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VALUE CHAIN OF POTATO IN INDIA: AN OVERVIEW

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ABSTRACT

This study offers an in-depth analysis of the potato value chain in India, covering its various stages from pre-production to post-production, including cultivation, processing, and marketing. Potatoes, a key cash crop in India, play a significant role in the agricultural economy, with the country ranking as the second-largest producer globally. The analysis begins with the botanical and nutritional significance of potatoes, examining their role in the global and Indian contexts. It then explores the stages involved in the potato value chain: input supply, production, marketing, and consumption. Key stakeholders such as farmers, cooperatives, wholesalers and retailers are identified along with their contributions to the value chain. The study also delves into the costs of cultivation, value-added products, and marketing efficiency across various channels. Additionally, the SWOT analysis highlights strengths, weaknesses, opportunities, and threats in the potato value chain, while recommendations focus on improving infrastructure and minimizing losses to enhance the profitability of the potato business in India. This research underscores the importance of efficient value chain management to maximize farmer income and optimize the potato market in India.

Key words : Agriculture, India, Marketing Channels, Potato, Value chain.

Introduction

The botanical name of potato is *Solanum tuberosum* L. It belongs to the family Solanaceae. Origin of potato is South America. International year of Potato celebrated in 2008. Potato is a cool-season vegetable, which is at par with wheat and rice, as one of the most important staple crops in the human diet around the world. Potato is a specialized underground storage stem called “tuber.” According to FAO, potato is consumed by more than one billion people around the world. It is a high-quality vegetable cum food crop used in preparation of more than 100 types of recipes in India.

The protein of potato has high biological value than proteins of cereals and milk. It is utilized in variety of ways, such as preparation of chips, wafers, flakes, flour, starch, potato custard powder, soup or gravy thickener and pan cake as a processed food, being one of the principal cash crops, gives handsome returns to the growers/farmers due to its demand nationally and

internationally for different kinds of utilization. It is grown in more than 100 countries in the world. At present, China, Russia, India, Poland and U.S.A. contribute to a major share of the total world production. China was the largest producer of potato in 2015 with an annual production of 87,260,000 MT followed by India with less than half of the total potato produced by China. Asia and Europe are the world’s major potato producing regions accounting for more than 80 percent of world production. USA, Russia & Germany are the other potato producing countries as noted by Saxena and Mathur (2013).

Global scenario of potato

Potato Processing Market size was valued at USD 29.28 billion in 2019 and is poised to grow from USD 38.74 billion in 2023 to USD 46.99 billion by 2031, growing at a CAGR of 5.42 per cent in the forecast period (2024-2031). China is the biggest producer of potatoes worldwide, with about one third of the world’s potatoes produced in China and India. According to FAO estimates,

in 2021, over 376 million metric tons of potatoes were produced worldwide, an increase from a production volume of 333.6 million tons in 2010. Top 10 Potato Producing Countries in world during 2023. We can clearly see China has a highest production of potato 38 per cent share in World during 2023. India got a second rank in Potato Production in World average 22 per cent share in World. Then Ukraine 8 per cent followed by USA, Russia, Germany, Bangladesh, France, Poland, Netherland as noted by FAOSTAT (2023).

Major Potato Seed Exporting Countries during 2022. Netherland Export highest average 5,57,672 MT followed by France, UK, Germany rest of the countries. Lowest Potato seed exporter was South Africa in 2022 average export of seed potato 23,827 MT as noted by FAOSTAT (2023).

Major Potato Seed Importing Countries during 2022. Egypt got a first rank for Potato Seed import average 2,21,639 MT. Belgium got second rank followed by Spain, Italy, Morocco, USA, Germany, France, Netherland, Portugal. Portugal Import of seed potato average 32,296 MT which lowest in all countries as noted by FAOSTAT (2023).

