

## Contribution of Mandarin on Livelihood Improvement of its Growers in Parbat District of Western Nepal

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### ABSTRACT

*The study was undertaken to explore the technology adoption and contribution of mandarin in different nine citrus pockets of Parbat district. Forty-five respondents were selected randomly from the study sites for interviews, group discussion, PRA, RRA and used a semi structured questionnaire for information and data collection. Data was also collected from traders. Average density of mandarin planting was found slightly higher (415 trees/ha) than national recommendation. (300 trees/ha) and majority of the farmers (86%) were still using seedling tress as planting materials. The average productivity of mandarin orange was found 14.84 mt/ha which is higher than the national average and highest was 17.3 mt/ha in Banskarkha. Farmers were using bamboo baskets (Dokos), bags (Bora) and the card board boxes for packaging. It was found that 33% respondent earned more than one million NRs per year, while 22% and 33% respondents earned NRs half to one million and One hundred thousand to half million respectively. Mandarin farming increased the income level of farmer. Farmers were using increased income on children's education family health care, drinking water, and housing facility improvement. Farmers have realized their improved nutritional condition because of more fruit consumption. It was found that mandarin cultivation decreased the work load of women in study area.*

**Key Words:** Mandarin, orchard management, marketing, economic impact

### INTRODUCTION

Citrus are important fruit crops of Nepal considered as a priority cash-generating commodity for mid-hill farmers (APP, 1995). It is estimated that about 25 percent of total fruit area in the country is covered by citrus in which mandarin (*Citrus reticulata* Blanco) shares the highest percentage (Shrestha and Verma, 1999). Mandarin contributes about 0.97 % to the agriculture gross domestic product (MoAD, 2012). Mandarin cultivation is one of the major economic activities in the mid-hills (550-1300 masl) of the western development region (Lohar, 1995). Mandarin is grown in 47 districts out of 75 and the area and production is increasing over the years in the western development region (NCDP, 1989). Mandarin cultivation provides nutrition, employment to the people, and source of household income and maintains environmental harmony (Shah, 1992; Gurung, 1993; Tomiyashu *et al.*, 1998; Shrestha and Verma, 1999). The total area under mandarin in Nepal is 24,284 ha with the productive area of 15,304 ha and production of 166,120 mt. and productivity 10.89 mt/ha. Parbat, the mid-hill district of western development region is the one of the important mandarin growing area of Nepal. The total area, productive area, production and productivity in Parbat district was 583 ha 272 ha, 3522 mt and 12.95 mt/ha respectively in 2011/12 (ABPSD, 2012).

Despite the fact that mandarin is a viable option to increase farm income and hence alleviate widespread poverty considerable attention has not been given for its production as well as marketing aspects. It is necessary to evaluate strength and weakness of mandarin growing in mid hill. This study aims to explore major production practice and problem faced by mandarin

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growers of Parbat district so as to suggest appropriate strategies to boost up production and productivity of this crop.

### **Materials and methods**

Five mandarin growers from each of the production pockets (Banskharka, Majhphat, Deupur/Deurali, Tilahar, Kurgha, Limithana, Thanamaula, Pangrag and Tribeni) were randomly selected. Altogether, 45 samples (farmers) from the whole district were selected. Three types of citrus traders; pre-harvest contactors, retailers and wholesalers were identified and selected for the interview. Two pre harvest contactors and two retailers were selected purposively from each pocket area and two wholesalers from each area were selected and were also interviewed by using the checklist. One farmers group representing to District Citrus Producers Association (DCIPA, Parbat) was selected for Focus Group Discussion (FGD). In order to assess required production parameters one Participatory Rural Appraisal (PRA) from each area was carried out. Likewise, to collect market related information Rural Market Appraisal (RMA) was conducted. The study being of the exploratory type, various sources and techniques of gathering information were used, both primary and secondary data were collected and analyzed. The primary information were collected mainly through; field survey, PRA, RMA and FGD while secondary information were collected by reviewing of various published as well as unpublished documents, reports, testimonials and related research paper available in Ministry of Agriculture Development, Fruit Development Directorate, Nepal Agricultural Research Council , National Citrus Development Program, District Agriculture Development Office (Parbat), Farmers Groups Records, Agriculture Service Center, Village Development Committee, private traders/dealers and growers.

