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Comparative production performance of vegetable crops in the country vis-à-vis Eastern India

Nasim Ahmad*, DK Sinha, KM Singh and RR Mishra

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Abstract

The present study was conducted to analyze the comparative production performance of vegetable crops in eastern India and India. In this study compound growth rates of vegetable crops and major vegetables like potato, tomato, onion, brinjal, cabbage, cauliflower, okra and pea were calculated by fitting exponential function to variables like area, production and productivity and tabular analysis was done to arrive at meaningful results. The study was based on macro framed data collected through different published secondary sources like Horticultural statistics of India and Agricultural statistics at a Glance, Ministry of Agriculture and Farmers Welfare, Government of India. The results pointed out positive growth trends in area, production and productivity of vegetable crops in the region and country during the last 16 years. Considering remarkable growth trends, vegetable crops may be taken as pathway for income enhancement of farming communities. Being good sources of healthy dietary requirements, nutritional security of the region in particular and nation in general can be addressed. Some limiting factors like pre and post harvest losses, storage facilities, lack of refrigerated vans and transportation and farmer's friendly marketing facilities restrict arrival of the actual quantity of vegetable to the consumers and in fetching remunerative prices of the produce. Hence, there is a need to improve pre and post harvest technologies, provide suitable transport and marketing facilities. Appropriate policy to tackle the abrupt price fluctuations during good harvest and scarce period is also needed to protect both the producers and the consumers. Shifting Indian farming from rural setup to urban setup and linking cultivators to super markets particularly for vegetables grower will be a key drivers in improving financial conditions of the farming community of country.

Key words: Vegetables, Compound growth rates, Nutritional Security Pre- and post-harvest technologies

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Introduction

Horticultural development had not been priority until recent years in our country. The era of Green Revolution in the country and thereafter, the emphasis was to enhance production and productivity of the food grains. Many schemes related to enhancement of food grains were launched during different five year plans. Horticultural development got attention in the post 1993 period through an enhancement of plan allocation and knowledge based technology. The need for diversification to horticulture sector was acknowledged by the Government of India in mid-eighties by focusing its attention on investment in this sector. National Horticultural Mission was launched in April 2005 as centrally sponsored scheme to promote holistic growth of horticultural 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. Presently horticulture has established its credibility in improving income through increased productivity, generating employment and in enhancing exports. Resultantly, horticulture has come out from rural confines to commercial front. Vegetables are one of the important components of horticulture sector of the Nation in particular and of the agriculture in general. India ranks second in vegetable production and vegetables and fruits accounts for 90% of the total horticultural produce. Various factors have catalyzed the growth in area and production of the vegetable crops in the country. The productivity of vegetable crops has been continuously increasing during the last many years. The factors like urbanization, increasing per capita income, health consciousness, increasing working women and shifting of farmers in growing higher value vegetables due to higher return have increased the annual growth rate of vegetable in India. Favourable income-elasticity of demand has also contributed in rising trend of vegetable production in the country (Choudhary and Kundal 2015, Verma et al. 2016).

In a study conducted in Andhra Pradesh by Reddy et al. (2010) has emphasized the value chain and retailing of fresh vegetables in the present emerging markets. It has been offering greater opportunities to the farmers who are growing vegetables and fruits can reap larger chunk of financial and economic benefits out of the cultivation of fruits and vegetables. The use of hybrid seeds in cultivation of vegetables has a huge impact over the farm incomes of the farmers growing vegetables by adopting commercial hybrid seeds (Sudha et al. 2006). In their study it was observed that use of commercial hybrid seeds resulted tremendous increase in production of Okra and tomato. This has helped the farmers to boost their income up to a great margin. A study on green pea production was carried out by Singla *et al.*, (2006) in Punjab. The results revealed that productivity of green peas was more for small farms than to medium and large farms. Thus, cultivation of green peas helps the small farmers in augmenting their earning. Agriculture is the backbone of Indian economy. The growth of this sector has strong linkage with other sectors and has striking effect on poverty and unemployment (Mohapatra et al. 2017). It has also been pointed out that per capita income in agriculture sector was just one third of the per capita income in the country thereby creating huge income disparity between primary agriculture vis-à-vis other sectors of the economy. The gap has been continuously widened showing alarming unrest among the farming community across the different states (Sarial 2016). As per NSSO 70th round data 53 per cent of farm households earn income lesser than poverty level income and 52 per cent of the farmers were reported under indebtedness. Most of them were marginal farmers and agricultural labourers. There is absence of efficient supply chain and value realization of agricultural produces. The ups and downs in prices during low harvest and good harvest keep the cultivators almost in same income level.