Indian scenario of potato

In India, the Potato is not primarily a rural staple but a cash crop that provides significant income for farmers. India holds third position in area and second position in total production in the world. Production of Potato is 54.23 million tonnes with 12.50 per cent share in global production. The production is largely concentrated in the Northern-Eastern part of the country. Share of Potato in all vegetable production is 28 per cent in India as outlined by CMIE (2023).

According to Indian Council of Agricultural Research (ICAR) production in India increased to 51,310.00 thousand tonnes in 2018-19. But during 2019-20 Potato Production went from 50.19 million tonnes to 48.56 million tonnes. It will increase 2022-23 average 60,141 MT. There are a number of reasons why potato production might fluctuate from year to year, including climate change, population growth, and other factors.

In India, UP has a highest production of Potato during 2023 average Potato Production is 54.89 MT. West Bengal got second rank in Potato Production in India average Potato Production is 12.60 MT. Gujarat got 4th rank in Potato Production average Potato Production is 3.38 MT followed by MP, Punjab, Haryana, Assam noted by NHB (2023). The highest area was recorded in 2022-23 at approximately 2,332.20 ha, while the lowest was in 2019-20 at approximately 2,051.30 ha. These fluctuations could

be attributed to various factors such as weather patterns, government policies, agricultural practices, and market demand analysed by CMIE (2023).

Value chain analysis

Potato value chain at the pre-production stage input and its source

Input wise analysis showed that tubers (seeds) cost was highest expenditure among various components of operational cost with 23.50 percent (Rs.22626.05) share of total cost. The overall major cost component of cultivation of potato crop was total cost of tubers (seeds) Rs. 22626 (24.43 percent) followed by rental value of owned land Rs. 21660.00 (22.49 percent), human labor Rs. 19149.09 (19.89 percent), fertilizers Rs. 8247.93 (8.57 percent), irrigation charges Rs. 6836.93 (7.10 percent), machine charges Rs. 6331.03 (6.58 percent), and plant protection Rs. 3659.69 (3.80 Percent). The cost of cultivation shown increasing trend from marginal to large farmer. It due to fact that large size of holding farmer could incur more expenditure on modern farm input like quality of seed, hired labor, manure, fertilizers, plant protection and machine labor charges etc. Farm size-wise analysis of the cost concept of the sample potato growers that indicated increasing trend of cost C3 with increasing farm sizes analyzed by Wubet *et al.* (2022).

The gross income was highest for the large farmers (Rs. 298569.60) followed by medium (Rs. 273942.00) small (Rs. 239957.07) and marginal (Rs. 220017.98) farmers. The net income on potato production was highest for the large farmers (Rs. 189167.39) followed by medium (Rs. 172228.20) small (Rs. 149607.79) and marginal (Rs. 136394.02) farmers. On an average, per hectare production of potato came to be 199.56 quintals. The B: C which indicates the profitability of investment was observed to be 2.67 at the overall level. Among the size of holding, the B: C ratio was highest in large size group (2.72) compared to medium (2.69), small (2.65) and marginal (2.63) farmers as noted by Wubet *et al.* (2022).

Potato value chain at post production stage

Curing and Drying : The harvested potato should be cured in the field. For optimum suberisation, curing is essential for healing the wounds of tubers resulted from cutting and bruising during harvesting. Expose to sun causes the greening of potatoes. Always dry the harvested tuber in storage shed. All the damaged and diseased tubers should be removed during sorting.

Handling and packaging : Handling and packaging of potatoes are done generally on farm. After harvesting, the tubers are kept in a heaped condition temporarily and

covered with straw. After a few days, sorting is done for separating the diseased and cut tubers. The sound tubers are packed in hessian cloth bags or netting bags. The Ordinary hessian bags are used for packing potatoes with a capacity of 80 kgs, 50 kgs and 20kgs. The netting bags made of plastic net are used to pack 25 kgs potato and preferred for export purpose.

