The History of the Potato and the Current Challenges it Encounters in India

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Abstract:

In India, potatoes were first introduced during the British colonial era. Early in the 17th century, the British introduced potatoes to India, where they were first planted in the southern Nilgiri Hills. Due to the crop's resilience to diverse soil types and temperatures, it eventually expanded to other parts of the nation. challenges require a multi-faceted strategy incorporating government policies, research and extension services, investment in infrastructure, promotion of sustainable agriculture methods, and support for farmer cooperatives and groups. The development and sustainability of the potato business in India can be aided by initiatives to enhance seed quality, create disease-resistant varieties, set up effective post-harvest management systems, and encourage value addition.

Keywords: *potato, British, infrastructure, sustainable*

Introduction:

The significant food crop known as the potato is grown in more than 100 different nations. According to FAO (2008), more than a billion people utilise potatoes worldwide. More than 100 distinct types of cuisine employ this premium vegetable crop. Potato protein is regarded to be preferable to milk and have a higher biological value than cereal protein. Therefore, potatoes can replace meat and dairy products by reducing energy consumption and lowering food expenses. The potato (Solanum tuberosum L.), popularly known as "The king of vegetables," has advanced to become India's fourth-most significant food crop after rice, wheat, and maize. An Indian vegetable basket wouldn't be complete without potatoes. Potatoes are a superb vegetable in terms of nutrition due to their ingestible protein and calorie content. It has grown to be seen by the larger community as a crucial part of breakfast, lunch, and dinner. Being a short-duration crop, it produces more dry matter, edible energy, and edible protein in less time than cereals like rice and wheat. Therefore, it is thought that potatoes are a key crop for ensuring the nutritional security of the nation.

Origin of Potato:

Potato is reportedly a native of South America. In one of the Andean settlements in 1537, the Spaniards had their first encounter with potatoes. Between 1580 and 1585, the potato was first grown in Europe in Spain, Portugal, Italy, France, Belgium, and Germany. It was brought to India by Portuguese sailors in the early 17th century, and during the British era, cultivation extended throughout North India.

Potato Market Size in India:

The Indian potato market had a dramatic downturn in 2021, when its value fell by -6.8% to $X, after three years of growth. From 2012 to 2021, the market value expanded at an average yearly rate of +3.5%; nevertheless, the trend pattern showed that there were some noteworthy swings during the examined period. Consumption increased until it peaked at $X. The market continued to develop at a somewhat slower rate from 2015 to 2021.

Potato Production in India:

In terms of value, potato production decreased to $X in 2021, according to the expected export price. However, manufacturing expanded strongly overall. The manufacturing volume climbed by 81% in 2014, which was the year with the highest growth rate. Production eventually reached its peak level of $X as a result. Production growth stayed at a somewhat lower rate from 2015 to 2021. In India, the average production of potatoes per hectare decreased to X tonnes in 2021 while being constant from 2020 levels. However, the yield displayed a rather flat trend pattern for the time period under examination. The yield climbed by 8.8% in 2017, which was the year with the fastest growth. The yield of potatoes reached its peak in 2018 at X tonnes per ha, but from 2019 through 2021 it lost steam. Negative weather conditions may still have an impact on yield estimates in the future despite the greater usage of sophisticated agricultural techniques and practises. The area of potatoes harvested in India in 2021 was X acres, remaining steady from the year before. From 2012 to 2021, the harvested area grew at an average yearly rate of 1.4%; the trend pattern remained stable, with some discernible changes being recorded throughout the course of the study period. With an increase of 4.5% in 2013, the growth rate seemed to be at its fastest. The area used to harvest potatoes reached a maximum of X hectares in 2017 before levelling off until 2021.

Potato Exports:

Exports from India:

Potato exports from India soared to X tonnes in 2021, an increase of 18% above 2020 levels. Exports rose significantly overall. With a 140% increase over the prior year, 2014 seems to have the fastest growth rate. The exports during the period under review reached record highs of X tonnes in 2019, however they stayed at a lower level from 2020 to 2021. Potato exports decreased slightly in value to $X in 2021. Exports had a steady increase during the time under study. When exports climbed by 219% over the prior year in 2014, the growth rate seemed to be at its fastest. As a result, exports reached their highest level of $X. The growth of exports stayed at a somewhat lower level from 2015 to 2021.

Exports by Country:

The average annual growth rate of volume to Nepal from 2012 to 2021 was +11.0%. The average yearly growth rates of exports to the other major destinations were as follows: Oman (+56.9% per year) and Indonesia (+117.0% per year). With 44% of all exports, Nepal ($X) continues to be India's top export destination for potatoes. Oman ($X), which accounted for 16% of all exports, came in second place in the ranking. Indonesia came in second with a 7.6% market share. The average annual growth rate in terms of value to Nepal from 2012 to 2021 was +11.4%. The average annual growth rates of exports to the other major destinations were as follows: Oman (+60.2% per year) and Indonesia (+107.1% per year).

