

# Indian vegetables: production trends, marketing efficiency and export competitiveness

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**Abstract:** India is the second largest producer of fruits and vegetables in the world next only to China. Horticulture development is currently constrained by poor marketing arrangements. The gap between prices received by the farmers and those paid by urban consumers is large, reflecting inefficient marketing arrangements. The huge production base offers India immense opportunities for export. This study estimates production trends, market efficiency and export competitiveness of vegetables in India and suggest measures to improve production, marketing and exports of Indian vegetables. The study was conducted India as whole for production and export competitiveness and for marketing efficiency in the 8 states of India covering 20 crops. The study found that area under total vegetables cultivation is grown at the rate of 4.12% and production growth rates was 6.48%. Indian vegetables production depicted glorious past and expected promising future. The most common marketing channel for majority of the crops is that Producer-Wholesaler-Retailer-Consumer. The results further showed that the producer share in consumer rupee was highest in Punjab, Tamil Nadu and Manipur compared to Andhra Pradesh, West Bengal and Rajasthan. It varies from 46% to 74% in Andhra Pradesh, 26% to 60% in West Bengal, 33% to 60% in Rajasthan, 85% to 88% in Manipur 91% to 95% in Tamil Nadu and 100% in Punjab. The study clearly shows that majority of the horticultural commodity markets are operating efficiently. The highest marketing efficiency found to be producer to consumer channel. Hence, government policies should promote direct marketing models for efficient horticultural marketing. The results showed that in most of the commodity cases marketing cost, marketing margin, transport cost, labour charges are adversely affecting marketing efficiency and open market price, volume of the produce handled and net price received are increasing marketing efficiency. The trends of fresh vegetables show that its export quantity increased 18.3% and 22.2% during two periods respectively. The results show that Indian vegetables are huge potential for exports. The results show that for all vegetables the Nominal Protection Coefficient is less than 1 indicating they are competitive in the international markets. The study suggests that Indian government should give priority to vegetable production, processing and exports.

**Keywords:** Indian Vegetables, Production Trends, Marketing Efficiency, Export Competitiveness

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## 1. Introduction

Horticulture development had not been a priority until recent years in India. In the period 1948-80, the main focus of the country was on cereals. During 1980-92 there was consolidation of institutional support and a planned process for the development of horticulture then started. It was later in the post-1993 period that a focused attention was given to horticulture development through an enhancement of plan allocation and knowledge based technology.

National Horticulture Mission was launched in April 2005 as a centrally sponsored scheme to promote holistic growth of the horticulture sector through an area based regionally differentiated strategies. The foreign trade policy in 2004-09 emphasized the need to boost agricultural exports, growth and promotion of exports of horticultural products. Horticultural sector contributes 28% of Agriculture Gross Domestic Product and 54% of Agricultural Exports in India (2007-08). The sector is growing at an average growth rate of 3.6 % over the last decade.

In India, the area under cultivation of vegetables stood at 8.495 million hectares while fruits were cultivated at 6.383 million hectares. India produced around 146.55 MTs of vegetables and 74.88 MTs of fruits (2010-11) which accounts for nearly 14.0% and 12.0% of country's share in the world production of vegetables and fruits, respectively. India is the second largest producer of fruits and vegetables in the world next only to China (NHB, 2011). The country's annual requirement is 74.40 MTs fruits and 175.2 MTs vegetables. With the present level of population, the annual requirement of fruits and vegetables will be of the order of more than production level. India plans to increase the production of horticultural crops to 300 million tons by 2012 (Government of India, 2001) from the level of 221.43 million tons (NHB, 2010-11).

The huge production base offers India great opportunities for export. During 2011-12, India exported vegetable and fruits worth Rs. 4801.29 crores which comprised of vegetables worth Rs. 3021.74 crores and fruits worth Rs. 3021.74 crores. Onions, Okra, Bitter Gourd, Green Chillies, Mushrooms and Potatoes contribute largely to the vegetable export basket. While, Mangoes, Walnuts, Grapes, Bananas, Pomegranates account for larger portion of fruits exported from the country. The major destinations for Indian vegetables and fruits are Bangladesh, UAE, Pakistan, Malaysia, Sri Lanka, UK, Saudi Arabia and Nepal (NHB, 2011).

Based on 11th Five year plan approach paper, accelerated agricultural growth will require diversification into horticulture and floriculture which in turn imply structural changes in the relation between agriculture and non-agriculture. Diversification requires effective marketing linkages, supported by modern marketing practices including introduction of grading, post-harvest management, cold chains etc.

