Quality Planting Material Production in Cassava: Current Status, Challenges and Way Forward

R. Muthuraj, D. Jaganathan, P. Prakash and G. Byju

Introduction

Cassava (*Manihot esculenta* Crantz) is the most popular tuber crop among all tropical tuber crops. It is a native of Brazil which was introduced to Kerala in India by the Portuguese during 17th century. Cassava is grown in an area of 0.166 million ha with a production and productivity of 5.94 million tonnes and 35.77 t ha^{-1} respectively (FAOSTAT, 2023). Though the productivity of cassava is one of the highest in the world, considering the big gap between actual and potential productivity, there is much scope to raise its average yield by using zone specific improved varieties, agrotechniques as well as quality planting materials.

National Scenario

In India, about 57.92 lakh tonnes (94.73%) of total cassava produced is used as food and industrial purposes followed by other applications (2.93 lakh tonnes; 4.79%) and animal feed (0.29 lakh tonnes; 0.48%) (Figure 1). Consumption of cassava tubers as various food preparations is mainly confined to Kerala, Tamil Nadu, Andhra Pradesh and North Eastern States. The cassava starch and sago factory waste product, *Thippi* and cassava plant parts (including leaves, stem and tubers) both in fresh and dried forms are used as animal feed in parts of Tamil Nadu and in other tribal areas in eastern and north eastern states. India ranks second in the world in terms of productivity of cassava with 35.77 t ha^{-1} as against the world average of 10.36 t ha^{-1}. In India, cassava is cultivated in 17 states, with three southern states viz., Tamil Nadu, Kerala and Andhra Pradesh contributing over 97.14% of the total cassava produced in India (Ministry of Commerce and Industry, Government of India, 2024; Prakash *et al*., 2024).

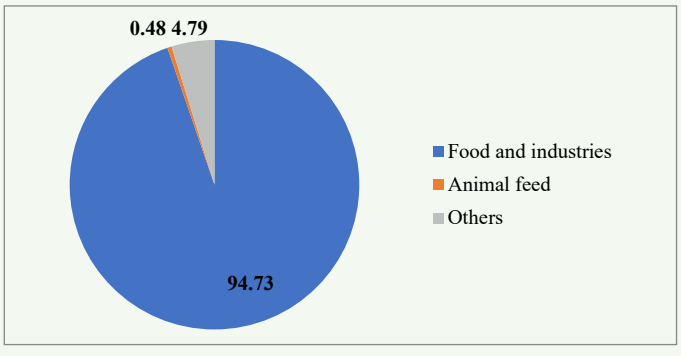


Figure 1. Utilization pattern of cassava in India (Source: FAOSTAT, 2022)

Cassava is a popular secondary staple food in Kerala while it is an industrial crop in Tamil Nadu. Figure 2 gives the trend in area and production of cassava in India over the past 62 years from 1961 to 2022. Analysis of the long-term data indicates that area under cassava showed a decreasing trend from 1961 to1965 and later it started increasing and the country had the highest area under cultivation of 0.392 m ha in 1976 and thereafter it showed a declining trend and in 2022 the country harvested cassava from an area of 0.172 m ha.

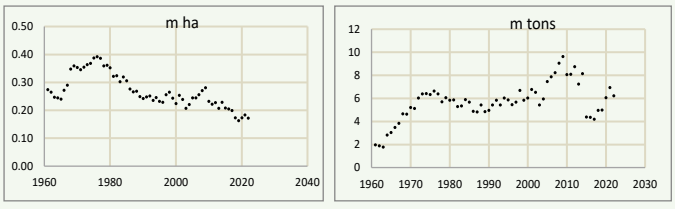


Figure 2. Long term trend in area (m ha) and production (m tons) of cassava in India from 1961-2022

Regression analysis of the 62 years data indicated an average annual decrease in area of 2400 ha (R^2=0.53). The production of cassava in 1961 was 1.969 m tons and it showed an increasing with slight fluctuating trend until 2014 and the highest production of 9.623 million tons was achieved in 2009. In 2015, the total production of cassava in India was almost halved to 4.373 m tons compared to previous year which was not due to decrease in area under cultivation but due to decrease in productivity which declined to 21.02 t ha^{-1} in 2015 from 35.66 t ha^{-1} recorded in the previous year. The country harvested 6.21million tons of cassava in 2022 with an average productivity of 36.12 t ha^{-1} (Figure 3).

