Research Article

ECONOMICS OF SAPOTA CULTIVATION IN DHARWAD DISTRICT OF NORTHERN KARNATAKA

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Abstract- An attempt has been made to estimate the trends in area, production and productivity of sapota fruit cop in Dharwad district of Northern Karnataka. Secondary data on area, production and productivity were collected from State Department of Horticulture. Compound growth rate analysis was employed to evaluate the objective of the study. The results revealed that the growth in area, production and productivity for sapota were found positive (7.45, 8.02 and 0.99 respectively). Factors contributing to variation of sapota fruit crop were studied using multiple linear regression analysis using time series data collected from State Department of Horticulture, District Statistical Office and various issues of Dharwad district at a Glance. The results revealed that the factors responsible for the changes in area under sapota fruit crop over the years were price, population, rainfall, net irrigated area, fertilizer, number of factories and number of commercial banks. The results revealed that major constraints faced by sapota growing farmers in production were adequate irrigation (water) facilities, rainfall, resources, non-availability of labour, irregular power supply and management. Major constraints faced by sapota growing farmers in marketing were storage, high commission charges, high transportation cost, lack of availability of adequate market information, markets far away from farm, low price and mutual understanding between commission agents and traders.

Keywords- Area, Production, Productivity, Sapota, CGR, Multiple Linear Regression.

Introduction

India is the largest producer of sapota in the world. In India, area under sapota accounts for 121 thousand ha with a production of 1457 thousand million tonnes and productivity of 12.0 metric tonnes/ha(Horticultural Statistics at a Glance-2015) [1]. In karnataka state, area under sapota accounts for 31.14 thousand ha with a production of 382.45 thousand million tonnes and productivity of 12.28 metric tonnes/ha (Horticultural Statistics at a Glance-2015) [2]. The total area under sapotafruit in Dharwad district accounts for 1128.00 ha with a production of 12358 metric tonnes (State Department of Horticulture-2015) [3]. Cricket Ball variety sapota is largely grown in Dharwad district. Sapota is largely grown in Hubli taluk of Dharwad district.

According to the Horticultural Statistics at a Glance-2015 [4], Sapota is now being cultivated commercially in a number of countries such as Mexico, Central America, West Indies, Philippines and Malaysia in addition to India. In India, sapota is cultivated commercially in states like Karnataka, Maharashtra, Gujarat, Tamil Nadu, Andhra Pradesh, West Bengal and Orissa.

Karnataka accounts for maximum area and production of sapota. Kolar district occupies first position with area of 3.40 thousand ha and production of 52.32 thousand tonnes followed by Mandya, Chikkaballapura, Hassan, Belguam, Haveri and Dharwad districts. The most important verities of sapota grown in Dharwad district are Kalipatti, DHS-1 and DHS-2.

According to Horticultural Statistics at a Glance-2015[5], countries such as UAE (535.43 tonnes valued at rupees 351.02 lakhs), Bahrain (357.33 tonnes valued at rupees 170.87 lakhs), Canada (117.89 tonnes valued at rupees 62.00 lakhs), Qatar (75.08 tonnes valued at rupees 50.21 lakhs), United Kingdom (72.91 tonnes valued at rupees 65.05 lakhs), Saudi Arabia (50.46 tonnes valued at rupees 39.06 lakhs), Oman (45.18 tonnes valued at rupees 20.82 lakhs, United States (32.80

tonnes valued at rupees 21.37 lakhs), Kuwait (22.64 tonnes valued at rupees 11.94 lakhs), Singapore (16.74 valued at rupees 9.48 lakhs) and other countries (45.65 tonnes valued at rupees 17.07 lakhs) have been continuous importers of our fresh sapotas. Total sapota export from India is 1372.11 tonnes valued at rupees 818.09 lakhs.

State wise value of output of sapota in Karnataka at current price is rupees 47117 lakhs. The total number of estimated operational holdings under sapota crop is 176021 which include marginal, small, semi-medium, medium and large farmers. The total area of operational holdings is 29315.23ha, in which irrigated area accounts for 21097.68 ha and unirrigated area accounts for 8217.55 ha. Harvest and post harvest losses of sapota fruit crop is high at 9.73%. Fertilizer consumption of sapota fruit crop in India is about 783 ha utilized by irrigated area of 746 ha and unirrigated area of 37 ha.

There is a huge scope to study the economics of sapota area, production and productivity in Dharwad district because of increase in area year after year. Marketing institutes like APMC, HOPCOMS and many co-operative societies and export opportunities to sapota.