Semi structure questionnaire was designed for collecting the information from farmers, and checklist were administered for traders, entrepreneurs, transporters and farmers groups. Likewise, necessary sets of checklists were prepared for collecting information from DADOs staffs and also other key stakeholders. Collected data were manually tabulated and analyzed by using MS-Excel software package then presented in tables and graphs.

### **Result and Discussion**

#### **Land holding and production history**

The average land holding size of the surveyed farmers was 30.55 ropani (1 ropani = 500 m<sup>2</sup>) in which 5.17 ropani was irrigated land (Khet), and 10.06 ropani rainfed upland (Bari) and 12.48 ropani other type of land.. On an average mandarin cultivation in the study area was started 26years ago. However, in Banskharka mandarin cultivation was started 38 years before. More commercial cultivation of mandarin was started in Parbat in the year 1980 (DADO, 2068).

### Existing mandarin growing situation

The average area per household used for cultivating mandarin was 2.38 ropanis. Household mandarin cultivation area was found highest in Banskarkha (6.1 ropani) followed by Pangrang (4.8 ropani), Deupur/Deurali (2.4 ropani), Tribeni (1.80 ropani) and Limithana (1.70 ropani). and least was in Majhphat (0.80 ropani). The average number of trees of mandarin/ha was found slightly higher than national recommended density (300 trees/ha i.e. 15 plants/ropani) and this was because of highly terraced land that gives farmers an opportunity to maintain the plant to plant distance as per the recommendation but they couldn't manage the row to row spacing between the trees that made possible to adjust higher density of trees.

The average number of mandarin trees was recorded 20.8 trees per ropani. The highest was 25 trees in Banskarkha.

**Table 1:** Area, planting density, yield parameters and farm gate price of mandarin

Pocket Area	Per household area under mandarin (ropani)	Plant density (No. of trees/ropani)	Fruit bearing %	Average Fruits /Tree	Productivity (mt/ha)	Stage of maturity at harvest (%)	Average farm gate price (NRs/kg)
Banskarkha	6.1	25	73.7	821	17.3	75	32.5
Majhphat	0.8	18	68.7	467	12.2	77	30.0
Deupur/Deurali	2.4	21	67.3	678	13.2	78	30.0
Tilahaar	1.1	19	63.6	490	13.9	75	30.0
Kurgha	1.3	20	67.8	637	15.9	78	27.0
Limithana	1.7	21	71.8	568	14.9	75	29.0
Thanamaula	1.5	20	63.3	510	14.2	75	26.5
Pangrang	4.8	23	58.0	735	16.7	79	30.0
Tribeni	1.8	20	73.7	579	15.32	76	27.5
Average	2.4	20.8	67.6	609.4	14.8	76.4	29.2

The result showed that about 67.55 percent of mandarin trees were at bearing stage. The average productivity of mandarin at surveyed areas was 14.84 mt/ha which is higher than national average productivity (11.18 mt/ha). It could be due to the reason that all the study areas were special pockets for citrus production where commercial growers are involved in production and management.

Mandarin fruit was found marketed mainly through the pre-harvest contractors in Banskarkha and Deupur/Deurali. The contractors come to the orchard and contract the farmer by price bargaining on the basis of estimated number of fruits per tree. The contractors that come to the field are mainly from Pokhara, Kathmandu and Butwal. Once the negotiation is done, they harvest as per the market demand. The fruits can be found till Magh and Falgun months in those areas. In Pangrang, farmers market their produce through the cooperatives and every farm orchard is involved in whole process of marketing and thus they are able to achieve good price. But in other pockets the farmers themselves take their produce to the market and occasionally it is done by the pre-harvest contractors and post-harvest traders and collection agents. It was also noted that fruits are harvested at 75% maturity stage based on yellow color development.