Export Prices by Country:

In 2021, the average price of potatoes exported per tonne was $X, a decline of -15.8% from the previous year. In general, export prices showed strong rise from 2012 to 2021: over the past nine years, they climbed at an average annual rate of +2.1%. However, the trend pattern showed that there were some observable changes during the studied time. Based on 2021 data, the price of potato exports grew above 2018 index by 19.1%. The average export price climbed by 33% in 2014, the year with the fastest growth. Thus, the export price rose to its highest point of $X per tonne. The average export prices did not pick up steam from 2015 to 2021. The country with the highest price was Oman ($X per tonne), while the average price for shipments to Nepal ($X per tonne) was among the lowest. Prices varied substantially by country of destination. Oman (+2.1%) witnessed the highest rate of price growth between 2012 and 2021, while the growth rates for the prices of the other major destinations were more moderate.

Potato Imports:

Imports into India:

After two years of decline, potato exports grew by 3,580% to X tonnes in 2021, growing for the second year in a row. Imports experienced a notable increase throughout the time period under consideration. As a result, imports have peaked and are likely to keep growing in the near future. The value of imported potatoes increased to $X in 2021. Imports showed a considerable increase overall. As a result, imports have peaked and are likely to keep growing in the near future.

Imports by Country:

Bhutan (X tonnes) supplied the majority (almost 99.9%) of India's total imports of potatoes in 2021. The volume from Bhutan increased at an average yearly rate of +4,138.2% from 2015 to 2021. Bhutan ($X) was India's leading potato supplier in terms of value. The average annual growth rate of value from Bhutan from 2015 to 2021 was +3,712.0%.

Import Prices by Country

The average price of imported potatoes in 2021 was $X per tonne, down 38% from the previous year. The import price had a sudden decrease throughout the time period under examination. The average import price rose by 714% in 2018, which was the year with the highest growth rate. As a result, the import price rose to its highest point of $X per tonne. The average import prices stayed around a lower number from 2019 to 2021. Prices for Bhutan are used to establish the average price level because there is just one major supplier country. Bhutan saw price rise at a rate of -10.2% year from 2015 to 2021.

Emerging problems and challenges:

Lower potential yield

More than 90% of the potato crop in India is generated between the months of October and March, which coincide with the shorter daytime hours in the northern hemisphere. The crop life cycle is shortened under short day conditions, and there are less hours of sunlight available, so the physiological potential of potato productivity in the tropics and subtropics is significantly lower than in temperate countries. Given the reduced potential yield, the organisations engaged in potato research and development confront a substantial challenge in increasing the achievable output.

Early harvesting

Potato crops are frequently planted in between paddy and wheat crops by small and marginal farmers. Due to wheat and paddy crops' lower production risks and lack of market risk as a result of being covered by India's support price system, small and marginal farmers choose to harvest potatoes early, 60 to 70 days after planting, with a yield compromise of 30 to 40% of the regular one. The early harvest of a sizable section of the potato crop has a negative impact on the country's overall potato yield. Another significant difficulty in this scenario is raising national potato productivity to 34.5 tonne/ha by 2050. Finding the gene(s) responsible for tuberization will enable the development of kinds of potatoes that mature earlier.

Uneconomic land holdings:

On little, unprofitable parcels of land, a disproportionately high number of potato growers in India produce potatoes. Because farming is more of a way of life than a business for the majority of these producers, they are dependent on remittances from one or more family members who work in cities. Most often, elderly or less capable people who don't follow the most recent crop husbandry techniques are in charge of cultivating potatoes. Communicating technical knowledge to this less receptive agricultural sector and ensuring proper implementation of the most cutting-edge scientific potato technologies are challenging tasks.

Wrong doses of fertilizers:

Almost all farmers, including those who grow potatoes, use chemical fertilisers according to their own judgement and experience. Complex fertilisers are being used more frequently these days, and without accurate soil test results, farmers frequently do so. As a result, the soils' nutritional balance is disturbed, the ecosystem is degraded, and farm productivity is decreased. Some nutrients are oversupplied, while others are undersupplied. Agencies responsible for agricultural development throughout the nation must set up dependable and adequate soil testing equipment as soon as practicable.

Inadequate and inefficient transport infrastructure:

Potato farmers and consumers nationwide suffer from a lack of modern transportation infrastructure because of the crop's bulky nature, short growing season, and regional production dominance. High post-harvest losses are caused by this deprivation as well as greater price disparities in this agricultural commodity among the regions. The supply of less expensive, higher-quality potatoes across the nation will be ensured by the policy makers and development organisations acting quickly to address this limitation.