Materials and Methods

The study is confined to the Dharwad district in which sapota fruit crop is extensively grown. The district has five taluks *viz.,* Dharwad, Hubli, Kalghatagi, Kundgoland Navalgund. For evaluating the objectives of the study secondary data pertaining to study were collected from District Statistical Office, State Department of Horticulture for the period of 1991-2010 and various issues of District at a Glance of Dharwad from 1991-2010. Primary data regarding production and marketing constraints were collected from 60 sample farmers, selected randomly using multistage random sampling process.

The growth in the area, production and productivity of sapota fruit crop was estimated using the exponential growth function of the form:

$$Y_t = ab^t u_t \dots\dots\dots\dots\dots\dots [1] \quad Y = ab^t e^u$$

Where,

Y_t : Dependent variable for which growth rate was estimated
a : Intercept
b : Regression coefficient
t : Years which takes values, 1, 2, …,n
u_t : Disturbance term for the year t
e : Error term

The equation was transformed into log linear form for estimation purpose and was estimated using Ordinary Least Square (OLS) technique as follows:

$$\ln y_t = \ln a + t \ln b + u, \text{ which can be rewritten as } \ln y_t = A + Bt + u$$

The compound growth rate (g) in percentage was then computed as

$$g = \{\text{Antilog of (B)} - 1\} \times 100.$$

The significance of the regression coefficient was tested using the students 't' test. Multiple Linear Regression analysis was carried out using time series data for the period from 1991-92 to 2010-11 to identify the important factors such as price, population, rainfall, net irrigated area, fertilizer, number of factories and number of commercial banks affecting area of under sapota. The functional form used was

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + \dots\dots\dots + b_n X_n + u$$

Where, Y = Area under fruit crop in ha
1. Price of sapotafruit crop lagged by one year (Rs/q)
2. Land holders (number)
3. Commercial banks (number)
4. Net irrigated area (hectares)
5. Fertilizer consumption (tonnes)
6. Rainfall (mm)
7. Factories (number)

Tabular analysis/ Ratio analysis/ Percentage analysis
Tabular analysis is used for the presentation of some of the analyzed data such as labour availability, infrastructure for fruit processing and export demand. In the present study Tabular analysis is used for the documentation of production and marketing constraints faced by farmers while growing sapota fruit crop in Dharwad, Hubli, Navalgund, Kalghatagi and Kundgol taluks of Dharwad district. Appropriate percentages and averages were worked out and presented in the form of tables.

Results
[Table-1] indicates that the area under sapota in Dharwad taluk increased at the rate of 11.97 per cent per annum. While production increased at the rate of 12.40 per cent per annum and productivity increased at the rate of 0.39 per cent per annum. However, the area under sapota in Hubli taluk increased at the rate of 11.67 per cent per annum. Production increased at the rate of 10.00 per cent per annum. Productivity showed negative trend at the rate of -1.49 per cent per annum. The area under sapota in Navalgund taluk increased at the rate of 1.06 per cent per annum. Production increased at the rate of 0.90 per cent per annum. Productivity increased at the rate of 0.92 per cent per annum. The area under sapota in Kalghatagi taluk increased at the rate of 24.84 per cent per annum. Production increased at the rate of 24.80 per cent per annum. Productivity increased at the rate of 0.04 per cent per annum. The area under sapota in Kundgol taluk increased at the rate of 28.71 per cent per annum. Production increased at the rate of 28.37 per cent per annum. Productivity showed negative trend at the rate of -0.26 per cent per annum. But the area under sapota in Dharwad district grew at the rate of 14.18 per cent per annum. Production increased at the rate of 12.96 per cent per annum. Productivity increased at the rate of 0.77 per cent per annum.

Table-1 *Compound growth of area, production and productivity of sapota in Dharwad district (1991 to 2010) (growth rate per cent per annum)*

Sl. No.	Particulars	Growth rate					
		Dharwad taluk	Hubli taluk	Navalgund taluk	Kalghatagi taluk	Kundgol taluk	Dharwad District
1.	Area	11.97*	11.67*	1.06*	24.84*	28.71*	14.18*
2.	Production	12.40*	10.00*	0.90	24.80*	28.37*	12.96*
3.	Productivity	0.39	-1.49*	0.92**	0.04	-0.26	0.77

*, ** denotes significance at 1% and 5% level, respectively

A perusal of [Table-2] revealed that the area under sapota in Dharwad, Hubli and Kundgol taluks were positively influenced by their lagged price at 5 per cent significance level. Navalgund taluk was negatively influenced by their lagged price. Kalghatagi taluk and whole Dharwad district were positively influenced by their lagged price. The area under sapota in Dharwad taluk was positively influenced by population at 5 per cent significance level.