**Planting Material:** Farmers are not yet aware of benefit of grafted saplings for higher productivity and stress management. More than 85% of farmers reported that they are using seedlings (seed propagated) planting materials and rest are using grafted sapling as a planting material obtained from DADO.

**Cropping System:** Mandarin was found grown mostly in rainfed upland (Bari) in the study area while rice is particularly grown in the irrigated land (Khet). In the Khetland, maize, rice, followed by wheat and rice, fallow and maize cropping system is common. Similarly, maize relay by millet and fallow, and maize followed by vegetable and fallow cropping system is common in upland. For the soil management and to retain nutrients, farmers adopt terracing in citrus. Although mulching is a very effective technique to conserve the moisture particularly in citrus but farmers are not adopting the technology. Maize is the main intercrop in mandarin orchard, however some farmers are also intercropping millet and maize. Now a days, ginger, turmeric, pulses as well as vegetables are also cultivated in orchards as intercrops. Intercropped orchards are generally manured and compost applied. Farmers hoe their orchard for intercropping which can damage the roots of the mandarin trees. Similarly, in Deupur and some parts of the Kurgha area, farmers practiced coffee and mandarin in the same orchard that leads to competition for the nutrients and water as they uptake the nutrients from the same surface level leading to low productivity of both the crops.

**Application of Manure and Fertilizers:** One Doko (ca. 25 kg), compost was used particularly during plantation and most of the farmers of Deupur and Pangrang areas used a Doko of compost/tree/year. Use of chemical fertilizer in mandarin was found very rare.

**Land Preparation:** Pit digging prior to one month of sapling plantation and were filled with compost/FYM. Pit size 1m × 1m and the distance between two pits was 5 meter. Mandarin plantation is usually done in rainy season.

**Training and Pruning:** Training and pruning are most important in orchard management operations for quality production of fruits. In case of training and pruning, farmers were found usually doing it after finishing the harvest removing dead branches from the trees. Apart from that no pruning was done in some areas like Tribeni. Dried and diseased branches are removed generally in Poush-Magh (Jan-Feb) of year.

**Weeding:** Weed free orchard is the key factor for tree healthy production and productivity. The most commonly found weeds in mandarin orchard were Siru, Gandhe, Banmara, Boke, and Dubo. It was observed that, the farmers were not much serious to control weeds in fruit orchards. Few farmers were also found growing climber summer vegetables like pumpkins, sponge gourd, bitter gourd, cucumber on mandarin orchards.

## Marketing

Major markets of mandarin produced in Parbat district are Kushma, Beni, Baglung, Pokhara, Narayanghat, Butwal, Kathamandu. Fruit from the orchards are collected at collection centers and from there fruit are sold to retailer, bicycle vendor, brokers, school/hostels, hotels/restaurants, and distant wholesaler and also to exporter. Various marketing agencies or middlemen are involved in marketing process.

The average seasonal market price of the mandarin in Kushma bazar as reported by DADO publication was Rs. 30.25 per kg in 2011. However, the farmers from Banskhakha reported that they were able to get Rs. 60 per kg in Falgun and Chaitra after storing the product and taking out the product when the market is lean. So we can infer that the market price of the mandarin in each pocket area fluctuates from Rs. 15 to Rs 45 depending on season and average market price of the produce in each pocket area was Rs. 29.16/kg and shown in table 1.

## Problems

**Production problem:** Despite the potential economic benefits of citrus, a number of socioeconomic and agronomic constraints were responsible to prevent farm households to adopt, integrate and expand mandarin into the present farming system. Insect pests and diseases were the major problems in citrus cultivation. The major insects causing problems in citrus cultivation in the district were leaf minor, sting bug, lemon butterfly, leaf eating caterpillar, shoot borer, aphids, leaf hopper, citrus psylla and fruit fly. Powdery mildew, root rot and foot rot were the major diseases. PRA discussion at field level have identified various issues and constraints such as scattered production centers, high cost of production, lack of appropriate production technology, poor distribution system due to agricultural road and transport to the production pocket and insufficient storage facilities .

