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RESEARCH ARTICLE

ECONOMICS OF MANDARIN (*CITRUS RETICULATA* BLANCO) PRODUCTION IN DAILEKH, NEPAL

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ABSTRACT

A study was carried out to assess the production status of mandarin in Dailekh, Nepal in 2019. A total of 75 households were sampled by using simple random sampling technique and interviewed with the pre-tested semi-structured interview schedule. Mandarin producers were the main source of primary data. Descriptive statistics, chi-square test and independent-sample t-test were used for data analysis using SPSS and MS-Excel. Farmers were categorized into large holder farmers (n = 30) and smallholder farmers (n = 45) category based on the farm size. The variable cost of mandarin cultivation was NRs. 7663.19/ropani. The gross return of mandarin was found to be NRs. 12403.76/ropani with the profit of NRs. 4740.58. The BC ratio of large holder farmers was 1.82 and the smallholder farmer was 1.53 with the overall BC ratio of 1.62. The price of mandarin had been increasing every year since 2015 A.D. to 2019 A.D. Labour and Bordeaux paste costs shows positive and significant relation with income from mandarin farming while costing of FYM and land rent cost show negative but non-significant relation. Disease and pests (0.74) were identified as a major production problem and lack of technical knowledge (0.75) was identified as a major pre-production problem of mandarin farming. Likewise, delay payment to the farmers (0.76) was identified as a major marketing problem faced by farmers. Out of total respondents, 60% were found to be highly satisfied with mandarin farming and 69.3% of the farmers were willing to expand their mandarin orchard.

KEYWORDS

marketing, price variability, BC ratio, Cobb-Douglas.

1. INTRODUCTION

Agriculture is the mainstay of the Nepalese economy where about 66% of farmers are involved in agriculture whose income is primarily from agricultural sources. The agricultural sector contributes 27.6% in national GDP, among which fruit contributes 7% in total agricultural GDP (CBS, 2017). Citrus is one of the indigenous and main fruit crop grown in mid-hills of Nepal. Mandarin is an important species covering a major part of the citrus growing area globally. Mandarin occupies 65.3% and 67.2% of total citrus growing area and production in Nepal respectively (Pandey et al., 2017). It covers a total growing area of 26,282 ha and has a production of 146,690 Mt (MoAD, 2017).

Citrus is believed to be originated in South East Asia including South China, North-Eastern India and Burma (Spiegel-Roy and Goldschmidt, 1996). It is cultivated all around in the world in the tropical and sub-tropical region where there is suitable climatic and soil condition (Pokhrel, 2011). China is now the biggest mandarin producer with a production of 7600 thousand tons of production followed by Brazil, USA, India, Mexico and Spain (FAO, 2015). Citrus has been grown in 62 districts among which Dhankuta, Terathum, Gorkha, Lamjung, Sinduli, Ramechhap, Dhading, Kavre, Tanahun, Kaski, Syangja, Myagdi, Palpa, Salyan, Dailekh, Baitadi, Dadeldhura are the major (Adhikari, 2014). High qualities of citrus produced in Nepal have a high potential for export (Gurung, 2003). Citrus is one of the priority crops of the mid-hill of Nepal (APP, 1995).

Dailekh is one of the mid-hill districts of Nepal with a total mandarin cultivated area of 1,656 ha, production of 5,856 Mt and productivity of 10 Mt/ha (DADO, 2017). Situated in the mid-hill region of the country, the climate and soil of the district are suitable for the cultivation of citrus fruits mainly mandarin. According to the latest labour force survey, the unemployment rate of Nepal is 2.3 percent (MoF, 2018). Therefore, Mandarin farming can be used as the source of employment for the locals.

Although there is a high potentiality of production and export of mandarin due to its tropical variability and climatic suitability, the commercial production of the citrus fruit crops is very low (Atreya and Manandhar, 2016). Because of the various problems like lack of technical knowledge, unavailability of various inputs like fertilizers, pesticides, irrigation etc. and incidence of disease and pest, farmers are not able to get expected production from mandarin cultivation. Also, the limited access to extension services, new modern technologies as well as marketing network to the rural farmers of the mid-hill regions has affected the commercialization of their production (Acharya et al., 2011).