The objective of the regulated markets established by the government was to regulate trade practices, increase marketing efficiency by reducing marketing charges, eliminate intermediaries and protect the interests of the producer seller. Though regulated markets helped to reduce multiple charges to the producer-seller, the system failed to check trade malpractices, making such markets highly restrictive, inefficient and dominated by traders.

To overcome the defects of regulated markets, direct marketing by farmers was experimented with Apni Mandi in Punjab and Haryana. Rythu Bazars in AP and Uzhavar Santhigalin TN. In the meantime, private players such as Cargill India, Mahindra, ITC e-Choupal, Bharti etc., have emerged with sophisticated supply chain management systems and vertical co-ordination in India.

Horticultural crops being highly seasonal, perishable are also capital and labour intensive and need care in handling and transportation. Their bulkiness makes the handling and transportation a difficult task, leading to huge post-harvest loss which is estimated at around Rs. 23,000 crore or nearly 35% of the total annual production (CII, McKinsey, 1997). Their seasonal production pattern results in frequent market gluts and associated price risk, thereby forcing the farmers into distress sale to pre harvest contractors and commission agents. The price spread along the marketing channel is directly proportional to the number of market intermediaries involved along the channel (Gupta and Rathode, 1998).

Most of the fruits being bulky and highly seasonal are sold through the Pre-Harvest Contractor (PHC) at the field much before they come to harvest. Very often, the PHC takes most of the production risks due to pests and diseases and also the cost of maintenance, while he makes his margin through bulking (Sudha and Froukje, 2006). Vegetables, barring cabbage and cauliflower, are mainly sold through the commission agents at the market, who intern transports the produce to the distant markets and makes his margin, traditional flowers are self marketed at the wholesale auction centers (Subrahmanyam, 1989).

Horticulture development is currently constrained by poor marketing arrangements. The gap between prices received by the farmers and those paid by urban consumers is large, reflecting inefficient marketing arrangements. Horticultural produce is typically collected from farmers by market agents, who sell it in organized markets established under the Agricultural Produce Marketing Acts. Unfortunately, these markets are controlled by a few traders and operate on a highly nontransparent basis. The net result is much lower realization of income by the farmer.

Studies at abroad viz; Martin (2001) found that as farming shifts from a rural lifestyle to an agribusiness sector with a supply chain mentality is a key driver for industrialization of agriculture. Linne et al (2005) found in Kenya that the export system could be a useful role model for the development of more efficient marketing systems in the

local subsector. Mithofer et.al. (2008) found in Kenya that more smallholders were linked to the export market by middlemen and flexible arrangements than by an export company. Galanopoulos et.al (2009) found that Mediterranean countries are traditional growers of fruit and vegetables, but are struggling to remain competitive in the global market. Lenné & Ward (2010) found that the export vegetable subsector as a role model for improving the efficiency, growth and economic value of domestic vegetable marketing systems in East Africa. Diogo et al (2011) found in Niamey, Niger that for amaranth and lettuce, the net profit (NP) of market retailers depended only on marketplace, whereas the NP of cabbage and tomato strongly depended on season and marketplace.

Dastagiri and Immanuelraj (2012) found that shifting Indian farming from a rural lifestyle to an agribusiness sector and linking farmers to super markets is a key driver for industrialization of agriculture. Several studies such as Bansal (1994), Bhatia (1994), Sudha and Gajanana (2001) were done on traditional areas / conventional crops. Studies by Raju and Rao (1993), Ganesh (2004) were mainly focused on traditional marketing channels. Limited scientific studies on the emerging/newer institutional marketing models are available (Chengappa 2001). Hence, this study was under taken in about 8 states with the following objectives.

#### **Objectives**

Study of area and production trends of Indian vegetables

Estimation of the marketing cost and marketing margin price spread, marketing efficiency and farmer's share in consumer rupee in various supply chains

Study of factors influencing the marketing efficiency

Estimation of exports trend and competitiveness of Indian vegetables

Suggest suitable strategies to enhance the production, marketing efficiency and export competitiveness of Indian vegetables.

