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Vegetable production: A probable pathway for healthy nation and doubling farmers' income

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ABSTRACT

Indian economy is an agrarian economy. During the last 50 years India has achieved self-sufficiency in foodgrains production. The contribution of farming community is appreciable for achieving this giant goal. But the country is still lagging in combating agrarian crisis and nutritional insecurity. Unexpectedly low returns from agriculture on account of either occurrence of natural calamities or low farmer's share in consumer's price are compelling them to commit suicide. Variation of prices of vegetables and other horticultural prices affect the farmers' income and also have impact on consumers' pocket. Realizing these facts, the government has initiated steps to enhance the income of the cultivators. Operation Greens and Operation Blue are steps to provide sustainable prices and to stop the wastage of vegetables of the farmers and also to address the nutritional requirement of malnourished population of the country. If implemented in proper ways, it may help in augmenting the cultivators' income and may save consumers from price variations.

Key words: Agrarian crisis, Horticulture, Operation Blue, Operation Green, Vegetables

Indian economy largely depends on Agriculture. It has witnessed many changes during the last fifty years. Productivity of crops increased due to technological changes and use of high yielding varieties during green revolution and made the country self-sufficient in many foodgrains. Yet, for all of the increase in production, food losses have also increased, and a majority of farmers are still facing poverty. In a developing country like India, two-thirds of expenditure of a large population goes to meet their daily food requirements. Majority of population is dependent on agriculture for their livelihood. During the last 50 years since adoption of Green Revolution, India's food production increased by about 4 times and population by 2.55 times, resulting in 45 per cent increase in per person increase in food production. Farmers have played decisive role not only in making India self-sufficient in food production but also in exporting foodgrains to other countries. In spite of these favourable situations the socio-economic conditions of Indian farmers are reportedly in shambles today (Anonymous 2017). Poor income from farming resulted in increased indebtedness, which in turns, led to widespread suicides of farmers across the nation. The fluctuation in farm income is causing detrimental effect on the interest of the farming community and forcing more and more cultivators to quit farming. This can cause serious adverse impact on the future of agriculture in the country (Mohapatra *et al.*, 2017).

Realizing the need to pay special attention to the plight of cultivators, Government of India changed the name of Ministry of Agriculture to Ministry of Agriculture and Farmers' Welfare in 2015. It is apparent that income earned by farmers

from agriculture is crucial to address agrarian distress and promote farmers' welfare. Keeping this in view the central government set a target to double the income of farming community by 2022-23 and to bridge the gaps in income of those working in farm sector and those working in non-farm sector (Chand, 2016). Successes of different revolutions and operations in agricultural and allied sectors motivated the government to launch another operation *i.e.*, 'Operation Greens' in the year 2018. The main idea behind Operation Greens is to double the income of farmers by the end of 2022. Operation is essentially a price fixation scheme that aims to ensure farmers are given the right price for their produce. One of the focus points of this operation is to reduce price volatility in vegetable crops, thereby helping farmers to augment incomes on a sustainable basis. It also aims to provide vegetables to consumers at affordable prices. It will need to avert situations wherein farmers have been forced to dump potatoes and tomatoes on roads. Also, checking the prices from going through the roof compelled the government to ban exports. Government's priority to keep the cultivator on TOP is referred to as stabilize the prices of T-tomatoes, O-onions and P-potatoes and to augment income of farmers and to avert situations like dumping potatoes and tomatoes on roads.

Fruit and vegetables are important components of a healthy diet, and their sufficient daily consumption could help prevent major diseases, such as cardiovascular diseases and certain cancers. Approximately, 16.0 million (1.0%) disability and 1.7 million (2.8%) of deaths worldwide are attributable to low fruit and vegetable consumption. Moreover, insufficient

intake of fruit and vegetables is estimated to cause around 14% of gastrointestinal cancer deaths, about 11% of ischaemic heart disease deaths and about 9% of stroke deaths globally.