Farmers are facing problems in production, processing and marketing of mandarin. Nepal exported a total of 2400 kg of oranges in fresh or dried form in FY 2017/18 (DoC, 2018). It has been found that the export share of summer fruits is 96% followed by citrus fruits (3%) and winter fruit (1%) in terms of volume (Pandey et al., 2017). Realizing the importance of this sector, the government of Nepal had initially established Citrus

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Research Station, Paripatle in 1961(2018 B.S.) which is now recognized as National Citrus Research Programme (NCRP) since 2000(2057 B.S.) under NARC. It has the national mandate of conducting citrus research and studies and producing healthy saplings of different citrus species (NCRP, 2017).

2. MATERIALS AND METHODS

2.1 Study area

The research was conducted in Dailekh district of Nepal which represents the mid-hill region and has the potentiality of mandarin cultivation. It extends from 81°25' to 81°53' east longitude and 28°35' to 29°80' north latitude. It lies at an altitude of 544m at the lowest level to 4168 m at the highest level from the sea level. The study was conducted in Ranukhana, Chhiudi, Kalbhairav and Naule of Dullu Municipality as it is the working site of PMAMP, Citrus Zone, Dailekh.

2.2 Sample size and sampling procedure

The study population was the mandarin growers of Dullu municipality. A list of mandarin growing farmers of the study area was obtained from PMAMP, Citrus Zone, Dailekh. A total of 75 households were selected using simple random sampling technique from the different places of Dullu municipality.

2.3 Sources of data

Both primary and secondary data were collected focusing on quantitative as well as qualitative types. The primary data was collected from mandarin farmers within the study area by using research instruments like household survey, focus group discussion, key informant interview, case study and field observation. The secondary source of data was obtained from Citrus Zone, Dailekh, Agricultural Knowledge Center, Dailekh, Ministry of Agriculture Development (MoAD), Central Bureau of Statistics (CBS), NARC, NGO's and INGO's and various published journals and research articles.

2.4 Data collection techniques

2.4.1 Household survey

The household survey was conducted by face to face interview of mandarin farmers using a semi-structured questionnaire. The information on the production system and problems in the study site were obtained. A total of 75 mandarin producing farmers of the study area were interviewed for primary data collection. Respondents above 20 years were only interviewed since the data obtained would be more realistic, reliable and complete. Respondents was interviewed with questions seeking demographic, educational, sociocultural, behavioural, economic and other information regarding the production of mandarin.

2.4.2 Focus group discussions (FGDs)

Focus group discussion was conducted with farmer leaders and active commercial farmers by using an open structured checklist. The information obtained from focus group discussions was used to supplement and verify the data collected from the household survey.

2.4.3 Key informant interview (KII)

Important stakeholders of mandarin production in the study area like local leaders, local extension workers, heads of farmer groups and cooperatives, heads of community-based organizations, etc. was identified as key informants. These key informants was interviewed using an interview checklist. The information obtained from the key informant interview was used in verifying the information obtained from the household survey.

2.4.4 Case study

A case study of a typical mandarin farmer of the study area was conducted for an in-depth search of all relevant information. Farmer's perception, technology adoption, package of practice, social organization, migratory behaviour, gender roles, production and marketing economics and its impacts on rural livelihood was characteristically studied.

2.4.5 Field observation and verification

Field observation was done at different times in the site to witness the situation which was useful in verifying the information from the household survey.

2.5 Data Analysis technique

2.5.1 Data coding, entry and cleaning

Both the primary and secondary information collected from the field survey and other methods were coded, tabulated and analyzed by using Statistical Package of Social Science (SPSS) and Microsoft Excel.

2.5.2 Qualitative data analysis

The qualitative data were either analyzed qualitatively or further quantified to carry out the quantitative analysis.

2.5.3 Quantitative data analysis

The collected quantitative data were analyzed using both descriptive and analytical techniques.

2.6 Descriptive analysis

The average productive area under mandarin cultivation of the sampled households was found to be 7.3 ropani. Based on average mandarin farm size, the farmers were categorized into large holder farmers (>7.3 ropani) and smallholder farmers (<7.3 ropani). The further analysis was done by comparing between these two categories. The socio-demographic and economic characteristics were described using descriptive statistics such as frequencies, percentage, mean and standard deviation.

2.7 Cost of Production

All the major factors involved in the production process namely input costs, labour costs, and land renting cost were considered and valued at the current market price to calculate the cost of production. Cost analysis was carried for different scale of production based on the size of the area under cultivation.