Table-2 *Factors responsible for changes in area under sapota*

Sl. No.	Variables	Dharwad	Hubli	Navalgund	Kalghatagi	Kundgol	Dharwad District
1	Intercept	-3.3633	-246.618	-44.276	-1117.33	-184.062	4.679
2	Price	0.0525** (8.07)	0.0895** (2.64)	-0.0031 (-0.75)	0.0181 (0.41)	0.0268** (3.09)	0.0877 (1.74)
3	Population	8.42** (1.74)	-0.0038 (-1.37)	0.0003 (0.36)	0.0065 (0.94)	0.0011 (0.79)	-6.6157 (-0.46)
4	Rain fall	-0.1193 (-3.92)	0.1019 (0.64)	0.0137 (0.89)	-0.0312 (-3.2)	0.0013 (0.03)	-0.0834 (-2.6)
5	Net irrigated area	-0.0006 (-0.12)	-0.0344 (-1.30)	0.0007 (1.53)	0.0819 (4.48)	0.0041 (0.12)	0.0091 (2.22)
6	Fertilizer availability	-0.0014 (-1.02)	0.0008 (0.19)	0.0015 (1.48)	-0.0075 (-0.4)	-3.9 (-0.01)	0.0004 (0.16)
7	No. of factories	0.5632 ** (2.14)	0.1584** (0.68)	-0.4789 (-1.05)	20.0480 (1.75)	0.8970 (0.32)	0.4706 (1.03)
8	No. of commercial banks	-2.5403 (-1.34)	10.1576** (2.25)	-1.1275 (-0.38)	19.0273** (0.65)	2.0542 (0.48)	2.5325 (1.04)
9	'F' value	5.93	3.2	0.0577	0.0001	2.26	3.91084
10	R² value	0.9951*	0.9751*	0.6349*	0.9039*	0.9361*	0.9874*

Note: Figures in parentheses indicate 't' values; *, ** denotes significance at 1% and 5% level, respectively

The area under Hubli taluk and whole Dharwad district were negatively influenced by population. The area under sapota in Navalgund, Kalghatagi and Kundgol taluks were positively influenced by population. The area under sapota in Dharwad, Kalghatagi taluks and whole Dharwad district were negatively influenced by rainfall. The area under Hubli, Navalgund and Kundgol taluks were positively influenced by rainfall. The area under sapota in Dharwad and Hubli taluks were negatively influenced by net irrigated area. The area under Navalgund, Kalghatagi, Kundgol taluks and whole Dharwad district were positively influenced by net irrigated area. The area under sapota in Dharwad, Kalghatagi and Kundgol taluks were negatively influenced by fertilizer availability. The area under Hubli, Navalgund taluks and whole Dharwad district were positively influenced by fertilizer availability. The area under sapota in Dharwad and Hubli taluks were positively influenced by number of factories at 5 per cent significance level. The area under Navalgund taluk was negatively influenced by number of factories. The area under sapota in Kalghatagi, Kundgol taluks and whole Dharwad district were positively influenced by number of factories. The area under sapota in Dharwad and Navalgund taluks were negatively influenced by number of commercial banks. The area under Hubli and Kalghatagi taluks were positively influenced by number of commercial banks at 5 per cent significance level. The area under sapota in Kundgol taluk and whole Dharwad district were positively influenced by number of commercial banks. The R^2 value for Dharwad taluk was 0.9951. The R^2 value for Hublitaluk was 0.9751. The R^2 value for Navalgund taluk was 0.6349. The R^2 value for Kalghatagi taluk was 0.9039. The R^2 value for Kundgol taluk was 0.9361. The R^2 value for Dharwad district was 0.9874.

A perusal of [Table-3] revealed that for overall category of sapota growing sample farmers, irrigation (water) was reported as highly acute constraint as opined by 95 per cent of the farmers and for 5 per cent of the farmers it was acute. Rainfall was reported as acute constraint as opined by 90 per cent of the farmers and for 10 per cent of farmers it was not acute constraint. Resources were reported as less acute constraint as opined by 85 per cent of the farmers, for 10 per cent of farmers it was acute problem and 5 per cent of the farmers considered resources as not acute constraint. Non-availability of labour was reported as highly acute constraint as opined by 95 per cent of the farmers and for 5 per cent of the farmers it was medium acute constraint. Power supply was reported as medium acute constraint as opined by 80 per cent of the farmers, for 15 per cent of the farmers, it was less acute constraint and 5 per cent of the farmers considered power supply as acute constraint. Management was reported as medium acute constraint as opined by 90 per cent of the farmers and 10 per cent of the farmers considered management as less acute constraint.

