 meter.
Varieties growing	Widely Khoku local/ Unshu, Marcott for testing only
Sapling types (grafted, seedling)	Many farmers use seedlings, some use grafted saplings
Planting month	Most in Asar-Shrawan month
Weeding method	Physical method
Intercropping	Some farmers are practicing with cereal crops and vegetables
Application of fertilizer for manuring	Many farmers are applying compost while some of them are also using chemical fertilizer, NPK
Irrigation	Mangshir to Baisakh
Insect pest types and control	All farmers are facing problems and management is done by insecticides and pesticides.
Difference between applying chemical fertilizer Vs compost	Yield increases using chemical fertilizer but quality deteriorates
Ripening time	Stars from Mangshir
Harvest time	Mangshir-Falgun
Direct sell/ store	All farmers sell directly to the contractor
Market	Dhankuta, Dharan, Hile, Biratnagar, Itahari, Uurlabari
Training/ Pruning	95% farmers follow training/ pruning after harvesting



## 6.2 Findings related to Focus group discussion survey

**Table 12. Overview of Focus Group Discussion survey**

<b>Description</b>	<b>Response</b>
FGD conducted group	2 groups
No. of male and female participated	28 male/ 8 female
Year of cultivation	Since 1825
First sapling introduced	Khoku jungle
Why named suntala	Resembling golden and comparison with gold
Evidences about suntala	Song and Papani festival
Land covered by mandarin	2000 ropani
Household growing mandarin actively	350- 400
Variety growing	Khoku local, Marcott, Unshu
Sapling exported	Ramechhap, Sindhuli, Kavre, Dhading, Gorkha, Taplejung, Sankhuwasava, Dailekh, Salyan, Kailai etc
ITK applied	Ash, weeding, interculture, irrigation, training/pruning bamboo ladder, sack
Positive and negative impact after establishing orchard	PMAMP declared pocket area, agriculture road developed
Benefits of growing orchard	Awarded by government, tourist visit Dhankuta in mandarin season
Changes in same variety growing in different geographic	differs in size, taste, height of plants, leaf size, shinning of fruit, juice content
Attribute of growing variety	Provide identity
Suggestion	Provide subsidies to actual farmers, prioritize for growing trifoliate sapling for disease free saplings growing and train farmers

### ***6.3 Findings related to consumers survey***

**Table 13. Overview of Consumer survey**

<b>Description</b>	<b>Response</b>
No. of Respondent	5
Access of getting mandarin in market	Yes
Price of mandarin (season and off season)	Rs 60-90 and 150 per kg
Choice of Variety in market	Khoku local
Location of growing	Khoku Chintang
Qualitative characters of choosing	Sweet, juicy, tasty, thin skin layer
Time of availability of mandarin	Mangshir-Falgun
Problems	Low price in local market
Suggestions	Grading, storage, free saplings supply

### ***6.4 Findings related to market survey***

**Table 14. Overview of market survey**

<b>Description</b>	<b>Response</b>
No. of respondent/ traders	6
Experience of selling mandarin	5 – 20 years
Most preferred location	Khoku Chhintang
Variety sold	Mostly Khoku local, Indian and Chinese
Priortized location/var. for selling	Khoku local from Chintang
Price of mandarin	Rs. 60- 80 per kg / 160 per kg
Easily sold or not	Easily
Distinguishing character	Khoku local is tasty, sweet, juicy, thin layer skin and shining like golden in comparison with others
Market supplied	Dhankuta, Dharan, Itahari, Biratnagar, Uurlabari, Birtamod
Storage	Not needed, directly sold
problems	7 % commission to wholesaler ,grading, labelling
Suggestion	Avoid commission, storage facility

## 7.0 Findings of the survey: Kaski district

### 7.1 Findings related to farmers household survey

**Table 15. Overview of Farmers household survey**

<b>Description</b>	<b>Response</b>
Initial orchard establishment	2033 BS
First sapling introduced	Malepatan Krishi farm
Land type	60% sloppy and 40% Plain
Land preparation	Traditional way
Lay out	More than 50 % farmer follow standard layout
Pit digging	68 % follow standard pit digging method
Compost pitting	1.5 to 4 doko compost per pit
Plant to plant distance	Most farmers use 4-5 meter distance
Varieties growing	Mostly local (Raithane)
Sapling types (grafted, seedling)	83 % farmer plant seedlings and 17% farmer plant grafted saplings
Planting month	Asar-Shrawan month
Weeding method	Manually
Mulching	Most farmers are practicing organic mulching and green manuring
Intercropping	Most farmers are practicing seasonal vegetables and few with cereal crops
Application of fertilizer for manuring	90% farmers are applying compost only and 10% also use chemical fertilizers
Irrigation	Magh to Chaitra
Insect pest types and control	All farmers are facing problems of insect pest and management is done based on chemical and IPM approach
Difference between applying chemical fertilizer Vs compost	Yield increased with chemical, quality enhance with composting
Ripening time	Starts from Mangshir till Magh
Harvest time	Mangshir-Magh
Direct sell/ store	All farmers sell directly to the contractor from orchard

<b>Description</b>	<b>Response</b>
Market	Pokhara
Training/ pruning	Most farmers follow training/ pruning after harvesting
Average fruit no./plant	265
Average plant no./farmer	145

## ***7.2 Findings related to Focus group discussion survey***

**Table 16. Overview of Focus Group Discussion survey**

<b>S.N.</b>	<b>Description</b>	<b>Response</b>
1	FGD conducted group	2 groups
2	No. of male and female participated	30 male/ 10 female
3	Year of cultivation	Since 2033 BS
4	First sapling introduced	Malepatan krishi farm
5	Why named suntala	Mostly follow from their parents
6	Evidences about suntala	Festival (Thulo Ekadashi)
7	Land covered by mandarin	1800-2000 ropani
8	Household growing mandarin actively	250- 320
9	Variety growing	Local
10	Sapling exported	Syangja, Baglung, Myagdi, Parbat, Tanahun, Lamjung, Gorkha, Palpa
11	Positive and negative impact after establishing orchard	Neighboring district (With Lamjung) connecting road developed, Secondary school established in Syastri area
12	Benefits of growing orchard	The place turned to tourist destination, home stay business developed
13	Changes in same variety growing in different geographic	Size variation, taste, height of plants, leaf size, shinning of fruit, taste and juice content varies
14	Attribute of growing variety	Local area identity
15	Suggestion	Training for pest and disease control, provide subsidies to actual farmers

### 7.3 Findings related to consumers survey

**Table 17. Overview of Consumer survey**

<b>Description</b>	<b>Response</b>
No. of Respondent	4
Access of getting mandarin in market	Yes
Price of mandarin (season and off season)	Rs 100-150 and 150-225/kg
Choice of Variety in market	local
Location of growing	Kaski, Syangja, Myagdi, Gorkha, Parbat
Qualitative characters of choosing	Sweet, juicy, tasty, skin layer
Time of availability of mandarin	Mangshir-Magh
Problems	Disease and pest, Orchard Management
Suggestions	Training to farmers, Grading, storage

### 7.4 Findings related to market survey

**Table 18. Overview of market survey**

<b>Description</b>	<b>Response</b>
No. of respondent/ traders	6
Experience of selling mandarin	4 – 32 years
Most preferred location	Kaski, Parbat, Syangja, Gorkha, Myagdi
Variety sold	Mostly local, Indian and Chinese
Prioritized location/var. for selling	Kaski, Parbat, Syangja, Gorkha
Price of mandarin	50- 80 per kg / 150-200 per kg
Easily sold or not	Easily
Distinguishing character	Local variety is tasty, sweet, juicy, thin skin and shinning
Market supplied	Kathmandu, Butwal, Narayanghad, Birganj,
Storage	Not needed, directly sold
problems	Training on post-harvest, grading, labelling and tagging
Suggestion	Storage facility, Post-harvest training

## 8.0 Findings of the survey: Parbat district

### 8.1 Findings related to farmers household survey

**Table 19. Overview of Farmers household survey**

Description	Response
Initial orchard establishment	2033 BS
First sapling introduced	Directorate of Agricultural Research, Gandaki Province and Malepatan Krishi farm
Land type	100% sloppy
Land preparation	Digging pit, fire on pit and putting fertilizer
Lay out	100 % farmer follow standard layout
Pit digging	100 % farmers
Compost pitting	37.62±2.95 kg compost per pit
Plant to plant distance	4.56±0.17 m
Varieties growing	Mostly local (Raithane)
Sapling types (grafted, seedling)	84.62 % farmer practice seedlings and 15.38% farmer plant grafted saplings
Planting month	Asar-Shrawan month
Weeding method	Manually
Mulching	Most farmers (100%) are practicing organic mulching and green manuring
Intercropping	Only 21.43% farmer practice intercropping with cereal crop and vegetable crop
Application of fertilizer for manuring	100% farmer composting and applying chemical Fertilizer
Irrigation	70% farmer irrigated on Magh to Jestha
Insect pest types and control	All farmers are facing problems of insect pest and management is done based on chemical and IPM approach with technical support of DAR, Gandaki Province and AKC Parbat
Difference between applying chemical fertilizer Vs compost	Yield increased with chemical, quality enhance with composting
Ripening time	Stars from Poush till Falgun

<b>Description</b>	<b>Response</b>
Harvest time	Poush - Falgun
Direct sell/ store	Retailers and wholesalers
Market	Kusama, Baglung, Myagdi Pokhara, and Kathmandu
Training/ pruning	Most farmers follow training/ pruning after harvesting
Average fruit no./plant	674±39.12
Average plant no./farmer	391±260

## ***8.2 Findings related to Focus group discussion survey***

**Table 20. Overview of Focus Group Discussion survey**

<b>Description</b>	<b>Response</b>
FGD conducted group	1 group
No. of male and female participated	90.5% male/ 9.5% female
Year of cultivation	Since 2000 BS
First sapling introduced	Directorate of Agricultural Research, Gandaki Province
Why named suntala	Mostly follow their parents
Evidences about suntala	Festival (Thulo Ekadashi)
Land covered by mandarin	4200 ropani
Household growing mandarin actively	44
Variety growing	Local
Sapling exported	Baglung, Parbat, Myagdi
Positive and negative impact after establishing orchard	Banskharka local variety register
Benefits of growing orchard	Place upgraded to tourist destination, home stay developed
Changes in same variety growing in different geographic	Farmer have on Information
Attribute of growing variety	Local area identity
Suggestion	Provide training for pest and disease control and subsidies to actual farmers

### 8.3 Findings related to consumers survey

**Table 21. Overview of consumer survey**

<b>Description</b>	<b>Response</b>
No. of Respondent	5
Access of getting mandarin in market	Yes
Price of mandarin (season and off season)	Rs 100-300 and 150-300/kg
Choice of Variety in market	Banskharka Local
Location of growing	Kaski, Syangja, Myagdi, Gorkha, Parbat
Qualitative characters of choosing	Sweet, juicy, tasty, skin layer
Time of availability of mandarin	Late variety available from last week of poush to Falgun
Problems	Transport problem cause decline in quality of mandarine
Suggestions	Transport facility, Training to farmers, Grading, storage

### 8.4 Findings related to market survey

**Table 22. Overview of market survey**

<b>Description</b>	<b>Response</b>
No. of respondent/ traders	5
Experience of selling mandarin	2 – 13 years
Most preferred location	Parbat, Kaski, Myagdi
Variety sold	Mostly local, Indian, and Chinese
Prioritized location/var. for selling	Parbat, Kaski, Myagdi, Syangja, Gorkha
Price of mandarin	150-250 per kg (Banskharka local)
Easily sold or not	Easily (High demand less supply)
Distinguishing character	Local variety is tasty, sweet, juicy, thin skin and shinning
Market supplied	Pokhara, Kathmandu
Storage	Not needed, directly sold
Problems	Training on post-harvest, grading, labelling and tagging
Suggestion	Storage facility, Post-harvest training,