Total variable cost = $C_{labor} + C_{manure} + C_{Bordeaux\ paste} + C_{rent}$
Where,
C_{labor} = Cost on human labor used (NRs/ropani)
$C_{rental\ value}$ = Cost on land rent (NRs/ropani)
C_{paste} = Cost on Bordeaux paste (NRs/ropani)
C_{manure} = Cost on organic manures (NRs/ropani)

2.8 Benefit-Cost Analysis

The undiscounted benefit-cost ratio was estimated as a ratio of gross return and total variable cost. For calculating gross return, income from produce sale was accounted.
Benefit-cost ratio (BCR) = Gross Return (NRs/ropani) / Total variable cost (NRs/ropani)

2.9 Profit analysis

The profit was the difference between the total revenue and the total cost incurred. Thus, net profit for any farm business can be written as:

$\Pi = TR - TC$
$\Pi = \sum Py \times Y - \sum Pxi \times Xi$
Where,
Π = net profit
TR = total revenue
TC = total cost
Y = quantity of output
Xi = quantity of i^{th} input
Py = price of output
Pxi = price of i^{th} input

Profit analysis was carried for different scale of production based on the size of the area under cultivation.

2.10 Scaling technique

Qualitative data were taken into account to prepare the index. First of all, the major problems of mandarin cultivation were identified. Respondents were then asked to rank those problems from their point of view. Based on responded frequencies, weighted indexes were calculated for the analysis of farmer's perception on the extent of production problems. Farmer's perception of the different problems was ranked by using five-point scales. The scale value of 1, 0.8, 0.6, 0.4 and 0.2 was used to indicate most serious, serious, moderate, a little bit serious and least serious problems respectively. The index of importance was computed by using the formula:

$$I_{imp} = \sum \frac{SiFi}{N}$$

Where,

I_{imp} = index of importance
$\sum$ = summation
S_i = i^{th} scale value
F_i = frequency of i^{th} importance given by the respondents
N = total number of respondents

2.11 Factors Affecting Mandarin Production

To estimate the factors affecting mandarin production, the linear multivariate regression model was applied. Return from mandarin (in NRs.) was accounted as the dependent variable while cost incurred on the labour, FYM, Bordeaux paste and land rent cost were considered as the explanatory variables.

A linear relationship was assumed to exist between these variables. The regression model is expressed as;

Mandarin Production = f (Expense on labour, FYM, Bordeaux paste, land rent)

The mathematical specification is,

$Y = \alpha 0 + \beta 1\ R + \beta 2\ FYM + \beta 3\ L + \beta 4\ BP$
Y = Return from mandarin (in NRs.)
R = Land rent cost
FYM = Expense on Farmyard manure (NPRs.)
L = Expense on Labour (NPRs.)
BP = Expense on Bordeaux paste (NRs.)
$\alpha 0, \beta 1 \ldots\ldots \beta 4$ = Coefficient to be estimated

3. Result and Discussions

3.1 Education of the respondents

The education of the respondents ranges from illiterate (2.7%), literate (8.0%), primary (12.0%), secondary (10.7%), SLC (30.7%), PCL/+2 (20%) to university level (16%) as given in Figure 1.

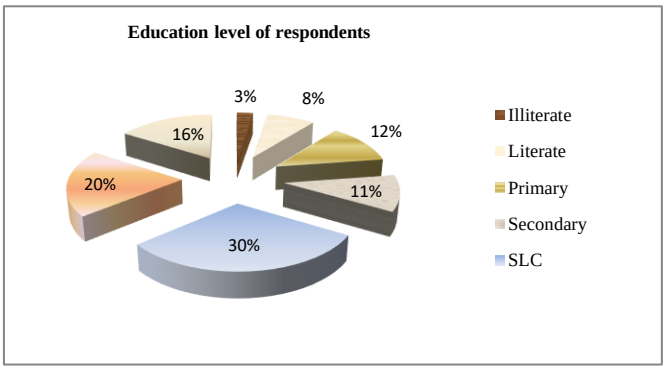


Figure 1: Education level of respondents in the study site

3.2 Access to extension services

In overall, about 60% of the total sampled households have received training on mandarin farming. 70.0% of the large holder farmers and more than half (51.1%) of the smallholder farmers have received training on mandarin which was found statistically non-significant. Similarly, about 71% of the total sampled households have received technical assistance. About 87% of the large holder farmers and 60.0% of the smallholder farmers have received technical assistance which was found statistically significant at 5% level of significance (Table 1).

