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ORIGINAL CONTRIBUTION

PRODUCTION AND EXPORT OF MANGO FRUIT IN INDIA: AN EMPIRICAL ANALYSIS OF VIJAYAWADA MANGO MARKET

V Vijay Durga Prasad

Professor and Head, Department of Management Studies

PSCMR College of Engineering and Technology, Kothapet, Vijayawada -520 001

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ABSTRACT

India is blessed with diverse agro-climatic conditions, which are conducive to cultivation of varied horticultural crops round the year. In India tropical, sub-tropical and temperate horticulture crops which include Fruits, Vegetables, Flowers, Coconut, Cashew nut, Areca nut, Tuber crops, Spices and Mushroom, Ornamental, Medicinal and Aromatics plants, etc, are growing throughout the country. India is now the second largest producer of fruits in the world and is the leader in several horticulture crops. As far as mango production is concerned India stands the first in the world. Globalization, trade liberalization and changes in consumer demand are creating new market opportunities for farmers and landless laborers especially through horticultural systems in the tropics and subtropics. Many cereal farmers are already converting a portion of their land into production of high value horticultural crops. A strong horticulture sector is an engine for economic growth: it creates jobs, supports agri-businesses, and generates income to a greater degree than staple crops. The present study has been conducted based on primary and secondary data. Primary data has covered price spread between Wholesale Mango Traders and Retailers and Secondary data emphasized on Area, Production, Yield and Export of fresh mango fruit in all over the world and in India.

Keywords— Agriculture, Horticulture, Fruits, Mango, Area Production and Productivity, Export, Market, Wholesale mango Traders, Retailers and Price Spread

1. INTRODUCTION

Agriculture activity broadly refers to the science and technology of raising plants, crops and animals. On the other hand 'horticulture' has emerged as an important sector for diversification of agriculture. India has a wide variety of climate and soils on which a large number of horticultural crops such as a fruits, vegetables, potato, tropical tuber crops, mushroom, ornamental, medicinal and aromatic plants, plantation crops, spices, cashew, coca and betelvine are grown. After the green, blue and yellow revolution we now have yet another revolution called the "Golden Revolution" with the advancements made in the horticulture sector

in terms of rapid increase in fruit production, the employment generated and tremendous potential it promises for the future.

Globalization, trade liberalization and changes in consumer demand are creating new market opportunities for farmers and landless laborers especially through horticultural systems in the tropics and subtropics. Many cereal farmers are already converting a portion of their land into production of high value horticultural crops. A strong horticulture sector is an engine for economic growth: it creates jobs, supports agri-

businesses, and generates income to a greater degree than staple crops. Furthermore, horticultural crops can provide the micronutrients that are essential, yet lacking in the diets of half of the world's population. The mission of the Global Horticulture Initiative is to improve the health and income of the poor in developing countries through sustainable, demand driven, horticultural production, processing and marketing systems. The Global Horticulture Initiative will promote higher education and output-oriented research, and expand outreach activities through broad-based partnerships. The Global Horticulture Initiative will energize global systems of horticultural research, production, processing and trade. It will also enable the formulation of policies and programs that support small-scale farmers and horticultural commerce both domestically and internationally.

The trade in horticultural goods can play a significant role in promoting economic development, especially in developing countries where the majority of the population is engaged in agriculture, whereas, horticulture an integral part of it. Horticulture is getting incentive and systematic cultivation is being taken up which possess a very high potential for improving the agriculture economy. Many less developed countries have greater comparative advantage as they are capable of producing these goods with competitive export prices and these goods would form the main source of their exchange earnings. The present annual growth rate of horticulture is more and it contributes 24.5 per cent from the mere 8.0 per cent of area to the GDP and 54.55 per cent to export earnings in the agriculture sector. Horticulture has become an integral part of food and nutritional security and essential ingredient of economic security. It has emerged as an indispensable part of agriculture, offering a wide range of choices to farmers for crop diversification. Adoption of horticulture by small and marginal farmers has brought prosperity in many regions of the country.

Today horticulture encompasses more than garden cultivation. The modern 'horticulture' may be defined as an art as well as science which deal with the production, utilization and

improvement of garden crops. It deals with a combination of the botanical and agricultural aspects of plants. Thus one may define horticulture as the culture and biology of garden crops including both the aesthetic and the scientific dimensions. Basic principles of physics, chemistry and biology are used by horticulturists to understand manipulate of plant life. Biotechnology is now finding direct applications in horticulture.

