

Introduction

Chinese potato [*Plectranthus rotundifolius* (Poir.) Spreng.,] is one among the important minor tropical tuber crops grown in India, Sri Lanka, south east Asia and parts of Africa mainly for edible purpose. The tubers resemble potato in appearance and are consumed as vegetable after cooking and has an aromatic flavour and delicious taste. It is a bushy herbaceous annual with succulent stems and aromatic leaves. It grows well under tropical and sub-tropical conditions. It requires a well-drained fertile soil. Crop can be grown as rainfed both under upland and lowland situations where there is no water logging. It is propagated by stem cuttings or tubers. Harvest can be done within 4-5 months and the yield varies from 15 to 20 t ha⁻¹. The plant produces a cluster of dark brown aromatic tubers at the base and lower parts of the stem. The tubers contain 31-33 % dry matter and 18-20 % starch with a characteristic flavour which is preferred by the consumers. In India, it is mainly cultivated in Kerala (Thrissur, Palakkad, Kasaragod and Kannur districts), Tamil Nadu (Tirunelveli, Tenkasi, Tuticorin, Virudhunagar and Kanyakumari districts) and in tribal settlements throughout the country.



Chinese potato field



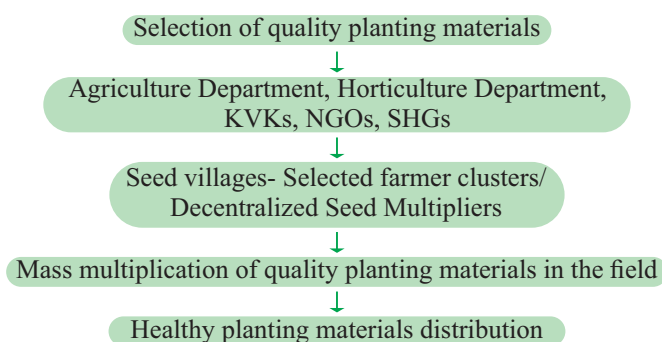
Chinese potato tubers

Seed Village Programme (SVP)

The availability of quality planting materials (seed) at appropriate time determines the crop growth and productivity. Replacement of the local varieties with the good quality planting materials of newly released improved varieties is one of the important mandates of the Institute to increase the yield by 15-20%. Small and marginal farmers are often at disadvantageous position in adopting the new varieties as they have limited access to quality planting materials of the improved varieties and this is because of centralized production and distribution of quality planting materials by ICAR-CTCRI,

AICRP TC centres, State Agricultural Universities (SAUs), Krishi Vigyan Kendras (KVKs) etc. Though the organized sectors are producing enough quantity of planting materials, the supply chain is unable to meet the huge demand of planting materials across the country. Seed village programme provides an alternative to this problem and helps farmers to become self-reliant and to meet timely supply of planting materials. A village, wherein trained group of farmers are involved in planting materials production of Chinese potato to serve their needs and farmers of the village and neighbouring village in appropriate time and at economical cost is called 'Seed Village'. Seed villages for Chinese potato have been established for increasing the quality planting material production of improved variety. The seed village concept not only ensures good quality planting materials for enhancing productivity but also helps in distribution of planting materials among the villagers.

Seed Production System in Chinese Potato



Partners

Chinese potato growers, scientists/staff of ICAR-CTCRI and officials of KVK/State Department of Horticulture were the partners in seed village programme (SVP) of Tirunelveli and Tenkasi districts of Tamil Nadu.

- Lead Institute: ICAR-CTCRI, Thiruvananthapuram
- Supporting Institutes: KVK, Department of Horticulture
- Chinese potato growers

Lead Institute: ICAR-CTCRI	Supporting Institutes: KVK, Department of Horticulture	Participatory Farmers
<ul style="list-style-type: none"> ● To identify the farmers' preference, estimate the crop area, forming field clusters and assess the requirement of planting materials. ● To identify and select the appropriate and interested farmers group from different parts of the villages and train them as master trainers. ● To motivate and link up the farmers at planting materials cluster production level. ● To supply quality planting materials and other necessary inputs. ● To arrange periodic field inspection at different stages of crop growth, roguing of off-types and need based measures for quality of the produce. ● To arrange scientific harvesting, selection and storage of planting materials. ● To arrange periodic checking of planting materials during storage. 	<ul style="list-style-type: none"> ● To train the selected farmers on quality planting materials production. ● To ensure frequent visit of the experts to planting materials production plots. ● To make effective group discussion with the seed growers to solve current problems and to inspect the fields in association with the team leader. ● To monitor roguing and post-harvest operations. 	<ul style="list-style-type: none"> ● Should have an area of more than one acre for field clusters. ● To collect quality planting materials from ICAR-CTCRI and registered seed growers. ● Production of quality planting materials as per the recommended protocols published by ICAR-CTCRI. ● To maintain assured irrigation facilities for field clusters. ● To maintain proper isolation distance (time/space). ● To follow periodic roguing operation carefully. ● To take care of selection and proper storage of planting materials after harvesting to avoid physical admixture.

