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An Analysis of Production and Sales of Choerospondias Axillaris

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Abstract**—***Choerospondias Axillaris, locally known as Lapsi in Nepal, is a high potential fruit cultivated for revenue generation mainly in eastern and central region of Nepal. This paper discusses the analysis of price, and sales of Lapsi in Kalimati Fruit and Vegetable Market in Kathmandu. In this market, the arrival of Lapsi had been endlessly decreasing from 520330 Kg in 2000/2001 to 17300 Kg in 2017/18 and the percentage increase in the average price was found to be 117.43. Out of all the fruit and vegetables, the average percentage coverage of Lapsi fruit was 0.076. There is significant negative correlation (r = -0.53) between average price (Rs. per Kg) and quantity in kg of Lapsi. The annual sales value for the year 2019/2020 is estimated to be Rs. 17091.17.*

Keywords**— Choerospondias Axillaris, Kalimati Vegetable Market, Lapsi fruit, Nepal.**

I. INTRODUCTION

Choerospondias Axillaris is a pioneer fruit tree species that belongs to Anacardiaceae family, and locally known as Lapsi in Nepal. The fruit tree grows up to 20 to 40 feet high and 30-40 cm in diameter. The greenish- yellow fruit is also known as Hog Plum and has the features of a plum. It is awfully sour in taste at the ripe stage. Its pulp firmly attached to the seed can be separated easily from the seed after cooking. However, the warm temperature fruit tree is commonly cultivated as annual cash crop [1, 2]. In a study of Choerospondias axillaris (Lapsi), the researchers have determined the nutritive components of the fruit, which are amino acid, vitamin C, reductic saccharide, non-reductic saccharide, organic acid, pectin, tan fat, and trace element [3].

The fruiting period of Lapsi is from July to September and flowering season is for three months April to June. The deciduous fast growing tree has economic and medical importance. It blossoms well in hill and mountain forests in the altitude about 600 m. It is mostly cultivated in East Asian countries such as China, Nepal, India, Bhutan, Japan, Cambodia, and Vietnam. It is important for its wood, bark, fruit, and hard seeds. The wood is used for furniture, fruits edible, and used for spicy candy, juices, ice creams, sweets, jellies, pickle, and wine production. The bark fibrous is used for making rope and for fuel [4]. The fruit wall (pericarp) is used for medical purpose. It is healthy low sodium fruit. The hard seed shells are used as a fuel in brick kilns. The tree has long been cultivated for revenue generation by farming populations in Nepal. The fruit being used locally is also exported to the international market [1, 5]. However, there are very little information known for the available and sales of Lapsi in various markets of Nepal. This paper discuses the trend of price, and sales of Choerospondias axillaris in Kalimati Fruit and Vegetable Market, Kathmandu.

II. METHODS AND MATERIALS

The data were obtained from the government annual reports of Ministry of agriculture and livestock development, and the yearly reports, from fiscal year 2000/2001 to 2017/2018, published by Kalimati Fruit and Vegetable Market Development Board (KGVMDB) Kathmandu, Nepal. The data were compiled analyzed in terms of average, percentage, variability, and presented in graph and charts. The relationship between average price and volume of Lapsi was attained using correlation coefficient. The trend line was fitted using method of least square for the sales and time data and the sales value for the coming up year was estimated.

In this study, a mathematical relationship is established between the time factor and the variable (sales). Let (t_1, y_1), (t_2, y_2), (t_3, y_3),..., (t_n, y_n), denote the given time series. A trend line is fitted to the data using method of least squares satisfying the two conditions: i) the sum of the deviations of observed values of y and corresponding estimated values of y will be zero i.e. $\Sigma (y-y_c) = 0$ and ii) the sum of squares of the deviations of observed values of y and corresponding estimated values of y should be least, i.e. $\Sigma (y-y_c)^2$ is least, where y is the actual sales (Rs.) value of Lapsi and y_c is the estimated value of y [6].

Let the trend line between the dependent variable y = annual sales (Rs.) and the independent variable x = fiscal year and can be represented by y = a + bx, where ‘a’ and ‘b’ are constant or unknown values. The values of ‘a’ and ‘b’ are obtained by solving the two normal equations:

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$\Sigma y = na + b\Sigma x$ and $\Sigma xy = a\Sigma x + b\Sigma x^2$, where 'n' is the number of years. The deviation of the independent variable (year) are taken from the middle of the time period so that $\Sigma x=0$. The two unknown values 'a' and 'b' are unbiased and calculated using $a=\Sigma y/n$ and $b=\Sigma xy/\Sigma x^2$. These values are substituted in the equation $y= a +bx$ to get the equation of the trend line as $y_c= a +bx$. If b value is positive, the trend will be upward and if b is negative, the trend line will be downward [6, 7, 8].

III. DATA ANALYSIS AND DISCUSSION

Lapsi is a high potential fruit cultivated for revenue generation because of the appropriateness throughout Nepal. In 1995, the agriculture perspective plan of Nepal had given more priorities to high valued agricultural products like Lapsi by fruit development project in Nepal during 2007. Nepal has high potential for selling this fruit in domestic market and exporting to neighboring countries [9].

