



## Research Article

# ECONOMICS OF MANGO CULTIVATION IN DHARWAD DISTRICT OF NORTHERN KARNATAKA

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**Abstract-** An attempt has been made in this paper to estimate trends in area, production and productivity of mango fruit crop in Dharwad district of Northern Karnataka. Secondary data on area, production and productivity were collected from 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 mango were found positive (7.45%, 8.02% and 0.99% respectively). Factors contributing to variation of mango 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 mango fruit crop over the years were price, population, rainfall, net irrigated area, fertilizer, number of factories and number of commercial banks. Constraints faced by farmers in production and marketing of mango fruit crop were analyzed using the primary data collected from 60 sample respondents by personal interview method using pre-tested schedule. The results revealed that major constraints faced by mango growing farmers in production were adequate irrigation (water) facilities, rainfall, resources, non-availability of labour, irregular power supply and management. Major constraints faced by mango 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, Mango, CGR, Multiple Linear Regression.

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## Introduction

India is the largest producer of mango in the world. In India, area under mango accounts for 1077.6 thousand ha with a production of 8715.6 thousand million tonnes and productivity of 8.1 metric tonnes/ha. In Karnataka state, area under mango accounts for 183.46 thousand ha with a production of 183.46 thousand million tonnes and productivity of 9.48 metric tonnes/ha (Horticultural Statistics at a Glance-2015). The total area under mango fruit crop in Dharwad district accounts for 12503 ha with a production of 107429.5 tonnes (State Department of Horticulture-2015). Among mangoes, Alphonso variety is largely cultivated in Dharwad district. While Dharwad Alphonso has got its own sweet and taste due to ambient environmental conditions of the Dharwad district. Earlier Dharwad district was known as 'Pedhanagari' and at present it is being popularised as 'mavinabeedu' that means 'city of mangoes'.

According to the Horticultural Statistics at a Glance-2015, mango is now being produced commercially in a number of countries such as China, Thailand, Indonesia, Mexico, Pakistan, Brazil, Bangladesh, Nigeria and Egypt in addition to India. In India, mango is commercially grown in Andhra Pradesh, Uttar Pradesh, Karnataka, Bihar, Gujarat, Tamil Nadu, Maharashtra, West Bengal, Orissa and Kerala. Andhra Pradesh accounts for maximum area and production with the districts of Chittoor, Krishna, Vizianagaram and Khammam having major share. In Karnataka Kolar district occupies first position in area and production followed by Ramanagara, Tumkur, Chikkaballapura and Dharwad districts. The most important mango varieties grown in Dharwad district are Alphonso, Pairi, Neelum, Dasher and Totapuri.

According to Horticultural Statistics at a Glance-2015, countries such as UAE (29231.90 tonnes valued at rupees 21497.85 lakhs), Nepal (3574.93 tonnes

valued at rupees 695.42 lakhs), Bangladesh (2475.33 tonnes valued at rupees 473.42 lakhs), Saudi Arabia (2171.49 tonnes valued at rupees 1428.59 lakhs), Qatar (998.10 tonnes valued at rupees 810.81 lakhs), Kuwait (787.28 tonnes valued at rupees 1238.18 lakhs), Canada (669.26 tonnes valued at rupees 429.63 lakhs), Bahrain (658.71 tonnes valued at rupees 505.36 lakhs), Oman (605.20 tonnes valued at rupees 469.27 lakhs), Singapore (562.95 tonnes valued at rupees 588.31 lakhs) and other countries (1263.16 tonnes valued at rupees 2116.81 lakhs) have been continuous importers of our fresh mangoes. Total Mango export from India is 42998.31 tonnes valued at rupees 30253.65 lakhs.

The total number of estimated operational holdings under mango crop is 5055485, which includes marginal, small, semi-medium, medium and large farmers. The total area of operational holdings is 1129710.22 ha, in which irrigated area accounts for 361919.28 ha and un-irrigated area accounts for 767790.83 ha. In Karnataka, the number of registered fruits and vegetable processing units is 2038. Harvest and post harvest losses of mango fruit crop is high at 9.16%. In Karnataka there are about 189 cold storages with a capacity of 526752 tonnes. Fertilizer consumption of mango fruit crop in whole India is about 167584 ha utilized by irrigated area of 57935 ha and un-irrigated area of 109649 ha.