**Marketing problem:** The result showed that among the different marketing problems on an average 96.44 percentage mandarin growers reported that there is a problem of training followed by organized market requirement (96.16%), transportation (91.94%), market price (84.97%), price behavior (83.86%), marketing information (81.44%), and packaging / grading (62.88%), respectively (Table 2). Thus the study strongly needs to organize market related training activities and to construct organized market facilities. However this has been started in Parbat District in last fiscal year with 11 members of the mandarin growing farmers from each of the region forming an association called District Citrus Producer Association (DCIPA) and they are operating in the concerned area but yet its impact on production and marketing has yet to be determined in the following years.

**Table 2 :** Marketing Problems (% of farmers responding as problem).

Pocket Area	Market Price	Price Behavior	Marketing Information	Organized Market	Transport Facility	Packaging Grading	Training
Banskharka	70.00	90.00	85.00	100.00	90.00	70.00	100.00
Majhphat	82.00	82.00	70.00	92.00	97.00	52.00	99.00
Deupur/Deurali	88.00	78.25	86.00	94.00	86.00	65.00	97.00
Tilahar	92.00	83.00	82.00	96.00	85.00	63.00	92.00
Kurgha	75.25	89.00	75.00	91.00	87.00	61.00	95.00
Limithana	97.50	87.50	87.50	100.00	100.00	62.50	100.00
Thanamaula	70.00	70.00	82.50	95.00	90.00	75.00	87.50
Pangrang	92.50	82.50	85.00	100.00	95.00	55.00	100.00
Tribeni	97.50	92.50	80.00	97.50	97.50	62.50	97.50
Average	84.97	83.86	81.44	96.16	91.94	62.88	96.44
Rank	IV	V	VI	II	III	VII	I

## Impact

**Impact on livelihood:** Because of the low education level and income of poor rural farmers, they are unable to invest for drinking water, toilet construction and for better housing. Survey shows that, the drinking water facilities in the study areas are improved after increased income generated by mandarin growing.

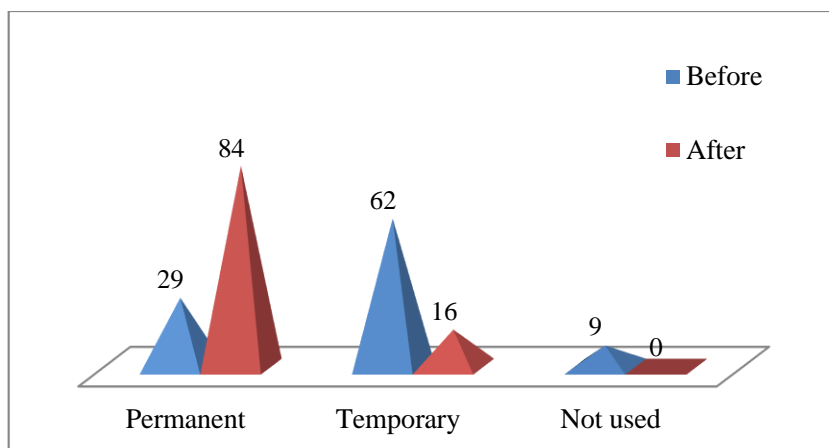


Fig 1: Percentage of respondents using toilet before and after mandarin orange farming

Similarly housing condition of farmers is directly related with economic status. It was found that 32 (71%) farmers had temporary type of house and 13 (29%) had permanent type of house before mandarin growing. After they started getting income from mandarin cultivation pattern of housing changed. At present 40 (89%) households have permanent type of house with stone and tin roofing. Before, most farmers had thatch (Khar) roofing.