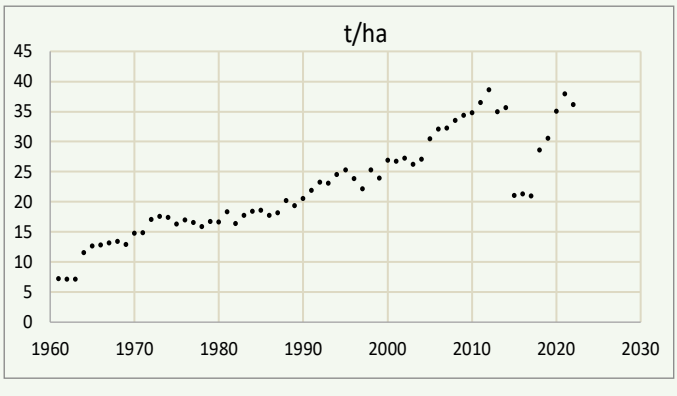


Figure 3. Long term trend in average yield (t/ha) of cassava in India from 1961-2022

Projected demand of cassava in India

Demand projections in India showed that in 2030, the demand for cassava is anticipated to rise to 6.94 million tons, with 6.57 million tons (94.67%) for food and industrial use and 0.37 million tons (5.33%) for animal feed and other uses. Looking further ahead to 2047, the demand is projected to reach 8.38 million tons, with 7.92 million tons (94.51%) for food and industrial use, and 0.46 million tons (5.49%) for animal feed and other uses.

Table 1. Demand projections of cassava and its products in India

Year	Demand of cassava and its products			
	Total demand (million tons)	% increase over 2022 level	Food and industries (million tons)	Animal feed and others (million tons)
2030	6.94	11.75	6.57 (94.67)	0.37 (5.33)
2040	7.76	24.95	7.33 (94.46)	0.43 (5.54)
2047	8.38	34.94	7.92 (94.51)	0.46 (5.49)