Mango fruit crop is gaining strength in economy day by day and many research efforts in the similar lines have been made to study in detail about the mango fruit crop in the entire Karnataka except Dharwad district. Dharwad district is having largest area under major mango crop in Northern Karnataka. The study also throws light on the various constraints being faced by farmers in the study area and suggests suitable policy measures to their problems. The study employs various analytical techniques to draw meaningful conclusions to impart suitable

policies and give boost to export business (international trade) due to vast potentialities, etc. and rising importance. The economic analysis of mango fruit crop of Dharwad district throws light on its potential importance in shaping the careers of ignorant hardworking peasants through systematic planning in production as well as marketing of mango crop and thus strengthening the basic foundation of hardworking farmers of the district.

### Materials and Methods

The study is confined to the Dharwad district in which mango fruit crop is extensively grown. The district has five taluks viz., Dharwad, Hubli, Kalghatagi, Kundgol and 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 mango fruit crop was estimated using the exponential growth function of the form:

$$Y_t = ab^t u_t \dots \dots \dots (1) \quad Y = ab^t e^u$$

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:

$\ln Y_t = \ln a + t \ln b + u_t$ , 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 mango. 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 mango fruit 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 mango 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.

### Result

The growth in area of mango fruit crop of Dharwad district over the period of two decades (1991-2010) were analyzed using the compound growth rate (CGR).

**Table-1** Compound growth of area, production and productivity of mango 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	5.26*	13.31*	0.0	18.27*	16.95*	7.45*
2.	Production	5.86*	13.32*	0.0	20.00*	17.34*	8.02*
3.	Productivity	0.57	0.01	0.0	1.46	0.34	0.99

\* \* \* denotes significance at 1% level

The CGR of mango fruit crop was presented in [Table-1] indicates that mango crop area in Dharwad taluk was increased at the rate of 5.26 per cent per annum while production increased at the rate of 5.86 per cent per annum and productivity also increased at the rate of only 0.57 per cent per annum. However, the area of mango in Hubli taluk increased at the rate of 13.31 per cent per annum, production increased at the rate of 13.32 per cent per annum while productivity increased at the rate of 0.01 percent per annum. The area, production and productivity of mango in Navalgund taluk did not reveal any significant growth. The area under Kalghatagi taluk increased at the rate of 18.27 per cent per annum, while production increased at the rate of 20.00 per cent per annum while productivity also increased at the rate of only 1.46 per cent per annum. The area under Kundgol taluk increased at the rate of 16.95 per cent per annum, production increased at the rate of 17.34 per cent per annum and productivity increased at the rate of only 0.34 per cent per annum. But total cropped area of mango in Dharwad district registered growth rate of 7.45 per cent per annum, while production increased at the rate of 8.02 per cent per annum and productivity increased at the rate of only 0.99 per cent per annum.

The response of area under mango fruit crop to the causal factors such as price, population, rainfall, net irrigated area, fertilizer, number of factories and number of commercial banks has been analyzed for all taluks of Dharwad district. A perusal of [Table-2] revealed that the area under mango crop in Dharwad, Hubli and Kalghatagi taluks and whole Dharwad district were positively influenced by their lagged price at 5 per cent significance level. Navalgund and Kundgol taluks were

positively influenced by their lagged price. The area under mango in Dharwad, Hubli and Kundgol taluks and whole Dharwad district were negatively influenced by population, while Navalgund and Kalghatagi taluks were positively influenced by population. The area under mango in Dharwad, Navalgund and Kalghatagi taluks and whole Dharwad district were negatively influenced by rainfall. The area under Hubli and Kundgol taluks were positively influenced by rainfall. The area under mango fruit crop in Dharwad, Kalghatagi and Kundgol taluks were positively influenced by net irrigated area. However the area under Hubli and Navalgund taluks and whole Dharwad district were negatively influenced by net irrigated area. The area under mango fruit crop in Dharwad and Hubli taluks were positively influenced by fertilizer availability at 5 per cent significance level. The area under Kalghatagi taluk and whole Dharwad district were negatively influenced by fertilizer availability. In Navalgund and Kundgol taluks area was positively influenced by fertilizer availability. In Dharwad taluk, it was positively influenced by the number of factories at 1 per cent significance level. The area under Navalgund and Kalghatagi taluks were positively influenced by the number of factories, whereas Hubli and Kundgol taluks were negatively influenced. However the area under mango fruit crop in whole Dharwad district was positively influenced by the number of factories at 5 per cent significance level. The area in Dharwad, Hubli and Kalghatagi taluks was positively influenced by the number of commercial banks at 1 per cent significance level. In Navalgund taluk it was negatively influenced by the number of commercial banks and in Kundgol taluk it was positively influenced. However the area under whole Dharwad district was