The total productive area for Lapsi had significantly increased from 265 hectares in 2011/12 to 1508 hectares in 2015/16 but there was a sudden fall in 2016/17. Similarly, the production of Lapsi had continuously increased from 2609 metric tons in 2011/12 to 10448 metric tons in 2015/16 and declined to 7885 metric tons in the year 2016/17 comparing to last four years. The annual yield in metric ton per hectare was 9.8 in 2011/12 and decreased in the following year 2012/13. There was remarkable increase in the annual yield from 6 to 7.5 metric ton per hectare from 2012/13 to 2016/17.

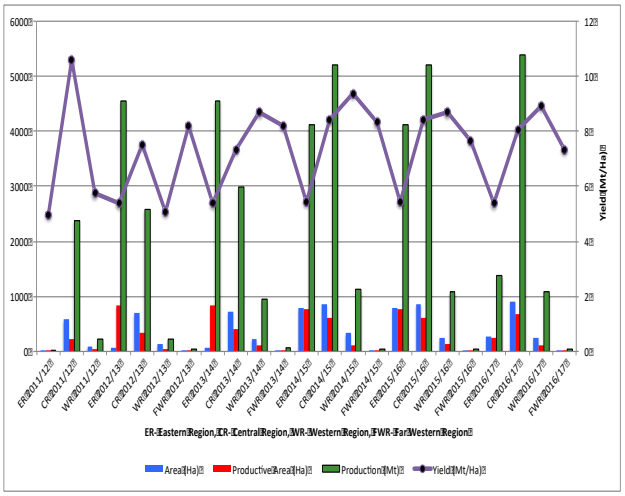

Fig. 1: Productive area, production, and yield of Lapsi in Nepal

The Fig.1 shows the productive area, production, and yield of Lapsi in eastern, central western and far western region of Nepal. The production of Lapsi was higher in hill and mountains of eastern and central region as compared to western and far western regions of Nepal.

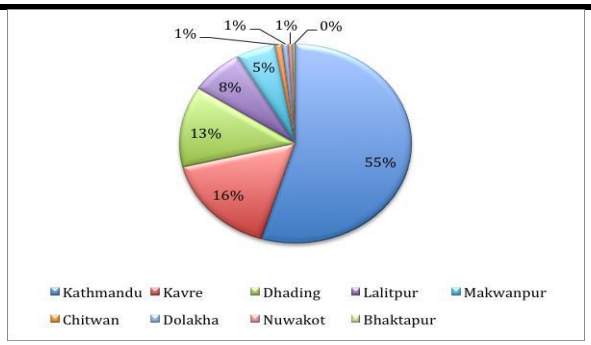

Fig. 2: Sales of Lapsi in Kalimati Fruit and Vegetable Market

The Fig. 2 shows the sources for arrival of Lapsi in Kalimati vegetable market. The major Lapsi production district was Kathmandu (55%) followed by surrounding districts Kavre (16%), Dhading (13%), Lalitpur (8%), Makwanpur (5%), Chitwan (1%), Dolakha (1%), Nuwakot (1%), and Bhaktapur (0.3%). In some of the fiscal year, Lapsi was imported from India and other countries.

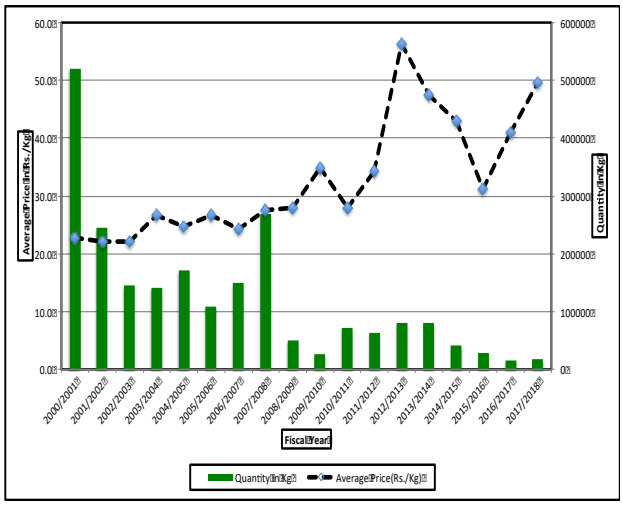

Fig. 3: Quantity of Choerospondias axillaris (kg) and average price (Rs./kg) at Kalimati Fruits and Vegetable Market

The Fig. 3 shows the average price (Rs. per Kg) and arrival of quantity (Kg) of Lapsi at Kalimati vegetable market. The average price of Lapsi had continuously increased from Rs. 22.8 per kg in the year 2000/2001 to Rs. 56.3 per kg in 2012/13. Then after, there was decrease in the price for three years till 2015/16 but the price had climbed unceasingly to Rs. 49.7 in 2017/18. During 18 years, the percentage increase in the average price was found to be 117.43. In the Kalimati vegetable market, the arrival of Lapsi had been endlessly decreasing from 520330 Kg in 2000/2001 to 17300 Kg in 2017/18. The percentage decrease in the quantity of Lapsi in 2017/18 was found to be 96.67 comparing with 2000/2001year.

