

Potato processing scenario and future prospects in India

V K Gupta^{1*}, Salej Sood², Vikas Mangal², S K Luthra¹ and Babita Chaudhary¹

¹ICAR-Central Potato Research Institute, Regional Station, Modipuram, Meerut, Uttar Pradesh 250 110

²ICAR-Central Potato Research Institute, Shimla, Himachal Pradesh 171 001

This article provides an overview of the evolving role of potatoes in India's agricultural landscape and food industry, focusing on their journey from a staple food crop to a key component of the processing sector. It highlights the significant increase in potato production since 1950, driven by expanded cultivation areas and improved yields. Projections suggest further growth in potato cultivation and demand for processing potatoes by 2050. The article discusses efforts to develop processing-specific potato varieties and the expansion of India's potato processing industry, both in organized and unorganized sectors. It also explores the export potential of processed potato products and outlines key areas for future research and development to sustain the growth of the potato processing sector. Overall, the article underscores the promising prospects for the potato processing industry in India, driven by changing consumer preferences, technological advancements, and favourable market conditions.

Keywords: Processing, Industry, Potato

POTATO is one of the most produced and consumed crops in India, and forms an important part of the regular diet. Potato production increased more than 33 times since 1950, due to both increased area and yield. There has been a phenomenal increase in area, production and per capita availability of potatoes in India in the last 50 years. Projections for 2050 suggest that the area under potato crop will rise to 3.6 million ha and production to reach approximately 125 million MT, with productivity of 34.7 t/ha. (Fig. 1). Similarly, by 2050, projected demand for processing potatoes will be around 25 million tonnes from the processing industry alone (Fig. 2). Potato processing is increasing in India at a rapid pace due to the changing habits of consumers, the growing interest of farmers and rapid expansion of the processing industry. Additionally, the increasing acceptance of home-made ready-to-eat foods along with the increase in home-cooked meals

due to the pandemic has encouraged the consumption of these products. Manufacturers continue to provide consumers with seemingly healthy variants by offering baked or low-fat options.

The accessibility and round-the-year availability of dehydrated or frozen potato products further expands their market, making them a consistent choice for households

and the food service industry. Potato processing is a highly industrial, technologically advanced and very market-driven activity. This requires suitable potato varieties, yield, quality in its various aspects during the growing season and good post-harvest performance (storage). Processors organize their potato supply (chain) through contracts and direct contact with farmers.

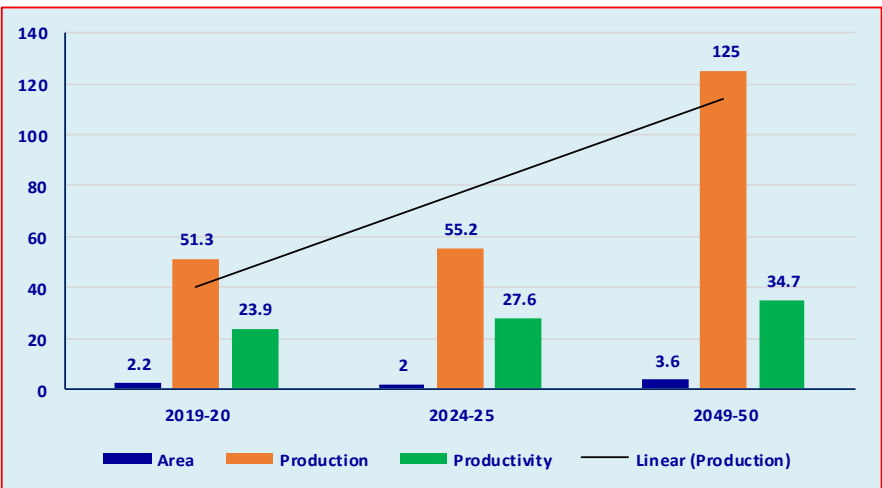


Fig. 1. Projection of potato area (Mha), production (MT) and yield (t/ha)