positively influenced by the number of commercial banks at 5 per cent significance level. The  $R^2$  value for Dharwad, Hubli, Navalgund, Kalghatagi and Kundgol taluks

and Dharwad district as a whole were 0.99, 0.95, 0.56, 0.95, 0.93 and 0.99 respectively.

**Table-2** Factors responsible for changes in area under mango crop

Sl. No.	Variables	Dharwad	Hubli	Navalgund	Kalghatagi	Kundgol	Dharwad District
1	Intercept	1.975	-844.097	-4.221	-1320.56	63.711	4.763
2	Price	0.035** (1.83)	0.016** (0.59)	2.289 (1.42)	0.022 ** (1.41)	0.007 (3.40)	0.091** (2.06)
3	Population	-4.9 (-1.12)	-0.002 (-0.27)	2.659 (1.45)	0.008 (0.81)	-0.001 (-0.52)	-6.735 (-2.05)
5	Rain fall	-0.047 (-0.22)	0.041 (0.17)	-0.000 (-0.76)	-0.029 (-2.1)	0.016 (0.46)	-0.053 (-0.74)
6	Net irrigated area	0.103 (2.04)	-0.049 (-1.01)	-9.61 (-0.81)	0.087 (3.03)	0.019 (0.75)	-0.006 (-0.49)
7	Fertilizer availability	0.005** (0.39)	0.002** (0.28)	1.412 (0.31)	-0.007 (-0.42)	0.001 (0.67)	-0.007(-1.31)
8	No. of factories	7.054* (3.44)	-0.284 (-0.55)	0.028 (1.65)	24.813 (1.82)	-2.111 (-0.84)	1.440** (1.51)
9	No. of commercial banks	3.357* (0.21)	18.155* (1.97)	-0.030 (-0.27)	15.398* (0.39)	1.222 (0.35)	27.503** (5.46)
12	'F' value	4.26	8.94	0.123	8.4	4.01	3.966
13	$R^2$ value	0.987*	0.948*	0.564	0.949*	0.928*	0.987*

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

**Table-3** Constraints faced by farmers in production of mango

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

The constraint analysis in the production of mango was carried out by classifying the problems faced by the farmers as highly acute, medium acute, less acute, acute and not acute by using Tabular analysis and results are presented in [Table-3]. The results indicated that for overall category of sample farmers irrigation (water) was reported as not 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 less acute constraint as opined by 90 per cent of the farmers, for 5 per cent of farmers it is acute and 5 per cent of the farmers considered rainfall as medium acute. Resources were reported as acute constraint as opined by 85 per cent of the farmers, for 10 per cent of farmers it was less acute problem and 5 per cent of the farmers considered resources as medium 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 a less acute constraint and 5 per cent of the farmers considered power supply as acute constraint. Management was reported as acute constraint as opined by 90 per cent of the farmers and for 10 per cent of the farmers considered management as less acute constraint.

**Table-4** Constraints faced by farmers in marketing of mango

Sl. No.	Problem	Highly acute	Medium acute	Less acute	acute	Not acute
1	Storage	90%	10%	-	-	-
2	High commission charges	95%	5%	-	-	-
3	High transportation cost	80%	20%	-	-	-
4	Lack of	-	90%	10%	-	-

	availability of adequate market information					
5	Markets far away from farm	-	95%	5%	-	-
6	Low Price	90%	10%		-	-
7	Mutual understanding between commission agents and traders	-	95%	5%	-	-

