**Growth and instability of potato in India**

**Subhash Chand, Sonia Chauhan, Ezaj Anwer, Mangal Singh Chauhan, Arvind Kumar**

**INTRODUCTION**

Potato is one among the main food crop worldwide and grown in more than 150 countries. The total world production for potatoes in 2020 was 371.14 million tonnes, up 0.63 % from 368.83 million tonnes in 2019. China was the largest producer, accounting for 21.07% of world production, followed by India at 13.82%. Ukraine, Russia and United States of America contributed around 5 percent in world potato production. Bangladesh shared 3 percent, whereas France, Netherlands and Poland contributed 2percent share at global level (Figure 1). China, India, Ukraine, Russia, United States and Germany shared more than 60 per cent of total global production.

The consumption of potato in the world has been increasing due to its taste and nutritional importance. The major potato consuming countries in the world are China, India and United states. These three countries consume around 47 percent of potato consumption in the world. The top ranked country, China, alone accounted for 27.0 percent of potato consumption in the world in the year 2020 (FAO, 2020).

Potato was introduced in India by the Portuguese sailors during early 17th century and its cultivation was spread to North India by the British. It has become one of the main commercial food crop in India and cultivated in all most all states of the country. About 85 per cent of potatoes are cultivated in Indo-gangetic plains of North India. Uttar Pradesh, West Bengal, Bihar, Punjab and Gujarat account a lion’s share in total production. These five states accounted for more than 80 per cent share in total production. Country has achieved a tremendous growth in potato production during last seven decades. The annual compound growth rate of potato is higher than other major food crops in respect of area, production and productivity. The estimates of area and production for 2021-22 recorded all time high area and production of potato (Agricultural statistics at a glance, 2021). The cultivated area is 2.24 million hectare and production is 54.23 million tonnes. India occupied 0.24 million hectare area and produced merely 1.66 million tonnes potato during 1950-51. Hence, owing its significant growth in production, bumper yields has been observed almost in every year.

Due to the bumper crop, and lack of post-harvest management, glut situations risen in the market for the surplus yield every year which ultimately results in decline the prices of potato drastically (Agmarknet, 2007).

**Data and methodology**

Data on important variables like area, production and yield of potato for the period 1950-51 to 2020-21 were compiled from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi and National Horticulture Board. The time period used under the study is divided into seven periods to observe decadal changes. The compound annual growth rate of area, production and yield of potato has been computed using semi log model.

Annual growth rate was used to assess trends in area, production and productivity of pulses crops by following exponential growth function (Avinash et. al 2018)

The growth was analysed using equation

Y= abte

Where,

Y=area/ production/ productivity of pulses

a= intercept

b=regression coefficient

t= time variable

e= error term

The compound growth rate was obtained from logarithmic form of the equation as follows

Ln y= ln a +t ln b

The per cent compound growth rate (G) was derived as follows

G= (Antilog of b-1)\*100

For calculating instability index the methodology used by Chand and Raju (2009) has been used. The instability index is given by:

Instability Index = Standard deviation of the natural logarithm (Xt+1/Xt)

Here Xt refers to Area (A), Production (P), Yield (Y) in the year “t”; and Xt+1 denote the same for subsequent year. This index is unit free and robust and measures deviations from underlying trend (log linear in this case). When there are no deviations from the trend, the ratio of Xt+1 and Xt remains the same and their standard deviation is zero.

**Production Profile and Growth**

Total production of potato increased substantially at all-India level during past seventy years, from 1.66 Mt in 1950-51 to 48.56 Mt in 2019-20 (Figure 2). During the above period, area increased by 3-times, productivity by 2-times, and output by 5-times. Specifically, India registered impressive growth of 5.34 percent in the production of potato since 1950-51. The area under potato cultivation recorded growth of 3.24 percent and productivity of the magnitude 2.03 percent. The increase in productivity has been contributed by research and government initiatives like release of genetically improved high yielding and stress tolerant varieties, use of certified quality seeds and micro irrigation facilities.

Area under potato cultivation has also been accelerating over the last seventy years (Figure 3). India cultivated potato on 0.24 million hectares during 1950-51 which raised to 2.05 million hectares during 2019-20. The period of 1970s (1970-71 to 1979-80) after the adoption of green revolution registered highest growth in area and production. The productivity also registered growth nearly 4 percent. (Table 1).

Table 1: Growth rates in area, production and productivity of potato in India (Percent)

|  |  |  |  |
| --- | --- | --- | --- |
| Period | Area | Production | Productivity |
| 1950-51 to 1959-60 | 4.46 | 3.95 | -0.56 |
| 1960-61 to 1969-70 | 3.89 | 6.28 | 2.17 |
| 1970-71 to 1979-80 | 5.36 | 9.17 | 3.71 |
| 1980-81 to 1989-90 | 2.92 | 5.17 | 2.19 |
| 1990-91 to 1999-2000 | 3.83 | 5.44 | 1.53 |
| 2000-01 to 2009-10 | 4.81 | 4.86 | 0.04 |
| 2010-11 to 2019-20 | 1.50 | 2.18 | 0.68 |
| 1950-51 to 2019-20 | 3.24 | 5.34 | 2.03 |

Table 1 shows that during the overall period of seventy years, growth in area, production and yield was positive except in first period. Over time particularly after 2000s the growth in productivity declined and growth in area was mainly responsive for increase in production. This advocates more focus on research and development on potato varieties, schemes, policies and technologies for enhancing potato production in the country.