## ***9.0 Findings of the survey: Sankhuwasabha district***

### ***9.1 Findings related to farmers household survey***

**Table 23. Overview of Farmers household survey**

<b>Description</b>	<b>Response</b>
Initial orchard establishment	Since forefathers time (Mangtewa) Since BS 2040 (Khadbari)
First sapling introduced	Fore fathers time/ Self-produced
Land type	100 % sloppy
Land preparation	Traditional way (Mangtewa) Pit digging (Khadbari)
Lay out	not in practice in Mangtewa but they do practice in Khadbari
Pit digging	only 20% practiced in Mangtewa but they do practice in Khadbari
Compost pitting	not in practice (Mangtewa) 1.5 to 2 doko compost per pit (Khadbari)
Plant to plant distance	some farmers use 4-5 meter distance (Mangtewa) Most farmers use 4-5 meter distance (Khadbari)
Varieties growing	Mostly local (Raithane)
Sapling types (grafted, seedling)	90 % farmer plant seedlings and 5 % farmer plant grafted saplings, 5% plant both (Mangtewa) and 85 % farmer plant seedlings and 5 % farmer plant grafted saplings, 10% plant both (Khadbari)
Planting month	Asar-shrawan month
Weeding method	Manually
Mulching	not in practice in Mangtewa and few practice in Khadbari
Intercropping	Most farmers intercrop cereal crop
Application of fertilizer for manuring	Tying of animals on tree trunk in Mangtewa. Most of the farmers are applying compost and very few apply chemical fertilizers in Khadbari
Irrigation	Very few do irrigation from Magh to Chaitra
Insect pest types and control	Farmers have insect pest problems but they don't do management
Difference between applying chemical fertilizer Vs compost	No use of chemical fertilizers in Mangtewa however farmers fell difference in taste

<b>Description</b>	<b>Response</b>
Ripening time	Starts from Magh (Mangtewa) and starts from Poush (Khadbari)
Harvest time	Magh to Falgun (Mangtewa) and Poush to Magh (Khadbari)
Direct sell/ store	All farmers sell directly to the contractor from orchard
Market	Main market Dharan
Training/ pruning	Not in practice (Mangtewa) however it is practiced after harvesting in Khadbari
Average fruit no./plant	250 (Mangtewa) and 180 (Khadbari)
Average plant no./farmer	5 % of orchards were of larger size in Mangtewa and 25 % of orchards were of larger size in Khadbari (100 and more than 100 trees)

## ***9.2 Findings related to Focus group discussion survey***

**Table 24. Overview of Focus Group Discussion survey**

<b>Description</b>	<b>Response</b>
FGD conducted group	2 groups
No. of male and female participated	14 male/ 6 female (Mangtewa) 12 male/ 8 female (Khadbari)
Year of cultivation	Since forefathers time (Mangtewa) Since BS 2040 (Khadbari)
First sapling introduced	Self-produced
Why named suntala	Ancestral called by that name
Land covered by mandarin	Around 80 ropani (Mangtewa) 200 ropani (Khadbari)
Household growing mandarin actively	15 (Mangtewa) and 30 (Khadbari)
Variety growing	Local
Sapling exported	No
Positive and negative impact after establishing orchard	Increase in farm income and living standard of farmers
Changes in same variety growing in different geographic	Juice content, size, smoothness of fruit skin and taste
Attribute of growing variety	Local area identity
Suggestion	Improvement of road condition irrigation facility and training on orchard management for farmers

### 9.3 Findings related to consumers survey

**Table 25. Overview of Consumer survey**

<b>Description</b>	<b>Response</b>
No. of Respondent	11
Access of getting mandarin in market	Yes
Price of mandarin (season and off season)	Rs 80-100 and 120-150/kg
Choice of Variety in market	Local
Location of growing	Bhojpur, Sankhuwasabha
Qualitative characters of choosing	Juicy, sweetness and thickness of rind
Time of availability of mandarin	Mangshir-Chaitra
Problems	Poor Road condition , Lack of knowledge on Orchard Management
Suggestions	Improving the road condition and irrigation facility

### 9.4 Findings related to market survey

**Table 26. Overview of market survey**

<b>Description</b>	<b>Response</b>
<b>No. of respondent/ traders</b>	3
<b>Experience of selling mandarin</b>	6-22 years
<b>Most preferred location</b>	Mangtewa, Malta, Khadbari
<b>Variety sold</b>	Mostly local
<b>Prioritized location/var. for selling</b>	Outside the district
<b>Price of mandarin</b>	Rs. 70- 80 per kg / 100-120 per kg
<b>Easily sold or not</b>	Easily
<b>Distinguishing character</b>	Locally grown mandarin are preferred by consumer due to sweetness, brightness and juiciness
<b>Market supplied</b>	Dharan , Jhapa Morang, Sunsari
<b>Storage</b>	Directly sold but storage facility is necessary
<b>problems</b>	Training on post-harvest, grading, labelling and tagging
<b>Suggestion</b>	Storage facility and Government initiation for export

## 9.5 Fruit quality measurements

Fruit quality measurements was done by organoleptic evaluation and TSS measurements.

### A. Organoleptic Evaluation

Organoleptic evaluation refers to the assessment of food products based on the sensory characteristics experienced through the senses of sight, smell, taste, touch, and hearing. This type of evaluation is commonly used to determine the quality and acceptability of food by examining its appearance, aroma, flavor, texture, and sound (Hasani et al., 2018).

The main objective of our evaluation was to understand the perceptions of the quality of mandarin oranges from six different study districts. A customized 6-point hedonic scale evaluation sheet was prepared and replicated to test the overall perception of the quality of these mandarin oranges. Each test was conducted with 12 office staff members from the National Center for Fruit Development, NARC, members of the Nepal Horticulture Society, and other staff at different times. The evaluators were asked to assess the following sensory attributes:

- 1) Taste
- 2) Quality of orange peel
- 3) Juiciness of oranges
- 4) Shining quality of orange peel
- 5) Puffiness
- 6) Quantity of seeds in each piece of orange

Also the name of place was not declared to the evaluators and was coded (Table 27)

**Table 27. Code given for the place of study for organoleptic taste evaluation**

<b>Code</b>	<b>Place</b>	<b>Name</b>	<b>Type</b>
A	Dhankuta, -3 Kagate	Khoku sthaniya	grafted
B	Dhankuta, -3 Kagate	Khoku sthaniya	Local
C	Sahidbhumi, 4 Khoku	Khoku sthaniya	grafted
D	Sahidbhumi, 4 Khoku	Khoku sthaniya	Local
E	Arghakhachi, Panini, Simle	Butwal local	Local
F	Arghakhachi, Malarani, Sakindhara	Butwal local	Local
G	Sankhuwasabha, Pangma	Local	Local
H	Sankhuwasabha, Mantewa	Local	Local
I	Kaski		Local

<b>Code</b>	<b>Place</b>	<b>Name</b>	<b>Type</b>
J	Kaski		Local
K	kaski		Local
L	Dailekh, Dullu		Local
M	Parbat, Banskharka		Local

## ***B. TSS contents***

The Total Soluble Solids (TSS) provided a measure of the concentration of dissolved solids such as sugars in a fruit. The TSS content of the orange samples was measured in the field using a refractometer. The highest Brix content was found in the Banskharka Local oranges from Parbat district, followed by samples from Dailekh, Sankhuwasabha, Kaski, Dhankuta, and Arghakhanchi. The variation in TSS may be attributed to the differences in elevation, location of the mandarin growing areas and the maturity stage of fruits also.

**Table 28. TSS recorded of Mandarin oranges of study districts**

<b>S.N.</b>	<b>Name of District</b>	<b>TSS (°Bx )</b>
1	Arghakhanchi	10
2	Dhankuta	11
3	Dailekh	13
4	Kaski	11.5
5	Parbat	14
6	Sankhuwasabha	12

## ***Findings***

According to the organoleptic taste evaluation, the oranges from Parbat, particularly the Banskharka Local variety, were the sweetest, had the highest juice content, and exhibited the most puffiness among all the samples. The Kaski Local variety had the thinnest skin. Both the Khoku Sthaniya from Dhankuta-3 Kagate and the Kaski Local had a shinier appearance compared to the others. The Banskharka Local oranges also had the fewest seeds, followed by the Khoku Sthaniya from Dhankuta-3 Kagate. Detailed evaluation results are attached (Table 29).

Table 29. Organoleptic Evaluation Results with code of study district

क्र.सं.	Parameters	अन्ना संख्या (सं.)													
		A	B	C	D	E	F	G	H	I	J	K	L	M	
१	स्वाद	१	१	१	१	१	१	१	१	१	१	१	१	१	१
१.१	गुणवत्ता	१	१	१	१	१	१	१	१	१	१	१	१	१	१
१.२	अम्लि अम्ल गुणवत्ता र अम्लि अम्लि अम्लि	२	६	५	३	२	६	१	६	२	६	५	३	१	१
१.३	अम्लि	३	१	३				५	१						
१.४	घरे अम्लि	५													
१.५	फिक्का	५	५	३											
२	बौका														
२.१	भारलो	१	२	५	१	५	६	५	५	५	१०	५	५	५	
२.२	टिके	२	७	५	६	५	५	५	५	५	९	६	५	६	
२.३	बबरो	३	२	१	२	३			२		१				
३	सुपला केसको रसिलोप/भिलोप														
३.१	उमम	१	५	२	६	६	५	७	५	७	७	५	३	११	
३.२	मध्यम	२	६	५	३	३	७	५	५	५	५	६	६	१	
३.३	सुम	३	१	२	२						१				
४	बाहिरी बाबरा														
४.१	चिकिलो	१	३	७	२	१	५	७	५	५	७	५	७	५	
४.२	हल्का चिकिलो	२	६	५	७	५	५	५	५	५	५	७	५	७	
४.३	भुरो	३	२	५	३	२			१						
५	बौका र केसा बुटिने समय (Puffiness)														
५.१	ठिटो	१	५	३	७	६	३	१	३	५	३	२	६	९	
५.२	मध्यम	२	५	७	५	३	७	७	५	७	५	९	५	२	
५.३	ठिलो	३	१	१		१	१	३	३	५	५	१	१	१	
६	पसला बाउको संख्या														
६.१	कम (१-३)	१	१०	९	९	१०	९	१०	६	९	९	९	६	१२	
६.२	मध्यम (४-५)	२	१	१	२	२	२	१	१	२	२	२	५		
६.३	बढी (>५)	३											१		

Code given for the place of study for organoleptic taste evaluation

Code	Place	Name	Type
A	Dhankuta, -3 kagate	Khoku shaniya	grafted
B	Dhankuta, -3 kagate	Khoku shaniya	Local
C	Sauidbhumi, 4 khoku	Khoku shaniya	grafted
D	Sauidbhumi, 4 khoku	Khoku shaniya	Local
E	Arghakhachi, Padmi, Simle	Butuwal local	Local
F	Arghakhachi, Maltrani, Sakudhara	Butuwal local	Local
G	Saankhuwasabha, Pangma	Local	Local
H	Saankhuwasabha, Manewa	Local	Local
I	Kaski		Local
J	Kaski		Local
K	kaski		Local
L	Dalchik, dullu		Local
M	Parbat, Banskharka		Local

# *District Profiles*

## 10.0 District Profile of Mandarin Orange: Arghakhanchi

Arghakhanchi is a district in Lumbini Province, Nepal, with Sandhikharka as its headquarters. Covering an area of 1,193 km<sup>2</sup> (461 sq mi), it had a population of 177,086. The district is bordered by Palpa to the east, Gulmi to the north, Kapilvastu to the south, and Pyuthan to the west. Mandarin orange cultivation is vital to the local economy and livelihoods, benefiting from favorable agro-climatic conditions and traditional farming expertise. Farmers rely heavily on mandarin oranges for their income, earning between 1 lakh to 15 lakh annually depending on land holdings. The oldest and newly established mandarin orange orchards are located in Pidini and Malarani, with seedlings originally sourced from Nayahau, Dhurkot in Gulmi. Naya Gaun farmers primarily sell orange seedlings for income, and the area is home to the oldest known orange tree, seven generations old. The native orange variety is preferred for its thin flesh, juiciness, resistance to pests, large size, extended shelf life, and sweet taste. Butwal and Rupandehi are the main wholesale markets for these oranges. Most farmers (85%) sell their produce directly to contractors who store them in cold facilities. Cultivation practices are largely uniform, focusing on clean methods, and the district's favorable climate helps minimize pest infestations, which are managed with simple agronomic practices.