Figures in parenthesis indicate percentage

Improved varieties of cassava

A. Released by ICAR-CTCRI

I. Industrial varieties

S.No.	Variety	Duration (months)	Yield (t ha^{-1})	Year of release	Important features
1	H-97	10	25-35	1971	Semi branching, starch content 27-31% Recommended for Tamil Nadu, Kerala, Karnataka, Andhra Pradesh
2	H-165	8-9	33-38	1971	Non-branching, starch content 23-25% Recommended for Tamil Nadu, Kerala, Karnataka, Andhra Pradesh
3	H-226	10	30-35	1971	Semi branching, susceptible to CMD, starch content 28-30% Recommended for Tamil Nadu, Kerala, Karnataka, Andhra Pradesh
4	Sree Sahya	10-11	35-40	1977	Semi branching, starch content 29-31% Recommended for Assam, Andhra Pradesh, Karnataka, Kerala, Maharashtra, North Eastern Region, Tamil Nadu
5	Sree Visakham	10	35-38	1977	Semi branching, yellow flesh with β carotene, starch content 25-27% Recommended for Assam, Andhra Pradesh, Karnataka, Kerala, Maharashtra, North Eastern Region, Tamil Nadu
6	Sree Prakash	7	30-35	1987	Semi branching, suitable for lowland as a rotation crop, early maturing, starch content 29-31% Recommended for Kerala, Tamil Nadu, Andhra Pradesh, Assam
7	Sree Harsha	10	35-40	1996	Erect branching, good cooking quality, drought tolerant, starch content 38-41%, Recommended for Kerala
8	Sree Padmanabha	9-10	29-30	2006	Resistant to CMD with normal yield, starch content 25-26% Recommended for Tamil Nadu and Andhra Pradesh
9	Sree Athulya	10	35-40	2014	Suitable for cultivation in industrial areas in Tamil Nadu, high extractable starch content (30.2%) with higher yield Recommended for Tamil Nadu and Andhra Pradesh
10	Sree Apoorva	10	35-40	2014	Variety with extractable starch of 29.9%, higher yield, ideal for cassava based industries. Recommended for Tamil Nadu and Andhra Pradesh
11	Sree Swarna	7-8	35-40	2015	Field tolerant to CMD, starch content 25.2%, suitable for both upland and lowland conditions Recommended for Kerala, Tamil Nadu and Andhra Pradesh
12	Sree Suvarna	7-8	45-50	2018	Non-branching, CMD resistant, medium starch content 25-27%, industrial use Recommended for Kerala, Tamil Nadu and Andhra Pradesh
13	Sree Sakthi	9-10	45-50	2018	Non-branching, CMD resistant, high yielding, high starch content 27-32%, tolerant to post-harvest physiological deterioration Recommended for Kerala, Tamil Nadu and Andhra Pradesh

14	Sree Kaveri	9-10	40-50	2023	Resistant to CMD, high nutrient use efficiency, drought tolerance and starch content 27-28% Recommended for Kerala, Tamil Nadu and Andhra Pradesh

II. Edible varieties

S.No.	Variety	Duration (months)	Yield (t ha^{-1})	Year of release	Important features
15	Sree Jaya	6-7	26-30	1998	Erect branching, excellent cooking quality, suitable for lowland as a rotation crop, susceptible to CMD, early maturing, starch content 24-27%, Recommended for Andhra Pradesh, Kerala
16	Sree Vijaya	6-7	25-28	1998	Erect branching, excellent cooking quality, suitable for lowland as a rotation crop, susceptible to spider mites and scale insects, starch content 27-30% Recommended for Bihar, Assam, Kerala
17	Sree Rekha	9-10	35-40	2000	Erect branching, good table variety, suitable for both upland and low land conditions, starch content 28-30% Recommended for Kerala
18	Sree Prabha	9-10	35-40	2000	Semi branching, good table variety, suitable for both upland and lowland conditions, starch content 26-29% Recommended for Kerala
19	Sree Pavithra	9-10	35-40	2015	Medium starch content (24.4%), high K efficiency (243.65 kg tuber/kg K absorbed), suitable for soils which are inherently low to marginal in soil exchangeable K Recommended for Kerala.
20	Sree Reksha	8-9	40-50	2017	Non-branching, CMD resistant, starch content 27-31%, tolerant to post-harvest physiological deterioration Recommended for Kerala and Tamil Nadu
21	Sree Annam	9-10	30-40	2025	NPK Use efficient, starch content 20-25 %, Excellent cooking quality, Recommended for Kerala
22	Sree Manna	9-10	40-50	2025	NPK Use efficient, starch content 20-25 %, Excellent cooking quality, Recommended for Kerala

