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REVIEW ARTICLE

Role of potato in entrepreneurship development

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Abstract

Potatoes can play various roles in entrepreneurship development, especially in sectors related to agriculture, food processing, and retail. Potatoes are a staple crop in many regions, and cultivating them can be a profitable venture for farmers. Entrepreneurial farmers can innovate in terms of cultivation techniques, such as adopting organic farming practices or implementing technology-driven precision agriculture methods. They can establish businesses related to potato farming inputs, such as supplying high-quality seeds, fertilizers, and pesticides. Additionally, there's potential for startups to provide farm machinery, irrigation systems, and other equipment tailored to potato cultivation. Potatoes are versatile ingredients used in various food products like chips, fries, mashed potatoes, and snacks. Entrepreneurs can set up food processing units to manufacture these products, focusing on quality, flavor innovation, and health-conscious options to meet consumer demands. Beyond traditional potato products, there's an opportunity for entrepreneurs to create value-added products like dehydrated potato flakes, starch, flour, and specialty potato-based foods. These ventures can cater to niche markets or capitalize on trends such as gluten-free or vegan diets. Distribution networks or retail outlets specializing in potato products can be established. This could involve setting up standalone stores, online platforms or partnering with supermarkets and grocery chains to reach a broader customer base. In regions with surplus potato production, entrepreneurs can explore export opportunities by tapping into international markets. This might involve complying with export regulations, ensuring product quality and packaging standards, and building relationships with overseas buyers. Overall, potatoes offer a multitude of opportunities for entrepreneurship across the agricultural and food industry value chain, from farming and processing to distribution and retail. Entrepreneurs who innovate, adapt to market trends, and focus on quality and sustainability can unlock the full potential of potato-based ventures.

Keywords: Seed potato, Value-added products, Startups, Export, Retail.

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Introduction

The growth of any nation depends upon the proper and optimal utilization of different resources of a nation. With globalization and economic liberalization concomitant with growing urbanization, consumer preferences are changing (Devaux et al., 2014). To address this situation, the emphasis is on enabling farmers to increase their level of competitiveness, to produce for an identified market and seek new market opportunities that offer higher levels of income. Agriculture and allied sectors are the largest enterprises in the country and an enterprise can survive only if it can grow consistently. Potato is one of the most crucial food crops in the entire world. Potato is the third most important food crop worldwide. The Indian economy is primarily based on agriculture and over 58% of the Indian population is involved in livelihood related to agriculture works (Kaur et al., 2023). Potato contributes strongly to the agricultural economy of the country. The current share of potatoes in agricultural growth domestic product (GDP) from a unit area of cultivable land is about 3.7 times (2.86% agricultural GDP from 1.32% cultivable area) higher than rice (18.25% GDP from 31.19% cultivable area) and 5.4 times higher than wheat (8.22% GDP from 20.56% cultivable area), which are the two principal food crops of the country (Singh et al. 2020a). India is the

second largest producer of potatoes in the world, but when it comes to processing, it is not even in the top ten nations. Its global contribution to processing is minuscule. There are 9 major potato-producing states in India, i.e., Punjab, Andhra Pradesh, West Bengal, Gujarat, Uttar Pradesh, Haryana and Assam, Bihar, and Madhya Pradesh. Potatoes occupy an important place in Indian cuisine and it is one of the most demanding items of Indian cuisine. Potatoes are also contributing majorly to the food security of the nation in addition to cereals.

Entrepreneurship is commonly referred to as a process of setting up one's own business and at the same time having the capabilities to identify the fruitful opportunities that come in the way. It is the process of creating something new with value by devoting the necessary time and effort, assuming the accompanying risks, and receiving the resulting rewards. Entrepreneurs are innovators or developers who recognize and seize opportunities, convert those opportunities to marketable ideas (products or services that can be sold); add value through effort and skills, assume the risks of the competitive marketplace and realize the rewards or losses. ICAR-CPRI technologies related to mini-tubers production through Aeroponics systems, Indigenous varieties, value-added products managed and transferred by the institute technology management unit (ITMU) have spread over almost different states of the country, building farmers' and enterprises' confidence and contributing to potato productivity, production and development of entrepreneurship. In the journey of successful entrepreneurship in the potato sector, the entrepreneur must have traits like decision-making ability, being resourceful, personable, adaptable, persuasive and hungry for business development. ICAR-CPRI is marching ahead with its vision of advancing professional competency for pursuing excellence in research and entrepreneurship development in relation to potato and associated sectors with ethical values to meet the regional and national needs and offering specialized services to the farmers and entrepreneurs for decent livelihood and earning. The potato sector has a bright scope of entrepreneurship development (Fig. 1).