Objectives

The main objectives of the study are as follows:

1. To analyze the growth of area, production, yield of Mango Fruit in India.
2. To study the total exports of Fresh Mango fruit from India
3. To examine the export earnings of Mango and its influence on production and area of mango in India.

Hypotheses

The hypotheses have been framed on the base of objectives.

- 1) The growth of area of cultivation, production, and yield is not satisfactory.
- 2) The quantity of mango exports is not in progress.
- 3) Export earnings of mango are not increasing at desirable level.

2. RESEARCH METHODOLOGY

A model of Multiple Regression Analysis and Annual Growth Rate has been employed for secondary data for a period from 1991-92 to 2013-14 with reference to area of cultivation, production, yield of fresh mango fruit, quantity of export and earning of exports of mango fruit. The sources of secondary data have been collected from CMIE Centre for Monitoring Indian Economy DGCIS, and APEDA etc. The primary data also has been collected (2012-13) from a sample of 80 traders of Vijayawada Mango Market. The profit levels have been estimated for whole sale and retail traders in the market.

Model Specification:

The Multiple linear regression models are specified below:

$$\text{Export of Mango } (Y_{i1}) = b_0 + b_1(\text{Area}) + b_2(\text{Production}) + b_3(\text{Yield}) + U_i \dots 1$$

$$\text{Export Earnings } (Y_{i2}) = \alpha_0 + \beta_1 (\text{Area}) + \beta_2 (\text{Production}) + \beta_3 (\text{Yield}) + U_2 \dots 2$$

In the above equations α and β terms equal parameters and u equals error term.

Dependent Variables:

Y_{i1} = Export of Mango in Quantity in Million Tons

Y_{i2} = Export Earnings of Mango in Rs. Lakhs

Independent Variables:

1. Area of Mango Cultivation in Million Hectares
2. Production of Mango in Million Tons
3. Yield of Mango per Hectore in Million Tons.

3. RESULTS AND DISCUSSION

Table-1: Regression on the Export Quantity of Mango

Sl.No	Indicators	Coefficients	t-Values	P.Values
1	Area of Cultivation	0.859	3.636	0.002
2	Production of Mango	-0.086	-2.45	0.025
3	Yield of Mango	5852.242	1.133	0.272
	Constant	-41377.336	-1.06	0.303
	R Square	86.2%		
	Adj.R Square	83.9%		
	F-Statistic	37.386		
	P-Value	0.000		
	Durbin-Watson	2.043		

Regression results on Mango Export:

The quantity of mango export from India is depends on the area of cultivation, production and yield of the mango. The coefficient of area under mango cultivation is 0.859 and the coefficient of production of mango is negative at - 0.086. This is because of an increase in one unit increase in mango production leads to decrease in exports of mangos. Area of cultivation increased by one unit will increase

the export of 8.59 per cent. Yield of mango is also influences the increase of exports of mango. The t values of both area and production are significant but in case of yield it is not significant. The variability of explanatory variables explains about 86 per cent. F-values also show that there is a model of goodness of fit in relation to mango exports.

Table-2: Regression on the Export Earnings of Mango

S.No	Indicators	Coefficients	t-Values	P.Values
1	Area of Cultivation	0.028	0.483	0.635
2	Production of Mango	0.019	2.215	0.040
3	Yield of Mango	-591.984	-0.470	0.644
	Constant	-12817.011	-1.344	0.195
	R Square	92.50%		
	Adj.R Square	91.30%		
	F- Statistic	74.195		
	P-Value	0.000		
	Durbin-Watson	1.514		

Regression results on Export Earnings of Mango

The export earnings of mango from India depends on the area of cultivation, production and yield of the mango. The coefficient of area under mango cultivation is 0.028 and the coefficient of production of mango is positive at 0.019. These two independent variables are positive in relation to earning of export of mango. This is because of an increase in one unit of mango cultivation in hectares leads to

increase 2.8 per cent increase of earnings by exports. In the same manner one unit increase in production of mango will lead to increase of 1.9 per cent of earnings of mango exports. Yield of mango is also influences negatively to increase of exports earnings of mango. The t values of the mango production are very highly significant, but in case of area and yield it is not significant. The variability of explanatory variables explains about 92.5 per cent. F-values also show that there is a model of goodness of fit in relation to mango exports.