1. District map showing landrace diversity, and mandarin orange growing areas

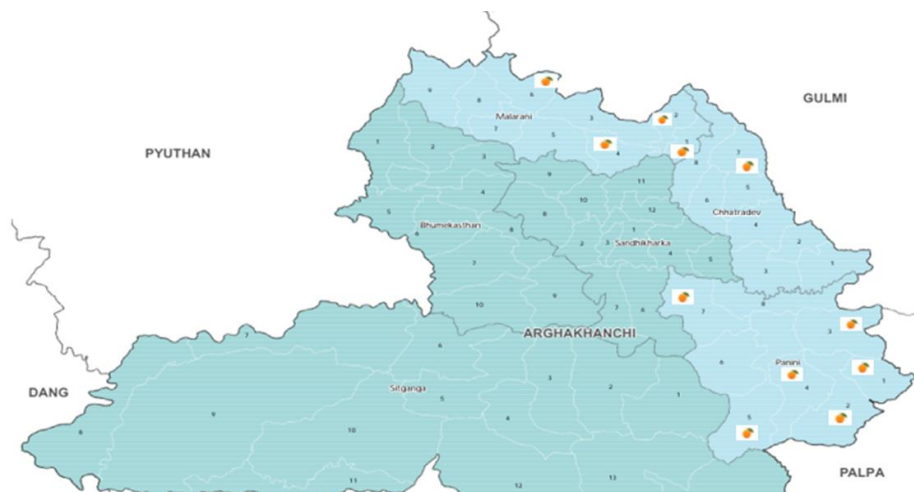


Figure 15. District map of *Arghakhanchi* district showing local landrace diversity and mandarin orange growing areas



## 2. Mandarin statistics:

- ✓ Total area of Mandarin: 734 ha
- ✓ Productive Area: 531 ha
- ✓ Altitude range: 305 to 2515 meter above the sea level.
- ✓ Production: 6021.5 Mt.
- ✓ Number of landraces: one
- ✓ Number of sites/ or household having mandarin: In total 6 cooperatives of mandarin producing farmers in the district.
- ✓ Improved varieties: seedling and grafted varieties of local landrace.

### 3.0 List of landraces and their main features, center of diversity

S.N.	Name of Landraces	Main features	Center of Origin
1	Local	Thin flesh, juicy, resistance to insects and pests, large size, extended post-harvest lifespan and sweet taste	Nayagaun of Gulmi district, Rainadevi Rural municipality of Palpa

### 4.0 Trend analysis: production, area, market value, import and export, diversity

S.N.	Trend	Unit	2076	2077	2078	2079	2080
1	Production	Mt.	5408	5279	5681	5310	6021.5
2	Total Area	Ha.	729	729	729	729	734
3	prod <sup>n</sup> Area	Ha.	429	494	444	504	531
4	Market value	Rs/kg	45	50	80	80	100
5	Import	Rs.			-	-	
6	Export	Rs.	almost 20 crore	almost 22 crore	24 crore 14 lakh	27 crore	29 crore 35 lakha 48 thousand

**5. Major famous areas, ranking of fruit quality, sources of mandarin saplings/ seedlings, services providers: relevant organizations**

S.N.	Address	Ward No.	Local Name	Ranking of fruit quality with 1 being the best quality	sources of mandarin saplings/ seedlings	services providers: relevant organizations
1	Panini	1	Simle	Simle-1	1)	
		2	Pokharathok	Pokharathok-		
		4	Patauti	2		
		5	Maidan	Patauti-3		
		7	Adguri	Maidan-6	2)	PMAMP
2	Malarani	2	Dadakatri	Sakindhara-4	Rainadevi	Zone, AKC
		4	Mareng	Mareng-5	Rural	Arghakhanchi,
		6	Sakindhara	Khanna-7	municipality	local level
		2	Khanna	Bhagabati -	of Palpa	government
		1	Sande	11	3) Local	
3	Chatradev	7	Bhagabati	Adguri- 10	orange	
				Dadakatrri-9	nurseries of	
				Sande-8	the district	

✓ **Cold store:**

- 1) Shiva Shakti Cold Store, Panini, 2, Pokharathok (In use)
- 2) Sandikhark Cold Store, Sandikhark 1, Hatari (in the process of making)
- 3) Malarani Cold Store, Malarani 5, Kalyar (Built but not in use)

✓ **Field gene bank:** Not available

✓ **Fruit availability time period:** From the month of Kartik to Magh

✓ **Main market places:** Butwal, Palpa, Bhairahawa, Arghakhanchi, Kapilbastu, Pyuthan, Nawalparasi, Kathmandu, Pokhara.

**6. Traditional knowledges and uses; and any geographically related information**

- ✓ 160 years old plant was found in the orchard of Dadhiram Gautam at Simle,, Panini

**7. Ecological services by mandarin, etc.**

- ✓ Greenery
- ✓ Reduces global warming by absorbing excess carbon dioxide as it evergreen plant.
- ✓ Helps to balance ecosystem
- ✓ Serves as a host for many birds, insects.

## 8. Problems:

### a) Insects:

S. N.	Name of insects infestation seen in the district (mandarin)	Control measures practiced in the district
1	Fruit Flies	Protein Bait, Pheromone
2	Aphid	Imidacolorapid
3	Citrus Thirps	Thimet, Furadan
4	Citrus Mites	Roger 1.5ml/lit of water

### b) Diseases:

S. N.	Name of Disease Infestation seen in the district (mandarin)	Control measures practiced in the district
1	Root/Foot rot	Bordomixture
2	Powdery Mildew	Kyarathen
3	Sooty Mould	Kyarathen

## 9. Agronomical practices

- **Breeding aspects:** Seedlings, Grafted saplings of local landrace.
- **Post-harvest tech:** Harvesting bag, doko
- ✓ **Loss of landraces and diversity:**
  - Climate change
  - Unwanted pesticide used
  - Inefficient orchard management and cultivation practices.

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## 10.2 District Profile of Mandarin Orange: Dailekh

Dailekh, a district in Karnali Province, Nepal, with Dailekh as its headquarters, spans an area of 1,502 km<sup>2</sup> (580 sq mi) and has a population of 252,313. The district is renowned for its local mandarin oranges, which were first cultivated from seedlings found in the local jungle and riverbanks of Dullu-6. These mandarins are celebrated for their superior quality, characterized by a juicy and sweet taste, shiny and smooth thin skin. The primary market for these mandarins is Bulbule Krishi Hatbazar in Surkhet, 80 km from Dullu, with additional sales in markets across Surkhet, Nepalgunj, Dhangadi, Dang, Bhairahawa and Butwal. Despite traditional farming methods, the yield has been good but is now declining due to global warming and increasing pest infestations. Pests such as white grubs, bugs, leaf miners, red ants, aphids, citrus greening, canker, anthracnose, and dieback are significant issues affecting production.

Approximately 90 percent of farmers in Dullu are engaged in citrus farming, relying heavily on mandarin cultivation for their economic well-being. This cultivation has significantly impacted their livelihoods, improving education, living standards, and income, and has led to the development of agricultural roads in every village to facilitate easier sales. The government has declared the area a "Suntala zone" under the PMAMP program, highlighting its importance for mandarin production. In season, Dailekh local mandarins dominate nearly 90 percent of the local market, with high consumer demand. Contractors often visit farms directly for collection and trading attracted by the mandarins' superior genetic characteristics, sweet taste, juiciness, thin skin, and gold-like shine.

### 1. District map showing landrace diversity, and mandarin orange growing areas.

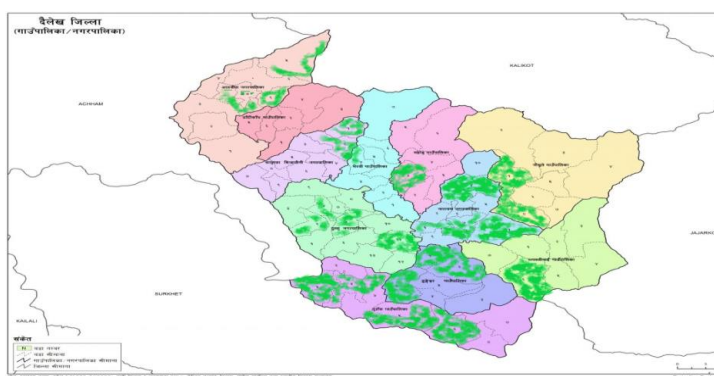


Figure 16. District map of **Dailekh** district with mandarin production area

## 2.0 Mandarin statistics:

- ✓ Total area of Mandarin: 1745ha
- ✓ Productive Area: 612 ha
- ✓ Altitude range: 544M to 4168 meter above the sea level.
- ✓ Production: 6738 Mt.
- ✓ Number of landraces : only local variety
- ✓ Number of sites/ or household having mandarin: 845 HHs. In total 9 Municipality/Rural municipality, Mandarin is Produced.
- ✓ Improved varieties: Khoku local, Unshiu and Local Landraces, Sweet orange.

## 3.0 List of landraces and their main features, center of diversity

S.N.	Name of Landraces	Main Features	Center of Origin
1	Local and Local landraces	Sweet Juicy, attractive color	Dullu Dailekh
2	Khoku	-	-
3	Japanese Unshiu	-	-
4	Sweet Orange. Dhankuta Local.	-	-

## 4.0 Trend analysis: production, area, market value, import and export, diversity:

S.N.	Trend	Unit	2076	2077	2078	2079	2080
1	Production	Mt.	4946	5282	5816	5876	6738
2	Productivity	Mt/ha	3.12	3.18	3.43	3.41	3.86
3	Total Area	Ha.	1584	1659	1695	1723	1745
4	Prod <sup>n</sup> Area	Ha.	515	550	607	609	612
5	Market value	Rs/kg	70	80	85	90	100
6	Production Value	Rs. (thousands)	346.22	422.56	494.36	528.84	673.80
7	Import	Rs.					
8	Export	Rs.	5 crore 15 lakh	7 crore 38 Lakh	8 crore 4 Lakh	8 crore 17 Lakh	11 crore 46 Lakh

**5. Major famous areas, ranking of fruit quality, sources of mandarin saplings/ seedlings, services: providers: relevant organizations**

S.N.	Address	Ward No	Local Name	Ranking of fruit quality with 1 being the best quality	Sources of mandarin saplings/ seedlings	Services providers: relevant organizations
1		1	Siyala			
2	Gurans Rural municipality	5	Goganpani		Khadka Fruit Nursery and Agro Farm: Dullu Mun-6,	
3		6	Bala			
4		7	Tamkhu			
5		Mahabhu Rural municipality	3	Bansi		
6	Naumule Rural municipality	8	Chauratha		Khadka BC Agro Farm Dungeshwor RM 2 Proprietor: Sunil BC	
7		1	Raili, Tame, Tili,			
8						
9		4,5	Santibazar			PMAMP Zone Dailekh-Surkhet ADO Dailekh, Nepal Agriculture research Center Station Kimugaun Dailekh. Local level government.
10	Dullu Municipality	6	Chhiidipusakot	Khoku local -1	Khanal Krishi tatha Nursery farm: Naumule-2, Proprietor: Ganesh Khanal.	
11		11				
12		2	Naulekatuwal	Malta-.2		
13	Narayan Municipality	3, 4	Khursanibari, Sota, ratapani	Other 2	Sijapati Krishi tatha Nursery Farm Aaathbis Municipality 9 Proprietor: Bhupendra Sijapati	
14		7,8	Kimugau,Tartang	Local		
15		11	Kanda	Quality-3		
16	Chamunda Bindrasaini Municipality	1	Bhirmaura			
17		2	Bhirmaura			
18		9	Chepadi			
19	Aathbis Municipality	8	Tilepata		Nepal Agriculture research Center Station, Kimugaun, Dailekh. Also, Local nursery of Dailekh district supply seedlings/saplings.	
20		5	Pipalkot			
21	Bhagawatimai Rural Municipality	6	Katti			
22	Dungeshwor Rural Municipality	1,2, 3,6	Belpata Lakuri Dandaparajul			

- ✓ **Cold store:**  
Built but not in use.
- ✓ **Field gene bank:** Not available
- ✓ **Fruit availability time period:** From the month of Kartik to Poush.
- ✓ **Main market places:** Dailekh Bazar, Birendranagar, Surkhet.

## 6. Traditional knowledges and uses; and any geographically related information

- ✓ Previously orange saplings were bought from Dullu jungles and later domesticated.

## 7. Ecological services by mandarin, etc.:

- ✓ Greenery
- ✓ Green Manuring
- ✓ Reduces global warming by absorbing excess carbon dioxide as its evergreen plant.
- ✓ Helps to balance ecosystem
- ✓ Serves as a host for many birds, insects.

## 8. Problems:

### a) Insects:

S. N.	Name of insects infestation seen in the district	Control measures practiced in the district
1	Fruit flies	Pheromone trap.
2	Scale insects	Mineral oil. Neemicide
3	Trunk borer	
4	Leaf miner	Imidacloprid, Emamectin Benzoate. Juto lure
5	Aphid	Mineral oil. Imidacloprid, Emamectin Benzoate. Sticky Trap
6	Citrus mites	Emamectin
7	White fly	Yello trap
8	Citrus Thirps	Neemicide
9	Citrus Mites	Emamectin.
10	Citrus Psylla	Neemicide

### b) Diseases:

S. N.	Name of diseases infestation seen in the district	Control measures practiced in the district
1	Greening	Neemicide
2	Root/Foot rot	Application of Bordo Paste.
3	Powdery Mildew	Sulphur based fungicides.
4	Felt disease	Copper oxychloride, Bordo Mixture.
5	Sooty mold	Imidacloprid, Mineral oil. Bordo Mixture.