## **2. Data and Methodology**

The study was conducted to estimate vegetable area production trends India as a whole for 2001-10. The compound annual growth rate formulae were used. The study was conducted by NCAP in 8 states, viz; Andhra Pradesh, Karnataka, Tamil Nadu, Punjab, Rajasthan, West Bengal, Manipur and Mizoram during April 2009- August 2010. 20 crops were studied and for each crop 120 farmers were selected. The data pertains to the year 2009-10. For all these crops, primary survey was conducted to elicit the required information on marketing channels, marketing cost, market margin, price spread. Producer share in consumer rupee, constraints, opportunities and suggestions and analytical techniques were employed are functional, logistic model, rank correlation and Delphi technique. Shepherd formula, Acharya Modified Marketing Efficiency formula were used for the estimating marketing efficiencies as given below. The exports trends and competitiveness are estimated using growth rates and NPC calculations.

### **Area and Production trends**

#### **Growth rate formulae:**

The compound growth rate (r) was calculated by fitting exponential function to the variables of interest viz., Area and Production for the period 2001-02 to 2010-11.

$$Y_t = Y_0(1+r)^t \quad (1)$$

Assuming multiplicative error term in the equation 1, model may be linearized by logarithmic transformation

$$\ln Y_t = A + Bt + \varepsilon \quad (2)$$

Where, A (=lnA<sub>0</sub>) and B (=ln(1+r)) are the parameters to be estimated by ordinary least square regression, t = time trend in year, r = exp (B) -1

### **Marketing Efficiency Estimated:**

#### **Shepherd Formula**

$$E = (O/I) \times 100$$

Where, E is index of marketing efficiency, O is value added by the marketing system, I is 'cost + margin' of market intermediaries

#### **Acharya's Modified Marketing Efficiency (MME)**

$$MME = FP / (MC + MM)$$

Where, MME is modified measure, FP is price received by farmers, MC is marketing cost, MM is marketing margin.

#### **Producer Share in Consumer Rupee (PS) has calculated as below:**

$$PS = (PF/PR) \times 100$$

Where, PF is price received by the farmer

PR is retail price (consumer price)

### **Price Spread**

It is the difference between the two prices, i.e., the price paid by the consumer and the price received by the producer. For e.g. P<sub>1</sub>-P<sub>2</sub>, Where, P<sub>1</sub> is price at one level or stage in the market, P<sub>2</sub> is price at another level

### **Factors affecting Marketing Efficiency**

Multiple linear regression analysis with following variables was done to know the effect of these variables on marketing efficiency.

$$Y = f(X_1, \dots, X_n)$$

Where,

Y = Marketing efficiency (%)

$X_1$  = Marketing cost (Rs.)

$X_2$  = Marketing margin (Rs.)

$X_3$  = Transport cost (Rs.)

$X_4$  = Open market price (Rs.)

$X_5$  = Labour wages (Rs.)

$X_6$  = Controlling middlemen (put '1', if middlemen are controlled and '0' if not)

$X_7$  = Volume of produce handled (kg)

$X_8$  = Presence of cold storage facilities (put '1', if present and '0' if not present)

$X_9$  = Length of the market channel (No. of market intermediaries)

$X_{10}$  = Length of the market channel (No. of market intermediaries)

$X_{11}$  = Nature of produce (put '1', if semi-perishable and '0' if perishable)

#### **Export trends and competitiveness:**

The compound growth rate of export and its value for the period 1991-92 to 2000-01 and 2001-02 to 2010-11 was calculated by fitting equation (2).

$$NPC = P_d / P_w$$

Where  $P_d$  is Domestic Price and  $P_w$  is International price (border price)

### **3. Result and Discussion**

#### **3.1. Area and Production Trends**

The area and production trends of Indian vegetables during 2001-10 are presented in the Table 1. On an average the area under total vegetables cultivation is grown at the rate of 4.12%. The highest area growth rate was found for onion. All vegetables area is grown positive except sweet potato in which it was negative. Similarly, on an average total vegetables production growth rates was 6.48%. The highest production growth rate was found for onion. All vegetables production growth rates was more than 4% except decline in sweet potato. The results show that Indian vegetables production depicted glorious past and expected promising future.

*Table 1. Area and production trends scenario of Vegetables in India.*

Vegetable	Area (2001)	Area (2010)	Growth rate %	Production (2001)	Production (2010)	Growth rate %
Total vegetable	6156	8495.00	4.12	88622.00	146555.00	6.48
Cabbage	258.1	369.00	3.94	5678.20	7949.00	3.73
Brinjal	502.4	680.00	3.07	8347.70	11896.00	4.02
Cauliflower	269.9	369.00	4.44	4890.50	6745.00	4.84
Okra	347.2	498.00	4.26	3324.70	5784.00	5.85
Onion	495.8	1064.00	8.80	5252.10	15118.00	14.74
Peas	303.3	370.00	2.73	2038.20	3517.00	6.60
Tomato	458.1	865.00	5.60	7462.30	16826.00	8.08
Potato	1259.5	1863.00	4.57	24456.10	42339.00	6.07
Sweet Potato	131.9	113.00	-1.63	1130.70	1047.00	-0.84
Tapioca	238.9	221.00	1.00	6515.90	8076.00	4.80