B. Released by SAUs/AICRP TC Centres

S.No.	Variety	Duration (months)	Yield (t ha^{-1})	Year of release	Important features
	AICRP TC Centres, TNAU, Coimbatore and Yethapur				
23	CO 1	9-10	49.51	1976	Starch content 25-27%, erect, tall growing and non branching type, cassava mosaic virus grade is one to two. Recommended for Tamil Nadu
24	CO 2	9-10	35	1984	Branching variety, Starch content 35%, flowering, variety suitable for edible purpose and industry. Recommended for Tamil Nadu, Kerala
25	CO 3	9-10	42	1993	Branching variety, Starch content 35%, flowering variety, suitable for edible purpose. Recommended for Tamil Nadu
26	CO (TP) 4	9-10	50	2002	Non-branching, erect, tall growing, starch content 40 %, flowering variety, Recommended for Tamil Nadu
27	YTP-1	9-10	49.50	2013	Non branching, starch content 25 to 27%, erect, tall growing and non branching type, Cassava mosaic virus grade is one to two. Recommended for Tamil Nadu
28	YTP-2	9-10	46.20	2020	Starch content 29.62%, erect, medium growing and top branching type, suitable for edible and industry purpose, resistant to CMD. Recommended for Tamil Nadu
	AICRP TC Centre, Peddapuram				
29	PDP CMR-1	9-10	42.96	2016	Starch content 24.37%, tall growing and semi spreading and non branching type Recommended for Andhra Pradesh

	KAU, Thrissur				
30	Nidhi	5.5-6	35-40	1993	High yielding, early maturing, tolerance to mosaic and moisture stress, starch content 26.8% Recommended for Onattukara (Coastal sandy tract) region in Kerala
31	Kalpaka	6	42	1996	Non branching, Suitable for intercropping in coconut gardens, starch content 31.4% Recommended for Kuttanad region in Kerala
32	Vellayani Hraswa	5-6	35-40	2002	High yielding, early maturing, very good cooking quality, starch content 27.8% Recommended for Kerala
33	KAU Uthama	6	45-50	2021	Suitable for Upper Kuttanad region, good cooking quality, starch content 22.52% Recommended for Kerala

Source of quality planting materials

- ICAR-CTCRI, Thiruvananthapuram
- ICAR-CTCRI, Regional Station, Bhubaneswar
- AICRP TC Centres- TCRS, Yethapur, Salem, TamilNadu and Peddapuram, Kakinada, Andhra Pradesh
- KAU, Thrissur
- Krishi Vigyan Kendras
- Departments of Agriculture/Horticulture
- Decentralized Seed Multipliers/ Progressive farmers
- Industries

A. Current Status

Production and supply of quality planting materials in cassava

A total of 18.6 lakhs stems of cassava were produced and distributed to farmers through Institutes and AICRP TC centres from 2013-14 to 2023-24. Among these, 8.32 lakhs stems of cassava were produced and distributed by ICAR-CTCRI, Thiruvananthapuram 9.24 lakhs stems by AICRP TC, Yethapur and the remaining 1.04 lakhs stems of cassava by AICRP TC, Peddapuram.

ICAR-CTCRI

The ICAR-CTCRI produced and distributed 8.32 lakhs of stems of ten varieties of cassava viz., Sree Vijaya, Sree Jaya, Sree Pavithra, Sree Swarna, Vellyani Hraswa, Sree Athulya, Sree Reksha, Sree Suvarna, Sree Sakthi and Sree Kaveri during the period 2013-2024. (Figures 4 & 5).

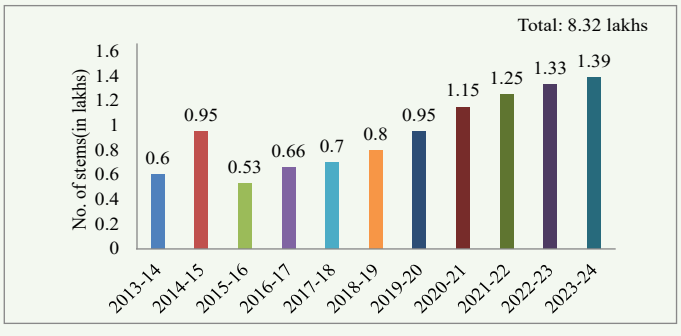


Figure 4. Quality planting material production and distribution of cassava (2013-2024) by ICAR-CTCRI