## 9. Agronomical practices

- **Breeding aspects:** Seedling, Air Layering, Grafting.
  - **Post-harvest tech:** Plastic Crate, doko
- ✓ **Loss of landraces and diversity:**
- Change in temperature
  - Unwanted pesticide used
  - Inefficient orchard management and cultivation system.



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### 10.3 District profile of Mandarin Orange: Dhanakuta

Dhankuta District, one of the 14 districts of Koshi Province in eastern Nepal, spans an area of 891 km<sup>2</sup> (344 sq mi) and is home to 150,599 people. The hill town of Dhankuta serves as the district headquarters which lies at an altitude of 1,200 to 1,500 meters above sea level. Renowned for its orange groves and picturesque scenery, the district's mountain streams enhance its appeal as a base for trekking in the Kanchenjunga region. The first mandarin saplings, introduced by ancestors from the Khoku jungle known as "Mujure Sherpa Samudayik Ban," led to the establishment of commercial orchards in 1825 BS in the district. Almost every household in the district has mandarin plants, with sales generating annual incomes ranging from 4 to 20 lakhs, depending on orchard size and the number of plants. Farmers primarily cultivate the local Khoku mandarin landrace, though some also experiment with varieties like kinuwas, unshius, and markats. These mandarins, developed from both seedlings and grafted saplings, are sold in markets across Dhankuta, Biratnagar, Dharan, and Itahari. Despite the favorable climate, production of Khoku oranges is decreasing due to challenges from insect pests such as citrus bugs, aphids, scaly insects, and citrus psylla, which are managed with available insecticides and fungicides. Consumers prefer the Khoku local mandarin for its sweet taste, high juice content, thin skin, and appropriate size. However, farmers face trading issues, including a high commission rate of 7%, and there is a need for better packaging, labeling, and cold storage facilities.

#### 1.0 District map showing landrace diversity, and mandarin orange growing areas



Figure 17. District map of **Dhanakuta** showing local landrace diversity and mandarin orange growing areas

## 2.0 Mandarin statistics

- ✓ Total area of Mandarin: 877 ha.
- ✓ Productive Area: 501 ha.
- ✓ Altitude range: 1100 to 1600 meter above the sea level.
- ✓ Production: 2955 Mt.
- ✓ Number of landraces only local variety ( Khoku local )
- ✓ Number of sites/ or household having mandarin: Mandarin is produced in 4 local levels, 400 household have mandarin in Dhankuta district. There are 10 cooperatives of mandarin producing farmers in the district.
- ✓ Improved varieties: seedling and grafted varieties of local landrace.

## 3.0 List of landraces and their main features, center of diversity

S.N.	Name of Landraces	Main Features	Center of Origin
1	Khoku local	Good quality mandarin with high yield, thin skin layer, juicy, sweet, golden in colour, shiny.	Khoku
2	Unishu	For tasting only	Japan
3	Marcott	For tasting only	North east India

## 4.0 Trend analysis: production, area, market value, import and export, diversity

S.N.	Trend	2076	2077	2078	2079	2080
1	Production	5096 mt.	4800 mt.	3310 mt.	2815 mt.	2955 mt.
2	Total Area	875 ha.	875 ha.	875 ha.	877 ha.	877 ha.
3	Export	4,026 mt.	3,696 mt.	2592 mt.	2648 mt.	2068 mt.
4	Import					
5	Market Value	60-120/kg	60-120/kg	60-120/kg	60-120/kg	60-120/kg

**5.0 Major famous areas, ranking of fruit quality, sources of mandarin saplings/ seedlings, services providers: relevant organizations**

S. N.	Address	Ward No.	Local Name	Ranking of fruit quality with 1 being best quality	sources of mandarin saplings/ seedlings	services providers: relevant organizations
1		10	Paripatle			
2	Dhankuta municipality	3	Sipting,kagate, Syaule		National Citrus Research Program, Parapatle, Dhankuta.	PMAMP Dhankuta, AKC, National Citrus Research Program, Parapatle, Dhankuta
3		1	Okmalung			
4		2	Sambu gaau	Khoku.-1		
5	Sahidbhumi rural municipality	3	Panchakanya	Mauna Budhuk.-2	, Local nursery of Dhankuta district.	Research Program, Parapatle, Dhankuta Local level government.
6		4	Khoku,Satale,Piple	Kagate Sipting Syaule.-3		
7		6	Mamphing	Paripatle.-4		
8	Chaubise rural municipality	2	Sukrabaare,ker aabaari,aiselu	Remaining others have same quality.-5		
9		6	Meghe,Chiliga u			
10		5	Bodhe,Hamela			
11		7	Mauna Budhuk			
12	Pakhribas Municipality	10	Chungbang			

- ✓ **Cold store : Not available**
- ✓ **Field gene bank:** Farmers maintain their own orchard and NCFRP, NARC, Paripatle is maintaining local and improved varieties.
- ✓ **Fruit availability time period:** From the month of Kartik to Falgun
- ✓ **Main market places:** Dharan, Biratnagar, Kathmandu, Dhankuta,

**6. Traditional knowledges and uses; and any geographically related information**

Mandarin saplings were first bought from Khoku jungle which was later domesticated.

**7. Ecological services by mandarin, etc.**

- ✓ Greenery
- ✓ Reduces global warming by absorbing excess carbon dioxide as it evergreen plant and provides oxygen.
- ✓ Helps to balance ecosystem
- ✓ Serves as a host for many birds, insects.
- ✓ Soil conservation by stopping soil erosion

## 8. Problems:

### a) Insects:

S. N.	Name of insects infestation seen in the district (Mandarin)	Control measures practiced in the district
1	Citrus Fruit Fly	Application of protein bait.
2	Citrus Psylla	Systemic Insecticides is used to control.

### b) Diseases:

S. N.	Name of diseases infestation seen in the district (Mandarin)	Control measures practiced in the district
1	Citrus Canker	Orchard sanitation, timely irrigation, training and pruning , spraying of Bordeaux mixture and fertilization
2	Citrus Greening	Orchard sanitation, timely irrigation, training and pruning , spraying of Bordeaux mixture and fertilization
3	Powdery Mildew	Applications of Fungicides, Orchard sanitation, timely irrigation, training and pruning , spraying of Bordeaux mixture and fertilization

## 9. Agronomical practices

- ✓ Growing leguminous, Finger millet, Ginger, Turmeric crop in mandarin orchard.
- ✓ Fertilizer is applied through ring method.
- ✓ Mini-tiller is used for tillage in Mandarin orchard.

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## 10.4 District profile of Mandarin Orange: Kaski

Kaski District, part of Gandaki Province, is historically tied to the ancient Kaski Kingdom. The district spans 2,017 square kilometers and has a population of 600,051 with Pokhara as its headquarters. Positioned at the centroid of Nepal, Kaski's altitude ranges from 450 meters to 8,091 meters, encompassing parts of the Annapurna mountain range, offering breathtaking mountain views from many areas. This makes it one of Nepal's top tourist destinations. Mandarin orange cultivation began in Kaski and spread to neighboring districts like Syangja, Baglung, and Parbat, playing a vital role in the local economy and promoting tourism due to favorable agro-climatic conditions, diverse tourist attractions, and traditional farming expertise. Oranges from Chyarpe and Syastri in Rupa Gaunpalika and Kristi-Dophare in Pokhara are renowned for their thin flesh, juiciness, good taste, insect and pest tolerance and large size. The first mandarin saplings were brought from the Horticulture Research Center in Malepatan. Most farmers in Kaski received their saplings from Malepatan Krishi Farm. Pokhara serves as the primary wholesale market for oranges, facilitating local consumption and distribution to distant markets like Narayanghat, Butwal, and Kathmandu. Commercial cultivation of mandarins began in Syastri and Chyarpe of Rupa Gaunpalika in 2033 BS with support from Malepatan Krishi Farm. However, orange production in Kaski is declining these days due to the insect pest infestations, labor crisis, poor orchard management and greening issues. This decline is partly because many young people have migrated for employment, leaving the elderly to manage farms. Additionally, the rise of tourism as an alternative income source has reduced the incentive to cultivate oranges. Consequently, Kaski relies on oranges from neighboring districts to meet its internal demand.

### 1.0 District map showing landrace diversity, and mandarin orange growing areas

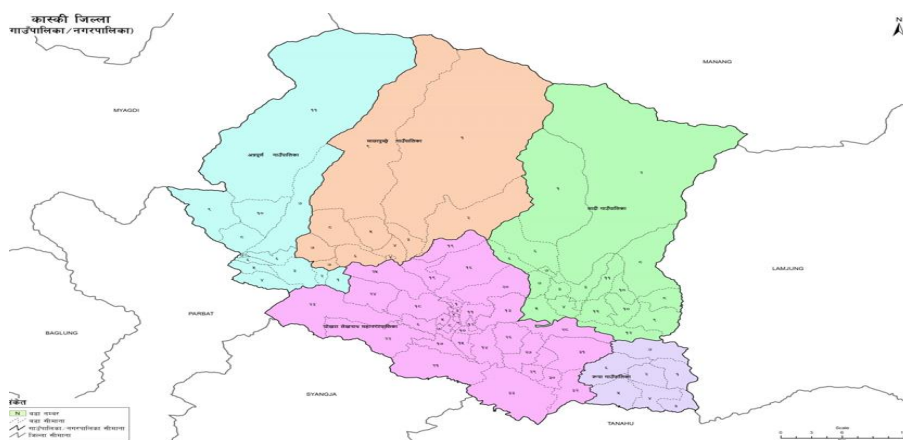


Figure 18. District map of **Kaski** showing mandarin orange growing areas

## 2.0 Mandarin statistics

- ✓ Total area of Mandarin: 851 ha
- ✓ Productive Area: 726ha
- ✓ Altitude range: 800-1200masl
- ✓ Production: 7610 Mt.
- ✓ Number of landraces: only local variety
- ✓ Number of sites/ or household having mandarin: Mandarin is produced in five different locations of Pokhara and Annapurna Rural Municipality.

## 3.0 List of landraces and their main features, center of diversity,

S.N.	Name of Landraces	Main Features	Center of Origin
1	Local	Brightly colored, sweet tasting, average fruit size: 110-130 gram. TSS 12-13%.	Hemja, Pokhara 25 Rural Municipality.
2	Marcott	-	-
3	Japanese Unsu	-	-
4	Indian Kinno	-	-

## 4.0 Trend analysis: production, area, market value, import and export, diversity

S.N.	Trend	Unit	2076	2077	2078	2079	2080
1	Production	Mt.	6817.2	5692.8	7612.5	7610	5620
2	Total Area	ha	810	967	860	851	830
3	prod <sup>n</sup> Area	Ha.	618	524	725	726	720
4	Market value	Rs/kg	65	70	70	80	70
5	Import (Rs.)	Rs	443118	398496	532875	608800	393400
6	Export (Rs.)	No export					



**5.0 Major famous areas, ranking of fruit quality, sources of mandarin saplings/ seedlings, services providers: relevant organizations**

S.N	Major famous areas	Ward No.	Ranking of fruit quality with 1 being best quality	Sources of mandarin saplings/ seedlings	Services providers: relevant organizations
1	Pokhara	21 Kristi	Kristi-1 Fedipatan-2 Remaining others have same quality.3	Malepatan Krishi farm, Local nursery of Parbat and Kaski district supply seedlings/saplings	PMAMP Kaski, AKC Kaski, Horticulture Development Research Center Kaski, Annapurna, Pokhara local level government
2	Pokhara	21 Fedipatan			
3	Annapurna rural municipality	8 Aangbang 10 chomrang			

- ✓ **Cold store:** Paschimanchal cold store Pokhara-5, Hemja cold store Pokhara-25, Pokhara krishi shit Bandar Pvt.Ltd pokhara-14 but mandarin are not kept in the cold store.
- ✓ **Field gene bank:** No
- ✓ **Fruit availability time period:** October-November
- ✓ **Main market places:** Pokhara valley

**6. Traditional knowledge and uses; and any geographically related information**

- ✓ Pokhara as a favorite place as a tourist destination which helps in Agribusiness promotion and Marketing however most of the orange pocket areas are vanished these days due to the infestation of Citrus Greening.