Table-3: Regression on the Profit of Wholesale Mango Traders

S.No	Indicators	Coefficients	t-Values	P.Values
1	Sold Value of Mango	0.264	10.736	0.000
2	Cost of Mango Sold	-9.780	-1.911	0.065
	Constant	24668.276	2.759	0.010
	R Square	93.80		
	Adj.R.Square	93.50%		

	F- Statistic	243.766
	P-Value	0.000
	Durbin-Watson	2.257

Regression results on Net Profit of Whole sale business of Mango Traders

An amount spent on purchase of mango and sold value of mango significantly influencing the net profit levels. The coefficients of sold value of total mangos of wholesale is 0.264 and the cost incurred for getting to market is negative value -9.780. This is because of an increase in purchase of mango production, profit also increases. The impact of sold value of mango of wholesale traders also positive but significant, this is on account of price spread which they taken up also increases the profit of the mango traders. Cost incurred by traders is not influencing positively to increase their net profits. It represents one rupee of sale value influences to increase 26.4 per cent increase in

net profit. The cost of the transport of mango and other costs which have a negative impact on net profit levels of the traders. As one rupee cost increases on transport and other costs which influences to decrease the net profit of whole sale mango trade at 978 per cent. Increasing costs influences negative cascading effect on net profits. The sold value of mango has positive impact on the increase of net profit of wholesale mango traders in Vijayawada Mango Market. As far as the wholesale traders of mango are concerned, sold value represents a positive impact on the increase of net profits of the traders. The variability of explanatory variables in whole sale trade 93 per cent. F values show at a maximum of 243.766 which reveals that there is a high significant of the model.

Table-4: Regression on the Profit of Retail Mango Traders

S.No	Indicators	Coefficients	t-Values	P.Values
1	Mango Sold Value	0.216	17.708	0.000
2	Cost of Sold Mango	-0.924	-6.129	0.000
3	Constant	532.494	0.674	0.504
	R Square	90.1%		
	Adj.R Square	89.6%		
	F- Statistic	191.365		
	P-Value	0.000		
	Durbin-Watson	2.432		

Regression results on Net Profit of Retail business of Mango Traders:

An amount spent on purchase of mango and sold value of mango significantly influencing the net profit levels. The coefficients of sold value of total mangos of retail trade is 0.216 and the cost incurred for getting to market is minus -.924 This is because of an increase in purchase of mango production, profit also increases. The impact of sold value of mango of retail traders also positive but significant, this is on account of price spread which they taken up also increases the profit of the mango traders. Cost incurred by traders is not influencing positively to increase their net profits. It represents one rupee of sale value influences to increase 21.6 per cent increase in net profit. The cost of the transport of mango and other costs which have a negative impact on net profit levels of the traders. As one rupee cost increases on transport and other costs which influences to decrease the net profit of whole sale mango trade at 92.4 per cent. Increasing costs influences negative cascading effect on net profits. The sold value of mango has positive impact on the increase of net profit of retail mango traders in Vijayawada Mango Market. As far as the retail traders of mango are concerned, sold value represents a positive impact on the increase of net profits of the traders. The variability of explanatory variables in retail trade 90 per cent. F values show at a maximum of 191.365 which reveals that there is a high significant of the model for retail trade of mango in Bangalore Mango Market.

Fruit Production

India is blessed with diverse agro-climatic conditions, which are conducive to cultivation of varied horticultural crops round the year. In India tropical, sub-tropical and temperate horticulture crops which include Fruits, Vegetables, Flowers, Coconut, Cashew nut, Areca nut, Tuber crops, Spices and Mushroom, Ornamental, Medicinal and Aromatics plants, etc, are growing throughout the country. India is now the second largest producer of fruits in the world and is the leader in several horticulture crops. As far as mango production is concerned India stands the first in the world which accounts 16.34 million tons of the world mango production, which is followed by China with 4.35 million tones, Thailand with 2.55 million tones. The details can be seen from the table -5. Among the major fruit producing countries, India ranks number two after China. Similarly, in case of vegetables, India is the second largest producing country in the World, next to China (See table – 5).

