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Production, Export and Post-harvest Management of vegetables in India

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ABSTRACT

The present study thoroughly reviews the production, export and post -harvest management of vegetables in India. The design of the study was based on the secondary data during the period of 2017-18.The results revealed that the growth in area, production and productivity of total vegetables during the year 1991-2018 was (3.04%), (4.60 %) and (1.45%) respectively. India is the second largest producer of vegetables in the world withits share in world production of about 10.8 percent. The percent share of India in the total world production of vegetables was highest in case of Okra i.e. 66.3 percent followed by brinjal (27%), onion (21.5%), potato (12%),cabbages and other brassicas (12.5%) and tomato (11.1%). Uttar Pradesh, West Bengal and Madhya Pradesh are the leading vegetable producing states of India. Nepal, Bangladesh, Sri Lanka, United Arab Emirates, Malaysia and U.K. are the major export destinations for Indian vegetables.Nepal receives bulk of India's exports of cauliflower (80%), potato (77%) and peas (75%). Onion continued to be the dominant exporting crop among Indian vegetables. India is facing rejections and bans due to the presence of higher than approved levels of chemical residues, pest and bacterial infestation in the exported vegetables such as Okra and Brinjal. Tomato was observed to incur the highest degree of post-harvest loss i.e. 12.44 percent during farm operations (sorting/grading and transportation) as well as in storage. Major focus should be emphasized on post-harvest management practices including better handling of produce and development of processing and cold-chain infrastructure.

Key words: vegetables, post- harvest management, processing, cold-chain, India

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INTRODUCTION

Vegetables play an important role in Indian agriculture by providing food, nutritional and economic security to the people. Vegetables being a rich and cheap source of vitamins and minerals, occupy an important place in the food basket. Besides that, vegetables have higher productivity and shorter maturity cycle, which leads to higher returns per unit of area and time. The productivity of vegetables in India has been showing rising trend for the past years. All this has been happening because of the factors like shifting of farmers in growing higher value vegetables due to higher returns and increasing annual growth rate of vegetables in India, increasing per capita income, urbanization, increasing health consciousness, increasing working women. Favorable income-elasticity of demand has also helped towards the increasing trend of vegetables production in India. The area, production and yield of vegetables in the world have grown tremendously over the years. At the global level, vegetables occupy an area of 61.22 million hectares with an annual production of 1169.45 million tonnes [3]. The production of vegetables has also increased to 178 million tons in 2016-17, which is about 5 per cent higher than the production during 2015-16. With projected population of 1.33 billion in 2020, 1.46 billion in 2030, 1.57 billion in 2040 and 1.65 billion in 2050, the country has to produce 190, 210, 225 and 240 million tonnes

of vegetables by the respective years [1] The positive growth in vegetable production will lead to significant emergence of processing and export sector thereby generating additional on farm and off farm employment opportunities in the country.

Table1: India's position in World Agriculture (2014)

Vegetables	Production of vegetables (in million tonnes)				
	World's production	India's production	% Share	Rank	Next to
Potato	382	46	12.0	Second	China
Tomato	171	19	11.1	Second	China
Onion	88	19	21.5	Second	China
Cabbages and other Brassicas	72	9	12.5	Second	China
Brinjal	50	13.5	27.0	Second	China
Cauliflower and Broccoli	24	8.5	35.2	Second	China
Okra	9.5	6.3	66.3	First	
Total Vegetables	1169	127	10.8	Second	China
Source: Horticulture Statistics at a Glance (2017)					

India is the second largest producer of vegetables and its share in world production is about 10.8 per cent. The per cent share of India in the total world production of vegetables was highest in case of Okra i.e. 66.3 per cent followed by potato (12%), tomato (11.1%), onion (21.5%), cabbages and other brassicas (12.5%), brinjal (27%), cauliflower and other brassicas (12.5%).

Table 2:Area, Production and Productivity of total Vegetables in India, (1991-92 to 2017- 18)

Year	Area (In ' 000 Hectare)	Production (In ' 000 MT)	Productivity (In MT/Hectare)
1991-1992	5.593	58.532	11
1995-1996	5.335	71.594	13
2001-2002	6.156	88.622	14
2005-2006	7.047	110.270	16
2010-2011	8.495	146.555	17
2011-2012	8.990	156.326	17
2012-2013	9.205	162.187	18
2013-2014	9.396	162.897	17
2014-2015	9.542	169.478	18
2015-2016	10.106	169.064	17
2016-2017	10.238	178.172	17
2017-2018	10.147	182.034	18
CAGR (%) (1991-92 to 2000-2001)	2.14	5.24	2.58
CAGR (%) (2001-2002- to 2010- 2011)	4.01	6.27	2.17
CAGR (%) (2011-2012 to 2017-2018)	2.34	2.46	0.20
Overall CAGR (%) (1991-92 to 2017-18)	3.04	4.60	1.45
Source:Indiastat.com			