**Change in workload of women:** Mostly in rural area women are main contributors in agricultural sector. It was found that mandarin cultivation decreased the work load of women in study area. Seasonal work has to be done for mandarin orange cultivation. Before mandarin cultivation farmers used to grow millet, maize, upland rice and other cereal crops which requires regular management such as tillage, weeding, and other intercultural operations but fruit farming does not require such. Out of 45 respondents only 2% mentioned that mandarin farming increased the work load of women and rest 9% indicated there is no change in workload while 89% said incorporation of mandarin cultivation decreased the workload of women (Fig. 2).

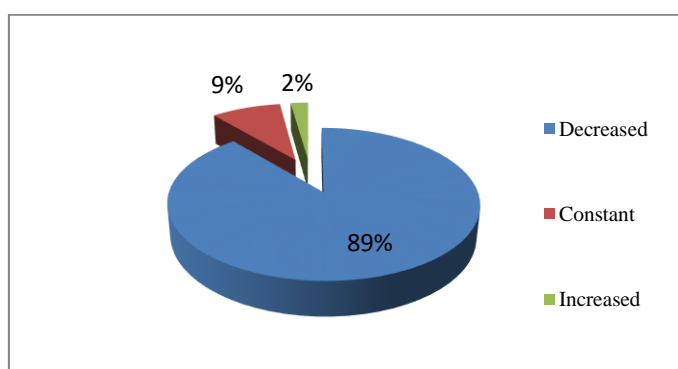


Fig 2: Change in work load of women after mandarin farming.

**Fruit consumption:** Trends of fruit consumption are directly related with fruit availability and level of awareness. Mandarin farming increased the awareness in society, increased the level of education which caused increasing trends of fruit consumption.

As high as 96% respondents mentioned that household fruit consumption increased after mandarin farming while rest respondent has said that there was no effect of mandarin farming in fruit consumption.

**Socioeconomic:** At present they can easily manage money for their child education compared to earlier. Similarly fig. 8 shows that mandarin farming increases the social and health status of farmers. It was found that out of 45 mandarin growers interviewed 33% mentioned that mandarin cultivation provided full time employment for them partial employment for 56% farmers while 11% farmers were found hiring external people during peak period of time.

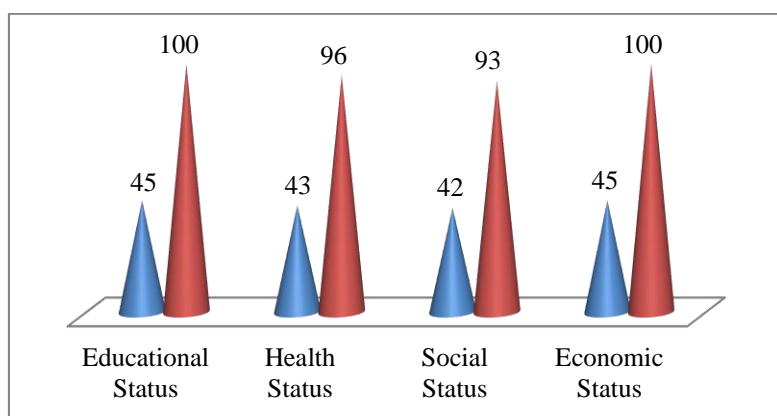


Fig 3: Positive change experienced in different sector

Fig. 4 shows that 33% of the respondent earned more than 10 lakhs/year, while 22% and 33% respondents earned Rs 5-10 lakhs and 1-5 lakhs/ year respectively. Before mandarin cultivation it was very hard to them to even Rs 50 thousand per annum.