Uttar Pradesh, West Bengal, Bihar, Gujarat and Punjab are the leading states in the production and cultivated area of potato in the India. (Figure 4 & 5). These five states contributed more than 80 per cent share in the total production of potato in the country and constitute more than 70 per cent in the total cultivated area.

Potato has remained major vegetable crop in India. It has been observed that during present trend of diversification from cereals to horticultural crops, shifting from wheat / barley cultivation to potato cultivation, returns more to the farmers. (Agmarknet, 2007). Potato occupied substantial share in total vegetable area and production (Figure 6). Though the share of potato in total vegetables area and production has been declining over the years yet it is more than 20 percent (Table 2). Potato occupies 20 per cent and 28 per cent share in total cultivated area under vegetables and total production of vegetables in India during 2020-21.

Table 2: Share of potato in Total Vegetables (Percent)

|  |  |  |
| --- | --- | --- |
| Year | Area | Production |
| 1980-81 | 26.60 | 25.65 |
| 1990-91 | 28.34 | 33.38 |
| 2000-01 | 19.52 | 23.96 |
| 2010-11 | 21.90 | 28.89 |
| 2020-21 | 20.50 | 27.50 |

**Instability in Production**

Instability in potato production is caused by the variability in both area and productivity (Sant Kumar, et.al. 2021). If the instability in both components will decrease, the instability in production also declines. It is interesting to observe that the instability in area and productivity in the latest period 2010-11 to 2019-20 has declined from the previous period 2000-01 to 2009-10, so as the instability in the production of potato for the country as a whole. The rise in instability in area and productivity in the period 1960-61 to 1969-70 and in 1990-91 to 1999-2000 from previous period resulted rise in instability of production. The instability in area, production and productivity are presented in Table 3 that reflects that production is highly instable as high as around fourteen eleven per cent. The instability index for cultivated area in nearly six percent and productivity is around eleven per cent in the period of last seventy years.The instability in production could be reduced by adoption of quality seeds, improved technologies and reducing post-harvest losses across all potato growing states.

Table 3: Instability in area, production and productivity of potato in India (Percent)

|  |  |  |  |
| --- | --- | --- | --- |
| Period | Area | Production | Productivity |
| 1950-51 to 1959-60 | 2.63 | 10.52 | 9.02 |
| 1960-61 to 1969-70 | 5.16 | 21.04 | 16.99 |
| 1970-71 to 1979-80 | 9.11 | 14.53 | 10.13 |
| 1980-81 to 1989-90 | 3.77 | 11.50 | 10.48 |
| 1990-91 to 1999-2000 | 4.81 | 16.97 | 13.76 |
| 2000-01 to 2009-10 | 7.43 | 10.87 | 10.00 |
| 2010-11 to 2019-20 | 3.22 | 9.27 | 8.24 |
| 1950-51 to 2019-20 | 5.47 | 13.50 | 11.09 |

**Conclusion**

Potato has been one of the main food and commercial crop in India. The growth in the production of potato is contributed by the growth in the area and productivity. It remained positive in almost all years. But the growth in yield of potato is decelerating in the latest years. The scope of expansion of area is limited, therefore more focussed should be on the improvement of yield by special attention of potato researchers and policy makers to improve the situation. The Indian potato has demand in the foreign markets and consumption of potato has also been increasing globally due to various uses and preparation of potato. So more efforts are to be done to decrease the instability and explore potential for exporting of potato be creating advance infrastructural facilities.

**References**

Agricultural Statistics at a Glance (Various Issues), Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi.

Avinash CS and BL Patil (2018), Trends in area, production and productivity of major pulses in Karnataka and India:An economic analysis, 2097,Journal of Pharmacognosy and Phytochemistry, 7(4):2097-2102

Chand, Ramesh and S.S. Raju (2009), Instability in Indian Agriculture During Different Phases of Technology and Policy, *Indian Journal of Agriculture Economics., Vol. 64, No. 2, April-June 2009*

Kumar Sant, Kingsly Immanuelraj T, Nalini Ranjan Kumar and N.K. Pandey (2021), Growth, instability and profitability of potato production in eastern India, Potato J., 48 (2): 93-98

NHB (2020) National Horticulture Board. Ministry of Agriculture & Farmers Welfare, Government of India. Online data on area, production and yield from website downloaded from <http://wwww.nhb.gov.in/Default.aspx>.

FAO (Food and Agriculture Organization of the United Nations) (2020) FAOSTAT. FAO Statistics Division. <http://faostat3>. fao.org

**Website referred:**

<https://www.helgilibrary.com/charts/which-country-eats-the-most-potatoes/>

http://www.agmarknet.gov.in%2FOthers%2Fprofile-potato.pdf&usg=AOvVaw1BzvO-6XbKixJJgQMqdQZD&opi=89978449