Storage : Storing potatoes for longer period in normal temperature is not possible as it is a living material and through respiration, the changes occurs due to heat, resulting in loss of dry matter and ultimate deterioration of quality of tubers. At optimum condition, the quality of potatoes remains good in storage for 3-5 weeks this discussed by Jaiswal *et al.* (2023).

Table 1 data given about storage conditions for potato during storage seed potato and ware potato both required 0 to 2 Celsius temperature and humidity required 90 to 95 per cent. Also ware potato with CIPC Fogging required temperature 10 to 12 Celsius and humidity should be 90 to 95 per cent analysed by Jaiswal *et al.* (2023).

Table 1 : Required storage condition for potato.

Types	Temperature	Relative Humidity
Seed potato	0-2	90-95 %
Ware Potato	0-2	90-95 %
Ware Potato with CIPC Fogging	10-12	90-95 %

Temperature-Celsius, Relative Humidity-Percentage

Potato Processing Value chain

Food processing is the Sunrise sector of India. Among all Top vegetables, potato has the highest share of processing at around 7per cent. There are numbers of national and international brands that are manufacturing potato – based products with contract farmers. Ex: Pepsi Co’s Frito Lyis a good example of engaging smallholders to grow potatoes matching international standards. Potatoes contributed about 280 billion Indian rupees in the Indian economy in fiscal year 2020. About 90 per cent of the potato crop in the country is harvested during January-February. Fresh produce is available over a short span of a few months after the harvest. Potato is semi-perishable in nature and contains 80per cent of water. It is estimated that 25per cent of the potatoes are spoiled due to various reasons such as transportation, type of packing and availability of cold storage. Along with an increase in potato production there is an urgent need to increase the rate of potato consumption also, to avoid wastage. The market of processed potato products is growing at the rate of 15 to 20 per cent per annum

discussed by Minten *et al.* (2011).

Company wise Preference of Potatoes in Gujarat

According to CPRI (2016) McCain, a renowned frozen food company, utilizes a diverse range of potato varieties including Santana, Innovator, Shafordi, Kennebec and Banana. PepsiCo, a global food and beverage giant, employs the Fc-3 and Fc-5 potato varieties for its Lay’s and other potato chip brands. Balaji, an Indian snack food company, sources the Lady Rosetta potato variety for its chips. Similarly, Hyfun and S.P Chips, both Indian snack food companies, also use the Lady Rosetta potato variety. This analysis highlights the variety of potato varieties employed by different companies to produce their potato chips, suggesting that the choice of potato variety can influence the taste, texture, and overall quality of the chips.

Marketing Channel

The Major Marketing channels identified in the present study were:

Channel I: Farmer – Wholesaler – Semi wholesaler – Retailer- Consumer (F-WS-SWS- R-C)

Channel II: Farmer – Wholesaler (Through Commission agent) – Semi wholesaler – Retailer-Consumer. (F-WS through CA-SWS- R-C)

Channel III: Farmer – Retailer – Consumer. (F-R-C)

The study revealed three major potato marketing channels *viz*, F- WS-R-C, F-WS through CA-C and F-R-C. The marketing cost towards packing material followed by transportation was high for farmers while for other market players, weight loss and spoilage were the major marketing cost. The marketing cost of channel II was the highest. The margin of the wholesaler and semi wholesaler was less on account of high volume of business as compared to the retailer who handles low volume of the business. Potato farmers were realizing higher share of consumer’s rupee in channel III as compared to other channels as analysed by Singh (2012).

The marketing efficiency of potato was worked out under different marketing channels by Acharya’s modified method. A perusal of Table 2 reveals that channel III was most efficient one because marketing efficiency was 2.17 in this channel as compared to 1.22 in channel I and 1.09 in channel II. But this is also a fact that major share of the potato cannot be sold through channel III because the traditional wholesalers, semi wholesalers and retailers have their own role in potato marketing. It’s a part of Indian culture that traditional vegetable hawkers supply various vegetables at the doorstep of the consumers in various localities of cities and towns. Comparing channel

I and II it is revealed that the relatively lower marketing efficiency of channel II was attributed towards involvement of one additional intermediary i.e. Commission agent as analysed by Singh (2012).