**7. Ecological services by mandarin, etc.**

- ✓ One of the agro-ecological and suitability in fragile and marginal hill-slope and high value nature.
- ✓ Greenery
- ✓ Reduces global warming by absorbing excess carbon dioxide as its evergreen plant.
- ✓ Helps to balance ecosystem
- ✓ Serves as a host for many birds, insects

## 8. Problems:

### a) Insects:

S. N.	Name of insects infestation seen in the district (mandarin)	Control measures practiced in the district
1	Fruit flies	Protein Bait, Pheromone traps.
2	Scale insects	Mineral oil.
3	Trunk borer	Application of Chlorpyrifos on affected parts
4	Leaf miner	Imidacloprid, Emamectin benzoate.
5	Aphid	Mineral oil, Imidacloprid, Emamectin Benzoate.
6	White fly	insecticides
7	Lemon butterfly	insecticides
8	Citrus psylla	insecticides

### b) Diseases:

S. N.	Name of disease infestation seen in the district	Control measures practiced in the district
1	Greening	Control Citrus Psylla
2	Powdery Mildew	Sulphur based fungicides
3	Canker	Fungicides
4	Post bloom fruit drop	Micro nutrient, irrigation

## 9. History:

It is known that the commercial cultivation of oranges was started from 2033 in Kaski district. One of the oldest orchards in Pokhara lies in Kristi- 21.

## 10. Agronomical practices:

**Breeding aspects:** Seedling, Air Layering, Grafting

- ✓ **Post-harvest tech:** Hand pinching, Plastic Crate, Doko, Perungo are used.
- ✓ **Loss of landraces and diversity:** Climatic extremities, poor orchard management, hailstone during flowering time, Citrus Greening and Fruit drop.
- ✓ The total production and productive area according to national data of Kaski is being reduced these days due to Citrus Greening.

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## 10.5 District profile of Mandarin Orange: Parbat

Parbat is a hilly district in Gandaki Province of Nepal, with Kusma as its district headquarters, Parbat spans 494 km<sup>2</sup> and has a population of 130,887, making it the fourth smallest district in Nepal. The district comprises 47 village development committees (VDCs). Notably, Parbat is renowned for the commercial production of high-quality mandarins due to favorable climatic conditions, suitable soil and market demand, particularly in Baskharka village, located in Jaljala Rural Municipality. Mandarin cultivation in Baskharka began in 2000 and has since become a major source of income for local farmers, boosting trade and commerce in the region. The local varieties, such as Baskharka local and Kamala are known for their shiny appearance, large size and sweet taste. These mandarins, harvested later than those in neighboring districts, command higher market prices, nearly double that of the normal season's oranges. Most farmers in Banskharka prefer their native varieties and are reluctant to introduce new ones, focusing instead on improving their local landraces. Farmers maintain good field sanitation and manage pests like fruit flies with support from AKC and PMAMP technicians. Diseases such as dieback, leaf and fruit spots, powdery mildew, and yellowing leaves are controlled using Bordeaux mixture and paste. Despite facing challenges like fruit drop, most produce from Banskharka is sent to Pokhara, with some supplied to the local district market. However, marketing mandarins is hindered by poor road connectivity, as Banskharka is only 9 km from the main highway but lacks a good road. Additionally, irrigation remains a significant issue in the district.

### 1.0 District map showing landrace diversity, and mandarin orange growing areas.

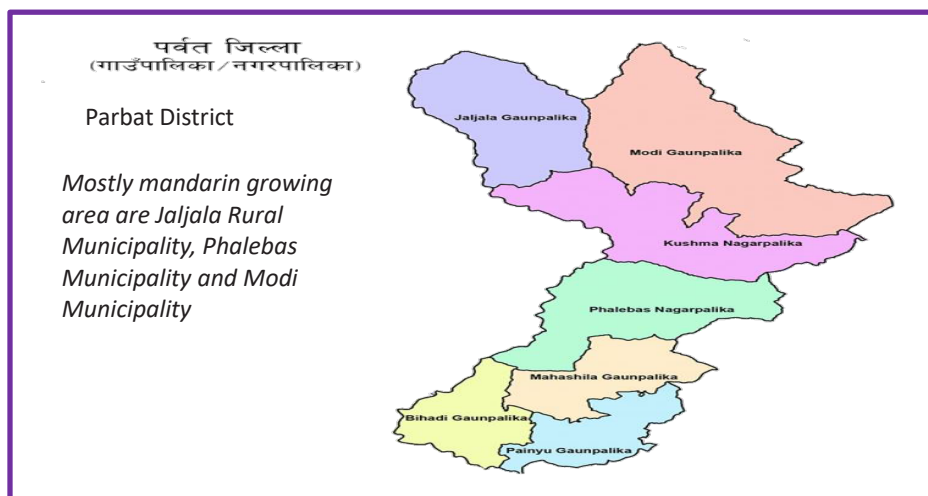


Figure 19. District map of **Parbat** showing local levels and mandarin growing areas

- ✓ Total area of Mandarin 835 ha
- ✓ Productive Area: 460 ha
- ✓ Altitude range: 700 to 1600 meter above the sea level.
- ✓ Production: 4015 Mt.
- ✓ Number of landraces: 3 (1 Banskharka local- Improved Varieties, 2. Kamala, and Others Local)
- ✓ Number of sites/ or household having mandarin: Mandarin is produced.in total 6 Municipality/Rural municipality, Bajarmare suntu utpadan krishi sahakari sastha is one of the important cooperative dedicated to mandarin orange cultivation.
- ✓ Improved varieties: Banskharka local, Unshiu and Local Landraces.

### 3.0 List of landraces and their main features, center of diversity,

S.N.	Name of Landraces	Main Features	Center of Origin
1	Banskharka local	Light yellow, attractive color, Averagefruit size: 120-130 Gram. TSS 12-14%.	Banskharka of Jaljala Rural Municipality.
	Kamala	Light yellow, attractive color, Averagefruit size: 135-150 Gram. TSS 12-14%.	Banskharka of Jaljala Rural Municipality
2	Khoku	-	-
3	Japanese Unshiu	-	-
4	Dhankuta Local.	-	-

### 4.0 Trend analysis: production, area, market value, import and export, diversity

S.N.	Trend	Unit	2077	2078	2079	2080
1	Production	Mt.	3580.00	4000	4040	4015
2	Productivity	Mt/ha	9	9	9.1	8.73
3	Total Area	Ha.	815	830	830	835
4	prod <sup>n</sup> Area	Ha.	400	450	452	460
5	Market value	Rs/kg	55	60	60	70
6	Production Value	Rs. (thousands)	196900	102711.0	242400	281050
7	Import	Rs.				
8	Export	Rs.				

**5.0 Major famous areas, ranking of fruit quality, sources of mandarin saplings/ seedlings, services: providers: relevant organizations**

S.N.	Address	Ward No.	Local Name	Ranking of fruit quality with 1 being best quality	Sources of mandarin saplings/ seedlings	Services providers: relevant organizations
1	Jaljala Rural Municipality	1	Banskharka	1. Kamala and Banskharka local varieties of Jaljala Rural Municipality-1	Saptagandaki Agro Tech, Jaljla-5 Nawajiwan Krishi Firm, Phalewas-11 Deurali Faful tatha Pashupanchi Firm, Modi-3 Local Nursery of Jaljala-1, Falewas-11	<ul style="list-style-type: none"> <li>• Agriculture Knowledge center, Parbat</li> <li>• Agriculture section of local level government</li> <li>• Nepal Agricultural Research Center, Agriculture Research Directorate, Lumle</li> <li>• PMAMP, Mustang</li> </ul>
2		6	Salija			
3		5	Bhuma			
4	Modi Rural Municipality	2,3	Deupur, Deurali			
5		10	Kurgaha			
6	Phalewas Municipality	11	Pangrang			
7		8	Salghari			
8		3	Shankarpokhari			
9		3	Durlung			
10	Kushma Municipality	2	Khurkot			
11		12	Thulipokhari			
12	Bihadi Rural Municipality	1	Bachchha	2. Other Local Varieties of Bihadi-1, Mahasila-2, Phalewas-10,11 and Modi-2,3,5		
13	Mahashila Rural Municipality	2	Bhoksing, limidanda			

- ✓ **Cold store:** do not have cold store facility for mandarin.
- ✓ **Field gene bank:** Not available
- ✓ **Fruit availability time period:** From the month of Kartik to Falgun.
- ✓ **Main market places:** Pokhara, Kushma, Kathmandu, Baglung and Beni

**6. Traditional knowledges and uses; and any geographically related information**

- ✓ More than 100 years old plant was found at Jaljala Rural Municipality.

**7. Ecological services by mandarin, etc.:**

- ✓ Greenery to environmental sector.
- ✓ Reduces global warming by absorbing excess carbon dioxide as its evergreen plant.
- ✓ Helps to balance ecosystem.
- ✓ Serves as a host for many birds and insects.
- ✓ Reduce natural disasters like landslides.

## 8. Problems:

### a) Insects:

S. N.	Name of insects infestation seen in the district	Control measures practiced in the district
1	Fruit flies includes Chinese fruit fly	Protein bait, Pheromone trap.
2	Scale insects	Mineral oil.
3	Green stink bug	Servo oil
4	Trunk borer	Application of chlorpyriphos on affected parts.
5	Leaf miner	Imidacloprid, Emamectin benzoate.
6	Aphid	Mineral oil, Imidacloprid, Emamectin benzoate.
7	White fly	
8	Mealy bug	
9	Lemon butterfly	
10	Citrus mites	Abamectin.

### b) Diseases:

S. N.	Name of disease infestation seen in the district	Control measures practiced in the district
1	Greening	
2	Root/Foot rot	Application of Bordo Paste.
3	Powdery Mildew	Sulphur based Fungicides.
4	Felt disease	Copper oxychloride, Bordo Mixture.
5	Canker	Copper oxychloride, Bordo Mixture.
6	Alternaria leaf spot	
7	Pink disease	
8	Post bloom fruit drop	
9	Sooty mold	Imidacloprid, Mineral oil, Bordo Mixture.
10	Greasy spot	

## 9. Agronomical practices

- **Breeding aspects:** Seedling, Air Layering, Grafting.
- **Post-harvest tech:** Plastic Crate, Doko, Cartoon etc.

### ✓ Loss of landraces and diversity:

- Ecological impacts of temperature
- Use of sapling outside the district
- Unwanted pesticide used
- Inefficient orchard management and cultivation system.

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## 10.6 District Profile of Mandarin Orange: Sankhuwasabha

Sankhuwasabha District, one of the 14 districts in Koshi Province of eastern Nepal, covers an area of 3,480 km<sup>2</sup> and has a population of 158,041, with its administrative center in Khandbari. The district's favorable climatic conditions support the potential for high-quality mandarin orange production, particularly the Khoku local and other local landraces are produced in eight local levels. Farmers claim that Mangtewa, in Silichong Rural Municipality, is the center of origin for Sankhuwasabha mandarins, which are known for their high quality, fewer seeds, and greater sweetness and juice content. The PIU of Sankhuwasabha PMAMP provides support for local nurseries and farmers. In Mangtewa, farmers use traditional cultivation practices and it is common practice to tie domestic animals around mandarin tree trunks after harvesting intercrops, to allow dung and urine to fertilize the soil before ploughing. However, the district faces several issues, including inadequate irrigation, poor orchard management knowledge, disease and pest incidences, lack of quality planting materials and insufficient technical assistance. Irrigation is particularly challenging, with some farmers using drinking water for hand irrigation during dry periods while others do not practice irrigation at all. The major markets for Sankhuwasabha mandarins are Dharan, Itahari, Biratnagar, Jhapa, Morang and Sunsari. Farmers also sell mandarins directly to collectors who then grade the fruits into two categories and sell them at different prices.

1 District map showing landrace diversity, and mandarin orange growing areas.

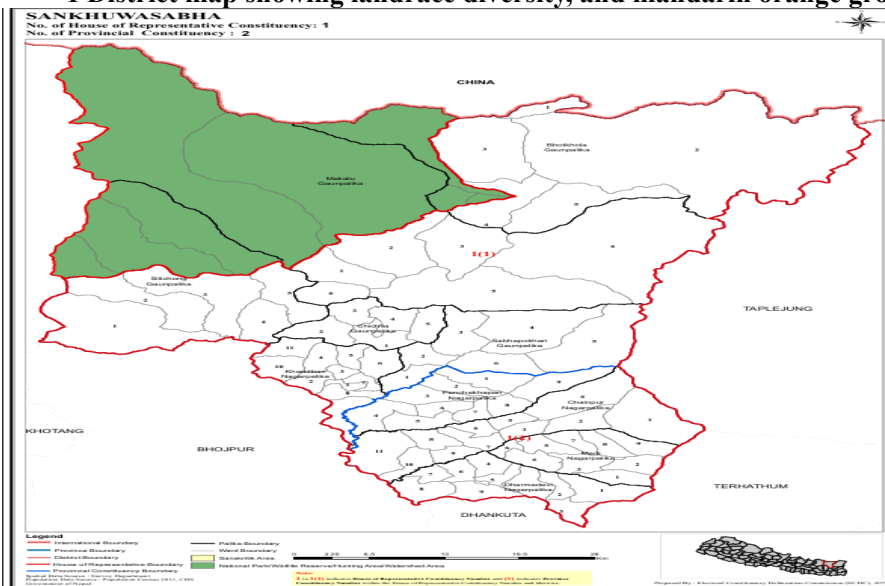


Figure 20. District map of *Sankhuwasabha* showing mandarin orange growing areas



## 2. Mandarin statistics:

- ✓ Total area of Mandarin:468ha
- ✓ Productive Area: 232 ha
- ✓ Altitude range: 457 to 1600 meter above the sea level.
- ✓ Production: 2088 Mt.
- ✓ Number of landraces : only local variety
- ✓ Number of sites/ or household having mandarin: Mandarin is produced in total 8 Municipality/Rural municipality.
- ✓ Improved varieties: Khoku local, Unshiu and Local Landraces, Sweet orange.