A recently published report (WHO/FAO, 2003) recommends a minimum of 400 g of fruit and vegetables per day (excluding potatoes and other starchy tubers) for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity, as well as for the prevention and alleviation of several micronutrient deficiencies, especially in less developed countries. India is the second largest producer of vegetables in the world with about 180 MMT after China. China produces four times more vegetables than India. A structural break in India's vegetable production around 2003-2004 can be seen in the graph. Although, it was not as revolutionary as the Green Revolution in wheat, or the White Revolution in milk, yields of potatoes, onions and tomatoes which constitute almost half of the country's vegetable production have shown an appreciable growth. The production of potato boosted up from 28 MMT to 49 MMT while onion yields went up from 6.3 MMT to 21 MMT and tomato production increased from 8.1 MMT to 22 MMT during 2003-2004 and 2017-2018.

However, the problem with these commodities is that their prices collapse when their production rises sharply. This is because the country lacks modern storage facilities and the links between processing and organized retailing are very weak. As a result, farmers often end up receiving less than a fourth of what consumers pay in major cities. Operation Greens needs to ensure that farmers receive at least 60% of what consumers pay. In the case of milk, the producers get more than 75% of what consumers pay. The basic principles of Operation Flood would be useful to adopt Operation Greens as well (Gulati and Saini, 2016). In this investigation an attempt has been made to explore the full potentiality of Operation Greens in augmenting income of the farmers.

MATERIALS AND METHODS

The study is based on secondary data obtained from Horticulture at a Glance, Horticulture Statistics Division, Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India from 2001-02 to 2016-17. Simple tabular analysis and compound growth rates (CGR) were computed for area, production and productivity of total vegetables, potato, onion and tomato for the period under study. Price fluctuations were analyzed for potato, tomato and onion crops.

RESULTS AND DISCUSSION

Production performance of vegetables in India

Apart from the health improvements, the production of vegetables improves the economy of a country as these are very good source of income and employment. The contribution of vegetables remains highest (59–61%) in horticulture crop productions over the last five years (Anonymous, 2017). The

performance of vegetable in the country is shown in Table 1. Area, production and productivity of vegetables were observed increasing over time. The compound growth rates were computed at 1.61%, 2.27% and 0.65% annum⁻¹ for area, production and productivity of vegetables, respectively. This growth may be due to higher return from vegetable crops as compared to traditional cultivation of foodgrains. Health consciousness among people has enhanced the demand for vegetables and that may be another reason for growth of vegetables in the country.

Table 1. Area, production and productivity of vegetables in India for different triennium and compound growth rates

| Period | Area (000 ha) | Production (000 tonnes) | Productivity (t ha ⁻¹) |
|---|------------------|----------------------------|---------------------------------------|
| TE-2004 | 6110 | 87257 | 14.28 |
| TE-2012 | 8490 | 145539 | 17.14 |
| TE-2017 | 9979 | 171183 | 17.15 |
| Compound growth rate from 2001-02 to 2016-17 | 1.61 | 2.27 | 0.65 |

In vegetable crops, major shares of area are under three vegetables potato, tomato and onion. The collective share of these crops in total vegetable area of the nation was computed to be 41.23% during 2016-17. Potato is cultivated in 21.03%, tomato in 7.86% and onion in 12.34% of total area under vegetables in the country. The area, production and yield of these crops for different periods along with compound growth rates of area, production and productivity of these crops from 2001-02 to 2016-17 are shown in Table 2 to Table 4.

Table 2. Area, production and productivity of potato in India for different triennium and compound growth rates

| Period | Area (000 ha) | Production (000 tonnes) | Productivity (t ha ⁻¹) |
|---|------------------|----------------------------|---------------------------------------|
| TE-2004 | 1360.7 | 25181.0 | 18.51 |
| TE-2012 | 1868.3 | 40133.0 | 21.48 |
| TE-2017 | 2119.0 | 45990.7 | 21.70 |
| Compound growth rate from 2001-02 to 2016-17 | 1.44 | 2.11 | 0.66 |

In all these three crops, it was observed that area, production and productivity increased over time. The compound growth rates were also found positive for all the vegetables under investigation. The increase in area, production and productivity of potato could be partly due to shift in consumption pattern from traditional crops to high value crops and partly due to realization on the part of consumer's consciousness that vegetables are good for health (WHO, 2002).