Table 1: Extension service received by farmers

Variables	Overall (N=75)	Large plantations (n=30)	Smallholder farmers (n=45)	Chi-square test
Training				
Yes	44(58.7)	21(70.0)	23(51.1)	2.648
No	31(41.3)	9(30.0)	22(48.9)	
Technical assistance				
Yes	53(70.7)	26(86.7)	27(60.0)	6.175**
No	22(29.3)	4(13.3)	18(40.0)	

Notes: Figures in parentheses resemble percentage. ** indicates the level of significance at 5%

3.3 Irrigation and intercropping of mandarin orchard

Out of the total sampled households, 44.0% of the households had irrigation facility at their mandarin orchards. Half of the large holder farmers and 40.0% of the smallholder farmers had irrigation facility which was found statistically non-significant. 81.3% of the sampled households cultivated other crops inside mandarin orchard. 60.0% of large and 95.6% of smallholder farmers of the sampled households had cultivated other crops inside the mandarin orchard which was found significantly different at 1% level of significance (Table 2).

Table 2: Mandarin orchards with irrigation and intercropping status

Variables	Overall (N=75)	Large plantations (n=30)	Smallholder farmers (n=45)	Chi-square test
Irrigation				
Yes	33(44.0)	15(50.0)	18(40.0)	0.731
No	42(56.0)	15(50.0)	27(60.0)	
Intercrop				
Yes	61(81.3)	18(60.0)	43(95.6)	14.988***
No	14(18.7)	12(40.0)	2(4.4)	

Notes: Figures in parentheses resemble percentage. *** indicates the level of significance at 1%

3.4 Population involved in mandarin cultivation

There was a significant difference between large holder farmers (2.37) and smallholder farmers (2.98) between the numbers of family members involved in mandarin cultivation at 5% level of significance (Table 3).

Table 3: Population involved in mandarin cultivation

Variables	Overall (N=75)	Large plantations (n=30)	Smallholder farmers (n=45)	Mean Difference	t-value
Population involved in mandarin cultivation	2.73 (1.212)	2.37 (0.765)	2.98 (1.390)	-0.611	-2.446**

Notes: Figures in parentheses resemble standard deviation. ** indicates the level of significance at 5%

3.5 Farmers willingness to expand mandarin farming

About two-third of the total sampled households were willing to expand the mandarin cultivated area further. 53.3% of the large holder farmers and 80.0% of the smallholder farmers were willing to expand the mandarin cultivation area further which was found significantly different at 5% level of significance.

Table 4: Farmers willingness to expand mandarin cultivation				
Variables	Overall (N=75)	Large plantations (n=30)	Smallholder farmers (n=45)	Chi-square test
Willingness to expand				
Yes	52(69.3)	16(53.3)	36(80.0)	6.020**
No	23(30.7)	14(46.7)	9(20.0)	

Notes: Figures in parentheses resemble percentage. ** indicates the level of significance at 5%

3.6 Respondents satisfaction level from mandarin farming

Out of total respondents, 60.0% of the mandarin farmers were highly satisfied with the mandarin farming followed by low satisfaction (26.7%), very low satisfaction (9.3%) and very high satisfaction (4%). 63.3% of large holder farmers and 57.8% of smallholder farmers of the sampled household were highly satisfied with mandarin farming (Figure 2).