## 3. List of landraces and their main features, center of diversity

S.N.	Name of Landraces	Main Features	Center of Origin
1	Khoku Local and Local landraces	Light yellow, attractive color, Averagefruit size: 100-125 Gram. TSS 12-13%.	Mangtewa of Silichong Rural Municipality.
2	Khoku	-	-
3	Japanese Unshu	-	-
4	Sweet Orange. Dhankuta Local.	-	-

## 4. Trend analysis: production, area, market value, import and export, diversity

S.N.	Trend	Unit	2076	2077	2078	2079	2080
1	Production	Mt.	1237.6	1388.6	1467.3	1612.5	2088
2	Productivity	Mt/ha	6.8	7.16	7.3	7.5	9.0
3	Total Area	Ha.	315.0	321.61	381	417	468
4	prod <sup>a</sup> Area	Ha.	182	194	201	215	232
5	Market value	Rs/kg	65	70	70	75	80
6	Production Value	Rs. (thousands)	80444	97233	102711	120936	167040
7	Import	Rs.					
8	Export	Rs.	48266.64	58339.68	61626.6	72562.5	100224

**5. Major famous areas, ranking of fruit quality, sources of mandarin saplings/ seedlings, services: providers: relevant organizations**

S. N.	Address	Ward No.	Local Name	Ranking of fruit quality with 1 being best quality	Sources of mandarin saplings/ seedlings	Services providers : relevant organizations
1		5	Yafu			
2	Silichong Rural Municipality	4	Mangtewa			
3		2	Bala			
4		3	Tamkhu			
5		1	Sisuwa			
6		1,4,5	Matsyapokhari			
7	Chichila Rural Municipality	2,3	Diding			
8	Sabhapokhari Rural Municipality	1,2	Dhupu			
9		3,4	Barabisha			
10		5,6	Sabhapokhari			
11	Khandbari Municipality	4	Pangma, Sekha, Chiplegaon	Mangtewa-1	Shree Pasang afro farm:	PMAMP
12		5	Malta, Leluwa	Malta.-2	chainpur-2,	Sankhuwa
13		6	Khipring	Madiram	Proprietor:	sabha,
14		1	Khorande	bani.-3	Pasang Sherpa.	National
15		10,11	Chandanpur Heluwa	remainin	Umesh Agro Farm: Madi-6.	citrus
16	Panchkhapan Rural Municipality	4,5,6	Wana	g others	Proprietor:	research
17		7,8,9	Jaljala	have	Umesh Subedi.	program,
18		1,2,3	Swaybun	same	National citrus	Parapatle,
19	Chainpur Rural Municipality	6,7	Chainpur	quality-4	research	Dhankuta.
20		8,9	Banesawor		program,	Local
21		10,11	Kharang		Parapatle,	level
22		4,5	Siddhapokhari		Dhankuta.	governme
23		1	Nundhaki		, Local nursery of	nt.
24	Madi municipality	7,8,9	Mawadin		Dhankuta district	
25		4,5,6	Madirambani			
26		1,2,3	Madimulkhark			
27	Dharmadevi municipality	1,2,3	Tamaphowk			
28		4,5,6	Mamling			
29		7,8,9	Aankheebhue			

- ✓ **Cold store:** Not Built.
- ✓ **Field gene bank:** Not available
- ✓ **Fruit availability time period:** From the month of Kartik to Falgun.
- ✓ **Main market places:** Dharan, Ithari, Biratnagar, Birtamod, Kathmandu.

#### 6. Traditional knowledges and uses; and any geographically related information

- ✓ More than 200 years old plant was found at Mangtewa of Silichong Rural Municipality.

#### 7. Ecological services by mandarin

- ✓ Greenery
- ✓ Reduces global warming by absorbing excess carbon dioxide as its evergreen plant.
- ✓ Helps to balance ecosystem
- ✓ Serves as a host for many birds, insects.
- ✓ Helps in soil fertility maintenance and conservation by stopping soil erosion.

### 8. Problems

#### a) Insects:

S. N.	Name of insects infestation seen in the district (mandarin)	Control measures practiced in the district
1	Fruit flies	Protein bait, Pheromone trap.
2	Scale insects	Mineral oil.
3	Trunk borer	Application of Chlorpyrifos on affected parts.
4	Leaf miner	Imidacloprid, Emamectin benzoate.
5	Aphid	Mineral oil. Imidacloprid, Emamectin benzoate.
6	Citrus mites	Abamectin.

#### b) Diseases:

S. N.	Name of disease infestation seen in the district ( mandarin)	Control measures practiced in the district
1	Root/Foot rot	Application of Bordo Paste.
2	Powdery Mildew	Sulphur based fungicides.
3	Felt disease	Copper oxychloride, Bordo Mixture.
4	Sooty Mold	Imidacloprid, Mineral oil, Bordo Mixture.

### 9. Agronomical practices

- **Breeding aspects:** Seedling, Air Layering, Grafting.
- **Post-harvest tech:** Plastic Crate, Doko, Perungo
- ✓ **Loss of landraces and diversity:**
  - Ecological impacts of temperature
  - Unwanted pesticide used
  - Inefficient orchard management and cultivation system.

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## *11.0 Conclusion*

The study uncovers a rich history of Mandarin orange cultivation in the Arghakhachi district, dating back over 200 years. Both old and new orchards in the area trace their origins to Naya Gaun in the neighboring Gulmi district, with the oldest orange tree, 400 years old, found in Nayagaun, however the initial introduction of oranges to the area remains unknown. The native orange variety is favored by farmers for its thin flesh, juiciness, resistance to pests, large size, extended post-harvest lifespan, and sweet taste, boasting an average brix content of 9.5. While there are no specific traditions or folk songs related to oranges, farmers heavily rely on them for their livelihoods, with average annual incomes ranging from 1 lakh to 15 lakh depending on land holdings. A significant majority of farmers (85%) directly sell their oranges to contractors, who then store them in cold storage facilities. Cultivation practices among farmers are largely uniform, with a focus on clean cultivation methods. Thanks to the district's favorable niche climate, infestations of insects and pests are minimal and managed through simple agronomic practices.

In the Kaski district of the Gandaki region, Mandarin oranges have been identified with special characteristics of taste, traditionally managed cultivation practices, and a history dating back to the early 20th century. The native landrace stands out for its sweet taste, juiciness, thin skin, relatively average size, and golden color, making it superior to other varieties available in the market. Due to high local demand, conservation efforts are deemed necessary, and the genotype requires conservation with a Geographical Indication (GI) tag to protect it and promote the citrus industry.

Similarly, in Dhankuta, Mandarin oranges with unique characteristics have been cultivated since the early 19th century. The locally managed cultivation practices have resulted in a landrace superior to Indian and Chinese varieties, with a sweet taste, juiciness, thin skin, average size, and a gold shiny appearance. Conservation efforts are necessary due to emerging threats like pests and diseases, and providing a GI tag can protect the genotype from extinction, promote cultivation, and encourage breeding for future generations.

In the Sankhuwasabha region, despite favorable climatic conditions, proper orchard management is crucial to enhance Mandarin production. There is significant potential to increase both the quality and quantity of Mandarin production in the area, but this requires improved irrigation facilities, better road conditions, and timely technical assistance for growers. Providing GI tags to Mandarin varieties based on their place of origin not only helps conserve diversity but also promotes rural development by adding value to agricultural products.

In Dullu ward no.6 and 11, Mandarin cultivation dates back to the early 19th century, with unique characteristics in terms of taste, juiciness, skin, shine, organic nature, long post-harvest life, and average size compared to Indian and Chinese varieties. Despite traditional farming methods, the area has reported good yields. However, the increasing threat of global warming, pest infestations, and diseases necessitates government intervention. Providing GI tags to local Mandarin varieties would help conserve existing landraces, ensure their sustainable use, and benefit both farmers and the country. In season almost 90 percent of local market is occupied by Dailekh local mandarin and consumer also prefer high demand towards local mandarin. Contractors directly reach to the farmer's field for the collection and trading of orange.

Lastly, in Banskharka, Mandarin cultivation has been ongoing since 2000, with both old and new orchards planting seedlings. The native orange variety is the most popular, known for its shine, thin flesh, juiciness, post-harvest lifespan, and sweet taste. Most farmers directly sell their oranges to contractors, with uniform cultivation practices focusing on cleanliness. There are no storage facilities, and harvesting typically occurs from the last week of Magh to the last week of Falgun.

Therefore, indigenous mandarin oranges growth in different parts of Nepal are superior to the imported ones and hence deserve to be GI tagged for their special recognition and promotion. For export it could be tagged as a "Nepali Suntala" or "Nepalese Mandarin Orange" referring to some specific qualities possessed by indigenous varieties.

## ***12.0 Recommendation from Close group discussion and Validation workshop***

### ***12.1 Close group discussion***

A closed-group discussion was held with members of the survey team, the Gene Bank team from NARC, and a member from the Ministry of Industry and Commerce.

Although all oranges found in the selected six districts were considered important and recommended for Geographical Indication (GI) protection by the survey team, Khoku oranges of Dhankuta district and Banskarka oranges of Parbat district were chosen as the best candidates for obtaining Geographical Indication (GI) status based on the overall survey report and the internationally recognized parameters of origin, reputation, and fruit quality required for GI. Additionally, the Kamala variety found in Banskarka of the Parbat district was suggested as a suitable variety for future Geographical Indication (GI) status after sufficient study and data.

Furthermore, activities such as molecular-level data analysis and comparative analysis for nutritional profiling of oranges should be included in next year's planning and implementation of National Centre for Fruit Development center. Additionally, a study related to the area coverage of the recommended varieties for GI status should be conducted in the near future.

### ***12.2 Validation workshop***

A validation workshop was held at the National Center for Fruit Development on 2080/1/18 following the field survey and closed-group discussion. The workshop was attended by almost all senior members of the Nepal Horticulture Society, the Director General of the Department of Agriculture, the Director of the Prime Minister Modernization Project, the Chief of the Center for Potato, Vegetable, and Spice Crops Development, an under-secretary from the Ministry of Industry and Commerce, as well as all members of the survey team and office staff.

The key decisions validated during the workshop are as follows:

According to the Geographical Indication (GI) policy, crops or products with a GI have significantly more value in terms of both monetary value and branding. Therefore, it is advisable to pursue Geographical Indication (GI) status for mandarin oranges. Additionally, Khoku orange and Banskarka orange are deemed suitable for GI status. The National Center for Fruit Development is also recommended to continue working on the prerequisites for obtaining GI status in the future.