The eastern region of India comprising the states of Bihar, Jharkhand, Odisha and West Bengal is one of the most backward regions (32.10% below poverty line population and maximum number of economically most backward districts (69 out of 150 at national level) of the nation. This region occupies about 21.85 per cent of geographical area and supports 34 per cent of the population of the country. The population density is 1.91 fold higher in Eastern states to national average. Agriculture is the mainstay of economy in this region. The net sown area is 29.17 million hectare with cropping intensity of 150 per cent in the region. The average rainfall varies from 1091 to 2477 mm with an average of 1526 mm in the region which is sufficient to

grow a variety of crops. However, the irrigated area in the eastern region is about 39% as against 45% of the country's average. About 67% of the cultivators belonged to marginal group and over 75% of their earnings are utilized to ensure food security. Eastern India is endowed with natural resources (145.12 BCM annual groundwater availability, groundwater draft is only 36%). Despite the rich natural resources (fertile land, abundant ground water), the pace of agricultural development is very slow (Ahmad et al. 2018). There is lot of scope to accelerate farmer's income by improving productivity and including high value crops like vegetables in cropping pattern of the region (Chand et al. 2008). Horticulture development is currently facing different constraints like poor marketing facilities. The gap between price received by producer and those paid by urban consumers is large, showing thereby inefficient marketing arrangements. Vegetables produced by farmers is collected by market agents, who sell it in organized markets, these markets are unfortunately controlled by a few traders and operate on highly nontransparent ways. The net result is poor realization of income by the farmers.

Many studies at abroad found that as farming shifts from rural lifestyle to an agribusiness sector with a supply chain mentality is the key driver for industrialization of agriculture (Martin 2001). Galanopoulos et al. (2009) found that Mediterranean countries are traditional growers of fruits and vegetables, but are struggling to remain competitive in the global market. In India, area under cultivation of vegetable crops was 10289.84 thousand ha with production of 175007.87 thousand tonnes and in the eastern region of India comprising the states of Bihar, Jharkhand, Odisha and West Bengal the area and production of vegetables stood 3469.28 thousand hectares and 56074.49 thousand tonnes during 2016-17 (Horticultural Statistics at a Glance 2017). The share of area under vegetable crops in eastern India to total area under vegetable crops of the country was computed to be 33.72% with production share of 32.04% during 2016-17. The same documentation has also reflected the wide potentiality of vegetable production and further flourishing on large scale to become a leader on global basis. In the present paper, an attempt has been made to study the comparative trends in area production and productivity of major vegetable crops in India and Eastern India and to find out the annual compound growth rates (CGR) of area, production and productivity of different vegetables in the country as well as in eastern India and to suggest measure to enhance the income of the vegetable growing farmers.

Materials and Methods

In the perspective of specific objective of the present investigation, the time series data from 2001-02 to 2016-17 pertaining to area, production and productivity was obtained from Horticultural Statistics, Govt. of India websites. Compound annual growth rates of area, production and productivity was computed for the period 2001-02 to 2008-09 and 2009-10 to 2016-17 and for overall period 2001-02 to 2016-17 for India and eastern India. The compound growth rate refers to the percentage change of a specific variable within specific period, given certain context. The growth model is given as under:

$$Y_t = AB^t$$

Where, Y_t = area/production/ productivity of vegetables for the year 't'

A = constant

B = growth coefficient

Log transformation of the above equation

$$\log Y_t = \log A + t \log (B)$$

Growth rate (%) = $\{\text{antilog}(b)-1\} \times 100$; Where $b = \log (B)$.