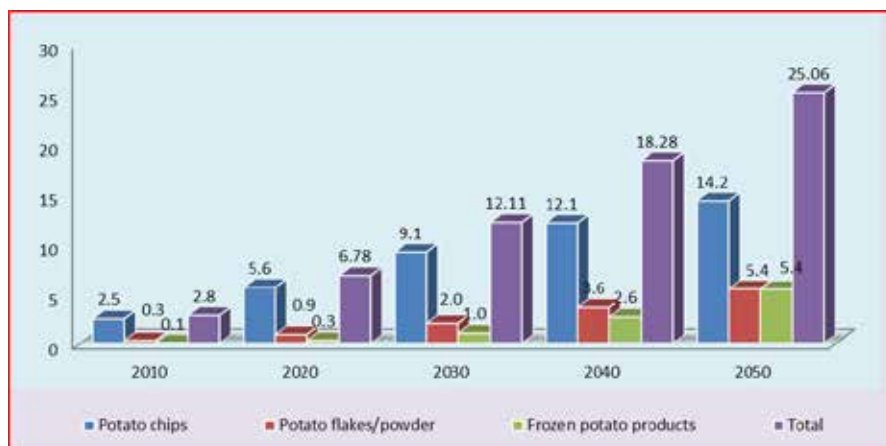


Fig. 2. Raw material demand of potato processing industry (million tonnes) in India
Source: ICAR CPRI Vision 2050

Table 1. Indian potato processing varieties

Variety name	Year	Uses
Kufri Chipsona-1	1998	Chips and Fries
Kufri Chipsona-2	1998	Chips
Kufri Chipsona-3	2006	Chips
Kufri Himsona	2008	Chips/Flakes
Kufri Frysona	2009	French fries
Kufri Chipsona-4	2010	Chips
Kufri FryoM	2018	French fries
Kufri Sangam	2019	Table/processing
Kufri Chipsona-5	2022	Chips

They provide advice/assistance and service to farmers during potato production and storage. Potato processing activity in both organized and unorganized sectors has increased from <1% in the late nineties to about 10% at present.

In India (till 1989), all the varieties were bred for consumption as fresh potatoes. Some of the varieties like Kufri Chandramukhi, Kufri Jyoti and Kufri Lauvkar were used by the chipping industry, especially from the produce of crops grown in warmer areas where night temperatures are relatively high (around 10°C). It was, therefore, necessary to encourage potato processing to avoid a glut situation and to spread out the demand throughout the year. Concerted breeding efforts for the development of processing varieties by ICAR-CPRI has led to development and release of nine processing varieties (Table 1) namely Kufri Chipsona-1 and Kufri Chipsona-2 (1998), Kufri Chipsona-3 (2006), Kufri Himsona (2008), Kufri Frysona (2009), Kufri Chipsona-4 (2010), Kufri FryoM,

Kufri Sangam (2019) and Kufri Chipsona-5 (2022).

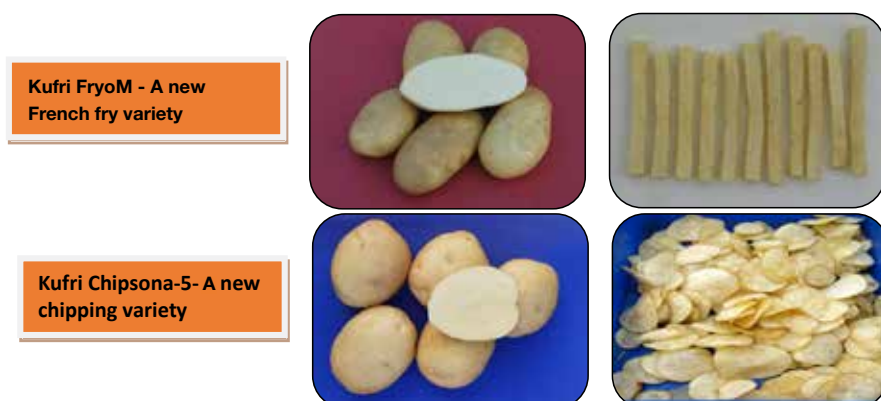
These varieties are gradually occupying substantial area in different regions of the country to meet the requirement of quality potatoes for processing. There is however, need to breed more processing varieties with early to medium maturity for various purposes, especially for the hotter regions of the country where the potato growing period is continuously decreasing and for the vast Indo-Gangetic plains.