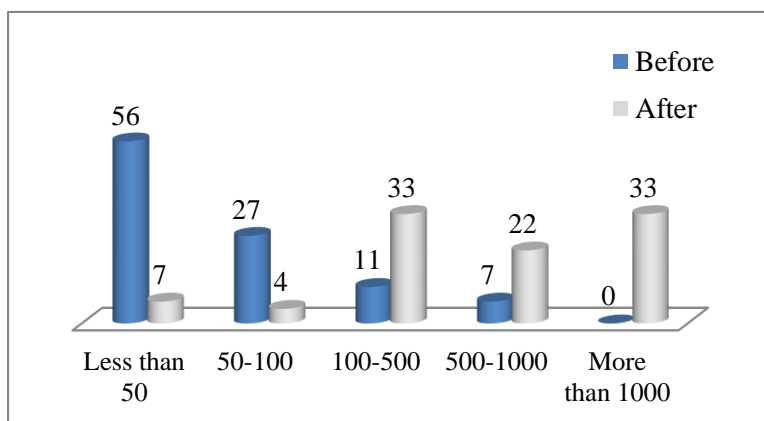


Fig 4: Annual income of respondents before and after mandarin orange farming in percentage.

It was found that farmers utilized their income primarily in food, child education, clothes, medicine and daily required goods as they earn more than they utilize in other sectors. Some farmers use to purchase cultivable land, improving the housing condition, livestock purchase and social functions. Fig 5 shows that how farmer utilized their income earned from mandarin farming.

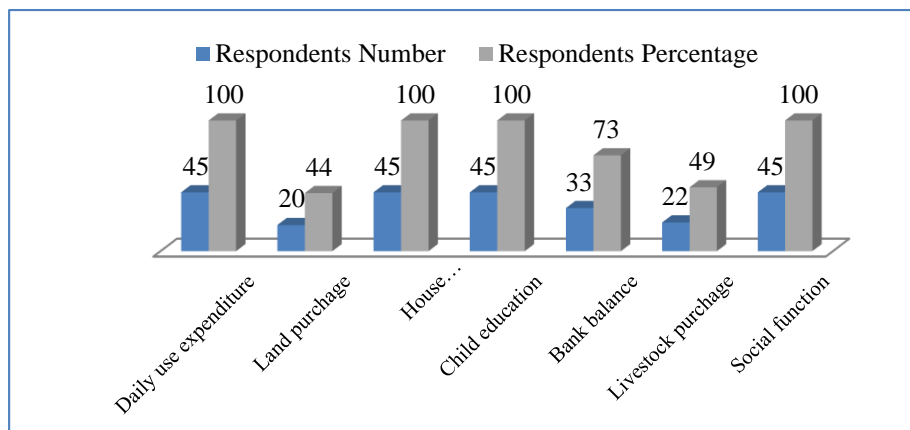


Fig 5: Utilization of income generated from mandarin orange farming

## CONCLUSION

The average density of mandarin was found slightly higher (415 trees/ha) than national recommended density (300 trees/ha) and the farmer of study area was found to using sapling and seedlings both for planting materials. The majority of the mandarin trees under study were found bearing and the productivity of citrus (14.84 mt/ha) was found higher than national average (11.18 mt/ha). The gross margin analysis showed that most of the farmers realized profit from the mandarin cultivation. Traditional packaging materials like bamboo baskets (*Dokos*) are used for packing. The modes of transportation are porters, mules, horses, tractors, local buses and so on. Many a time these packages filled with fruits are dropped or thrown while loading and unloading. Roads are rough and bumpy. Citrus fruit are damaged to great extent during transportation. Unsuitable storage conditions damage fruits further.

Mandarin cultivation has positive economic implication to the Nepalese farmers. It shares major portion of their household economy of the commercially growing farmers. It is empirical that mandarin based farming systems is more profitable land use approach in the hills of Nepal as compared to annual crop based systems could bring substantial improvement in income of farm households in the hill regions where farm size is very small and barely enough to sustain farm family from annual crops. Improvements in harvesting techniques, storage conditions, handling techniques during transportation, packaging, modes of transport and marketing conditions are needed improvement to reduce post-harvest losses in mandarin fruit. Although government has emphasized to produce/cultivate mandarin in mid hills of Nepal, this research results reveal that more efforts need to be given to solve growers' problem.



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