Results and Discussion

The comparative view on area, production and productivity of vegetables in India and Eastern India (Bihar, Jharkhand, Assam, Odisha and West Bengal) has been shown in Table 1. The compound growth rates for these variables for three periods i.e. 2001-02 to 2008-09, 2009-10 to 2016-17 and overall period 2001-02 to 2016-17 is presented in Table 2. The data presented in Table 1 revealed that the production of vegetables in India increased by about 1.96 times and that of eastern India approximately 1.38 times during study period. The increase in production of vegetables was due to increase in area during the investigation. The productivity also enhanced by around 1.20 times in India and 1.13 times with respect to eastern India. Average productivity of the region was found lower than that of the national

average. The reason may be that majority cultivators of this region are poor and could not afford the input costs. The reason may be unavailability better linkage between production centre and marketing centre i.e. infrastructure development and lack of proper marketing facilities.

Compound growth rate: Compound annual growth rate of area depicted significant growth in area at 1.61 percent per annum in the country as well as 1.08 percent per annum in eastern India. The overall growth rates of productivity were found significantly increasing for both India and eastern India. The enhancement in productivity may due to technological changes of production and also due to increasing demand of vegetables from the health awareness during the period under investigation.

Annual compound growth rates of major vegetables grown in the country and Eastern India is presented in Table 3. The results revealed that area of potato increased with significant CAGR of 2.39, 1.05, 1.44 per cent in India and 1.05, 0.81, 0.78 percent in eastern India during different period under study. Production depicted significant growth during 2009-10 to 2016-17 and for overall period (2001-02 to 2016-17 in the country but in eastern India production showed negative trend during 2001-02 to 2008-09 and 2009-10 to 2016-17 but for overall period it was found positive. Productivity for overall period for the country and eastern India was found positive. Compound annual growth rates of area, production and productivity of other vegetables like tomato, onion, cauliflower, cabbage, brinjal, Okra and pea were assessed positive and significant increase for eastern India and country as a whole. In the first period (2001-02 to 2008-09) growth rate of productivity for cabbage was estimated negative in eastern India. The reason may be pest and disease attack during that period. In second period i.e. 2009-10 to 2016-17 annual compound growth rates of the area, production of tomato, productivity of cauliflower, area, production and productivity of brinjal, area of okra and productivity of pea only in eastern India were computed negative. But overall the trends in area, production and productivity were observed increasing in eastern India and India as a whole.

Table 1: Area, production and productivity of vegetables in India and Eastern India, for different triennium during 2001-02 to 2016-17

Period	Area (000ha)		Production (000 tonnes)		Productivity (t/ha)	
	India	Eastern India	India	Eastern India	India	Eastern India
TE-2004	6110.00	2851.13	87257.00	40605.80	14.28	14.24
TE-2007	7179.33	3215.02	109212.67	46464.37	15.21	14.45
TE-2010	7938.00	3323.62	130421.33	52243.87	16.43	15.72
TE-2013	8896.33	3390.48	155022.00	55202.14	17.43	16.28
TE-2017	9979.45	3478.58	171183.34	56078.58	17.15	16.12

Table 2: Compound growth rate of area, production and productivity of vegetables in India and Eastern India (%)

Period	Area		Production		Productivity	
	India	Eastern India	India	Eastern India	India	Eastern India
2001-02 to 2008-09	1.99*	1.32*	2.93*	1.91*	0.93*	0.59**
2009-10 to 2016-17	1.48*	0.37**	1.48*	0.38	0.0003*	0.01
2001-02 to 2016-17	1.61*	0.61*	2.27*	1.08*	0.65*	0.47*

*, ** indicate significant at 1% and 5% of probability level, respectively.