### ***13.0 Name and contact number of farmers with old aged trees in their orchard***

<b>S.N.</b>	<b>Name of farmers</b>	<b>District</b>	<b>Address</b>	<b>Contact number</b>
1	Dadhi Ram Gautam	Arghakhanchi	Simle	9867032733
2	Dal Bahadur Khadka	Dailekh	Dullu, 6	9844859910
3	Jagat Bahadur Pant	Dailekh	Dullu, 11	9848064122
4	Khadka Bahadur Malla.			9863585595
5	Indra Bahadur Rai	Dhankuta	Kagate	9842551308
6	Daan Bahadur Rai			9814353800,9863782423
7	Kamal Thapa	Gulmi	Dhurkot Rural Municipality	9857067743
8	Jagat bahadur khatri	Parbat	Baskharka	9847643644
9	Dharma Raj Neupane	Kaski	Syastri	9861123300
10	Top Bahadhur Rai	Sankhuwasabha,	Mangtewa	9810455151
11	Biresh Rai		Khadbari	9852054155
12	Lochan Rai		Malta	9842193787

## 14.0 Annex (Questionnaires)

### 14.1. Farmer's household survey

#### क. सामान्य जानकारी

१. जिल्ला २. गाउँपालिका/ नगरपालिका
३. गाँउ
४. कृषकको नाम:
५. लिंग: पुरुष  महिला
६. उमेर:
७. सम्पर्क नम्बर.
८. तपाईंसँग कति जमिन छ (क्षेत्रफल):

#### ख. कृषकको सुन्तला खेती सम्बन्धी जानकारी

१. तपाईंले कति क्षेत्रफलमा सुन्तला लगाउनु भएको छ : रो
२. सुन्तला खेती गरिएको क्षेत्र  
मध्य पहाड  पहाड  अन्य .....
३. सुन्तला खेती गरिएको जग्गाको उचाई (Altitude) .....,  
अक्षांश (Latitude) :..... देशान्तर (Longitude) :.....
४. यो ठाउँमा कहिलेदेखि सुन्तला खेती शुरु भएको थियो ?
५. तपाईंको आफ्नो बारीमा चाहि कहिलेदेखि सुन्तला खेती शुरु भएको थियो ?
६. तपाईंले कुन कुन जातको सुन्तला खेती गरिरहनु भएको छ ? रैथाने जात (भूमिजात: Landraces) हरू भए  
ती जातहरू समेत उल्लेख गर्ने ।  
क) ख)  
ग)

७. सुन्तला खेती गरिएको ठाउँ कस्तो छ ?

भिरालो  % समथर  % गहा  % अन्य

८. तपाईंसंग सुन्तलाका बोटहरु कति छन् ?

क्र स	सुन्तलाको जात (रैथाने जात सहित)	बोट संख्या
क)		
ख)		
ग)		

९. तपाईंको विचारमा कुन जातको सुन्तला राम्रो छ ? के कारणले राम्रो उल्लेख गर्ने ।

१०. तपाईंले सबैभन्दा पहिले सुन्तलाका बिरुवाहरु कहाँबाट ल्याउनु भयो ?

११. तपाईंको बारीमा भएका सुन्तलाका बोटहरु कलमी (ग्रापटेड) हुन् कि बीजु हुन् ?

- कलमी (ग्रापटेड) बिरुवा संख्या
- बीजु बिरुवा संख्या

१२. तपाईंको सुन्तला खेती सम्बन्धी निम्न जानकारी दिनुहोस् ।

क्र स	सुन्तलाको जात रैथाने जात सहित	रापेको वर्ष	बोटको औषत उचाई	फलन सुरु गरेको वर्ष	प्रति बोट औषत फल संख्या
क)					
ख)					
ग)					

१३. सुन्तला खेती व्यवस्थापनका लागि के के काम कहिले कहिले गर्नुहुन्छ उल्लेख गर्नुहोस् । (कृषकको खेती प्रक्रिया A-Z, लगानी विवरण)

१३.१ सुन्तला बगैँचा स्थापना

१३.१.१ रोप्नु अघि जमिन तयारी कसरी गर्नुभयो ?

१३.१.२ खाडल खन्नु भयो कि भएन । खनेको भए कति गहिरो खन्नु भयो ?

१३.१.३ खाडल कति टाढा खन्नु भयो किन ?

१३.१.४ एक खाडलमा कति मल राख्नु भयो ?

१३.१.५ बिरुवा कुन सिजनमा रोप्नु भयो ?

### १३.२ सुन्तला बगैचा व्यवस्थापन

१३.२.१ हरेक वर्ष सुन्तला बगैचा व्यवस्थापनका लागि के के काम कहिले कहिले गर्नुहुन्छ ?

- **मलखाद दिने:** गाईवस्तुको मल प्रतिबोट                      के जी      डोको  
रासायनिक मल प्रतिबोट                      के जी (मलको किसिम अनुसारको परिमाणखुलाउने)  
अन्य मल प्रतिबोट                      के जी (मलको किसिम अनुसारको परिमाणखुलाउने)
- **सिचाई गर्ने:** कुन कुन सिजनमा कसरी ?
- गोडमेल/झारपात व्यवस्थापन कसरी ?
- बगैचाभिन्न अन्तरबाली के के लगाउनु हुन्छ ?

१३.२.२ रासायनिक मल राखेको भए रासायनिक मल र गाईवस्तु वा कम्पोष्ट मल मात्र राखेको सुन्तलाको स्वादमा केही फरक पाउनु भएको छ कि ? यदि फरक छ भने कस्तो प्रकारको फरक पाउनु भएको छ ?

१३.३ सुन्तला खेतीमा कुनै रोग, किराको प्रकोप छ कि छैन ?

किराको नाम :  
व्यवस्थापन तरिका

किराको नाम :  
व्यवस्थापन तरिका

रोगको नाम :  
व्यवस्थापन तरिका

रोगको नाम :

व्यवस्थापन तरिका

१४. तपाईंले कुन महिनादेखि कुन महिनासम्म सुन्तला टिप्नुहुन्छ ?

कुन महिनामा पाक्छ

कहिलेदेखि टिप्नु हुन्छ

१५. तपाईंले सुन्तला भण्डारण गर्नु हुन्छ कि सिधै बेच्नु हुन्छ ?

आफै बेच्नु हुन्छ वा ठेकेदारलाई दिनु हुन्छ

१६. सुन्तलाको भण्डारण गर्नु हुन्छ भने कहाँ कसरी गर्नुहुन्छ ?

१७. नजिकैको बजार कुन हो र कति टाढा छ ?

१८. के यी सुन्तलाहरू बजारमा सजिलै बिक्री हुन्छन् ?

१९. सुन्तला खेती गर्नका लागि जग्गा तयारीदेखि फल टिपेर बिक्री गर्ने कार्यसम्मका लागि यस ठाउँ विशेषमा परम्परागत ज्ञान/ सीप/ तरिकाहरू छन् भने उल्लेख गर्नुहोस् ।

२०. यस ठाउँमा सुन्तला खेती गर्नका लागि जग्गा तयारीदेखि फल टिपेर बिक्री गर्ने कार्यसम्मका लागि कुनै नयाँ तरिकाको विकास (Innovation) गरिएका छन् भने उल्लेख गर्नुहोस् ।

### ग. यस क्षेत्रको सुन्तला खेती सम्बन्धी जानकारी

१. यो ठाउँमा कहिलेदेखि सुन्तला खेती शुरु भएको थियो ? सबैभन्दा पहिले बिरुवा कहाँबाट ल्याएको/ उदगम स्थल ?

२. सुन्तलाको नाम यहि (सुन्तला) नै कसरी रहन गयो होला ? स्थानीय नाम के के छन् विभिन्न भाषा, संस्कृति, अनुसार अर्थ सहित बताउन भन्ने ।

३. सुन्तला फल तथा बालीसंग जोडिएर यस ठाउँमा गीत कविता उखान टुक्का केही चलेको छ कि? जस्तै सुन केँ भाउ छ सुन्तला बारीको ..... आदि ।

४. सुन्तला फल तथा बालीसंग जोडिएर यस ठाउँमा कुनै चाडपर्व मनाउने चलन छ कि ? यो चलन कहिलेदेखि चलेको होला ?

५. यो भेगमा कति क्षेत्रफलमा सुन्तला खेती भईरहेको छ होला ?
६. सुन्तला खेती गरिएको ठाउँ कस्तो छ ?  
भिरालो  .....% समथर  .....% गहा  ..... % अन्य .....
७. यो भेगको सबैभन्दा पुरानो सुन्तलाको बोट कहाँ कस्को वारीमा छ ? (फोटो लिने)
८. यस ठाउँमा सुन्तलाको नर्सरीहरू पनि छन् कि? छ भने नाम ठेगाना सम्पर्क नम्बर बताउनुहोस्।
९. यहाँको सुन्तलाको बिरुवाहरू अन्य भेगमा पनि लगेर सारेका छन् कि छैन ? छ भने कुन कुन ठाउँहरूमा लगेका छन् होला ?
१०. यहाँको सुन्तलाको बोटमा अरु ठाउँको बोटभन्दा के फरकपन छ ?
- पात र बोटमा फरक: जस्तै आकार पातको रङ्ग रोग कीरा सहन सक्ने आदि
  - फलमा फरक: जस्तै फल पाक्ने समय, फलको बोक्रा, स्वाद, फलमा रसको मात्रा, अमिलो/गुलियोपन
११. यहाँको सुन्तलाको बिरुवाहरू अरु भेगमा लगेर सार्दा पनि यस ठाउँमा पाईने स्वाद अर्को ठाउँमा पनि आउछ कि फरक हुन्छ ?
१२. यस ठाउँको सुन्तलामा अरु ठाउँको सुन्तलाभन्दा के यस्तो गुण/ विशेषताहरू (बोट, रोग कीरा सहन सक्ने, पाक्ने सिजन, फलको गुण, स्वाद बोक्रा..... आदि) छन्, जस्तै यस ठाउँको सुन्तलालाई चिनाएको (बढी महत्वपूर्ण बनाएको) छ ?
१३. सबभन्दा नाम चलेको सुन्तलाको जात (केही गुण सहित) / स्थान छन् भने बताउनुहोस् ।
१४. यस ठाउँको सुन्तलालाई अन्यत्र पहिचान गराउनका लागि यसको उदगमस्थल र पहिचान चिन्ह (ट्याग) दिएर बिक्री गर्दा के होला ? के गर्नु पर्ला ?
१५. कृषकको थप भनाई राय सुझाव केही भए उल्लेख गर्ने ।

## 14.2 Focus Group Discussion Survey

### क परिचयात्मक विवरण

१. ठेगाना जिल्ला

गाउँपालिका/ नगरपालिका

गाँउ/टोल

२. तथ्याङ्क संकलन मिति

३. उपस्थित कृषकहरुको संख्या : .....

४. लिङ्ग: पुरुष संख्या  महिला संख्या

### ख. सुन्तला खेती सम्बन्धि ऐतिहासिक जानकारी

५. यो ठाउँमा कहिलेदेखि सुन्तला खेती शुरु भएको थियो ?

६. यस क्षेत्रमा सबैभन्दा पहिले सुन्तलाका विरुवाहरु कहाँबाट ल्याईएको होला ?

७. सुन्तलाको नाम यहि (सुन्तला) नै कसरी रहन गयो होला ? स्थानीय नाम के के छन् ? विभिन्न भाषा, संस्कृति, अनुसार अर्थ सहित बताउन भन्ने ।

८. सुन्तला फल तथा बालीसंग जोडिएर यस ठाउँमा गीत, कविता, उखान टुक्का आदि केही चलेको छ कि? जस्तै सुन कै भाउ छ सुन्तला बारीको ..... आदि ।

९. सुन्तला फल तथा बालीसंग जोडिएर यस ठाउँमा कुनै चाडपर्व मनाउने चलन छ कि ? विशेष परिकार बनाएर खाने चलन छ कि ? यी चलनहरु कहिलेदेखि चलेको होला ?

### ग सुन्तला खेती सम्बन्धि जानकारी

१०. यो भेगमा कति क्षेत्रफलमा सुन्तला खेती भईरहेको छ होला ?

११. यस भेगमा सुन्तला खेतीमा संलग्न भईरहेका कृषकहरुको संख्या कति छ होला ?

१२. सुन्तला खेतीमा संलग्न भईरहेका समूह/ सहकारी/कम्पनीहरु छन् कि छैनन् होला ? छन् भने कति होलान् उल्लेख गर्नुहोस् ।





२२. सुन्तलाको भण्डारण गरिन्छ भने कहाँ कसरी गर्नुहुन्छ ?

**ड सुन्तला खेती सम्बन्धि परम्परागत ज्ञान सीप तथा Innovation**

२३. सुन्तला खेती गर्नका लागि जग्गा तयारीदेखि फल टिपेर बिक्री गर्ने कार्यसम्मका लागि यस ठाउँको विशेष परम्परागत ज्ञान/ सीप/ तरिकाहरु छन् भने उल्लेख गर्नुहोस् ।

२४. यस ठाउँमा सुन्तला खेती गर्नका लागि जग्गा तयारीदेखि फल टिपेर बिक्री गर्ने कार्यसम्मका लागि कुनै नयाँ तरिकाको विकास (Innovation) गरिएका भने भने उल्लेख गर्नुहोस् ।

**च. सुन्तला खेतीबाट यस भेगमा परेका सामाजिक तथा आर्थिक प्रभावहरु**

२५. सुन्तला खेतीबाट परेको सामाजिक प्रभाव .....