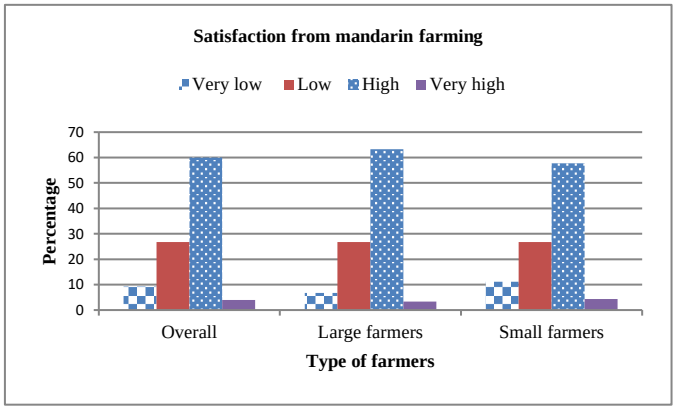


Figure 2: Satisfaction level of respondents from mandarin farming

3.7 Cost and return analysis

The variable cost of mandarin production in one ropani of the orchard for one year was estimated to be NRs. 7663.19. The total gross return from mandarin in one year was estimated to be NRs. 12403.76 per ropani which was lowest than that of Chiti, Lamjung and highest than that of Udipur, Lamjung (Pokhrel, 2011). Similarly, the total profit from mandarin farming in one ropani of the orchard for one year was estimated to be NRs. 4740.58. The benefit-cost ratio was estimated to be 1.62 which is lowest than that of Nalang and Jogimara VDCs (Shrestha, 2015). The benefit-cost ratio of large holder farmers was estimated to be 1.82 and that of smallholder farmers was estimated to be 1.53 with profit more in large holder farmers than in smallholder farmers (Table 5). The BC ratio calculated was similar to the BC ratio of mandarin farming calculated in Amravati district of India which was 1.63 but lowest than that of Nagpur district of Maharasta (Diliparo, 2014; Bante et al., 2015). According to Bheel and Burark (2012), the establishment cost of the mandarin orchard was Rs. 26,535 per hectare and total cost of cultivation for mandarin was Rs. 54,745.61 per year.

Table 5: Cost and return estimation of mandarin production in 1 ropani			
Particulars	Overall (N=75)	Large holder farmers (n=30)	Smallholder farmers (n=45)
Variable cost (NRs./ropani)	7663.19	5945.69	8808.19
Gross return (NRs./ropani)	12403.76	10828.41	13454
Profit (NRs./ropani)	4740.58	4882.72	4645.81
BC ratio	1.62	1.82	1.53

3.8 Production function estimation

Cobb-Douglas production function was estimated from the regression analysis. Return from mandarin was accounted as the dependent variable while labour cost, cost of FYM, cost of Bordeaux paste and land rent cost was considered as explanatory variables. Given production function shows that 59.3% of the dependent variable explained by the explanatory variables (Table 6).

Labour cost and cost of Bordeaux paste are significant at 10% and 1% level. The cost of FYM and land rent cost are not statistically significant. Use of labour is positive towards the increase in return from mandarin production. Data shows that while investing 1% in labour results increase in return from mandarin production by 0.304% while other production factors keeping constant. Similarly, changing the cost of Bordeaux paste by 1% in value, results change in income from mandarin production by 0.621% in the same direction (Table 6).

Meanwhile, the increase in the cost of FYM and land rent cost are negatively related to the return from mandarin production. The change in the cost of FYM and land rent by 1% individually, keeping other variables constant results negative change in the return from the mandarin production.

The study of the mandarin production function in Dhading district shows that 69.7 percent variation in the dependent variable was explained by all independent variables. Manure and fertilizer cost had a positive contribution to the total cost while plant protection cost and irrigation cost were found insignificant but yet contributed positively to the total cost (Shrestha, 2015).

Table 6: Production function estimation of mandarin				
Variables	Coefficient	Std. Err.	T	P value
Constant	4.132	0.607	6.808	0.000
Labour cost	0.304	0.153	1.988*	0.051
FYM cost	-0.053	0.081	-0.655	0.515
Bordeaux paste cost	0.621	0.195	3.187***	0.002
Land rent cost	-0.028	0.042	-0.657	0.513

R^2: 0.593 Adjusted R^2: 0.570

3.9 Problems in mandarin production

The mandarin subsector of Dailekh district was found to be affected by several problems. Major pre-production, production and marketing problems faced by farmers in mandarin farming were identified and analyzed separately which are given below:

3.9.1 Pre-production problem

Five major problems in mandarin production were identified from focus group discussion, key informants survey and field visits. Farmers were asked to rank these problems based on severity. Five-point scaling technique (1, 0.8, 0.6, 0.4 and 0.2) was used to measure the relative severity of those production problems. Lack of technical knowledge was identified as the most severe problem in mandarin cultivation with the index value of 0.75. Disease and pest had been identified as the second most severe problem with an index value of 0.74. The 3rd, 4th and 5th severe problem identified were late bearing period (0.69), harm caused by livestock (0.53) and unavailability of seedlings (0.29) (Table 7).