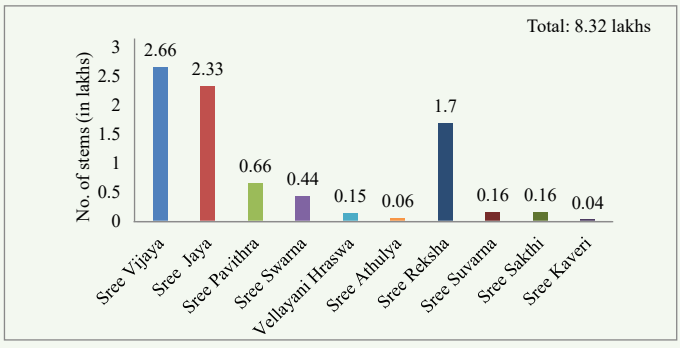


Figure 5. Variety wise production and distribution of quality planting materials of cassava by ICAR-CTCRI (2013-2024)

AICRP TC, Centre, TNAU, TCRS, Yethapur, Tamil Nadu

The AICRP TC centre, Yethapur, Salem, Tamil Nadu, produced and distributed 9.24 lakhs of stems of improved varieties of cassava viz., H 226, Co (TP) 4, Sree Athulya, YTP-1, YTP-2, Mulluvadi-1, Sree Vijaya and Sree Reksha during the period 2013-2024. (Figures 6 & 7).

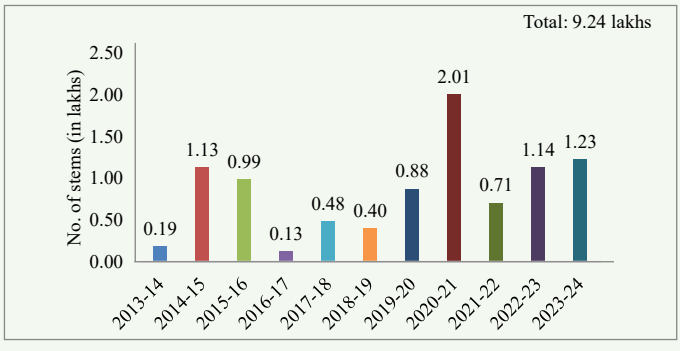


Figure 6. Quality planting material production and distribution of cassava by TCRS,Yethapur (2013-24)

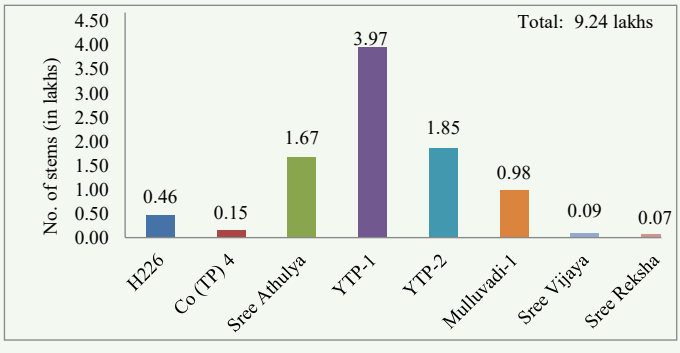


Figure 7. Variety wise production and distribution of quality planting materials of cassava by TCRS,Yethapur (2013-2024)

AICRP TC, Centre, Dr YSRHU, HRS, Peddapuram, Andhra Pradesh

The AICRP TC centre, Peddapuram, Kakinada, Andhra Pradesh produced and distributed 1.04 lakhs of stems of improved varieties of cassava viz., H 226, Co (TP) 4, Sree Athulya, YTP-1, YTP-2, Mulluvadi-1, Sree Vijaya and Sree Reksha during the period 2017-2024. (Figures 8 & 9).