Table - 5: Leading Fruit Producing Countries 2012–13

Country/State	%
<u>China</u>	21.2
<u>India</u>	12.6
<u>Brazil</u>	5.9
United States of America	4.1
Indonesia	2.7
Philippines	2.5

<u>Mexico</u>	2.5
Turkey	2.3
Spain	2.2
Italy	2.1
<u>Others</u>	41.8
World total	100.00

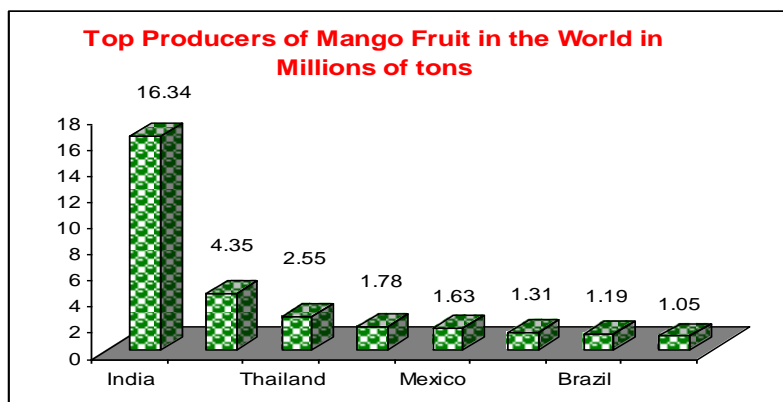
Source: Hand Book on Horticultural Statistics, 2014

Fresh Mango Production

India is number 1 position in the list of largest mango producing countries. It produces 16,337,400 ton of mango every year and constitutes 42.2 percent of world's total mango production. Mango is the most relished

fruit in India. There are about a dozen varieties of mangoes available here. India exports mangoes to a lot of countries. An area of about 1.23 million hectares is employed for the production of mangoes. Mangoes account for about 22.9 per cent of the total fruit production in India.

Figure-1:



Despite of this “golden revolution” in horticultural production, the productivity of horticultural crops has increased from 8.4 tones per hectare in 2004-05 to 11.4 tones per hectare in 2010-11. If India has to emerge as an economic power in the world, our agricultural productivity should equal those countries, which are currently rated as economic power of the world. Horticulture has emerged as an important segment having immense potential to provide food, employment and foreign exchange. The

major horticultural crops in 2012-13 growing states in India are Maharashtra (10.05%) is registered a highest area under fruits crop, followed by Andhra Pradesh (9.79%), Karnataka (8.16%), West Bengal (7.35%), Kerala (6.85%), Gujarat (6.40%), Uttar Pradesh (6.12%), etc, respectively. The average share of area, production and yield of fruit crops in different states in India are presented in **Table-6**. As far as production is concerned West Bengal is registered the highest with 23.8 million tones

which are followed by Andhra Pradesh, Uttara Pradesh, Karnataka and Maharastra. The yield

per acre is more in West Bengal and Utter Pradesh.

Horticulture in India

Table -6: The Major Area, Production of Horticultural Crops

in States of India (2012-13)

(Area: in '000' ha, Production: in '000' tones, Yield: M.Tons/Hectare)

State/UT'S	A	%	P	%	Y	%
Maharashtra	2380.24	10.05	18378.28	6.84	7.72	8.13
Andhra Pradesh	2308.72	9.74	28913.15	10.75	12.52	13.18
Karnataka	1939.42	8.19	19665.74	7.31	10.14	10.67
West Bengal	1742.11	7.35	29199.50	10.86	16.76	17.64
Kerala	1622.74	6.85	10329.48	3.84	6.37	6.71
Gujarat	1517.18	6.40	20211.67	7.52	13.32	14.02
Uttar Pradesh	1448.91	6.12	25004.91	9.3	17.26	18.17
Others	10734.82	45.31	117144.72	43.57	10.91	11.48
All India	23694.15	100	268847.45	100	95	100.00

Source: National Horticultural Report, 2013.