Table-3 *Constraints faced by farmers in production of sapota n=60*

Sl. No.	Problem	Highly acute	Medium acute	Less acute	Acute	Not acute
1	Irrigation (water)	95%			5%	
2	Rain fall				90%	10%
3	Resources			85%	10%	5%
4	Non-availability of labour	95%	5%			
5	Power supply		80%	15%	5%	
6	Management		90%	10%		

A perusal of [Table-4] revealed that for overall category of sapota growing sample farmers, storage was reported as highly acute constraint as opined by 95 per cent of the farmers and for 5 per cent of the farmers it was medium acute. High commission charges was reported as medium acute constraint as opined by 90 per cent of the farmers and for 10 per cent of farmers it was less acute. High transportation cost was reported as highly acute constraint as opined by 90 per cent of the farmers and for 10 per cent of farmers it was medium acute problem. Lack of availability of adequate market information was reported as highly acute constraint as opined by 95 per cent of the farmers and for 5 per cent of the farmers it was a medium acute constraint. Markets far away from farm was reported as medium acute constraint as opined by 90 per cent of the farmers and for 10 per cent of the farmers, it was less acute constraint. Low price was reported as highly acute constraint as opined by 95 per cent of the farmers and for 5 per cent of the farmers it was medium acute constraint. Mutual understanding

between commission agents and traders was reported as less acute constraint as opined by 90 per cent of the farmers and for 10 per cent of the farmers it was medium acute constraint.

Discussion

The area and production of Kundgol taluk grew at faster rate, because the soil and climate of Kundgol taluk is suitable for sapota cultivation and about 40 per cent of Kundgol taluk soil texture is red loamy soil (in red loamy soil percolation of water will be more), as most of the horticulture crops preferred to grow in red loamy rather than deep black cotton soil. Sharma and Kalitha (2008) reported the similar results while studying the trends of area, production and productivity of major fruit crops in Jammu and Kashmir [7].

Farmers have grown sapota in Dharwad district, irrespective of its price because fluctuation in the price of sapota fruit crop is negligible. Rainfall which is an important determinant of area in the Dharwad district was also found to affect 50% of sapota fruit crop production. As 50% of area under sapota fruit crop is irrigated in Dharwad district. As area under sapota fruit increased use of fertilizer also enhanced. As the net irrigated area increased, the farmers in the Dharwad district started taking up remunerative fruit crops like sapota. However the number of commercial banks in the Dharwad district tempted the farmers to go for sapota fruit crop as farmers were able to get loan easily on low interest rates. These conclusions are similar with the observations of Saraswati Poudel Acharya *et al.* (2011) while studying the nature and extent of crop diversification in the Karnataka state [6].

Table-4 Constraints faced by farmers in marketing of sapota n=60

Sl. No.	Problem	Highly acute	Medium acute	Less acute	Acute	Not acute
1	Storage	95%	5%			
2	High commission charges		90%	10%		
3	High transportation cost	90%	10%			
4	Lack of availability of adequate market information	95%	5%			
5	Markets far away from farm		90%	10%		
6	Low Price	95%	5%			
7	Mutual understanding between commission agents and traders		10%	90%		

Most of the sample farmers opined that irrigation was highly acute problem, because underground water table is depleting now days. Most of farmers expressed rainfall as acute constraint, as rainfall is decreasing day by day because of deforestation. Most of the farmers expressed resources as less acute constraint, the reason for this was lesser availability of genuine planting material at right time. Most of the farmers opined that non-availability of labour was highly acute, because of migration of rural people towards towns and cities. Most of the farmers expressed power supply as medium acute constraint, because of limited supply of electricity in the villages (only 6 hours). Most of the farmers opined that management was medium acute problem, because of lack of adoption of new technology. Lack of adoption of mechanization is also a serious problem in production of fruit crops. These conclusions are similar with the observations of Vinod Anavrat (2010) [9].

The constraint analysis in the marketing of sapota showed that majority of the farmers regarding marketing opined that storage was highly acute problem, because lack of cold storages in Dharwad district. Most of farmers expressed high commission charges as medium acute constraint, because commission charges faced by farmers during marketing of horticulture goods were very high. Most of the farmers expressed transportation cost as highly acute constraint, as petrol and diesel prices are increasing day by day. Most of the farmers opined that lack of availability of market information was highly acute constraint, because there are many new markets available domestically and internationally but farmers don't have knowledge about them. Most of the farmers expressed markets far away from farm as medium acute constraint because markets are far away and

transportation charges are higher. Most of the farmers expressed low price as highly acute constraint, because of variation in demand and supply and seasonal production of sapota. Most of the sample farmers opined that mutual understanding between commission agents and traders was less acute problem, because, now days the farmers are having that much knowledge to deal with commission agents. These conclusions are similar with the observations of Talati *et al.* (2006) [8].

Conclusion

Irrigation was highly acute production constraint for 95% of the farmers hence government should take steps to provide sprinkler and drip irrigation equipments at subsidy rates. Storage was one of the major marketing constraints hence cold storages should be built by government at taluka level. Low price was also one of the major marketing constraint hence government should announce minimum support price for sapota every year.

Author Contributions: Both author equally contributed

Conflict of Interest: None declared

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