Improved technologies of Chinese potato

Through systematic research conducted at ICAR-CTCRI, many technologies viz., improved variety (Fig.1) and package of practices (Table 1) were developed for enhancing the productivity and profitability of Chinese potato. Different programmes are implemented by research and development departments to disseminate the research outcomes among farmers. The adoption level of improved technologies of Chinese potato by the farmers is comparatively low due to constraints including technological, management, marketing and socio-economic factors. Hence, seed village programme has been attempted through action research in farmers' fields of Tirunelveli and Tenkasi districts of Tamil Nadu for enhancing the availability of quality planting materials for cultivation by farmers.



Sree Dhara (Yield: 25 t ha⁻¹; Starch: 16-20 %)

Fig.1. Improved variety of Chinese potato released by ICAR-CTCRI

Table 1. Recommended package of practices for Chinese potato

Cropping season	July to November
Seed rate and planting materials	75-100 kg of whole tubers are required to raise nursery in an area of 500 m ² to plant one hectare of land; use 10-15 cm long stem cuttings free from pests and diseases and nematodes
Planting materials requirement (ha)	74,000 stem cuttings
Land preparation	Ridge & Furrow; Mound
Method of planting	Horizontal / Vertical planting
Suitability	Rainfed both under upland and low land conditions, fertile soil with good drainage facilities
Spacing and plant population (ha)	45 x 30 cm; 74,000 plants
Farmyard manure (t ha ⁻¹)	10
N: P ₂ O ₅ : K ₂ O (kg ha ⁻¹)	60: 60: 100
Intercultural operations	Weeding and earthing up at first and second months after planting
Crop duration (months)	4-5
Harvesting, grading and packing	Manually & grading by Chinese potato grader
Average yield (t ha ⁻¹)	15-20

Technological Interventions

Selection of Area

The areas with suitable conditions viz., soil type, irrigation, climatic conditions, labour availability and knowledge of local farmers on Chinese potato, less incidence of pests and diseases, past history of the area for suitability to raise seed crop, sufficient rainfall and its distribution during crop period and accessibility for transport and other purposes were selected. Scientists of ICAR-CTCRI identified suitable areas in different villages for seed production.

Seed Supply

ICAR-CTCRI supplied quality planting materials (stems) of improved variety of Chinese potato to identified farmers in the area. The farmers used these quality planting materials and took up seed production for their own use and to supply remaining planting materials to the neighbouring villages.

Selection of Seed Growers of Chinese Potato

A total of 80 farmers (with 50 cents plot each) who had interest in taking up scientific interventions were selected during 2018-2019 to 2022-2023 with the help of State Department of Horticulture, Government of Tamil Nadu and KVK by following the guidelines of SVP (Table 2). Improved variety of Chinese potato 'Sree Dhara' was supplied to the farmers for proving its technical feasibility and economic viability. Demonstrations under SVP were conducted by multidisciplinary team from ICAR-CTCRI comprising scientists and technical staff. Quality planting materials and critical inputs were supplied to the farmers for establishing demonstration plots under SVP. Monitoring and field inspection were carried out during the crop growth period.

Table 2. Seed village programmes of Chinese potato in Tamil Nadu

Year	No. of farmers	Seed villages, district
2018-2019	05	Alvan Thulukapatti, Tenkasi
2019-2020	15	Pallakkal Pothukudi, Tirunelveli Keezhakuthapanjan, Tenkasi
2020-2021	15	Pallakkal Pothukudi, Tirunelveli Keezhakuthapanjan, Tenkasi
2021-2022	25	Pallakkal Pothukudi & Mannarkovil, Tirunelveli K. Alankulam, Keezhakuthapanjan & Rajankapuram, Tenkasi
2022-2023	20	Pallakkal Pothukudi & Mannarkovil, Tirunelveli Keezhakuthapanjan & Velayudhasamy kudiyruppu, Tenkasi
Total	80	



Fig. 2. View of demonstration plots on Chinese potato (Sree Dhara) under SVP

Capacity Building

Farmers were trained on improved technologies and frequent farm advisory visits were also conducted by a team of scientists to monitor the growth and yield performance.

- Special emphasis was given to build farmer's capacity to produce quality seeds in order to harness the synergy between technologies and the community participation.
- The identified farmers for the seed crops grown in the seed

villages were given technological empowerment through training on seed production and seed technology.

Training and Field Inspection Schedule

A total of eight training programmes were organized for the benefit of 774 farmers including 80 seed growers of Chinese potato (Figs. 3 & 4 and Table 3).

- Field inspection at the time of planting on isolation distance, planting methods, seed treatment and other agronomic practices.
- Field inspection during tuber formation stage on identifying off types/weeds and removal, maintenance of seed plots, plant protection measures, maturity status and harvesting methods.
- Field inspection at the time of harvest on seed cleaning, grading, seed treating, bagging and storage aspects, seed sampling and seed testing in laboratory for analysis.



