Sustaining Potato Revolution in India

An Interaction with R&D Manager

In India, the Shimla-based Central Potato Research Institute (CPRI) is a pioneer institute working on R&D of potato since 1949. The CPRI, Shimla, with a sound and strong research network has come out with the development of a number of production technologies and developed an array of high-yielding various varieties. The innovations made by the institute in both technological and varietal development have tremendous impact on the economy of potato growers, resulting in the development of a number of entrepreneurs and traders. Moreover, the potato cultivation has developed immense employment opportunities also. Thus, potato cultivation has increased the economy of farmers, entrepreneurs, traders and those who are involved in its business.

Potato is a wholesome food. It is used as a vegetable tuber in its mouth-watering delicacies. The historical background also enhances its value as a food of crisis and food for sustainability. Our forefathers used to eat its tubers and lived for a longer life. Today, potato is predominantly an integral part of both vegetarian and non-vegetarian societies. It is consumed in one or the other ways throughout the world.

Dr. S.K. Pandey, a renowned potato breeder, has developed a number of new potato varieties, which have revolutionized its cultivation as a lucrative venture. The varieties bred by Dr. Pandey are well-known for their distinguished characteristics all over the world in both fresh and processed products. Under his dynamic leadership, the CPRI, Shimla, has made our country self-sustainable in potato production by increasing the yield manifold and availability to masses.

The Editor interacted with Dr. S.K. Pandey, Director, CPRI, Shimla. The excerpts are given here:

Dr. Pandey, we come across by “sugar-free potato” daily with vegetable venders. What is the fact behind this?

Potatoes when stored at low temperature at 3-4°C in cold stores develops sweetening because of conversion of starch into reducing sugars. However, potatoes stored at 10-12°C have low level of sugars in them and they are termed as “sugar-free potato” although, they are not totally free of sugars. Such potatoes are also being sold as “Pahari Aloo” and Diet Potato.

You are working on potato since last so many years. What is the national scenario of total potato production in the country nowadays?

India has taken a giant leap in terms of potato area and production since independence. Compared to 1949-50, the year of establishment of CPRI, when the total production was 1.54 million tonnes from an area of 0.234 million ha, we now produce about 28 million tonnes of potato from about 1.3 million ha area. In terms of area, we are fourth in world after China, Russian Federation and Ukraine and third in production after China and Russian Federation.
Now, we produce 28 million tonnes of potato. How much credit should go to your contribution?

Although development of high-yielding varieties is a combined team effort, I have been associated in the development and release of more than 15 potato varieties out of total 47 varieties released by CPRI. My personal satisfaction is with the development of 4 Indian processing varieties, Kufri Chipsona-1, Kufri Chipsona-2, Kufri Chipsona-3 and Kufri Himsona, a very special variety for French fries, Kufri Frysona and a variety Kufri Surya, which is specially bred for non-traditional warmer areas. I never believe in credits because it is always a combined and team effort. Luckily, I have a good team of scientists working shoulder to shoulder alongside and the Institute is confident to meet any challenge in future.

Give the names of most popular varieties which are ideally suited for food purposes especially for vegetables

At varietal level, the most popular varieties are Kufri Jyoti, Kufri Bahar and Kufri Pukhraj. Each of these varieties occupy about 20% of total cultivated area in India. But the popularity of varieties for vegetable purposes varies from region to region. Each region has developed taste for specific varieties. The popular varieties in different potato growing-regions are:

North Indian hills: Kufri Jyoti, Kufri Chandramukhi, Kufri Giriraj, Kufri Himalini, Kufri Girdhari and Kufri Kanchan


North Bengal hills: Kufri Kanchan and Kufri Jyoti


South Indian hills: Kufri swarna, Kufri Jyoti and Kufri Giriraj.

Which varieties are ideal for processing purposes?

Potatoes with high dry matter and low reducing sugars are good for processing. Such potatoes on frying produce white/light colour in processed products.

In plains:
- For chips: Kufri Chipsona-1 and Kufri Chipsona-3.
- For French fries: Kufri Frysona.