सुन्तला खेतीबाट पाएको पहिचान, मान, प्रतिष्ठा, गाउँ के पहिचान, विभिन्न निकायबाट थप कार्यक्रम संचालन आदि

२६. सुन्तला खेतीबाट हुने आमदानी तथा आमदानीले जीवनयापन शिक्षा सम्पत्ति.... आदिमा भएको सुधार

**छ. सुन्तलाको पहिचान (Collective Marking)**

२८. यहाँको सुन्तलाको बिरुवाहरु अरु भेगमा लगेर सार्दा पनि यस ठाउँमा पाईने स्वाद अर्को ठाउँमा पनि आउछ कि फरक हुन्छ ?

२९. यस ठाउँको सुन्तला र अन्य क्षेत्रमा फलेको सुन्तलाको गुण एउटै छ कि फरक छ ? फरक छ भने के के (बोटमा फलमा ) फरक होला ?

• पात र बोटमा देखिने फरक:

• फलमा भएको फरकपन: (फल पाक्ने समय स्वाद फलमा रसको मात्रा (रसिलोपना), अमिलोपन फलको बोक्रा पातलो वा बाक्लो फलको आकार आदि)

३०. यस ठाउँको सुन्तलामा अरु ठाउँको सुन्तलाभन्दा के यस्तो गुण/ विशेषताहरु (बोट, रोग कीरा सहन सक्ने, पाक्ने सिजन, फलको गुण, स्वाद बोक्रा..... आदि) छन्, जस्तै यस ठाउँको सुन्तलालाई चिनाएको (बढी महत्वपूर्ण बनाएको) छ ?

३१. यस ठाउँको सुन्तलालाई अन्यत्र पहिचान गराउनका लागि यसको उदगम् स्थल र पहिचान चिन्ह (ट्याग) दिएर बिक्री गर्दा के होला । के के गर्नु पर्ला ?

३२. थप भनाई राय सुझाव केही भए उल्लेख गर्ने ।

## 14.3 Market Survey

बजारको नाम:	व्यापारीको नाम:
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१. तपाईंले यहाँ सुन्तला व्यापार सुरु गर्नभएको कति वर्ष भयो ?
२. तपाईंले सुन्तला कहाँबाट ल्याएर बेचनुहुन्छ ?
३. तपाईंले कुन कुन जातको सुन्तला बेचनुहुन्छ ?
४. कुन जातको or location सुन्तला बढी बिक्री गर्नुहुन्छ (प्राथमिकताको आधारमा लेखुहोस) ?  
सब भन्दा राम्रो कुन ठाउँको र कुन भूमि जात/ रैथाने जात राम्रो वा बढी प्रख्यात छ ? के कारणले  
क).....  
ख).....  
ग).....
५. प्रति के.जी. सुन्तलाको दर कति छ ?  
क) सिजनल (कुन कुन महिना..... )  
ख) बेमौसमी महिना
६. सुन्तलाको बिक्री सिजनल हुन्छ कि बाह्रैमहिना हुन्छ,  
ग) सिजनल (कुन कुन महिना..... )  
घ) बाह्रै महिना
७. कुन जातको सुन्तला भनेर कसरी छुट्याउनुहुन्छ, मुख्य जातीय विशेषता (स्वाद फलको किसिम अमिलोपन गुलियोपन) आदि बारे लेखुहोस ?  
क)  
ख)
८. यो क्षेत्रको सुन्तला अन्य कुन कुन ठाउँमा निर्यात गर्ने गरिएको छ ?
९. यो बजारमा सुन्तला कुन कुन ठाउँबाट आयात गर्ने गरिएको छ ?
१०. सुन्तलाको भण्डारण कहाँ कसरी गर्नुहुन्छ ?
११. सुन्तला कति समयसम्म भण्डारण गरेर राख्नुहुन्छ ?

१२. यो बजारमा सुन्तलाको कारोबार कति हुन्छ होला छ ?

बिक्री सिजन	कारोबार विवरण	परिमाण (टन)	मूल्य (रु)
सिजन	दैनिक		
	मासिक		
	वार्षिक		
बेमौसम	दैनिक		
	मासिक		
	वार्षिक		

१२. कुन ठाउँको र कुन जातको सुन्तला सबभन्दा राम्रो वा बढी बिक्री हुन्छ र के कारणले हो ?

१३. नेपाली सुन्तला बजारमा कति महिनासम्म पाईन्छ How many month Nepali suntala are available

१४. यस ठाउँको सुन्तलालाई अन्य ठाउँमा चिनाउन (पहिचान गराउन) का लागि फलमा पहिचान चिन्ह (ट्याग) दिएर बिक्री गर्दा के होला ? के गर्नु पर्ला ? If we provide tag to suntala how you feel?

१५. सुन्तलाको बजार (खरिद बिक्री कार्य) मा के समस्या देखु भएको छ What are the problem/ issues

१६. सुन्तलाको बजारीकरणलाई सुधार गर्न के काम गर्नुपर्ला how marketing of नेपाली suntala can be improved/

१७. तपाईंको विचारमा बजारमा गुणस्तरीय सुन्तला सहज रूपमा उपलब्ध हुनका लागि के गर्नु पर्ला ? how to ensure the quality of suntala to consumers

१८. थप भनाई राय सुझाव केही भए उल्लेख गर्ने ।

## 14.4 Consumer survey

स्थान:	उपभोक्ताको नाम:
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१. तपाईंले बजारमा सुन्तला किन्न जाँदा सहजै पाउनुहुन्छ ?

क) पाउछु

ख) पाउँदैन

२. सुन्तलाको सरदर प्रति के.जी. कति मुल्यमा किन्न पाउनुहुन्छ?

• सिजनमा

• बेमौसममा

३. बजारमा सुन्तला किन्न जाँदा कुन कुन जात/भेगको सुन्तला पाउनुहुन्छ? (स्थानीय/नेपाली/विदेशी)

क).....

ख).....

ग).....

४. तपाईं कुन जातको सुन्तला किन्न रुचाउनु (मन पराउनु) हुन्छ र किन?

जात	विशेषता (रुचाउनुको कारण: जस्तै बोक्रा पातलो, गुलियो आदि)
क)	
ख)	
ग)	
घ)	

५. तपाईंले स्थानीय जातको सुन्तला र विदेशी सुन्तलामा के भिन्नता पाउनुभयो? (रङ्ग, बोक्रा पातलो, रसिलोपन आदि color, taste and preference)

६. कुन ठाउँको वा कुन जात सुन्तला सबभन्दा राम्रो वा बढी प्रख्यात छ? के कारणले हो

७. घर परिवारमा कुन ठाउँको र कुन जात सुन्तला बढी मन पराउनु हुन्छ? के कारणले होला?

८. नेपाली सुन्तला बजारमा कति महिनासम्म किन्न पाईन्छ? How many month Nepali suntala are available

९. यस ठाउँको सुन्तलालाई अन्य ठाउँमा चिनाउन (पहिचान गराउन) का लागि फलमा पहिचान चिन्ह (ट्याग) दिएर बिक्री गर्दा के होला ? के गर्नु पर्ला ? If we provide tag to suntala how you feel?
१०. सुन्तलाको बजार (खरिद बिक्री कार्य) मा के समस्या देख्नु भएको छ What are the problem/ issues
११. तपाईंको विचारमा बजारमा गुणस्तरीय सुन्तला सहज रूपमा उपलब्ध हुनका लागि के गर्नु पर्ला ?  
Suggestion for better quality to consumer, what are the expectation?
१२. अन्य थप भनाई राय सुझावहरु केही भए उल्लेख गर्ने ।

## 14.5 Key Informant Survey

### क परिचयात्मक विवरण

१. नाम

२. ठेगाना जिल्ला

गाउँपालिका/ नगरपालिका

गाँउ/टोल

३. पद

४. लिंग: पुरुष

महिला

### ख. सुन्तला खेती सम्बन्धि ऐतिहासिक जानकारी

५. यो ठाउँमा कहिलेदेखि सुन्तला खेती शुरु भएको थियो ?

६. यस क्षेत्रमा सबैभन्दा पहिले सुन्तलाका विरुवाहरु कहाँबाट ल्याईएको होला ?

७. सुन्तलाको नाम यहि नै कसरी रहन गयो होला ? स्थानीय नाम के के छन् ? विभिन्न भाषा, संस्कृति, अनुसार अर्थ सहित बताउन भन्ने ।

८. सुन्तला फल तथा बालीसंग जोडिएर यस ठाउँमा गीत, कविता, उखान टुक्का आदि केही चलेको छ कि? जस्तै सुन कै भाउ छ सुन्तला बारीको ..... आदि ।

९. सुन्तला फल तथा बालीसंग जोडिएर यस ठाउँमा कुनै चाडपर्व मनाउने चलन छ कि ? विशेष परिकार बनाएर खाने चलन छ कि ? यी चलनहरु कहिलेदेखि चलेको होला ?

### ग सुन्तला खेती सम्बन्धि जानकारी

१०. यो क्षेत्रमा कति क्षेत्रफलमा सुन्तला खेती भईरहेको छ होला ?

११. कुन कुन जात (रैथाने जात समेत)को सुन्तला खेती भईरहेको छ ?  
(स्पष्टसंग चित्र सकिने गुणहरु सोधने)

क)

ख)

ग)

१२. सबभन्दा नाम चलेको सुन्तलाको जात (रैथाने जात समेत) / स्थान / स्पष्टसंग चित्र सकिने गुण सहित बताउनुहोस् ।

### घ. सुन्तला खेती प्रविधि बारे जानकारी

१३. सुन्तला खेती प्रविधि तथा बजारीकरणका प्रमुख समस्याहरू के के होलान् ?

१४. सुन्तला भण्डारण हुन्छ कि सिधै बिक्री हुन्छ ?

- सिधै बेच्ने कृषकहरूको संख्या .....% बिक्री परिमाण .....%
- भण्डारण गरेर पछि बेच्ने कृषकहरूको संख्या .....% बिक्री परिमाण .....%

१५. सुन्तलाको भण्डारण गरिन्छ भने कहाँ कसरी गरिन्छ ? समस्याहरू के छन् ?

### ङ सुन्तला खेती सम्बन्धी परम्परागत ज्ञान सीप तथा Innovation

१६. सुन्तला खेती गर्नका लागि जग्गा तयारीदेखि फल टिपेर बिक्री गर्ने कार्यका लागि यस ठाउँ विशेषमा परम्परागत ज्ञान/ सीप/ तरिकाहरू छन् भने उल्लेख गर्नुहोस् ।

१७. यस ठाउँमा सुन्तला खेती गर्नका लागि जग्गा तयारीदेखि फल टिपेर बिक्री गर्ने कार्य गर्नका लागि कुनै नयाँ तरिकाको विकास (Innovation) गरिएका भने भने उल्लेख गर्नुहोस् ।

### च. सुन्तला खेतीबाट यस भेगमा परेका सामाजिक तथा आर्थिक प्रभावहरू

१८. सुन्तला खेतीबाट भएको सामाजिक सद्भाव .....

सुन्तला खेतीबाट पाएको पहिचान मान प्रतिष्ठा गाउँ कै पहिचान आदि

१९. सुन्तला खेतीबाट हुने वार्षिक आमदानी .... तथा आमदानीले जीवनयापन शिक्षा .... आदिमा भएको सुधार

### छ. सुन्तलाको पहिचान (Collective Marking)

२०. यहाँको सुन्तलाको बिरुवाहरू अरु भेगमा लगेर सार्दा पनि यस ठाउँमा पाईने स्वाद अर्को ठाउँमा पनि आउछ कि फरक हुन्छ ?

२१. यस ठाउँको सुन्तला र अन्य क्षेत्रमा फलेको सुन्तलाको गुण एउटै छ कि फरक छ ? फरक छ भने

- पात र बोटमा फरक: जस्तै आकार पातको रङ रोग कीरा सहन सक्ने आदि



- फलमा फरक: जस्तै फल पाक्ने समय, फलको बोट्रा, स्वाद, फलमा रसको मात्रा, अमिलो/गुलियोपन आदि

२२. यस ठाउँको सुन्तलामा के गुण/ विशेषताहरू ( पाक्ने सिजन, फलको स्वाद ..... आदि) छन्, जस्तै यस ठाउँको सुन्तलालाई चिनाएको छ ?

२३. यस ठाउँको सुन्तलालाई अन्यत्र पहिचान गराउनका लागि यसको उदगम् स्थल र पहिचान चिन्ह (ट्याग) दिएर बिक्री गर्दा के होला । के के गर्नु पर्ला ?

२४. सुन्तला खेती तथा बजारीकरणमा सुधार र स्थानीय पहिचान दिनका लागि थप भनाई राय सुझाव केही भए उल्लेख गर्ने ।

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