Entrepreneurship in seed potato sector

The seed potato sector offers significant scope for entrepreneurship due to its critical role in ensuring quality and high-yielding potato crops. Entrepreneurship in producing quality seed mini-tubers using aeroponics technology presents a promising opportunity to address the challenges facing the seed potato sector while fostering innovation, economic growth, and sustainability in agriculture.

Seed potatoes: Indian scenario

The availability of virus-free planting material is a prerequisite for micropropagation and seed production of the clonally propagated potato crop. The Government of India is committed for ensuring the timely availability of certified seeds to the farmers cultivating different crops. However, for high-volume high-seed rate crops like potatoes, the production and supply of good quality certified seeds is a challenge. Annually, India requires 5.4 million tons of potato tubers as seeds. The challenge becomes even more complex as the vegetative mode of propagation makes the seed vulnerable to several pathogens in its multiplication process and the seed multiplication ratio (SMR) of 1:6 is meager. Farmers, mainly marginal and small farmers, rarely store their harvests as seeds for the next growing season. Often, they buy seed potatoes every season, making the seed replacement rate (SRR) almost 100%. However, there is no institutional mechanism to monitor the quality of seed potatoes. Most often, degenerated produce is sold as seed, especially to small and marginal farmers who lack finances (Buckseth et al., 2022). The seed alone comprises over one-third of the total cost of production of potatoes. There is a considerable gap between the requirement and supply of certified seed potatoes in India. The Central Potato Research Institute of the Indian Council of Agricultural Research produces about 3,000 tons of nucleus and breeder seed annually and supplies 80% of it to the states and other agencies for its multiplication. If this stock were to multiply in three stages, i.e., Foundation 1, Foundation 2, and Certified grades, we could produce only about 0.5 million tons of certified seed. On the assumption of 100% SRR, it meets only 10% of the total seed requirement, leaving a deficit of about 4.9 million tons. It is virtually impossible to produce such a massive quantity of certified seeds using traditional methods. Besides its low rate of multiplication in a longer span of 7 to 8 years, the traditional seed production system suffers from several other constraints like (i) the requirement of a huge number of disease-free propagules in the initial stage, (ii) the slower process of generating 100% healthy seed stock from the infected material, (iii) progressive accumulation of degenerative viral diseases in each field exposure, and (iv) field multiplications of initial

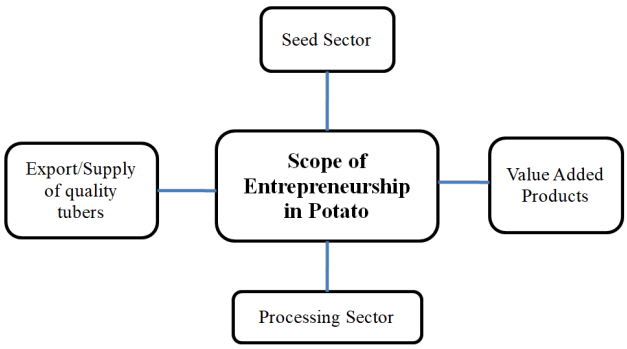

Fig. 1: Entrepreneurship scope in potato sector/farming

disease-free material. It is further complicated because the breeder Seed supplied by ICAR-CPRI is seldom multiplied in all three generations by the State Seed Certification Agencies maintaining the recommended procedures (Singh et al., 2019). About 1.2 million tons of potato seed is sold by private seed producers, especially those from Punjab, western Uttar Pradesh, West Bengal and Haryana, though there are no mechanisms and infrastructures for monitoring seed quality. It is, therefore, imperative to evolve a seed production system encompassing innovative techniques to improve the quality of seed (NAAS, 2021) and to reduce field exposure, along with a robust system of certification and quality assurance of the seed produced and supplied by private seed growers.

Role of ICAR-CPRI for the development of the seed industry

Of the key technologies developed by the institute, the tissue culture-based hi-tech seed system developed has led to the opening of > 30 labs across the country and has allowed the supply of healthy mother stock (in vitro plants) to different seed-producing organizations/agencies for seed production in the country. One in vitro tube with 2 to 3 plants, sub-cultured atleast ten (2^{10}) times will generate 2048 plants. During 2010-2020, ~1296 culture tubes were supplied to 64 firms, which would have generated 2654208 healthy microplants. These plants would have covered 8 ha area under G0 crop followed by 40 ha G1, 200 ha G2, 1000 ha G3, 50000 ha G4 and 25000 ha G5 area respectively, thereby producing 6250000 quintals of certified seed. This has resulted in covering 12.5% of the total potato area of the country, resulting in a total monetary gain of Rs. 1250 crores, assuming that seed potatoes were sold @ Rs. 20000/ton. Further, the aeroponics technology, which has revolutionized the seed system in the country, has been commercialized to 28 entrepreneurs associated with mini-tubers production and 6 entrepreneurs involved with the fabrication of aeroponics units in 10 different states of the country viz, Haryana, Punjab, Madhya Pradesh, Bihar, Uttar Pradesh, Mizoram, Gujarat, New Delhi, West Bengal and Maharashtra. There is a huge scope for entrepreneurship to produce quality seed mini-tubers in other states of the country. The combination of seed production technology advancement and the availability of varieties in the Indian market has resulted in tremendous development in the seed industry recently. There is an excellent transformation in the overall potato portfolio across the sectors in the country and farmers need to rationalize their production as per the requirement of various categories of potatoes. Many of the entrepreneurs like M/s Sekhon Biotech, Rupnagar and M/s Bhatti Agritech, Jalandhar are, directly established and benefited from the ICAR-CPRI technologies and started quality planting material production after licensing CPRI aeroponic technology. Another successful entrepreneur in potato mini-tuber production for fulfilling the seed requirement is M/s Raghuvansh Agro Farm, Kanpur (Fig. 2).