In hills:
- Kufri Himsona and Kufri Jyoti

Chipsona varieties having high dry matter when processed gives higher recovery of processed products with lesser absorption of oil and thus are ideal for processing.

Is there any potato variety which is at par or superior to the American varieties in terms of processed products?

American varieties suitable for processing are Atlantic and FTL-1533. But all of these are highly susceptible to Late Blight. All Indian processing varieties, viz. Kufri Chipsona-1, Kufri Chipsona-3 and Kufri Frysona adapted for growing in short winter days in plains and Kufri Himsona for hills have high level of resistance to Late Blight, very good yield potential (> 25 tonnes/ha) with better tuber shape and size. These varieties are ideal for making processed products of international standards and are equivalent or better than any international processing variety. All major processing units are using these varieties for preparation of chips and French fries.

Please, highlight major breakthroughs/technological advancements made in potato development

The Institute is credited with very large number of technologies. As a result of their adoption in last 6 decades there was 6.64 fold increase in area, 18.45 in production and 2.78 in yield of potato. In contrast, there was 0.42, 3.7 and 2.3 fold increase in area, production and yield respectively in case of rice and 1.8, 11 and 4.2 fold increase for wheat.

Tell the names of technologies which are most popular and famous in the country developed by the institute and how these innovations have made farmers/entrepreneurs prosperous?

- Seed plot technique of producing healthy seed in North-Western plains has made the country self-sufficient in production of required seed in the country. All neighbouring countries, e.g. Pakistan, Bangladesh, Nepal, Sri Lanka, etc. import their required seed from Holland, paying very high price. Not only farmers of North-West plains have benefitted but our country has saved of rupees in...
millions and millions foreign exchange which would have gone for purchase of costly seed from foreign countries.

- Development of indigenous processing varieties has revolutionized the processing industry. Not only the processing sector has been immensely benefited and saved from costly import, but their adoption and production through contract farming etc. has given lot of earnings to the farmers in recent years.

- Development of short duration varieties like Kufri Pukhraj has changed the entire scenario of early potato production where using this high-yielding varieties in Punjab, Uttar Pradesh, Gujarat, Madhya Pradesh and West Bengal, farmers are getting very high price of their produce within a very short period of two and half months. Early potatoes are now available in market right from first week of December onwards, whereas the normal crop comes in February onward.

- The introduction and adoption of India’s first ever short duration heat tolerant variety, Kufri Surya, has proved a boon for the farmers of Gujarat, West Bengal and Maharashtra, where warmer temperatures prevail during crops growing period. The variety is also likely to be helpful in mitigating ill effects of likely higher temperatures in the years to come due to changes in the climate.

- The technology of higher temperature storage with the use of CIPC, has made it possible round the year availability of fresh potatoes in the market. Such potatoes in the name of “Sugar free”, “Diet potatoes” and “Pahari aloo” are fetching very high returns to the farmers.

The R & D work has helped a lot to farmers, entrepreneurs and traders. Are there some success stories of such types of people?

Potato contributed 2.48% of the total agricultural output from only 1.07% of the total cropped area in the year 2007-08. In comparison rice and wheat contributed about 14.54% from 30.29% area and 10.95% from 19.48% area respectively. Potato thus contributed four times more than both wheat and rice from unit area to the national economy in agricultural sub sector. This in itself is a success story of Indian Agriculture and Central Potato Research Institute.

- The adoption of conventional and high-tech seed production technologies developed by the institute has led to opening of more than 15 tissue cultures labs throughout the country. However, opening of such tissue culture labs and production of good seed at the level of farmers by adopting the technology of the Institute is amazing. Such labs, viz. M/s Sangha Seeds at Jalandhar, KF Biotech at Bangalore, M/s Transgene Private Limited at Ropar/Chandigarh, entirely run by farmers are examples of successes of above technology where good quality healthy seed is being made available to the fellow farmers by farmers themselves.