Fruit cultivation allows optimum utilization reward of nature in making it possible to upgrade inferior fruit trees into superior ones by pinnacle making and by adopting other techniques of vegetative propagation. Nature has endowed India with a varied range of conducive soil and climatic conditions, there by, rendering it as one of the few countries in the world where almost all types and ranges of tropical, subtropical, temperate fruits are grown throughout the year under both extensive and intensive commercial methods of cultivation, in one or the other part of the country. The major fruits crop in 2012-13 growing states India are Maharashtra (22.19%) is registered a highest area under fruits crop, but

Tamil Nadu (13.47%) is the highest percentage under fruits production than the Andhra Pradesh (17.5%) followed by Maharashtra production with 12.04%) same ranking in area and production, Karnataka (5.65% & 10.35%), Gujarat (5.46% and 10.35%), Jammu & Kashmir (4.97%), Uttar Pradesh (4.67%), Tamil Nadu (4.44%), etc, respectively. The percentage ranking of the state-wise area production of fruit crops in India are presented in **Table-7**. The yield of fruit crops is the highest in Tamil Nadu, which is followed by Gujarat, Andhra Pradesh and Karnataka etc.

Table -7: Percentage of Area, Production and Yield of Fruit Crops in major

States of India 2012-13(Area: in '000' ha, Production: in '000' tones, Yield: M.Tons/Hectare)

STATES/Uts	A	%	P	%	Y	%
Maharashtra	1549.00	22.19	9785.00	12.04	6.32	54.30
Andhra Pradesh	940.74	13.47	13939.08	17.15	14.82	127.32
Karnataka	388.20	5.56	6619.60	8.14	17.05	146.48
Gujarat	381.50	5.46	8413.17	10.35	22.05	189.43
Jammu & Kashmir	347.22	4.97	1742.14	2.14	5.02	43.13
Uttar Pradesh	326.18	4.67	5176.14	6.37	15.87	136.34
Tamil Nadu	309.94	4.44	6699.88	8.24	21.62	185.74
Others	2739.23	39.23	28910.32	35.57	10.55	90.64
All India	6982.01	100.00	81285.33	100.00	11.64	100.00

Source: National Horticultural Report, 2013.

Area, Production and Yield of Mango Crop in India

Table-8: presents the fruit of mango and its area, production and yield during 1990-91 to 2012-13. The major mango producing states are Andhra Pradesh, Maharashtra, Tamil Nadu, Karnataka, West Bengal, and Gujarat, etc. During 2004-05, a tremendous growth of area of mango has increased at 23.15 per cent over the

previous year, afterwards it has been declined to 3.92 per cent during 2012-13. The production and yield of mango growth rate is concerned the highest rate at 17.86 per cent 17-75 per cent respectively during 2009-10 and latter it has declined to 7.94 per cent by 2012-13. The yield of mango per hectare has increased by 23.27 per cent during 2002-03 due to high growth of production at 7.58 per cent of production.

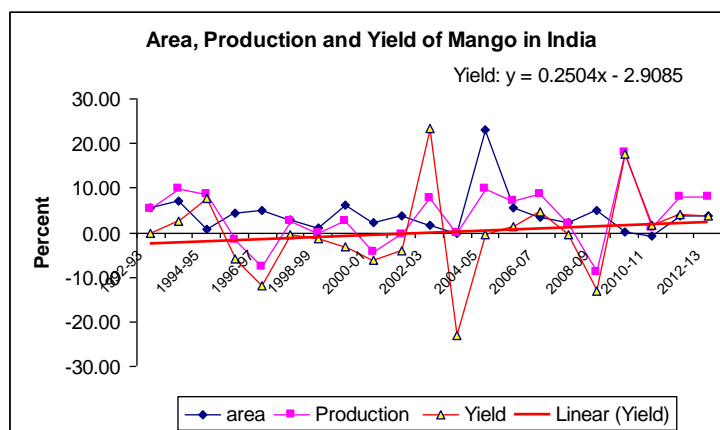
Table -8: Annual Growth Rate of Area, Production and Yield of Fresh Mango Fruit in India (1990-91 to 2012-13)

(Area: in '000' ha, Production: in '000' tones, Yield: M.Tons/Hectare)