Existing institutional support and infrastructure facility

National Horticulture Board (NHB) : The National Horticulture Board (NHB) is a government agency in India that offers financial assistance to horticulture projects. Their schemes provide subsidies for production, post-harvest management, and storage facilities. This helps encourage commercial horticulture and improve the income of farmers.

Central Potato Research Institute (CPRI) : The Central Potato Research Institute (CPRI) likely develops its own research schemes, not government ones. These schemes focus on improving potato varieties, disease resistance, and cultivation practices to boost potato production and farmer livelihoods.

All India Coordinated Potato Improvement Project : The All India Coordinated Potato Improvement Project works across India to develop better potato varieties. It focuses on increasing yield, disease resistance, and overall potato quality for farmers. This project aims to ensure food security by improving potato production in India.

Government Support and Policy Support

Operation Green : Recently Government announced operation green for TOP crop (tomato, onion and potato) in 2018-19 under the ministry of food and processing industries. Allocation of budget of 500 cr. Main aim of operation green is to stabilize the price of TOP crop through out the year. To promote farmer producer organization (FPO), Agri-logistics, processing facilities and professional management. In June 2020 to cover all fruits & vegetable (TOTAL) with additional allocation of Rs. 500 cr.

Mega Food Park Scheme : Main aim is to maximize value addition, minimizing wastages, increasing farmer's income and creating employment opportunities particularly in rural sector. The mega food park scheme is based on "cluster" approach. This food park will provide enabling infrastructure and mechanisms to strengthen the agricultural value chain, bring farmers, food processors and end consumers together such as wholesalers, retailers & exporters.

Market Intervention Scheme : This scheme for those crops which is not covered under MSP viz., Onion, potatoes, tomato, turmeric, chilies, etc. The market

intervention scheme (MIS) is anhoc scheme under which are included horticultural commodities and other agricultural commodities which are perishable in nature. Government implements MIS for a particular commodity at the request of a state government concerned.

Role of Value Chain in Potato Business

The potato value chain, a vital pathway from farm to table, encompasses various stakeholders and activities crucial for efficient production, processing, and distribution. Farmers, the foundation of the chain, select suitable seed varieties, manage their land, and employ effective cultivation practices to grow potatoes. Input suppliers provide these farmers with essential resources like seeds, fertilizers, pesticides, and equipment. Storage and transportation companies ensure potatoes are safely stored and transported to markets. Processors transform potatoes into diverse products such as french fries, potato chips, or other derivatives. Retailers, the final link, sell potatoes directly to consumers. The value chain activities involve input supply, production, post-harvest handling, optional processing and marketing and distribution. A robust value chain offers several benefits, including increased profitability, improved potato quality, reduced risks, and enhanced innovation. By optimizing processes and reducing waste, all participants can benefit from a fairer distribution of profits. Proper handling and storage throughout the chain guarantee potatoes reach consumers in a fresh and healthy state. Collaboration and communication among stakeholders help mitigate risks such as disease outbreaks or price fluctuations. Moreover, a strong value chain encourages investment in new technologies and potato varieties, leading to continuous improvement and advancement in the industry by Sirwan and Harun (2024).

Conclusion

This review paper offers a comprehensive analysis of the potato value chain in India. It explores the various stages from pre-production to post-production, including cultivation, processing, and marketing. The potato, a key cash crop in India, holds the second-highest production globally. The analysis identifies key stakeholders like farmers, processors, retailers and highlights their contributions. It explores cost structures, marketing channels and government support systems. The paper emphasizes the importance of an efficient value chain for maximizing farmer income, optimizing potato production, and minimizing losses. Overall, this review provides valuable insights for stakeholders in the Indian potato industry.

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