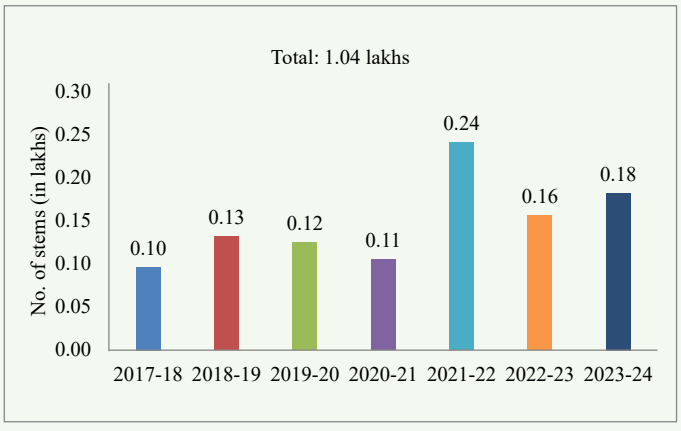


Figure 8.Quality planting material production and distribution of cassava by AICRP TC, Peddapuram (2017-24)

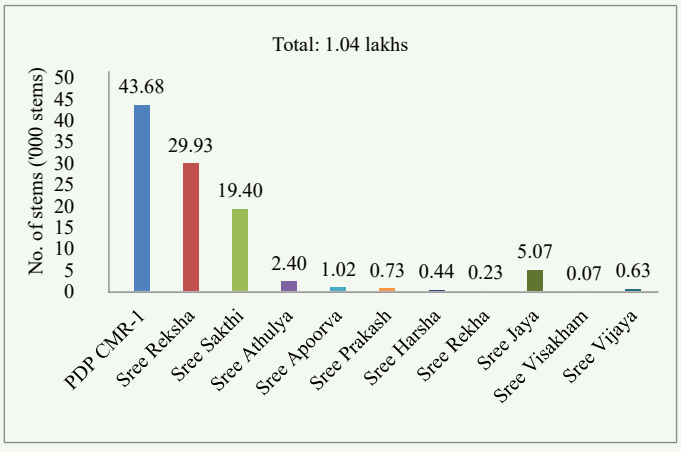


Figure 9. Variety wise production and distribution of quality planting materials of cassava by AICRP TC, Peddapuram (2017-24)

SEED CERTIFICATION STANDARDS

I. General seed certification standards

- All certified classes shall be produced from planting stakes (stem cutting) cut from the seed field (field where cassava is cultivated for the purpose of planting material) whose source and identity may be assured and approved by the certification agency.

II. Land requirements

- Land shall be free from volunteer plants. Swampy and shaded conditions are to be avoided.
- Avoid cassava residue and drainage from other cassava fields.
- Well drained loamy soil is best suited. The optimum soil pH preferred is between 5 and 6.

III. Field inspection

- A minimum of four inspections (60 days, 120 days, 180 days and at harvest) shall be made to verify the isolation, off-type plants, disease infected plants and other relevant factors.

IV. Field standards

- Isolation distance: Seed fields shall maintain minimum isolation distance for foundation seed and certified seed

Contaminants	Minimum distance (m)	
	Foundation Seed	Certified Seed
Fields of other varieties	5	5
Fields of the same variety not conforming to varietal purity requirements for certificate	5	5

The details of maximum permissible limits of off types, pest and disease are given below

Factor	Permissible limits (%)	
	Foundation Seed	Certified Seed
Off-types	0.10	0.20
Plants showing symptoms of mosaic	0.10	0.50
Plants infested with scale insects, papaya mealybug, spiralling whitefly	None	None

V. Seed standards

Specifications in respect of size and age of the planting stakes for foundation and certified classes are given below (Muthuraj *et al.,* 2016).

- The planting stakes for foundation and certified classes shall be collected from a seed crop which is 6-7 months for short duration and 9-10 months for long duration.
- Approximate length of planting stake should be 15-20 cm with five numbers of nodes and with a diameter of 2-3 cm.
- Pith area less than 50% of stem diameter, discard 1/3 top portion.

- Presence of latex at the cut end of the stake is the indication of good quality planting material.
- Keep the planting material upright side under shaded conditions.
- Proper care should be taken during transport, not to damage nodes and to provide proper ventilation.