Table 2 shows that the statistics regarding area, production and productivity of vegetables from the year 1991 to the year 2018.Table 2 represents that there has been a rising trend in terms of area (000'Ha), production (000'MT) and productivity (MT/ Ha) of vegetables in India in the continuous period of 1991-2018. In the year 1991-92 the area, production and productivity of vegetables in India was 5593MT/ha, 58532 MT/ha and 11MT/ha respectively. In the year 2017-18, the area, production and productivity of vegetables in

India was 10147MT/Ha, 182034MTand 18MT/ha, respectively. The compound annual growth rate of area, production and productivity under vegetables during the period 1991-92 to 2000-2001 was found to be 2.14 per cent, 5.24 per cent and 2.58 per cent while during theperiod of 2001-2002 to 2010-2011, it was 4.01 per cent, 6.27 per cent and 2.17 per cent. The CAGR of area, production and productivity under vegetables during the period 2011-2012 to 2017-2018 was found to be 2.34 per cent, 2.46 per cent and 0.20 per cent, respectively. Therefore, the overall CAGR of area, production and productivity for the selected time period of 27 years (1991-92 to 2017-18) was 3.04 per cent, 4.60 per cent and 1.45 per cent, respectively.

Figure 1: Leading vegetable producing states of India during 1991-92 and 2016-17.

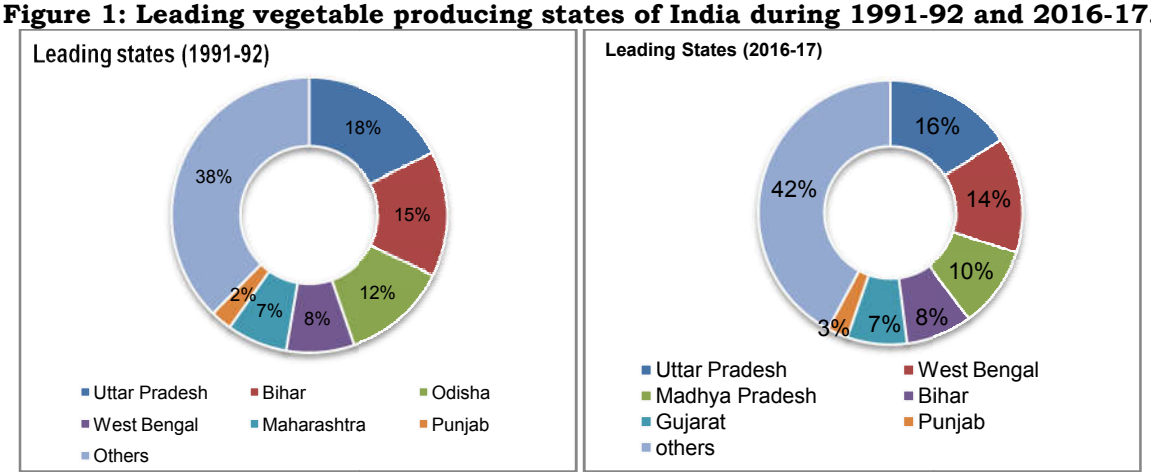

Figure 1 shows the comparison between the leading vegetable producing states in the year 1990's and 2000's. Uttar Pradesh happens to be the leading vegetable producing state during both the years under consideration contributing 18 and 16 per cent, respectively to the India's total production.

Table 3:Crop wise area and production of major vegetables in India (2016-17)

Vegetables	Area('000 HA)	% Share in area	Production('000 MT)	% Share in Production
Potato	2.164	21.03	46.546	26.60
Onion	1.27	12.34	21.564	12.32
Tomato	0.809	7.86	19.697	11.25
Brinjal	0.669	6.50	12.4	7.09
Peas	0.542	5.27	5.452	3.12
Okra	0.528	5.13	6.146	3.51
Cabbage	0.407	3.96	8.971	5.13
Cauliflower	0.452	4.39	8.499	4.86
.Others	3.449	33.52	45.733	26.13
Total vegetables	10.29	100.00	175.008	100.00
Source:Horticulture Statistics at a Glance (2017)				

Table 3 depicted that the potato, onion, tomato, brinjal, peas, okra, cabbage and cauliflower are the major vegetables that are produced in significant values. In terms of area, potato occupies the first position accounting for 21.03 per cent of total area under vegetables in the year 2016-17 followed by onion (12.34%), tomato (7.86%), brinjal (6.50%), peas (5.27%), okra (5.13%) and others and in terms of production, potato was again found to be the dominating vegetable crop with a share of about 26.60 per cent followed by other vegetables.