Table 7: Pre-production problems of mandarin farming in Dailekh		
Pre-production Problems	Index	Ranking
Lack of technical knowledge	0.75	I
Unavailability of seedlings	0.29	V
Harm by livestock	0.53	IV
Disease and pests	0.74	II
Late bearing period	0.69	III

3.9.2 Production problem

There were various production problems identified in the mandarin farming system. Disease and pest had been identified as the most severe problem with an index value of 0.74. Similarly, the 2nd most severe problem identified was the lack of technical manpower with an index of 0.73. The 3rd, 4th and 5th severe problem identified were lack of irrigation (0.65), poor management facilities (0.58) and poor quality planting materials (0.30) respectively (Table 8). Similar problems were found in mandarin farming in Lamjung, such as lack of irrigation, the occurrence of disease and insect, lack of technical knowledge and the high price of input (Pokhrel, 2011). Likewise, Acharya et al. (2011) reported the

unavailability of irrigation as the major problem. In particular to Jammu of India, the important production problems identified were lack of technical knowledge, inadequate or no irrigation facilities, the occurrence of citrus diseases, unavailability of FYM in time and lack of good quality seedlings (Bhat et al., 2015). A survey was done on constrains of production of mandarin where greening disease, root rot, pink disease, fruit drop and management factors were found to be responsible for the mandarin decline (Budhathoki and Pradhanang, 1992).

Table 8: Production problems of mandarin farming in Dailekh

Production Problems	Index	Ranking
Disease and pests	0.74	I
Poor quality planting material	0.30	V
Lack of technical assistance	0.73	II
Lack of irrigation	0.65	III
Poor management facilities	0.58	IV

3.9.3 Marketing problem

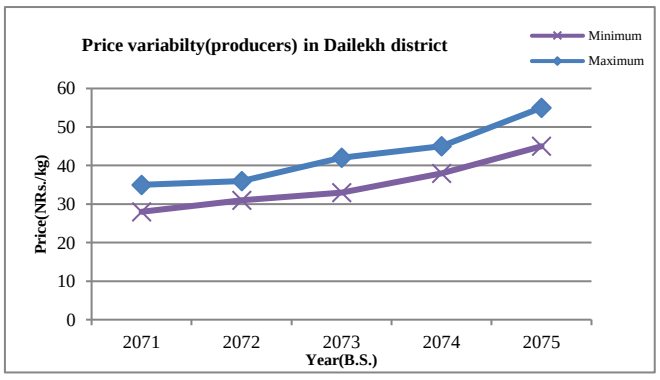
There were various marketing problems faced by farmers identified in mandarin farming. Delay payment to the farmers had been identified as the most severe problem with an index value of 0.76. Similarly, lack of market information (0.71) was the 2nd most severe problem identified. The 3rd, 4th and 5th severe problem identified were low price offered by traders (0.594), lack of storage facilities (0.592) and difficulty in transportation (0.34) respectively (Table 9).

Table 9: Marketing problems in mandarin farming faced by farmers in Dailekh

Marketing Problems	Index	Ranking
Lack of market information	0.71	II
Difficulty in transportation	0.34	V
Delay payment to the farmers	0.76	I
Traders offer low price	0.594	III
Lack of storage facilities	0.592	IV

3.10 Price Variability

The trend analysis was conducted to find out the maximum and minimum price of mandarin in 5 years. According to the data available, it shows the price of mandarin has been increasing every year since 2011A.D. (2071 B.S.). The price was highest in 2019 A.D.(2075 B.S.) with the maximum price of NRs. 55/kg and minimum price of NRs. 45/kg. The increase in the price of mandarin every year may be due to easy access to roads to main cities like Surkhet (Figure 3).



Note: 2071 B.S.=2015 A.D., 2072 B.S.=2016 A.D., 2073 B.S.=2017 A.D., 2074 B.S.= 2018 B.S. and 2075 B.S.=2019 A.D.

Figure 3: Year-wise price variability of mandarin in Dailekh

4. Conclusion

Mandarin farming was found to be a profitable enterprise in the study area, with more profit on large farms than small farms. Mandarin farming can be a suitable option for uplifting the socio-economic status of the people of Dailekh district. The price of mandarin is increasing every year which can be due to easy access to roads to big markets like Surkhet which has a positive effect on mandarin production.