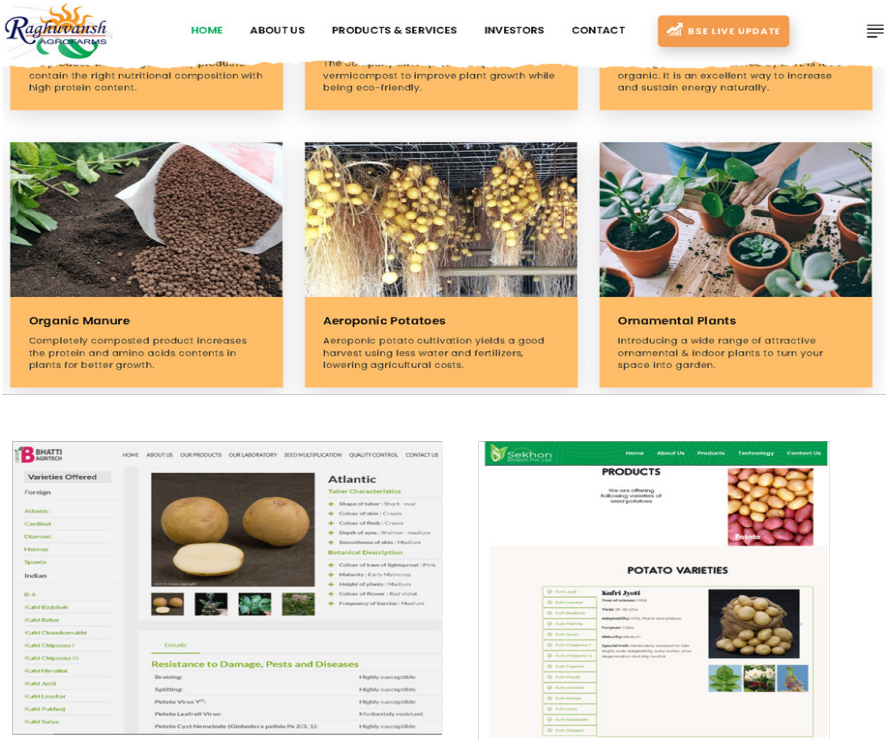

Fig. 2: Aeroponics entrepreneurs involved in the seed sector M/s Raghuvansh Agrofarm, Kanpur; M/s Bhatti Agritech, Jalandhar; M/s Sekhon Biotech Pvt. Ltd. Rupnagar Punjab

Entrepreneurship in Potato Processing Sector

Entrepreneurship in the potato processing sector offers a multitude of opportunities for value addition, innovation, and market expansion. The rate of population growth and urbanization is increasing as is the level of potato consumption, especially in the form of chips and crisps. The global potato market has been segregated into frozen products, potato chips and snack pellets, dehydrated and other products. Potato chips remain the most popular snack food across the globe, valued at USD 31.2 billion in 2020 and is expected to grow at a compound annual growth. Rate (CAGR) of 6.4% during 2020–2026 (IMARC 2020). The frozen potato market is growing fast due to the rise in the market for French fries supplied in restaurants and fast food outlets (Rana and Singh, 2017). The worldwide frozen potato market is dominated by French fries, capturing a share of about 40% (market share of USD 21.8 billion in 2020) (IMARC 2021). The market for dehydrated potato flakes is also witnessing substantial growth due to their longer shelf life, ease of handling and all-season availability. These instant potatoes mimic the original flavor of fresh potatoes and provide excellent thickening properties. Globally, the dehydrated potato market is dominated by flakes (capturing 36.5% market share), followed by potato powder, dice, value-added products and shreds (Fig 3). The potato processing sector contributes immensely towards global food security.