The perusal of [Table-4] revealed that for overall category of mango growing sample farmers, storage was reported as highly acute constraint as opined by 90 per cent of the farmers and for 10 per cent of the farmers it was medium acute. High commission charges was reported as highly acute constraint as opined by 95 per cent of the farmers and for 5 per cent of farmers it was medium acute. High transportation cost was reported as highly acute constraint as opined by 80 per cent of the farmers and for 20 per cent of farmers it was medium acute problem. Lack of availability of adequate market information 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 a less acute constraint. Markets far away from farm was reported as medium acute constraint as opined by 95 per cent of the farmers and for 5 per cent of the farmers, it was less acute constraint. Low price was reported as highly acute constraint as opined by 90 per cent of the farmers and for 10 per cent of the farmers it was a medium acute constraint. Mutual understanding between commission agents and traders was reported as medium acute constraint as opined by 95 per cent of the farmers and for 5 per cent of the farmers it was less acute constraint.

## Discussion

The area, production and productivity of Kalghatagi taluk grew at faster rate because of climatic conditions and soil texture are well suited for mango cultivation. Amod and Kalitha (2008) [6] reported the similar results while studying the trends of area, production and productivity of major fruit crops in Jammu and Kashmir.

The results indicated that mango price had positive impact and significant effect on area under the crop in three of the five taluks of the district. In two taluks of Navalgund and Kundgol, the effect of price was insignificant though it was positive. For the district as whole price impact was significantly positive.

Population did not appear to have significant impact on area under crop. Rainfall also did not appear to have significant impact on area. Net irrigate area had positive impact on area in three taluks of the district though it was significant. It indicated that increased irrigation prompted farmers to go for higher area under the crop. Higher availability of fertilizer encouraged the farmers to allocate more area for the crop in Dharwad and hubli taluks. For the district as a whole, availability of processing facilities encouraged the farmers to allot more area for the crop, which is as per expectation because increased processing facilities offer assured markets for mango growers. These conclusions are similar with the observations of Singh and Mathur (2008) [3].

Most of the sample farmers opined that irrigation was not an acute problem, since mango fairly performs well (in Dharwad district), in dry land horticulture. Most of farmers expressed rainfall as less acute constraint, as rainfall in Dharwad district was on an average. Most of the farmers expressed resources as acute constraint, the reason for this was negligence, and farmers not utilized resources properly. 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 acute problem, because of lack of technical knowledge about cultivation of fruit crop. These conclusions are similar with the observations of Meena *et al.* (2009) [4].

Most of the sample farmers opined that storage was highly acute problem, because, lack of cold storages in Dharwad district. Most of farmers expressed high commission charges as highly acute constraint, because during seasonal marketing of mango, farmers face lot of commission problems. Most of the farmers expressed transportation cost as highly acute constraint, the reason for this is petrol and diesel prices are increasing day by day. Most of the farmers opined that lack of availability of market information was medium 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 that markets far away from farm as medium acute constraint, because even though the transportation facilities improved, the major markets Hubli, Belgaum, Bangalore and Mumbai are far away from the mango growers orchards. Most of the farmers expressed low price as highly acute constraint, because of variation in demand and supply and seasonal production of mango. Most of the sample farmers opined that mutual understanding between commission agents and traders was medium acute problem, because now day's farmers are having knowledge to deal with commission agents. These conclusions are in consistent with the observations of Naphade and Tingre (2008) [5].

## Conclusion

Fruit production in Dharwad district, the growth in area and production shows an increasing trend, while productivity indicated stable trend. Hence, concerted efforts need to be made to enhance productivity by either using productivity increasing technologies or by replacing age old plants and also strengthening the existing research and development activities with new economically feasible technologies. Non-availability of labour was expressed as very acute production constraints by 95 per cent of the respondents when compared with other constraints particularly at the peak season like harvesting and marketing time. Hence, Government policies like Rojagar Yojana, subsidized rations and National Horticultural Mission Programmes etc. needs to be linked or redrafted in favour of peasants and labours with symbiotic benefits. Majority of the respondents expressed storage and distance of market as an acute constraint. Hence, village level community storage points and suitable transport facilities need to be thought to strengthen the fruit growers of Dharwad district. The exploitation of fruit growers by the commission agents in marketing is to the tune of 40-50 percent, which needs to be reduced or stopped forth with by concerted efforts in the working manner of Suffala or HOPCOMS.

**Conflict of Interest: None declared**

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