Table 3. Area, production and productivity of tomato in India for different triennium and compound growth rates

| Period | Area (000 ha) | Production (000 tonnes) | Productivity (t ha ⁻¹) |
|---|------------------|----------------------------|---------------------------------------|
| TE-2004 | 480.00 | 7735.00 | 16.11 |
| TE-2012 | 802.00 | 15870.67 | 19.79 |
| TE-2017 | 783.33 | 18271.33 | 23.33 |
| Compound growth rate from 2001-02 to 2016-17 | 2.19 | 3.25 | 1.03 |

Table 4. Area, production and productivity of onion in India for different triennium and compound growth rates

| Period | Area (000 ha) | Production (000 tonnes) | Productivity (t ha ⁻¹) |
|---|------------------|----------------------------|---------------------------------------|
| TE-2004 | 491.67 | 5243.33 | 10.66 |
| TE-2012 | 969.00 | 14929.33 | 15.41 |
| TE-2017 | 1254.33 | 20474.00 | 16.32 |
| Compound growth rate from 2001-02 to 2016-17 | 2.96 | 4.51 | 1.51 |

A part from larger intake of vegetables for a healthy life-style, concern for ecology also has been attracting attention of people for growing vegetables. Roughly 30% of global warming is attributed to society's greenhouse gas emission which stems from production of foods and beverages. One half of this comes from production, consumption and distribution of meat according to the annual report of American Association for Advancement in Science (Fischer, 2009).

Price volatility of vegetables

Prices of Agricultural commodities fluctuate in accordance with their supply and demand situation which, in turn is characterized by seasonality of production and marketing. Vegetables are produced seasonally and are highly perishable in nature. Due to these characteristics, such commodities register fluctuation in prices from month to month. These fluctuations ultimately affect the returns to the growers. The monthly trends in average wholesale prices for onion, potato and tomato are presented in Fig.1 to Fig. 3.