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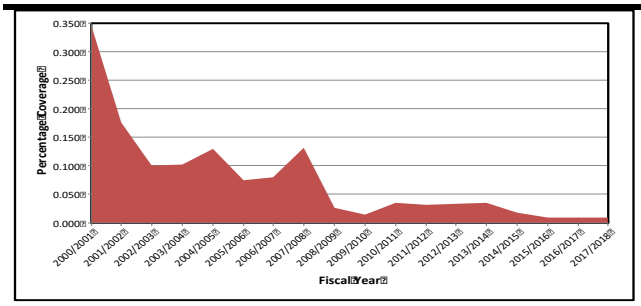

Fig. 4: Percentage coverage of annual arrival quantity of Lapsi at Kalimati Fruit and Vegetable Market

The Fig. 4 illustrates the percentage coverage of Lapsi for different years and is calculated as the ratio of total yearly arrival quantity in kg to the total yearly arrival quantity of all the vegetables and fruits multiplied by 100. Out of all the fruit and vegetables, the average percentage coverage of Lapsi fruit was 0.076 at Kalimati vegetable market.

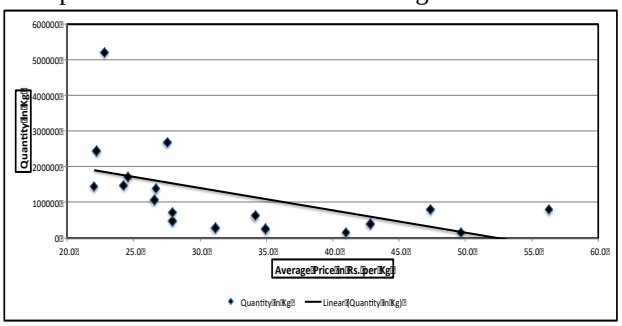

Fig. 5: Relationship between average price and quantity

The Fig. 5 displays that the correlation coefficient between average price (Rs. Per Kg) and quantity (in Kg) of Lapsi is r = -0.53, which shows that there is negative correlation between average price and quantity. The coefficient of determination R^2 = 0.28 shows that 28% of variation in the quantity of Lapsi is explained by the variable average price but 72% variation remains unexplained because other influencing variables were not included in the study.

The trend line is fitted using Least Square Method and is given by y= 3397680.77-169029.48x, where y= Annual Sales value (Rs.) and x= time period FY (fiscal year). The annual sales values (Rs) were obtained as a product of average price and the quantity of Lapsi. It is observed that annual growth rate is b= – Rs. 169029.48 for Lapsi. The monthly growth rate in sales is calculated as b/12= –Rs. 169029.48/12 = – Rs.14085.79. Since the growth rate is negative the sales of Lapsi was found in decreasing trend. On the basis of past 18 years sales data, the annual sales value for the year 2018/19 and 2019/2020 are estimated as Rs. 186120.65 and Rs. 17091.17 respectively.

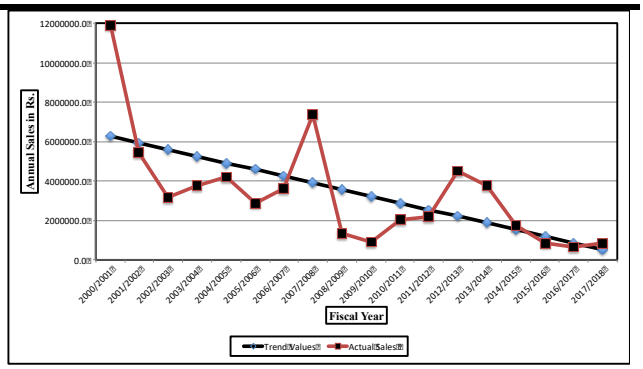

Fig. 6: Actual sales and trend values of Lapsi

The Fig. 6 shows that the graph of actual sales value and estimated trend values in Kalimati fruit and vegetable market. It depicts there was regular drop in the annual sales from 2000/01 to 2006/07. The sales sharply rose in the year 2007/8 and followed decreasing pattern till 2017/18.

IV. CONCLUSION

Choerospondias Axillaris or Lapsi is a fruit that has economic and medical importance. There was remarkable increase in the annual yield from 6 to 7.5 metric ton per hectare from 2012/13 to 2016/17 in Nepal. The major Lapsi production districts were Kathmandu, Kavre, Dhading, Lalitpur, Makwanpur located in eastern and central part of Nepal. The study has considered data of price and quantity from 2000/2001 to 2017/18 and observed the price of Lapsi has increased with the sharp decrease in sales. Nepal has high potential for selling this fruit in domestic market and exporting to the international market. The outcome of this study will be helpful for awareness and preparing planning to increase the production and sales of Lapsi. Further research can be conducted considering the other rational parameters to analyze the arrivals and sales of Lapsi for different markets of Nepal.

DATA AVAILABILITY

The data studied in this paper is open access data available on the website of Kalimati Fruit and Vegetable Market Development Board (KGVMDB) Kathmandu, Nepal at http://kalimatimarket.gov.np/publication and Ministry of agriculture and livestock development at https://www.moald.gov.np.

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