- Adoption and utilization of produce of indigenous Kufri Chipsona varieties as raw material in processing units led to opening of more than 30 processing units involved in production of chips, French fries, potato powder, potato sticks, etc. starting from first company by M/s Pepsico India Holdings in 1990. Not only every year at least one new companies enters into processing sector but the existing company like M/s Pepsico India Holdings, M/s ITC, M/s Balaji Wafer, M/s Haldi Ram etc. are enhancing their manufacturing capacity, every year. This speaks of popularity of varieties developed by the Institute.

- The technology of storing potatoes at elevated temperature with use of CIPC has resulted in opening of several new cold storages which run at 10-12°C instead of 3-4°C saving precious energy. Many existing cold storages are enlarging their capacity by adding elevated temperature storage chambers. Already nearly 1.5% of total cold storage capacity either has been created or converted into elevated temperature storage which is growing rapidly. Such potatoes not only are fetching very good price in market but are also suitable for processing providing raw material to the processing units during lean periods when fresh potatoes are not available in the market.

What is the maximum yield potential of potato varieties at farmers’ fields?

The yield potential of potato varies from variety to variety according to their maturity. However, it has been observed that the varieties like Kufri Bahar, Kufri Arun and Kufri Jyoti gave yield of 350-400 q/ha at farmers’ field.

Is there still yield gap to be bridged between the laboratory and farmers’ fields?

Yes, there is a potato yield gap between lab and

Most popular potato varieties grown in the Indo-Gangetic plains

Popular varieties for Indo-Gangetic plains are:

- Kufri Chipsona-1 and Kufri Chipsona-3 for processing.

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farmers’ fields. This can be minimized by making aware of the recent potato technologies to the farmers.

Highlight the farmers’ acceptability for your technologies.

A number of surveys were conducted by the scientists regarding farmers’ acceptability of the potato production technologies in Uttar Pradesh, Punjab, Haryana, Bihar and West Bengal. It has been found that the adoption level of different technologies like high-yielding potato varieties, nutrient management, disease and pest management found to be 70-90%.

Some farmers are doing excellent potato cultivation. Tell their names who have popularized potato cultivation and become source of inspiration to other farmers

Tek Chand, Bharat Singh and Basant Singh from Himachal Pradesh have popularized potato cultivation with latest potato production technologies. They have been also supplying quality seed potato to other farmers

What are your extension activities for the welfare of farmers every year?

The Institute has organizing Kisan Melas/Field Ghosti, farmers training, Live Phone-in-Programme on AIR/Doordarshan, Aloo Pathshala, putting up potato exhibitions in the villages, etc. every year for the benefit of the farmers. Despite of this the Institute also laid out on/off farms demonstrations/trials at farmers’ fields on different aspects of potato production technologies.

Do you supply some information on printed literature to the farmers?

Yes. The Institute has brought out a large number of technical and extension bulletins which covers each and every aspect of scientific potato cultivation. Through ATIC these information are being distributed to the farmers during their visit to the Institute. The farmers/potato growers are also shown Film on Potato cultivation.

Do the farmers get benefit from your dissemination of information on technologies developed by the institute

Yes. The farmers are benefited by the dissemination of the information on technologies. The ATIC also receives large number of letters from the potato framers of different parts of the country stating the benefits aroused from the potato cultivation through this Institute publications.

There are a number of cold storage for potato surrounding the Regional Station. But all these are of traditional type and cost more to farmers. Have you made some R&D on potato storage which is quite affordable and cost-effective to our farmers?

No, CPRI is not carrying out any R&D on cold storages as it does not work in this area. However, there are a number of traditional low-cost and non-refrigerated storage structures like sand pits, diffused light storage rooms, thatched mud wall rooms, etc. which are in use in India. We have studied, validated, refined and popularized these structures.

Give economic analysis of potato cultivation so that our farmers could start potato growing from traditional crops

Although Institute has conducted studies for assessing the economic of potato cultivation at farmers’ fields in different states of the country. On an average the variable cost of cultivation range from Rs 50,000 to 70,000/ha, depending from state to state. Gross income is about Rs 1.0 – 1.5 lakh/ha with a benefit:cost ratio of 1:1.6.

Dr Som Dutt

Indian Horticulture