*Source: Area in 000 ha's and production in 000 metric tonnes, NHB (2010-11). Growth rates calculated by authors.*

#### **3.2. Market Channels**

The agricultural commodities reach the final consumer through various channels depending on the season and price movement in the market. The marketing channels for different horticultural crops are presented in the Table 2.

The results show that the most common marketing channel for all crops is that P-W-R-C and some of the cases middlemen will come in the place of whole seller followed by P-R-C and P-C. The result shows that in different states for the same crops the different marketing channels are

adopted because of the situations and convenience. Even now, the farmers of most of the states are adopting tradi-

tional markets channels in spite of modern markets are available.

**Table 2.** Marketing Channels for horticultural crops in different states.

A.P	Crops	Potato	Tomato	Baby corn		
	Preferred channel	P-W-R-C	P-M-W-R-C	P-M-R-C		
Tamil Nadu	Crops	Brinjal	Potato	Tapioca		
	Preferred channel	P-W-R-C	P-W-R-C	P-R-C		
West Bengal	Crops	Brinjal	Bhindi	Tomato		
	Preferred channel	P-F-W-R-C	P-F-W-R-C	P-F-W-CA-R-C		
Manipur	Crops	Tomato	Cabbage			
	Preferred channel	P-R-C	P-W-R-C			
Rajasthan	Crops	Tomato	Carrot			
	Preferred channel	P-CON-C.A-R-C	P-T-C.A-R-C			
Punjab	Crops	Potato	Tomato	Green Peas	Brinjal	Okra
	Preferred channel	P-C	P-C	P-C	P-C	P-C
Karnataka	Crops	Banana	Tomato			
	Preferred channel	P - HOPCOMs – C	P - HOPCOMs-C			

Note: P = Producer, W = whole seller, M = middlemen, CA = commission agent, R = retailer, C = Consumer, CON – contractor; HOPCOMS – horticultural produce cooperative marketing societies.

### 3.3 Marketing Cost

The marketing cost of different crops in the study area for the most efficient channels is presented in table 3. The results showed that in A.P and West Bengal the marketing cost was more than Tamil Nadu, Manipur and Rajasthan.

But the marketing cost was too low in Punjab for all crops compared to other states because of direct marketing. It varied from 7% to 24% in A.P, 5% to 23% in West Bengal, 16% to 22% in Rajasthan, 5% to 60% in Manipur 4% to 9% in Tamil Nadu and 6% to 7% in Punjab in consumer price.

**Table 3.** Marketing Cost of Horticultural crops in different states (Rs. /Q).

Andhra Pradesh	Crop	Potato	Tomato	Baby corn		
	Efficient channel	P-W-R-C	P-R-C	P-M-R-C		
Tamil Nadu	M. C	95 (7.04)	312 (12.73)	310 (12.65)		
	Crop	Brinjal	Potato	Tapioca		
West Bengal	Efficient channel	P-C	P-C	P-C		
	M.C	180 (9.09)	165 (6.90)	50 (4.54)		
Manipur	Crop	Brinjal	Bhindi	Tomato		
	Efficient channel	P-F-W-R-C	P-F-W-R-C	P-F-W-R-C		
Rajasthan	M.C	335 (18.06)	330 9 (22.76)	345 (22.19)		
	Crop	Tomato	Cabbage			
Punjab	Efficient channel	P-R-C	P-C			
	M.C	437.10 (60.33)	37.98 (5.42)			
Tamil Nadu	Crop	Tomato	Carrot			
	Efficient channel	P-C.A-R-C	P-C.A-R-C			
West Bengal	M.C	178.41 (17.56)	144.66 (22.25)			
	Crop	Potato	Tomato	Green Peas	Brinjal	Okra
Manipur	Efficient channel	P-C	P-C	P-C	P-C	P-C
	M.C	52.17 (7.45)	76.27 (6.93)	69.48 (6.32)	63.14 (7.01)	73.70 (7.37)

Figures in brackets indicates %ages share of market cost in consumer price; MC – marketing cost

### 3.4. Marketing Margin

The Marketing margin of different crops in the study area for the most efficient channels was presented in Table 4. In case of Andhra Pradesh, Tamil Nadu and Punjab, the marketing margins in the selected crops indicated that wholesalers were gaining more % of benefit and the most efficient channel is Producer-Wholesalers-Retailer-Consumers.