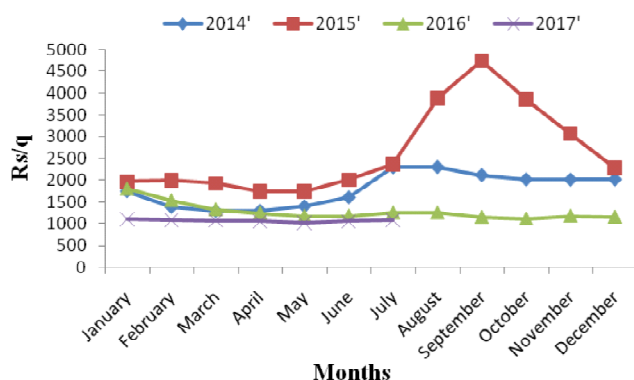


Fig. 1: Monthly wholesale prices of Onion in India

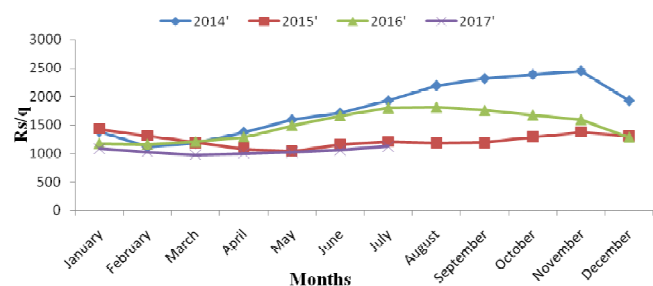


Fig. 2: Monthly average wholesale prices of potato in India

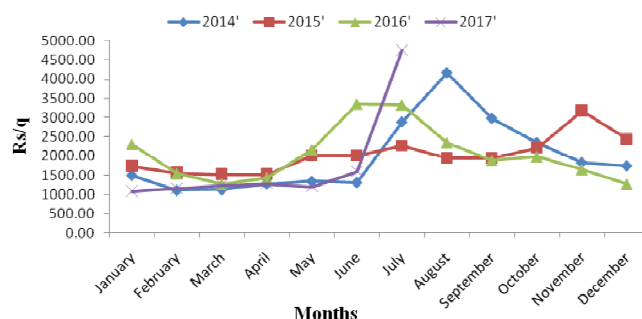


Fig. 3: Average monthly wholesale prices of tomato in India

Perusal of these figures depicted the ups and downs in the wholesale prices of the vegetables under study. Saving farmers from variations in prices and providing consumers affordable prices of vegetables was a big concern of the government. Variations in prices of agricultural commodities (especially onion) have thrown the erstwhile government out of power in the recent past. Keeping this in view the central government has initiated the steps of Operation Greens and Operation Blue for horticultural crops. If implemented in proper ways, these steps may prove not only significant contributors in enhancing farmers' income but also protect the consumer from ups and downs of prices of vegetables and other horticultural produces.

Share of Vegetables to total horticultural crops

Share of vegetables in total horticultural crops are presented in Table 5 for the last five years (2010-11 to 2015-16). Apart from health improvements, production of vegetables improve economy of a country as these are very good source of income and employment. The vegetables contributed highest (59-61%) among all the horticultural crops grown in the country. Thus, vegetables may prove worthy of income enhancement of the farming community if proper infrastructure is provided to link growing centre to marketing places.

Table 5. Percentage share of vegetables in total horticultural crops

| Year | Share (%) vegetables in horticultural crops |
|---------|---|
| 2010-11 | 61.00 |
| 2011-12 | 60.80 |
| 2012-13 | 60.30 |
| 2013-14 | 58.70 |
| 2014-15 | 60.30 |
| 2015-16 | 58.80 |

Source: Horticultural Statistics of India

Table 6. Per capita availability of vegetables in India

| | |
|---|----------|
| Projected population of India in 2016-17 (million) | 1268 |
| Vegetables production in 2016-17 (thousand tonnes) | 175007.9 |
| Per capita availability of vegetables (g person ⁻¹ day ⁻¹) | 378.13 |

Source: Population Projections for India and States, 2001-2026 Report, Office of Registrar General of India (RGI), May 2006

Per capita availability of vegetables

Per capita availability of vegetables as revealed from Table 6 indicated that the country is now in a position to provide more than recommended quantity (300 g vegetable day⁻¹ person⁻¹).

¹) vegetables to people. Despite increase in production of food grains, vegetables and other agricultural commodities, the population of malnourished children under 5 years of age in the country was reported 35.7% underweight 38.4% stunted and 58.4% anaemic and women (age 15-49) were found underweight (22.9%) and anaemic (53%) thereby depicting flaws in proper implementation of government policies.

Production and demand

The production and annual demand of the vegetables under investigation is presented in Table 7. During last five years' production of these commodities were observed more than that of their annual demand, thereby, indicating that India would not be dependent on import for agricultural commodities. The only need of the hour is proper implementation of government policies to ensure remunerative prices/higher returns to the farming community. The Government has already initiated some scheme like National Agricultural Market Scheme (E-NAM) and The Agricultural Produce and Livestock Marketing Act, 2017 (APLM) to ensure better prices, bringing transparency and competition to enable farmers to get higher returns for their produce, setting up of private markets, direct marketing, farmer-consumer market, construction of warehouses/cold storage near to the market places.

Policy framework for augmenting income from vegetable production

The major consumption centers lined to major production centers with a minimal number of intermediaries would reduce the intermediaries' commission and better facility of cooling van for transportation would also minimize the quality losses. According to Verghese Kurien, organizing farmers and increasing production is an easier job. The real challenge is to find the right markets that can give cultivators remunerative prices of the produces on a sustainable basis. So, there is a need to find out mega consuming centres and link their retail networks with the producing centres of each commodity.

field may be an effective step to obtain the reasonable prices of the produces. The third is value addition to the produces. This would be done by linking the processing industry with organized retailing. On an average, about one-fourth of the produce must be processed. India is far behind on this front as compared to most of the developing Asian countries. Dehydrated onions, tomato puree, tomato sauce and potato chips should become cheap, so that an average household can use them. Processing industry adds value and absorbs surpluses. An announcement of increasing allocation for the food processing industry is a welcome step. The food processing ministry will have to coordinate with Operation Greens.