Table 4:State-wise area and production of major vegetables in India (2016-17)

Major Vegetables	Total area (MT)	Total production (MT)	Total Productivity (MT/Ha)	Highest contributing state in area (%)	Highest contributing state in production (%)	State with highest productivity (MT/Ha)
Potato	2164.05	46545.6	31.58	Uttar Pradesh (28.2)	Uttar Pradesh (29.9)	Gujarat (31.58)
Onion	1270	21563.9	27.09	Maharashtra (37.1)	Maharashtra (31.4)	Madhya Pradesh (27.09)
Tomato	808.5	19696.9	37.86	Madhya Pradesh (12.3)	Madhya Pradesh (15.8)	Andhra Pradesh (37.86)
Brinjal	668.7	12399.9	21.48	West Bengal (24.4)	West Bengal (24.3)	Punjab (21.48)
Peas	545.89	5451.62	22.27	Uttar Pradesh (40.29)	Uttar Pradesh (45.79)	Jharkhand (22.27)
Okra	528.4	6146	13.76	West Bengal (14.6)	West Bengal (14.9)	Jharkhand (13.76)
Cabbage	406.9	8970.5	28.7	West Bengal (19.4)	West Bengal (25.3)	West Bengal (28.7)
Cauliflower	452.1	8498.8	25.6	West Bengal (16.4)	West Bengal (22.3)	West Bengal (25.6)

Source: Horticulture Statistics at a Glance (2017)

Table 4 highlights the highest contributing Indian states in terms of area, production and productivity towards that of the national pool of major vegetables during 2016-17. Uttar Pradesh is the state which was found to be the highest in total area and production of potato, but in case of productivity, Gujarat was the leading state because of better quality of soil. Major tomato producing states were Madhya Pradesh, Karnataka and Telangana out of which Madhya Pradesh was the major leading state in case of area and production of tomato i.e. 12.3 per cent and 15.8 per cent respectively. The productivity is higher in the state of Andhra Pradesh i.e. 37.86 MT/Ha due to the cultivation of Madanapalle variety of tomato as this variety has prolonged shelf life. The major cauliflower producing states were West Bengal, Bihar, Madhya Pradesh and Haryana out of which West Bengal was the major contributing state in case of all the three parameters i.e. per cent share in area (74.2%) and production (22.3%) and productivity (25.6%). Major onion producing state during the year 2016-17 was found to be Maharashtra in terms of per cent share in area and production contributing 37.1 % and 31.4 %, respectively, but in the case of productivity, Madhya Pradesh turns out to be the leading state. The leading states in the case of per cent share in area and production for other vegetables like okra, brinjal, cabbage and peas are Uttar Pradesh and West Bengal. But in terms of productivity Jharkhand and west Bengal are the leading states.

Table 5: Country-wise export scenario of vegetables from India (2016-17)

Major vegetables	Highest importer from India	Qty.(in MT) % share	Value(in MT) %share
Potato	Nepal	298739.1 (77.7)	47225.2 (73.7)
Tomato	Pakistan	190739.7 (71.4)	36845.5 (67.2)
Cauliflower	Nepal	1108.3 (80.1)	119.4 (51.2)
Onion	Bangladesh	847023.9 (38.8)	97611.2 (35.3)
Cabbage	Malaysia	149.0 (50.00)	192 (43.3)
Peas	United Kingdom	163.7 (15.2)	251.6 (44.3)

Source: APEDA
Figures in parentheses shows % share in total

Table 5 shows that, among vegetables, the major export destinations for Indian vegetables were found to be Nepal, Bangladesh, Sri Lanka, United Arab Emirates, Malaysia and U.K. are the major export destinations for Indian vegetables. Nepal imports bulks of cauliflower and potatoes. Other major exporting countries for India for fresh vegetables are Malaysia, Saudi Arabia and Netherlands.

Table 6: Post-harvest losses of major vegetable crops (2014-15)

Vegetables	Production (in million tons)	Overall total loss (%)	Monetary value of the total loss (Rs. Crore)
Onion	16.66	8.20	2312
Tomato	17.85	12.44	3666
Cabbage	8.53	9.37	874
Cauliflower	7.79	9.56	1214
Green pea	3.87	7.45	971
Potato	41.09	7.32	5008
Source: CIPHET REPORT			

Table 6 inferred that overall total loss was highest in case of tomato i.e. 12.44 per cent and the monetary value of the losses incurred was approximately Rs. 3666 crores. Potato, Tomato and Onion are the top three vegetables suffer the highest loss in terms of monetary value.