The results showed that in Andhra Pradesh and West Bengal the marketing margin was more for all crops and more on aonla and kinnow in Rajasthan compared to other states. It varied from 54% to 78% in A.P, 34% to 51% in West Bengal, 35% to 94% in Rajasthan, 24% to 49% in Manipur, 10% to 13% in Tamil Nadu and 15% to 40% in Punjab in consumer price.

**Table 4.** Marketing Margin of horticultural crops in different states (Rs/Qty).

	Crop (Rs.)	Potato	Tomato	Baby corn		
A.P	Efficient channel	P-W-R-C	P-R-C	P-W-R-C		
	M.M	732 (54.22)	1760 (71.02)	1740 (71.02)		
	Crop (Rs.)	Brinjal	Potato	Tapioca		
Tamil Nadu	Efficient channel	P-W-R-C	P-W-R-C	P-R-C		
	M.M	205 (10.35)	275 (11.51)	145 (13.18)		
	Crop (Rs.)	Brinjal	Bhindi	Tomato		
West Bengal	Efficient channel	P-F-W-R-C	P-F-W-R-C	P-F-W-R-C		
	M.M	700 (37.73)	590 (40.69)	800(51.45)		
	Crop (Rs.)	Tomato	Cabbage			
Manipur	Efficient channel	P-R-C	P-W-R-C			
	M.M	544.62 (24.72)	232.74 (33.24)			
	Crop (Rs.)	Tomato	Carrot			
Rajasthan	Efficient channel	P-C.A-W-R-C	P-T-C.A-R-C			
	M.M	355.06 (34.95)	412.71 63.49)			
	Crop (Rs.)	Potato	Tomato	Green Peas	Brinjal	Okra
Punjab	Efficient channel	P-W-R-C	P-W-R-C	P-W-R-C	P-W-R-C	P-W-R-C
	M.M	140.31 (20.04)	448.31(40.75)	164.06 14.91)	228.07 (25.34)	285.77 (28.98)

Figures in brackets indicates %ages share of market margin in consumer price; M.M = market margin

### 3.5. Price Spread

The price spread of different crops in the study area for the most efficient channels was presented in Table 5. The results showed that in Andhra Pradesh and West Bengal

except tomato the price spread is high compare to Tamil Nadu, Manipur and Rajasthan. And there is no price spread in Punjab because of direct marketing.

**Table 5.** Price spread of Horticultural crops in different states.

	Crop (Rs./q)	Potato	Tomato	Baby corn		
A.P	Price Spread	690	900	1850		
	Crop (Rs./q)	Brinjal	Potato	Tapioca		
Tamil Nadu	Price spread	180	190	50		
	Crop(Rs./q)	Brinjal	Bhindi	Tomato		
West Bengal	Price spread	955	850	26		
	Crop(Rs./q)	Tomato	Cabbage			
Manipur	Price spread	379.92	0			
	Crop	Tomato	Carrot			
Rajasthan	Price spread	485.29	435.23			
	Crop (Rs./q)	Potato	Tomato	Green Peas	Brinjal	Okra
Punjab	Price spread	0	0	0	0	0

### 3.6. Producers' Share in Consumers' Rupee

The producers' share in consumers' rupee for different crops in the study area for the most efficient channels presented in Table 6. In Andhra Pradesh, it was estimated to be 48.54% for potato, 63.26% for tomato, 24.48% for baby corn. In case of Tamil Nadu, it was 90.9%, 92.05%, 95.45% for brinjal, potato and tapioca respectively. The farmers markets and local shanties helped the producers to market directly to the consumers and realize more shares. In West Bengal, the producers' share in the consumers' price of brinjal was estimated to be 44 % and the same was 26% under bhindi, 26% under tomato. In Manipur and Mizoram,

the producers' share in the consumers' price of tomato was estimated to be 85% and the same was 95% for cabbage. In Rajasthan, it was estimated to be 52% for tomato, 33% for carrot. In Punjab, the producers' share in the consumers' price of was 100% as the producers sold their product directly to the consumer and there was no middlemen were involved. The results showed that the producer share in consumer rupee was highest in Punjab, Tamil Nadu and Manipur compared to Andhra Pradesh, West Bengal and Rajasthan. It varied from 46 to 74% in A.P, 26% to 60% in West Bengal, 33% to 60% in Rajasthan, 85% to 88% in Manipur 91% to 95% in Tamil Nadu and 100% in Punjab.