Novel techniques for quality planting material production in cassava

Tissue culture: ICAR-CTCRI has developed diagnostic techniques for elimination of virus through different techniques like TAS-ELISA, TBIA and PCR. Using these techniques virus free mericlones of all the popular varieties of cassava are produced. These virus free mericlones are produced through tissue culture laboratory and taken to field and multiplied in large quantities. Meristem culture has thus been found effective for cleaning off systemic infection like virus in vegetatively propagated crops. The procedure involved in this method is micro-dissection of meristem from shoot buds and growing them on culture media containing specific levels of growth regulators. The medium used for meristem culture along with specific growth regulators (0.1 NAA µm and 0.1GAµm). Hardened plants could be micropropagated.

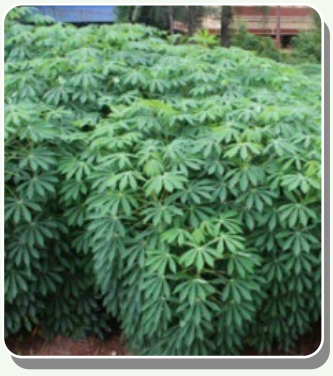
1. Inoculation of meristematic bud

2. Subcultured plantlet

3. *In vitro* hardening

4. Hardening in net house

5. Planting in net house



6. Main field

Figure 10. Tissue culture technique in cassava

Minisett Technique

ICAR-CTCRI, Thiruvananthapuram has developed a novel technique for quality planting materials production of cassava by minisett technique to overcome the challenges such as it is vegetatively propagated, low multiplication ratio compared to cereals and pulses, clonal propagation facilitates easy transmission of diseases and released varieties take a long time to reach farmers. The minisett experiment was conducted at ICAR-CTCRI during the period 2001-2006 and generated valuable data for optimizing the size of setts, method of planting, nursery practices, spacing and nutrient requirement for the rapid production of quality planting materials in cassava (James George *et al*., 2004). Minisett technique developed at ICAR-CTCRI has the potential to enhance the multiplication ratio in cassava from 1:10 to 1:60. Clean and disease free planting materials could be generated by this technique which also could be easily adopted by farmers. Minisett technology is considered to be the most effective and viable technique for rapid multiplication of quality planting materials in tuber crops.

Steps involved in minisett technique

i. Selection of apparently disease free plants
ii. Meristem dissected and raised in tissue culture medium
iii. Plantlets indexed and used as *in vitro* mother plants
iv. Hardening of the *in vitro* grown plants in green house/protected net house, hardening under protected covers
v. Minisett multiplication in nursery
vi. Transplanting of sprouted minisetts to the main field
vii. Repetition of the process and storage and distribution of planting materials

Figure 11. Minisett technique in cassava

Protray Nursery

The protray nursery technique is a method of raising seedlings in small, compartmentalized trays, often made of plastic, to produce high-quality, disease-free plants for cassava. This method helps in better germination, healthy root development, and reduced mortality during transplanting. It also allows for easier management and transportation of seedlings. Plant cassava two node minisett in protrays @ one minisetts per cell. Cover the setts with cocopeat or soil and keep the trays inside poly house. After 25-30 days minisetts seedling ready for planting in the main field.

Seed Villages

Replacement of existing varieties with the quality planting materials of recently released improved varieties is necessary to increase the yield. Small and marginal farmers are often at disadvantageous position in adopting the agricultural technologies related to genetic enhancement of production potential of cassava. This is because of lack of a formal seed system for cassava. Though institutes such as ICAR-CTCRI, SAUs, KAUs etc. are producing maximum possible quantities of planting materials, the supply chain is unable to meet the demand for planting materials across the country in order to circumvent this issue, Seed Village Programme (SVP) was envisaged by ICAR-CTCRI in 2017 which provides an alternative to this problem and helps farmers to become self-reliant and to meet timely supply of planting materials. 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.