Recommendation

This research will be beneficial to the students, researchers, PMAMP, Project Implementation Unit, Citrus zone, Dailekh, and mandarin farmers to know about the production patterns in the study area. Further research can be carried out to find out to evaluate the marketing patterns to achieve a better benefit from farming. . Farmers were facing several problems in the production and marketing of mandarin. Therefore, it is important to increase extension services in the study area to increase the technical knowledge of the farmers to overcome such problems. Agriculture Knowledge Center (AKC) and Citrus zone, Dailekh should help and support the farmers to handle those production and marketing problems. There is a need for good government policy for price fluctuations and access to road networks.

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References

Acharya, U., Timsina, K., Ghimire, K., & Subedi, G. D., 2011. Improving Citrus Production in Dailekh District of Nepal. Horticulture for the Future (pp. 1-18). Lorne, Victoria, Australia: Horticulture for the Future.

Adhikari, G., 2014. Causes of citrus tree dieback, citrus orchard decline and its management. Kritipur, Nepal: NCDP.

APP., 1995. Nepal Agriculture Perspective Plan, Final Report. Kathmandu, Nepal: Agriculture Projects Service Center.

Atreya, P. N., Manandhar, R., 2016. Fruit crop development in Nepal: Achievements and Future strategy. Proceedings of the First International Horticulture Conference, Kathmandu, Nepal, 2016 (pp. 36-49). Kathmandu: Nepal Horticulture Society.

Bante, R., Pallewar, S., Shrey, R., 2015. Economics of orange production in Nagpur district of Maharshtra. International Research Journal of Agricultural Economics and Statistics, 6(1), 136-139.

Bhat, A., Kachroo, J., Sharma, M., Peshin, R., 2015. Constraints in Production and Marketing of Citrus Fruit in Jammu region of J & K State. Economic Affairs, 60(2), 331-338.

Bheel, S. K., Burark, S. S., 2012. Economic Appraisal of Mandarin Cultivation in Jhalawar District of Rajasthan. India: Department of Agricultural Economics and Management.

Budhathoki, K., Pradhanang, P. M., 1992. Production Constraints of Mandarin in Western Hills of Nepal. Acta Horticulturae 292, 51-60. https://doi.org/10.17660/ActaHortic.1992.292.6

CBS., 2017. Statistical yearbook of Nepal 2017, Kathmandu. Central Bureau of Statistics, Government of Nepal.

DADO., 2017. Annual Agriculture Development Programme and Statistics. Dailekh: District Agriculture Development Office, Government of Nepal.

Diliparo, K. R., 2014. Economics of Production and Marketing of Mandarin in Amravati District. India: Department of Agricultural Economics, Vasantrao Naik Marathwada Krishi Vidyapeeth.

DoC., 2018. Foreign trade statistics. Tripureshwor, Kathmandu: Ministry of Finance, Government of Nepal.

FAO., 2015. Citrus Fruit Statistics 2015. Rome: Food and Agriculture Organization.

Gurung, H. P., 2003. Quality orange production for export. Workshop on fruits and vegetables in the prospect of Nepalese Export trade. Kathmandu: Agribusiness and Trade Promotion Multipurpose Cooperative.

MoAD., 2017. Statistical Information on Nepalese Agriculture. Singha

Durbar, Kathmandu: Ministry of Agricultural Development, Government of Nepal.

MoF., 2018. Economic Survey 2017/18. Singh Durbar, Kathmandu: Government of Nepal.

NCRP., 2017. Annual Report 2073/74. Paripatle, Dhankuta: Nepal Agriculture Research Council, Government of Nepal.

Pandey, G., Basnet, S., Pant, B., Bhattarai, K., Gyawali, B., Tiwari, A., 2017. An Analysis of Vegetables and Fruits Production Scenario in Nepal. Asian Research Journal of Agriculture, 6(3), 1-10.

Pokhrel, C. N., 2011. Analysis of market chain of mandarin in Nepal: A case of Lamjung district. Wageningen, The Netherlands: Van Hell Larenstein University of Applied Sciences.

Shrestha, D., 2015. Production Cost and Market Analysis of Mandarin in Dhading district of Nepal. The Journal of Agriculture and Environment, 16, 112-119. https://doi.org/10.3126/aej.v16i0.19844

Spiegel-Roy, P., Goldschmidt, E. E., 1996. Biology of citrus. Cambridge: Cambridge University Press.