**Table 6.** Producers' share in consumers' rupee (%) of horticultural crops in different states.

	Crop	Potato	Tomato	Baby corn		
A.P	Producers' price in consumers' rupee (%)	48.54	63.26	24.48		
Tamil Nadu	Producer share in consumer rupee (%)	90.90	92.05	95.45		
West Bengal	Producers' share in consumers' rupee (%)	44	26	26		
Manipur	Producers' share in consumers' rupee (%)	84.73	94.57			
Rajasthan	Producers' share in consumers' rupee (%)	52.24	33.04			
Punjab	Producers' share in consumers' rupee (%)	100	100	100	100	100

### 3.7. Market Efficiency

Marketing Efficiency estimated by following Acharya's modified method for different crops in the study area for the most efficient channels is presented in the Table 7. The results showed that for most of the crops the marketing efficiency was more than 1. In Tamil Nadu and Punjab the marketing efficiency was very high for all crops studied compared to crops in other states viz. A.P, Karnataka, West Bengal, Manipur (except cabbage) and Rajasthan. In Tamil Nadu, the efficiency ratio was highest for tapioca for

supply chain of producer to consumer. In Punjab, the efficiency rate was high for all crops for the direct supply chain of Producer and Consumer. In Manipur the efficiency ratio was high for cabbage. The study clearly showed that majority of the horticultural commodity markets were operating efficiently. The highest marketing efficiency channels found to be Producer to Consumer. Hence, government policies should promote direct marketing models for horticultural marketing.

**Table 7.** Marketing Efficiency of crops in different states for the most efficient channels.

	Crop.	Potato	Tomato	Green Peas	Brinjal	Okra
Punjab	M.E. ratio	12.42	13.42	14.83	13.25	12.56
	Efficient channel	P – C	P-C	P-C	P-C	P-C
A.P	M.E ratio	1.07	0.30	0.75		
	Efficient channel	P-W-R-C	P-R-C	P-R-C		
Karnataka	M.E ratio	2.29	0.79			
	Efficient channel	Hopcoms	Hopcoms			
Tamil Nadu	Crop	Potato	Brinjal	Tapioca		

<b>West Bengal</b>	M.E. ratio	14.33	10.00	21.00
	Efficient channel	P-C	P-C	P-C
	<b>Crop</b>	<b>Tomato</b>	<b>Bhendi</b>	<b>Brinjal</b>
	M.E ratio	0.36	0.58	0.79
	Efficient channel	P-F-W-R-C	P-F-W-R-C	P-F-W-R-C
<b>Manipur</b>	<b>Crop</b>	<b>Tomato</b>	<b>Cabbage</b>	
	M.E. ratio	4.80	17.43	
	Efficient channel	P-R-C	P-C	
<b>Rajasthan</b>	<b>Crop</b>	<b>Tomato</b>	<b>Carrot</b>	
	M.E. ratio	1.09	0.49	
	Efficient channel	P-CA-R-C	P-CA-R-C	

Note: P – Producer, W-Wholesaler, R – Retailers, RL – Reliance, F- Fariah, CA- Commission agent, C- Consumer

### 3.8. Factors Affecting Marketing Efficiency

The marketing efficiency of horticultural commodities was found influenced by several significant parameters as shown in Table 8. In Andhra Pradesh, marketing cost, marketing margin and transport cost negatively influenced and open market price had a positively effect on marketing efficiency. In West Bengal, marketing cost was negatively affecting and open market price positively affecting the marketing efficiency. In Manipur and Mizoram, it was found that marketing cost and transport cost negatively affected and volume of the produce handled positively affected. In

Rajasthan, marketing cost was found significantly negative in influencing marketing efficiency. In Punjab, marketing cost, transport cost, labour charges and marketing margins negatively affected and net price received positively affected the marketing efficiency. The results shows that in most of the commodity cases marketing cost, marketing margin, transport cost, labour charges were found adversely affecting the marketing efficiency and open market price, volume of the produce handled and net price received by the farmer improved the marketing efficiency