Fig. 3. Training programmes on Chinese potato for seed growers

Table 3. Training programmes organized in connection with SVP

Sl.No.	Name of the programme	Date	Venue	No. of beneficiaries
1	Field day cum agripreneur meet on Chinese potato	11 January 2019	Alvan Tulukkapatti, Tenkasi	100
2	Improved technologies of Chinese potato for enhancing productivity and farm income	27-29 August 2019	ICAR-CTCRI Thiruvananthapuram	25
3	Field day	20 September 2019	Pallakkal Pothukudi Tenkasi	70
4	Field day	10 December 2019	Kuthapanjan Tenkasi	84
5	Training on Improved technologies of Chinese potato for enhancing farm income	27 January 2021	Pallakkal Pothukudi Tirunelveli	75
6	Training on Improved production technologies and value addition in Chinese potato	23 December 2021	Rajankhapuram Tenkasi	115
7	Training on Improved production technologies and value addition in Chinese potato	24 December 2021	Mannarkovil Tirunelveli	105
8	Stakeholders interface and demonstration on Chinese potato grader	10 February 2023	Kuthapanjan, Tenkasi Pallakkal Podhukudi, Tirunelveli	200
	Total			774



Fig. 4. Field inspection and farm advisory visits to seed villages

Impact of SVP

The mean yield of the improved variety 'Sree Dhara' under seed village programme was found to be 5.06 t plot⁻¹ (25.30 t ha⁻¹) which can fetch a gross income of ₹ 2.02 lakhs (₹ 10.12 lakhs ha⁻¹) if it is sold as seed tubers @ ₹ 40 per kg. A total of 403.65 tonnes of seed tubers were produced by 80 seed growers in Tenkasi and Tirunelveli in five years which can cover an area of 2018 ha with 50 % of produced seed tubers (Table 5). The harvesting, grading and packing of the seed tubers were done manually for seed purpose and also for

transporting to different markets in Tamil Nadu, Kerala and other states of India for consumption (Fig. 5 & 6). Harvested tubers were distributed to the neighbouring farmers for establishing seed villages for meeting the demands of good quality planting materials of improved variety 'Sree Dhara' (Fig. 7) in the village. Realizing the advantages of improved technologies of Chinese potato, farmers have demanded for technological interventions in other villages. Accordingly, the SVP is continuing in Tenaksi and Tirunelveli districts of Tamil Nadu for improving the livelihood of the farmers through technological interventions. Large areas are expected to be covered under 'Sree Dhara' variety in the coming years for enhancing farm income and also to sustain the production of Chinese potato.

Table 5. Impact of SVP on improved variety of Chinese potato (Sree Dhara)

Year	Mean yield (t plot ⁻¹)*	No. of seed growers	Total seed tubers (t)	Projected area with 50 % seed tubers (ha)
2018-19	5.34	5	26.7	134
2019-20	4.66	15	69.9	350
2020-21	4.93	15	73.95	370
2021-22	5.14	25	128.5	643
2022-23	5.23	20	104.6	523
Total	5.00	80	403.65	2018

*Area: 50 cents per plot



Fig. 5. Harvesting and distribution of tubers of Chinese potato (Sree Dhara)



Fig. 6. Grading, packing and marketing of Chinese potato in Tamil Nadu



Fig. 7. Distribution of planting materials of Chinese potato (Sree Dhara) for SVP

Feedback from farmers

- The improved variety is high yielding with good shape and size
- More number of tubers/plant

- Tolerant to nematode infestation
- Good keeping quality
- High demand among traders/consumers
- Fetches remunerative price
- Nutrient efficient and drought tolerant and short duration (4 months).

Advantages of SVP

- Self sufficiency in seed production at village level
- Yield and income enhancement by seed production
- Problem of varietal admixture is less during harvesting and packing
- Easy monitoring and field inspection by the officials
- The cost of cultivation is less in seed village programme than normal seed production method
- Access to good quality seeds with high genetic and physical purity by the farmers
- No or low transportation cost and easy distribution of tubers/planting materials
- Motivation for the farmers to adopt new improved varieties

Conclusion

Seed village programme is a novel, demanding and highly practical approach which needs to be encouraged to facilitate production and timely distribution of quality seeds of improved variety of Chinese potato for self-sufficiency at village level. Results of the demonstrations have shown that productivity and profitability of Chinese potato could be increased by technological interventions with active participation of farmers and other stakeholders. There is an urgent need to have concerted efforts by various research and developmental organizations for ensuring availability of sufficient quantities of quality planting materials as well as to ensure farm income as envisaged in 'Doubling Farmers Income', the goal set by Government of India. The success story clearly proved that SVP is the need of the hour to make Chinese potato farming more profitable, inclusive and sustainable in the long run.

Technical Folder

SEED VILLAGE PROGRAMME FOR QUALITY PLANTING MATERIAL PRODUCTION IN CHINESE POTATO-A SUCCESS STORY

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