There have been several other interventions which not only helped to realize better economic yield but also have a significant role in sustaining the production of processing potatoes *vis-a-vis* ware potato. Refined production technologies for processing varieties, standardization of harvesting and handling methodology, reduction in the cost of transportation, reduction in post-harvest losses and storage of processing potatoes are important interventions for round-the-year operation of processing industries.

In India, the major potato processing industries are located in Gujarat, Madhya Pradesh, West Bengal, Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Assam, Punjab and around Delhi. Among these, potatoes produced in north-western and west-central plains require more duration to achieve desirable dry matter and low reducing sugars. It is known that areas with minimum night temperatures above 10°C during the last 30 days of the crop growth produce potatoes with high dry matter (> 20%) and low reducing sugars (< 100 mg/ 100 g fresh wt.). Due to changes in climatic conditions and pro-industry policies of many states, processors were, encouraged to invest and establish processing units in newer areas like Uttar Pradesh, Assam and many more states.

Based on the growing season, time of harvesting or availability of raw material and utilization period, these areas further can be divided into various groups. Potatoes for processing are, therefore, procured by the industry from-

- Gujarat, West Bengal, the Malwa region of Madhya Pradesh, Central Uttar Pradesh from February-March to June
- Chhindwara (Madhya Pradesh), Hoshiarpur (Punjab) and Nagrota (J&K), early *rabi* crop from November-January
- Plateau region of Karnataka, Maharashtra and similar agro-eco regions - from August to December



Further, fully mature crop of suitable processing varieties can be stored for 8-9 months and provide raw material throughout the year. This arrangement, however, involves long-distance transport of raw materials adding to the cost of production and deterioration in raw material quality. However, these above regions are also vulnerable to many biotic and abiotic stresses (late blight in West Bengal and bacterial wilt and late blight in Karnataka and Maharashtra), frosting (Malwa region of MP) and shorter window for growth and production of potatoes in central plains of the country.

Adoption and impact of these technologies and interventions are very much evident from the economic analysis done during 2014, which showed that net returns in the cultivation of French fry's potatoes were ₹ 1,45,330/ha against ₹ 113,852/ha for general potatoes and the benefit-cost ratio was 2.19 against 2.05 for general potato. This has made the French fry value chain highly sustainable and growth-oriented in India. In addition to chipping industries, varieties namely Kufri Chipsona-1 and Kufri Himsona are being exclusively used by the major potato flakes industry, Kufri Frysona and Kufri FryoM for French fry industries.

All those associated with the potato value chain from farmers to traders and processors to consumers have benefited due to the 'chipping revolution' in India. Analysis of the experience and pattern of the Indian processing industry envisioned that demand for processing quality potatoes over the next 40 years will rise at the fastest pace for French fries (11.6% ACGR) followed by potato flakes/ powder (7.6%) and potato chips (4.5%). The actual demand for processing potatoes will rise from 2.8 million tonnes in 2010 to 5.95 million tonnes during the year 2025 at an ACGR of 5.61 (ICAR CPRI Vision 2050). The organized potato processing industry in India has grown from 125 thousand tonnes in 2003 to about 1800 thousand tonnes in 2018-19. During 2018-19, processing in the organized

sector was only about 40% (1.83 million tonnes) and the share of the unorganized sector including home-scale processing like preparation of dehydrated products was about 60% i.e. 2.74 million tonnes. The present scenario seems to be very close to our analysis.

In recent years, the demand for processed/frozen potato products in India has further increased many folds and several national and multinational companies have ventured into the potato processing sector. Especially, frozen potato products have rapidly gained prominence in the country as they are convenient to cook and come in a large variety of flavours and shapes. According to the latest report by IMARC Group, titled 'Indian Frozen Potato Products Market: Industry Trends, Share, Size, Growth, Opportunity and Forecast 2023-2028', the Indian frozen potato products market size reached US\$ 1.4 Billion in 2022. Looking forward, IMARC Group expects the market to reach US\$ 2.8 Billion by 2028, exhibiting a growth rate (CAGR) of 12.16% during 2023-2028.