**Table 8.** Factors affecting significantly on Market efficiency of Horticultural commodities in Different states.

Factors	Coefficient't' value		Coefficient't' value		Coefficient't' value		Coefficient 't' value		Coefficient't' value	
<b>Andhra Pradesh/ Crop</b>	<b>Potato</b>		<b>Tomato</b>		<b>Baby corn</b>					
Marketing cost X <sub>1</sub>	-0.1467***	3.581	-0.0676***	6.2538	0.0005***	6.553				
Marketing margin X <sub>2</sub>	-0.2385***	38.189	-0.1041***	25.5595	-0.1136***	14.049				
Transport cost X <sub>3</sub>	0.0005	0.467	0.0031**	1.9694	0.0006	65.535				
Open market prices X <sub>4</sub>	0.1218***	27.089	0.0543***	16.9106	0.0831***	8.907				
<b>West Bengal/ Crop</b>	<b>Brinjal</b>		<b>Bhindi</b>		<b>Tomato</b>					
Marketing Cost X <sub>1</sub>	-0.0020	-1.3407	-0.0020	-1.3407	-0.0020	-1.3407				
Open market price X <sub>2</sub>	0.0069**	1.9846	0.0069**	1.9846	0.0069**	1.9846				
<b>Manipur&amp;Mizo/ Crop</b>	<b>Tomato</b>		<b>Cabbage</b>							
Marketing cost X <sub>1</sub>	-1.143***	-4.447	-1.143***	-4.447						
Transport cost X <sub>2</sub>	-0.487*	-1.774	-0.487*	-1.774						
Volume handled X <sub>3</sub>	0.935***	6.841	0.935***	6.841						
<b>Rajasthan/ Crop</b>	<b>Tomato</b>		<b>Carrot</b>							
Marketing cost X <sub>1</sub>	-0.0016***	-3.0663	-0.0023**	-1.70483						
<b>Punjab/ Crop</b>	<b>Potato</b>		<b>Tomato</b>		<b>Green peas</b>		<b>Brinjal</b>		<b>Okra</b>	
Marketing costs X <sub>1</sub>	-0.3703*	0.0102	-0.3814*	0.0088	-0.4467*	0.0103	-0.3274*	0.0175	-0.3752*	0.0132
Transportation costs X <sub>2</sub>	-0.1021*	0.0044	-0.0671*	0.0121	-0.0780*	0.0019	-0.0920*	0.0076	-0.0650*	0.0022
Labour charges X <sub>3</sub>	-0.0609*	0.0118	-0.0607*	0.0098	-0.0325*	0.0059	-0.0655*	0.0096	-0.0465*	0.0027
Marketing margins X <sub>4</sub>	-0.6100*	0.0073	-0.6972*	0.0148	-0.4554*	0.0236	-0.5778*	0.0122	-0.5442*	0.0054
Net price received X <sub>5</sub>	0.9878*	0.0078	1.1036*	0.0549	0.9947*	0.0062	1.1874*	0.0293	1.0095*	0.0165

$R^2$ , obtained varies from 0.68 to 0.91 for all commodities in different states<sup>1</sup> \* = 1% level of significance, \*\* = 5 % level of significance \*\*\*+ 10% level of significance

<sup>1</sup>  $R^2$  is coefficient of multiple determination.



### 3.9. Exports and Competitiveness of Indian Vegetables

The exports trends of Indian vegetables during 1991 to 2000 and 2001 to 2010 are presented in the Table 9. The export value is Rs in Crores, Quantity in 000 tonnes and price in Rs/kg. The trends of fresh vegetables show that its export quantity increased 18.3% and 22.2 % during two periods respectively. During both periods the export growth was high for tomato and potato. Cucumber & gherkin quantity exported was very high during 1881-2000 but its exports declined during 2001-2010. Similarly, the same case with legume vegetables. Contrastingly, Onion and Sharlots exports were high during 2001-2010 and were negative during 1990-2000. The results show that Indian vegetables are tremendous potential for exports.

**Table 9.** Exports trends of Indian vegetables.

		At level		Growth Rate in %	
Vegetables	Items	1991-00	2001-2010	1991-00	2001-2010
Fresh vegetable	value	275.17	1506.26	12.3	17.6
	qnty	19580.5	89445.5	18.3	22.2
Potato	value	9962.1	65260.6	23.6	35.4
	Price	4.5	6.9	5.4	13.2
	qnty	686.8	63227.6	25.6	49.5
Tomato	value	485.7	88386.8	19.9	67.6
	Price	7.1	13.7	-5.8	18.1
	qnty	334398.3	1043744.3	-2.2	12.0
onion& sharlots	value	196575.8	1123821.8	-1.5	22.1
	Price	6.0	10.2	0.7	10.2
	qnty	4524.4	7286.0	1.3	19.2
Garlic	value	4266.7	18315.0	0.3	33.3
	Price	9.6	26.4	-1.0	14.1
Cucumb-er&gherkin	qnty	4791.8	8393.8	74.5	-37.0
	value	7550.1	13446.3	71.1	-34.2
	Price	14.1	18.3	-3.4	2.8
Legume veg	qnty	318.3	2228.7	44.7	-0.3
	value	637.3	6110.5	43.3	1.1
	Price	18.6	29.8	-1.4	1.4