Year	Area	AGR	Production	AGR	Yield	AGR
1990-91						
1991-92	107760		875160		8.12	
1992-93	113670	5.48	922330	5.39	8.11	-0.12
1993-94	121740	7.10	1011330	9.65	8.31	2.47
1994-95	122830	0.90	1099330	8.70	8.95	7.70
1995-96	128300	4.45	1081100	-1.66	8.43	-5.81
1996-97	134490	4.82	998120	-7.68	7.42	-11.98
1997-98	138490	2.97	1023420	2.53	7.39	-0.40
1998-99	140160	1.21	1023420	0.00	7.30	-1.22
1999-00	148690	6.09	1050350	2.63	7.06	-3.29
2000-01	151900	2.16	1005680	-4.25	6.62	-6.23
2001-02	157580	3.74	1002020	-0.36	6.36	-3.93
2002-03	160000	1.54	1078000	7.58	7.84	23.27
2003-04	160000	0.00	1078000	0.00	6.03	-23.09
2004-05	197040	23.15	1182970	9.74	6.00	-0.50
2005-06	208070	5.60	1266310	7.04	6.09	1.50
2006-07	215400	3.52	1373400	8.46	6.38	4.76
2007-08	220100	2.18	1399700	1.91	6.36	-0.31
2008-09	230900	4.91	1275000	-8.91	5.52	-13.21
2009-10	231230	0.14	1502670	17.86	6.50	17.75
2010-11	229700	-0.66	1518800	1.07	6.61	1.69
2011-12	238702	3.92	1639377	7.94	6.87	3.93
2012-13	248056	3.92	1769526	7.94	7.13	3.78

Source: Agriculture, Center for Monitoring Indian Economy (CMIE), Intelligence of Indian Economy, Pvt. LTD. Government of India New Delhi various issues and NHB-2011-2012 database

Figure-2:



Mango Exports from India to Different Countries Marketing of the produce of mango is mainly controlled by intermediaries like wholesalers and commission agents. The profit by export of mango is the highest during 1997-98 at 63.99 per cent over previous year, which is followed by 47.31 per cent during 2005-06, 33.95 per cent during 2008-09, nearly 29.7 per

cent during 1992-93 and 27.26 per cent in 2011-12 and 26.21 per cent during 2012-13 respectively. As far as quantity of mango export is concerned the highest growth has registered at 73.15 per cent in 1997-98, which is followed by 54 per cent in 2008-09, 38 per cent in 2004-05 and 33 per cent during 2005-06.

Table -9: Annual Growth Rate of Total Fresh Mango Exports from India to Different Countries

Quantity: in 'million tones' Value: in 'RS. Lakhs'

Sl.No	Year	Quantity	AGR	In Lakhs	AGR
1	1990-91	19380	-	3122	-
2	1991-92	23104	19.22	3546	13.58
3	1992-93	25850	11.89	4599	29.70
4	1993-94	22271	-13.85	4387	-4.61
5	1994-95	25414	14.11	4503	2.64
6	1995-96	22269	-12.38	3852	-14.46
7	1996-97	24773	11.24	4488	16.51

8	1997-98	42895	73.15	7360	63.99
9	1998-99	42894	0.00	7360	0.00
10	1999-00	45407	5.86	7914	7.53
11	2000-01	34631	-23.73	7155	-9.59
12	2001-02	37109	7.16	6861	-4.11
13	2002-03	44429	19.73	8099	18.04
14	2003-04	38003	-14.46	8419	3.95
15	2004-05	52381	37.83	8695	3.28
16	2005-06	69609	32.89	12809	47.31
17	2006-07	79065	13.58	14194	10.81
18	2007-08	54348	-31.26	12744	-10.22
19	2008-09	83700	54.01	17071	33.95
20	2009-10	74461	-11.04	20054	17.47
21	2010-11	59221	-20.47	16481	-17.82
22	2011-12	63441	7.13	20974	27.26
23	2012-13	55585	-12.38	26472	26.21
24	2013-14	41279	-25.73	28542	7.81

Source: DGCIS, APEDA Calcutta various issues and Hand book on horticultural statistics (2014).

4. CONCLUSION

India has unique and favorable geo-climatic features of horticulture and particularly in the production of fresh mango fruit cultivation. An increase in one unit of mango cultivation in hectares leads to increase 2.8 per cent increase of earnings by exports. In the same manner one unit increase in production of mango will lead to increase of 1.9 per cent of earnings of mango exports. The impact of sold value of mango of wholesale traders also positive but significant,

this is on account of price spread which they taken up also increases the profit of the mango traders. Cost incurred by traders is not influencing positively to increase their net profits. It represents one rupee of sale value influences to increase 26.4 per cent increase in net profit. The impact of sold value of mango of retail traders also positive but significant, this is on account of price spread which they taken up also increases the profit of the mango traders. It represents one rupee of sale value influences to increase 21.6 per cent increase in net profit

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