Table 7: Post- harvest handling operations of major vegetable crops at national level

Vegetables	harvesting	Sorting /grading	Packaging	transportation	Total losses in storage	Overall total losses (%)
Cabbage	1.1	1.6	0.3	1.3	2.56	9.37
Cauliflower	0.8	1.7	0.2	1.9	2.00	9.56
Green pea	3.5	3.3	0.2	0.5	1.73	7.45
Onion	2.7	1.6	0.1	0.4	2.16	8.20
Potato	3.2	2.2	0.1	0.5	0.78	7.32
Tomato	1.7	3.2	0.8	3.1	3.03	12.44
Source: CIPHET REPORT						

Table 7 concludes that the assessment of losses in vegetables were carried out by selecting vegetables like cabbage, cauliflower, green pea, onion, potato and tomato. For the cabbage crop, the farm operation losses were mainly attributed to sorting, harvesting, and transport operations i.e. 1.6 per cent, 1.1 per cent, and 1.3 per cent and the storage losses was 2.56 per center national level. The overall total losses were found out to be 9.37 per cent, respectively. Due to the glut in the market, price of vegetables face downfall and many times farmers leave the cabbage in the field to rot and decay rather than harvest and sell them as they are unable to meet their working cost. For cauliflower, overall total losses at national level were estimated to be 9.56 per cent, farm operations losses were found to be 4.8 per cent and the farm operations losses of cauliflower were mainly attributed to transportation and sorting i.e. 1.9 per cent and 1.7 per cent. Transportation losses could be reduced by better road conditions. For green peas, overall total losses were found to be 7.45 per cent at the national level and the total farm operation losses were 8.6 per cent. Harvesting and sorting operations were the main losses accounting to 3.5 per cent and 3.3 per cent, respectively. The total losses during storage were 1.73 per cent. The losses in green pea are mainly due to the breakage of stem during harvest and immature pods. The per cent losses in potato at national level during farm operations were found to be 5.2 per cent, harvesting and sorting operations contributed more towards losses and the total losses during storage of potato were 2.16 per cent. Overall major losses estimated in tomato crop were found to be 12.44 per cent. The harvest and post harvest losses of vegetables varied between 4.58 to 12.44 per cent.

Current issues regarding production, export and losses of vegetables in India.

a) **Toxicity is the bane for our food exports:** Indian exports of vegetables such as Okra, Brinjal, and Chilies are facing rejections and bans in markets of US, Vietnam, EU, Saudi Arabia, Japan and Bhutan for issues like the presence of higher than approved

levels of chemical residues, pest and bacterial infestation. Between 1st April, 2005 and 31st May, 2017, Indian exports faced more border rejections compared to exports from Brazil and the number of border rejections in proportion to the notifications is highest in India. Indian exports faced 1324 interceptions as compared to 452 for Brazil, 602 for China, 114 for Turkey and 922 for Vietnam. Destruction of consignments was highest in case of India [8].

b) Spurt in pesticide residues in vegetables: A report by the agriculture ministry showed that there has been an almost two fold increase in the number of samples having pesticides above the permitted maximum residue level (MRL) in vegetables. The major culprits were green chili, cauliflower, cabbage, brinjal, okra, tomato and capsicum [9].

c) Poor cold chain infrastructure: The study highlighted that the shortage of inadequate infrastructure, lack of trained personnel, outdated technology and inconsistent power supply are the major obstacles in growth of cold chain infrastructure in India. This poor cold chain infrastructure leads to wastage of fresh produce [9].

CONCLUSION

To achieve the required growth rate in the vegetable yield, use of integrated nutrients and pest management along with good quality seed/ planting material is necessary, in order to feed the rising population. Modern storage infrastructure having tier system of storage for proper air circulation, which could maintain temperature and humidity should be developed. Farmers should be encouraged for the adoption of appropriate post-harvest management technologies for maximizing their returns. Unlike the developed countries of Brazil and USA where in the processing of fruits and vegetables are up to an extent of 70% and 65%, respectively; in our country less than 2 per cent of the horticultural produce undergoes processing. A major boost to the processing activities and industries is the need of the hour to keep in check the huge losses incurred both in terms of volume and value.

REFERENCES

1. Anonymous (2013). Vision 2050, Indian Institute of Vegetable Research, Indian Council of Agricultural Research, New Delhi.
2. Anonymous (2017). Horticultural Statistics at a Glance, Ministry of Agriculture and farmers welfare, Government of India, New Delhi.
3. FAOSTAT (2017)
4. Indiastat.com
5. APEDA.gov.in
6. CIPHET REPORT (2015). Report on assessment of quantitative harvest and post harvest losses of major crops and commodities in India. Ministry of food processing and industries, Government of India, New Delhi.
7. Mukherjee A, Kapoor A, Goyal T (2017). Toxicity is the bane for our food exports. ICRIER(Indian council for research on international economic relations. The Hindu.
8. Times of India (2015) Spurt in pesticide residues in vegetables.
9. Times of India (2017) Poor cold chain infrastructure.