The nominal protection coefficients for competitiveness of Indian vegetables during 1990-91, 2000-01 and 2010-11 are presented in the Table 10. The results show that for all vegetables the NPC is less than 1 indicating they are competitive in the international markets.

**Table 10.** Nominal protection coefficients for Export competitiveness of Indian vegetables.

	TE 1992-93	TE 2000-01	TE 2010-11
Potato	0.8	1.0	0.7
Tomato	0.5	0.3	0.5
Onion	0.3	0.2	0.3
Cucumber & gherkin	1.0	0.9	1.0

## 4. Conclusion

The study has come out with some important conclusions. The study found that area under total vegetables cultivation is grown at the rate of 4.12% and production growth rates was 6.48%. Indian vegetables production depicted glorious past and expected promising future. A typical marketing channel of horticultural crop in the study area involved a number of intermediaries like the pre harvest contractor, commission agent, wholesaler, retailer operating between the producer and the final consumer. The most common marketing channel for majority of the crops is that P-W-R-C. The other channels followed by are P-R-C and P-C. Some of the states like Punjab and Tamil Nadu are practicing the direct-marketing i.e. Producer to Consumer.

In A.P and West Bengal the marketing cost was more than Tamil Nadu, Manipur and Rajasthan. But the marketing cost was too low in Punjab for all crops compare to other states because of direct marketing. In Andhra Pradesh and West Bengal the marketing margin is more for all crops compare to other states. In Andhra Pradesh and West Bengal except tomato the price spread is high compare to Tamil Nadu, Manipur and Rajasthan. And there is no price spread in Punjab because of direct marketing.

The results show that the producer share in consumer rupee was highest in Punjab, Tamil Nadu and Manipur compare to Andhra Pradesh, West Bengal and Rajasthan. It varies from 46% to 74% in A.P, 26% to 60% in West Bengal, 33% to 60% in Rajasthan, 85% to 88% in Manipur 91% to 95% in Tamil Nadu and 100% in Punjab.

The results showed that in most of the commodity cases marketing cost, marketing margin, transport cost, labour charges are adversely affecting marketing efficiency and open market price, volume of the produce handled and net price received are increasing marketing efficiency.

The study clearly showed that majority of the vegetables commodity markets are operating efficiently. The highest marketing efficiency channel was found to be Producer to Consumer. Hence, government policies should promote direct marketing models for horticultural marketing. The trends of fresh vegetables show that its export quantity increased 18.3% and 22.2% during two periods respectively. The results show that Indian vegetables have huge potential for exports. The results show that for all vegetables the NPC is less than 1 indicating they are competitive in the interna-

tional markets. The study suggests that Indian government should give priority to vegetable production, processing and exports.

Strategies to enhance marketing efficiency of marketing of selected commodities can be increased significantly with certain interventions such as 1) up-scaling of the volume of produce handled through technology and institutions. 2) Integration among various markets through better transportation facilities and approach road to reduce the transportation cost. 3) Regular inflow of information to farmers about the prevailing wholesale market prices of commodities. 4) Providing market intelligence support to the farmers particularly on the time to grow certain crops and making availability of suitable seed/variety for crops. 5) Improving basic infrastructure in the market yard. 6) Enforcing government regulation for free and fair marketing practices.

These findings have important implications to be considered in designing agricultural policies and programs to improve farmer-to-market linkages in Asia and East European markets. India is the fruit and vegetable basket of the world. Over 90% of India's exports in fresh products go to West Asia and East European markets. Exports of mangoes, grapes, mushrooms have started going to the United Kingdom, Middle East, Singapore and Hong Kong.

Following macro-economic reforms in the phase of reforms in the globalization, it is expected that the combined effect of the reforms in the domestic policies and international trade reforms would result in a much larger integration of the Indian economy with the rest of the world, and such a scenario would bring about substantial benefits to the Indian farmers. The recent ventures by domestic and foreign players to invest in Indian food retailing and supply chains are an indicator of promoting equitable and efficient agricultural markets.

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