Enhanced pest resistance:

Another significant issue that potato research and development organisations employing conventional as well as contemporary molecular techniques must be tackled with a very high priority is the demonstration of enhanced pest resistance (both diseases and insects). In the future, using molecular methods to diagnose potato pests more accurately and comprehend their genetic makeup is likely to produce successful outcomes.

Capital intensive crop:

Due to the high input and capital requirements of the potato crop, small and impoverished farmers sometimes lack the necessary capital, which causes the crop to be grown with insufficient amounts of various inputs. Many times, potatoes are grown on unfavourable or even problematic soils. Furthermore, the issue has been worse recently due to the extremely rapid increase in the cost of agricultural inputs like fertilisers and plant protection chemicals. In addition to using subpar inputs, a very high percentage of potato growers utilise subpar inputs, particularly the seed potato because they cannot afford to buy the better one. This is more of a policy issue that must be resolved as soon as possible to improve profitability of potato farmers.

Shortage of farm labour:

Farm employment has been transferred to other developmental tasks by government rural development programmes, particularly the Mahatama Gandhi National Rural Employment Guarantee Scheme. As a result, one of the crops in India that has recently suffered the most harm is the labor-intensive potato production. Future potato research should prioritise the creation of efficient potato machinery for small and marginal growers. On fields with machinery, collecting

potato tubers currently accounts for more than half of the manpower. We need to create a combine potato harvester that can do digging and lifting tasks for tubers all at once for huge growers.

Global warming:

Due to fewer sunshine hours and shorter crop duration, rising average night temperatures in some potato-growing regions of the nation are reducing the already constricted potential yield of the Indian potato. The creation of potato types resistant to high temperatures will aid in the solution of this new issue. In order to combat the issue of heat stress, CPRI is expected to release more heat tolerant potato cultivars after the successful release of Kufri Surya.

Climate change impact:

The impact of climate change on potatoes in various locations was assessed using the INFOCROP Potato model. Estimates predict that the yield will be significantly lower in southern and peninsular India (9–47%), slightly lower in the Indo Gangetic plains (3–13%), and slightly higher (3–7%) in the northwest Indo Gangetic plains as a result of milder winters. The production of potatoes in India may decline by 2.61 and 15.32%, respectively, between the years 2020 and 2050. With a possible production decline of 9 to 55%, the North-Western Plains (Punjab, Haryana, and portions of Western UP and Northern Rajasthan) will be the least vulnerable area, while West Bengal, Plateau Regions, and Other Areas in South India will be the most vulnerable. Alternative tactics, which are described under other topics, must be used to lessen the impact of climate change on future potato productivity.

Scarcity of water:

Unpredictable precipitation and a lack of irrigation water are two significant future trends that are anticipated to provide difficult obstacles for potato agriculture in India. The development of micro-irrigation technologies for potatoes and their greater diffusion in areas with a lack of irrigation water will require more focused research. To address this looming issue, biotechnological methods must be used to create potato cultivars that can withstand drought.

Varieties for processing:

The CPRI has generated six different potato cultivars for processing, and as a result, India is currently processing 3.2 million tonne of potatoes. However, our current 375 million urban population will grow to around 465 million by the year 2050, creating a large demand for processed potato goods. If the industry is to increase potato processing up to 25 million t by the year 2050, it needs to be backed by the necessary technology, including enhanced processing varieties. To address this rapid improvement of processed potato products in India, which is rapidly increasing, we need a broader variety of processed potato types with superior processing properties.

Inefficient cold storage:

Many regions of the country lack cold storage facilities due to unstable electricity supply, which has a negative impact on the development of potatoes there. Cold storage facilities in other parts of the country have outdated technology, which results in increased post-harvest losses of potatoes. With considerable efforts, the National Horticulture Board has helped modernise cold storage, although the expected results have still not been achieved. A reliable electricity supply across the entire country will make it easier to build cold storage where it is required.

New pests:

As a result of climatic change and the importation of potatoes under Open General Licence in the 1990s, newer disease loads have infiltrated the Indian potato environment. In the wake of the importation of potatoes under OGL, several new viruses appeared. One of the most important and challenging challenges facing Indian potato research professionals is ridding the crop of these pests. Modern diagnostics utilising a transmission electron microscope, molecular methods, and a dip-stick are required to improve the quality of seed potatoes. Then, utilising aeroponics and other biotechnological methods, planting material must be rapidly multiplied in vitro.

Conclusion:

Indian agricultural authorities, research facilities, and farmers' organisations are working to implement sustainable agricultural practises, create disease-resistant potato varieties, encourage proper post-harvest management, and promote value addition through processing in order to address these new issues. The objective is to make potato farming more resistant to numerous difficulties while ensuring food security for India's expanding population.

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