By developing such forward and backward linkages, the government can ease large price fluctuations, raise farmers' share in the price paid by the consumer and at the same time, ensure lower prices for the consumers. To exploit its full potential, Indian agriculture urgently needs another revolution: the blue, or cool, revolution to build a sustainable cold chain connecting farms to cities, and allow small farmers to develop agri-business enterprises in order to serve the growing urban middle class. The cold chain would help to conserve large amounts of food that currently go to waste, leapfrog the old polluting technologies that dominate in the developed countries, and would help in achieving the target of doubling farmers' incomes by 2022. It is hard to overstate the importance of cold chain in addressing the target of doubling farmers' income. The International Institute of Refrigeration, Paris (France) has estimated that if developing countries had the same level of refrigeration equipment as the developed, they would save 200 million tonnes of food, or around 14% of their food supply. In India, the National Centre for Cold-chain Development (NCCD) New Delhi calculates the country has less than 15% of the refrigerated vans it needs, and less than 1% of the pack-houses, the vital first stage of the cold chain that preconditions the produce for onward transport.

Table 7. Production and demand of onion, potato and tomato (production and annual demand in 000 tonnes)

| Year | Onion | | Potato | | Tomato | |
|---------|------------|--------|------------|--------|------------|--------|
| | Production | Demand | Production | Demand | Production | Demand |
| 2012-13 | 16813 | 18252 | 45344 | 42203 | 18227 | 16766 |
| 2013-14 | 19402 | 18503 | 41555 | 41502 | 18736 | 17182 |
| 2014-15 | 18927 | 18488 | 42174 | 42151 | 18305 | 16961 |
| 2015-16 | 20333 | 19002 | 43417 | 43169 | 18732 | 17259 |
| 2016-17 | 21718 | 20770 | 48237 | 45739 | 19542 | 17871 |

Source: NSS Report No. 558: Household Consumption of Various Goods and Services in India, 2011-12

The Agricultural Produce Market Committee Act will have to be changed to allow direct buying from producers or their organizations, and giving incentives directly to producers or their organizations. Private companies and NGOs have to come forward to build back end infrastructure as was done in the case of milk. Second is the investment in logistics, starting with modern warehouses, that can minimize wastage and loss in quality and quantity of agricultural produce. Provision of cold storage with easy accessibility and nearer to the farmer's

This lack of infrastructure means scarcely 4% of India's food is moved through the cold chain, compared to 70% in the UK. As a result, for some crops, as much as 40% of the harvest is estimated to be lost between farm and market. This reduces farmers' income, which in turn limits their capacity to invest, and their incentive to grow more food. The missing link is a seamless 'cold chain' in the form of modern pack houses, distribution hubs, and refrigerated transport to maintain the safety, quality and quantity of food while moving it swiftly from farm gate to consumer.

CONCLUSION

To stabilize the economy of agricultural sectors and to address the farmers' distresses, Government has to take the initiative like maintaining relation between prices of foodgrains and other agricultural commodities like vegetables, keeping watch on producers' and consumers' interest, maintaining price relationship between the competing crops by taking into account, controlling seasonal fluctuations in prices, aiming at to bring the greater integration of prices across various regions of the nation for regular flow of marketable surplus and to stimulate the export of farm produce, increasing public sector outlay by stabilizing general prices to boost the economy of the nation. The Operation Green would be a fruitful step to augment the income of the farming community and in providing nutrition security to the weaker section of the society if implemented properly. To fulfill the above objectives, the government should come forward to develop infrastructure, revise and strengthen the co-operatives and local communities. The price policy should be aimed at providing firm support, encouragement and enforce thrust on farming activities in such a way that farmers may not quit farming and the youth may also be attracted forwards and take farming as profession.

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