The results pointed out that despite of flourishing urbanization in the country as well as in the region under investigation, the area under production vegetables was observed accelerating for both India and Eastern India. The area under vegetables increased from 6110 thousand hectares during TE-2004 to 9979.45 thousand hectares in TE-2017. Similarly in eastern India it increased from 2851.13 thousand hectares in TE-2004 to 3478.58 thousand hectares in TE-2017. India harvested 171183.34 thousand tonnes of vegetables from 9979.45 thousand area during TE-2017 (Anonymous 2017). This was possible only due to constant research efforts along with new production and protection technologies developed by agricultural scientists. But real credit goes to the farming community who adopted and implemented the technologies to boost up the production of vegetables. Paradoxically the post production facilities as well as marketing and handling system are inadequate in the country and the region under study. Consequently the quantity and quality deteriorate as these are perishable in nature. There is an urgent need to strengthen post harvest technologies especially in case of vegetables in order to minimize the percentage losses.

A study on “Vegetable marketing in the hinterlands of Pusa road and Tajpur in Samastipur district of Bihar (Ahmad et al. 2017) was conducted and was assessed that the loss of vegetables on account of attack from pests and diseases, wastage during transportation, driage etc was studied and it was found that on an average 2.90 quintals of vegetables was lost. Out of that larger proportion (42.85%) was lost from cauliflower closely followed by loss from brinjal (37.71%). Other important contributors were cabbage (5.98%) and Parwal (5.17%). These examples emphasized the urgent requirement of technologies and infrastructure which may reduce the losses and lure cultivators for cultivation of vegetables. In addition there is need to promote contract farming of vegetables which generally bridges the gap by provision of quality inputs, management skills, technical guidance and even financial assistance to the resource poor farmers who can't afford the cost of modern inputs and invest more in cultivation of vegetables.

Policy measures: To boost up the income from vegetables, improvement in post-harvest technologies, availability of cooling van, cold storage at accessible distance and installation of processing industries may prove worthy for vegetable growers. Contract farming may be promoted and farmers may be made aware of its benefits. To revolutionize agri-market by ensuring better price discovery and enable farmers to get improved remuneration (E-NAM) has been launch by the government with the mission ‘One nation One Market’ and The Agricultural Produce and Livestock Marketing Act, 2017 (APLM) has been made for promotion and facilitation of transparent marketing systems. Shifting Indian farming from rural setup to urban setup and linking cultivators to super markets particularly for vegetables grower will be a key drivers in improving financial conditions of the farming community of country. These steps may prove to improve income of the cultivators if strictly implemented in proper manner.

Conclusion

The present investigation has analyzed the trends in area production and productivity of vegetables in India as well as in eastern India. The overall finding suggested that area, production and productivity of the vegetables have increased at national level and also in eastern India over the time. Despite of such large enhancement in area, production and productivity of vegetables, post harvest handling and marketing facilities are inadequate and lack of systematic marketing system induce discouragement in vegetable growers. They are unable to fetch actual profit of their produce. Hence, there is an urgent need to address these lacking so that vegetables grower pay more attention towards better cultivation of vegetables as well as they may get proper income.

सारांश

वर्तमान अध्ययन पूर्वी भारत और भारत में सब्जियों की खेती में हो रहे तुलनात्मक विस्तार के विश्लेषण पर आधारित है। इस अध्ययन में मुख्य सब्जियाँ जैसे आलू, टमाटर, प्याज, बैंगन, पत्ता गोभी, फूल गोभी, भिण्डी और मटर आदि के क्षेत्र, उत्पादन एवं उत्पादकता के चक्रवृद्धि वृद्धि दर के घातांक प्राकार्य का उपयोग कर एवं तालिका

Table 3: Compound growth rates of major vegetables grown in India and Eastern India from 2001-02 to 2016-17