Growing urbanization and consumers' shift to convenient ready-to-eat foods have led to tremendous growth in the Indian potato processing sector, particularly with French fries being one of the largest-selling food items. India is the major producer of potatoes in the world, but only 7% of total produce is processed (compared to industrialized countries, this percentage is over 80). Recent trends in changing food consumption habits worldwide indicate that the Indian potato processing industry has potential scope for further expansion. With a global production of 371 million tonnes, India is producing over 53 million tons of potatoes which is second next to China. Also, India has the prospects for growth of processed potato products where the economic boom is apt to create a sturdy demand for convenient ready-to-eat snack foods. In India, most of the crop is cultivated for table and seed purposes while processing is still in its infancy stage. Hence, there is ample scope to invest in potato processing industries in India. The Indian frozen French fry industry and dehydrated potato flake industry has undergone enormous growth in the past one and half decades. In the year 2010, the potato processing level was only 3 to 4%, but now, due to the setting up of more potato processing units, the consumption of potatoes for processing has almost doubled up to 7–8%. Potato training activity is carried out as one of the solutions to increase entrepreneurial interest and courage to start a business among housewives from the smallest social sphere, namely the household. This can encourage women's independence and empower the potential of housewives who still have a lot of free time. The training and exposure of this material is expected to increase the understanding and spirit of entrepreneurship for housewives and the practice of making potato chips that is done can increase the skills of housewives. There are many startups with the products developed by ICAR-CPRI Shimla. Investing in research and development is essential for staying ahead of market trends and consumer preferences. Entrepreneurs can conduct product testing, flavor innovation, and sensory evaluations to continuously improve existing products and develop new offerings that meet evolving consumer demands.

Fig. 3: Value-added and processing products of potato

Entrepreneurship in the potato processing sector offers vast potential for growth, innovation, and profitability. By leveraging technological advancements, market insights, and strategic partnerships, entrepreneurs can establish successful ventures that contribute to the development and sustainability of the potato industry.

Export scope in Potato and its products

Exports surged beginning in 2017 as India established the capacity to produce international-grade French fries. There was a surplus of domestically created products available, resulting in a decline in import quantities. The production capacity of French fries increased by 0.1 million tonnes over the last decade, which is directly related to the expansion of fast food chains (McDonald's) and the creation and growth of food merchants (The Economic Times 2013). India managed to export around 10,000 tonnes of dehydrated potato flakes to countries like Malaysia, Indonesia, Thailand, Philippines and Vietnam in 2019 (FAOSTAT 2019). India also witnessed remarkable growth in export of fresh potatoes during the last decade. India entered the market in 1987 and now, it is Asia's third largest exporter of fresh potatoes (table and processing) after Iran, China and Pakistan. Export of fresh potatoes from India increased from 0.1 million tonnes in 2010 to 0.42 million tonnes in the year 2019 (FAOSTAT 2019), with 14% growth per annum, valued at 76.6 million USD (Gondalia et al., 2017).

Way Forward

The article highlights the importance of promoting entrepreneurial behavior among potato growers and underscores the potential of potato processing to contribute to India's self-sustainability in food production and nutrition. Here are some key points:

Enhancing entrepreneurial behavior

There is a need to enhance the entrepreneurial behavior of potato growers by providing them with specific knowledge and encouraging the adoption of value-added practices. This could involve training programs, workshops, and educational initiatives aimed at fostering entrepreneurship skills and mindset among farmers.

Understanding human behavior

Analyzing entrepreneurship and entrepreneurial behavior among potato farmers can aid in understanding and predicting human behavior in agricultural contexts. By gaining insights into the factors influencing entrepreneurial decision-making and actions, policymakers and stakeholders can design targeted interventions to support entrepreneurial growth.

Promoting Entrepreneurial Performance

The analysis of entrepreneurship among potato farmers can help in enhancing motivation and entrepreneurial performance within the agricultural sector. By identifying barriers to entrepreneurship and addressing them through policy measures and support programs, the overall performance and productivity of potato growers can be improved.

Future Growth Prospects

The growth of the potato-based industry in India is expected to be lucrative, offering opportunities for high-profile growth and development. Sustainable growth in the potato processing sector can benefit both producers and processors, creating employment opportunities, generating income, and supporting rural livelihoods.

Contribution to Food Security

Potato processing can contribute to achieving self-sufficiency in food security by diversifying food sources, reducing postharvest losses, and ensuring year-round availability of potato-based products. This can strengthen India's position in the global food market and enhance its resilience to food supply disruptions.

In conclusion, promoting entrepreneurship among potato growers and leveraging potato processing for value addition can contribute significantly to India's agricultural development, economic growth, and food security objectives. By investing in entrepreneurship development and supporting the growth of the potato processing industry, India can harness the full potential of its agricultural resources to meet the nutritional needs of its population and achieve self-sustainability in food production.

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