Potato processing typically involves numerous steps such as cleaning, peeling, washing, slicing, and blanching of fresh potatoes to create products such as French fries, chips, flakes, and starch. Processed potato products are used by households, fast food chains, and restaurants to produce dishes such as French fries, salads, and potato snacks while requiring only a fraction of the time as they are already partially prepared before reaching the end-user.

The rapid growth of quick-service restaurant chains and increasing penetration of online food delivery services during the COVID-19 pandemic, are some of the key factors that are set to drive the growth of the potato processing market during the period 2022-2027. Our discussion with industry personnel indicates that there is a huge demand for processing potatoes and processed products and this is going to get

more impetus in the near future. In 2014, about 3.0 million tonnes of potatoes were used for processing, which doubled to 6.0 million tonnes in 2023. The number of major potato processing units in the organized sector was about 7, which has now increased to more than 36 in 2023. India's French fry and other potato-based frozen products production in 2014 was 0.35 lakh tonnes, mostly for domestic consumption and now it has increased to 3.0 lakh tonnes and has become a major exporter of French fries and other potato-based frozen products of about 2.0 lakh tonnes in 2023-24.

Besides enhancement of processing capacity in newer areas by existing big processors like PepsiCo-Lays India, Balaji Wafers, Haldiram, ITC Bingo (chips, namkeen, flakes), HyFun Foods, McCain's Foods, Iscon Balaji, Amul (French fries/Flakes/hash browns), many more upcoming industries are exploring ventures in potato processing in various regions of the country which may significantly upscale the utilization of potato and potato processing scenario.

India's processed potato export share is negligible when it comes to the world's top 5 importers, i.e. US, UK, Japan, France and Germany. This indicates an opportunity for Indian processed potato manufacturers and exporters to cater to the global demand and grow their exports in the blooming international markets. However, there has been a quantum jump in the export of processed potatoes in the recent past. India's processed potato exports to the world have been growing for the past few years. As per India Business & Trade November 20, 2023, in 2022-23, India exported US\$ 107.49 million of processed potatoes to the world, up from US\$ 56.7 million in 2021-22, growing at a CAGR of 44.2% during the period (2017-23). India's total exports of processed potatoes to the Philippines stood at US\$ 43.24 million in 2022-23, followed by Thailand (US\$ 30.78 million), Indonesia (US\$ 6.99 million), Vietnam (US\$ 6.22 million), and Malaysia (US\$ 4.64 million).

Leading Indian and multinational industries like FMEL Agrifriz Pvt Ltd (Falcon group), Agristo India (Wave Agro), JK Singhania, JR Simplot Foods Private Limited, Farmton, Chillfill Foods, and SK International have already ventured into potato processing (French fries/ Flakes/hash browns) and many more are about to come in this sector.

India has the strengths and opportunities to achieve higher growth rates, a bright future in the potato processing sector due to the availability of indigenous processing varieties, suitability of producing areas, contract farming

and other risk management techniques, micro-irrigation, cheap labour and favourable location for export.

To cater for the demand of increasing raw materials, there is a need to develop more processing varieties for growing under early to medium crop durations (75-90 days) to fit well in popular cropping systems. Major areas where we need to give more emphasis on sustaining the cultivation of processing potatoes in the long run are:

- Varieties that withstand high temperatures during tuber formation and harvesting

- Varieties for stable processing quality after long-term storage
- Varieties for resistance to low-temperature sweetening for storing potatoes
- Need to reduce reliance on sprout-inhibiting chemicals and ensure the amount of acrylamide in finished products conforms to international standards
- Effective management of dry-rot, root knots nematode, fungal and bacterial diseases are need of the hour

*Corresponding author email:
Vijay.Gupta@icar.gov.in