Period	India			Eastern India		
	2001-02 to 2008-09	2009-10 to 2016-17	2001-02 to 2016-17	2001-02 to 2008-09	2009-10 to 2016-17	2001-02 to 2016-17
Potato						
Area	2.39*	1.05*	1.44*	1.05*	0.81*	0.78*
Production	1.13	1.20**	3.08**	-0.80	-0.51	1.15*
Productivity	-1.23	0.15	1.62	-1.83*	-1.31**	0.37
Tomato						
Area	1.72*	1.71***	1.78*	1.15**	-0.18	0.46*
Production	2.65*	3.40*	2.94*	2.05*	-0.17*	1.08*
Productivity	0.92*	1.66*	1.14*	0.89**	0.01	0.61*
Onion						
Area	4.25*	2.37**	3.08*	3.34*	1.12*	1.56*
Production	7.76*	2.97*	4.39*	6.81*	1.67*	3.02*
Productivity	3.37*	0.59	1.27*	3.36*	0.55**	1.43*
Cauliflower						
Area	1.76**	1.26*	1.80*	0.81*	0.16	0.53*
Production	2.01*	1.50*	2.02*	0.90*	0.06	0.68*
Productivity	0.25	0.23	0.22*	0.08	-0.10	0.15**
Cabbage						
Area	0.90	0.87**	1.73*	0.58*	0.37**	0.91*
Production	0.89***	1.12*	1.77*	0.50	0.44**	1.00*
Productivity	-0.01	0.24	0.04	-0.09	0.07	0.08
Brinjal						
Area	1.09*	0.17	1.07*	0.50*	-0.11	0.26*
Production	1.50*	0.77	1.61*	1.06*	-0.13	0.59*
Productivity	0.41**	0.60*	0.54*	0.56*	-0.01	0.33*
Okra						
Area	1.58*	0.46	1.49*	0.40*	-0.04	0.25*
Production	2.03*	0.61	2.13*	0.94*	0.06	0.65*
Productivity	0.45**	0.15	0.63*	0.55*	0.09	0.39*
Pea						
Area	0.46	2.30*	1.67*	-0.79***	1.76**	0.61**
Production	2.25*	2.89*	2.93*	1.27	0.10	1.75*
Productivity	1.79**	0.57	1.24*	2.08	-1.63**	1.14*

*, ** and *** indicate significant at 1% , 5% and 10% of probability level, respectively.

विश्लेषण कर किया गया है। यह अध्ययन सहायक आंकड़ा, जो सरकार द्वारा प्रकाशित विभिन्न स्रोतों से एकत्र कर किया गया है जैसे— हॉर्टिकल्चरल स्टेटिस्टिक्स, एग्रीकल्चरल स्टेटिस्टिक्स जो भारत सरकार के कृषि एवं किसान कल्याण मंत्रालय द्वारा प्रकाशित किया जाता है के 1 वर्षों के आंकड़ों को विश्लेषण कर मुख्य सब्जियों के क्षेत्र, उत्पादन और उत्पादकता में आ रहे परिवर्तन को जानने की कोशिश की गई है। परिणामतः इन सब्जियों के क्षेत्र, उत्पादन और उत्पादन में हो रहे सकारात्मक वृद्धि को दर्शाता है जिससे पूर्वी भारत और भारत के किसानों की आमदनी को बढ़ाने में एक सकारात्मक कदम के रूप में अपनाया जा सकता है। सब्जियाँ स्वास्थ्यवर्धक भोजन का एक मुख्य स्रोत है जो पूर्वी भारत एवं भारत के कुपोषण को कम करने में भी मददगार साबित हो रही हैं। इन सब्जियों के कटाई उपरान्त नुकसान, रख-रखावों के उचित प्रबंधन प्रशीतित वैन, अच्छी यातायात सुविधा और सुविधाजनक बाजार प्रदान कर किसानों की आमदनी को बेहतर किया जा सकता है। कीमतों के उतार-चढ़ावों को नियंत्रित कर कृषकों एवं उपभोगकर्ताओं को हो रही नुकसानों को बचाया जा सकता है। इसके लिये सरकार को उचित नीतियों को

लाना होगा ताकि कृषि को ग्रामीण परिवेश से लाभदायक सुपर मार्केट के परिवेश में लाया जा सके। यह नीति कृषकों के वित्तीय स्थिति को सुदृढ़ करने में एक अच्छी पहल हो सकती है।

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