A village, wherein trained group of farmers are involved in planting material production of cassava and serve as planting materials for next season, fellow farmers of the village and farmers of the neighbouring village in appropriate time and at economical cost is called seed village. Seed villages for cassava have been established for increasing the quality planting material production of improved varieties (Muthuraj *et al.,* 2021, 2023).

Role of different partners involved in seed villages

Lead Institute: ICAR-CTCRI	Supporting Institutes: AICRP TC Centres, KVKs, Departments of Agriculture/ Horticulture	Participatory Farmers
▪ 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.	▪ 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.	▪ Should have an area of more than one acre for field clusters. ▪ To collect stems of nucleus planting materials from ICAR-CTCRI for production of planting materials at farmers field through DSM. ▪ Production of quality planting materials as per recommended protocols published by ICAR-CTCRI. ▪ To take care of selection and proper storage of planting materials after harvesting to avoid physical admixture.

Selection of Seed Growers of Cassava

A total of 323 farmers (with minimum of 50 cents plot each) who had interest in taking up scientific interventions were selected during 2014-2015 to 2024-2025 with the help of State Department of Horticulture/KVKs by following the guidelines of SVP (Table 2). Planting materials of improved varieties of cassava 'Sree Vijaya, Sree Jaya,Vellayani Hraswa, Sree Athulya, Sree Pavithra, Sree Reksha and Sree Kaveri' were supplied to the farmers for proving their 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 programme of cassava in India

S.No.	Number of farmers	Area coverage (ha)	States	Districts
1	105	42	Kerala	Malappuram, Palakkad, Thrissur, Wayanad, Thiruvananthapuram, Kottayam, Idukki
2	198	40	Tamil Nadu	Kanyakumari, Tenkasi, Salem, Pudukkottai, Namakkal
3	15	3	Meghalaya	West Garo Hills
4	5	2	Arunachal Pradesh	Namsai
Total	**323**	**87**		

Decentralised Seed Multiplier (DSM)

The objective is to establish the cassava farmers' network for production of quality planting materials of cassava under the guidance of ICAR-CTCRI. The beneficiary farmers of onfarm demonstrations, seed village and frontline demonstrations of ICAR-CTCRI under various R&D projects who cultivate cassava in less than 1 ha area approved as Decentralised Seed Multiplier of quality planting material of cassava. A team of scientists monitor the planting material production on regular basis and provide agro-advisories as per the standard seed guidelines, the planting materials are of requisite quality standards as per ICAR-CTCRI guidelines.

A total of 65 farmers were registered as Decentralized Seed Multiplier (DSM) of quality planting materials of improved varieties of cassava viz., Sree Jaya, Sree Vijaya, Sree Athulya, Sree Swarna, Sree Reksha, Sree Sakthi and Sree Kaveri in Kerala, Tamil Nadu, Andhra Pradesh and Odisha.

Table 3. Decentralised Seed Multiplier (DSM) of cassava in India

Sl. No.	Year	State	No. of DSMs
1	2021	Kerala (5), Tamil Nadu (4)	09
2	2022	Kerala (6), Tamil Nadu (4), Andhra Pradesh (3)	13
3	2023	Kerala (1), Tamil Nadu (15), Odisha (10)	26
4	2024	Tamil Nadu (3), Odisha (13), Kerala (1)	17
		Total	**65**

B. Challenges

1. **Cassava is vegetatively propagated crop**: As the crop is vegetatively propagated, it has low seed multiplication ratio (1:5-10). Seed multiplication rate, also known as Seed Multiplication Ratio (SMR), refers to the number of seeds produced from a single seed after one growing season. It indicates the potential of a crop to generate a larger quantity of seeds from a small initial amount. This ratio is crucial for seed production and ensuring a consistent supply of quality seeds for farmers. In cereal crop seed multiplication rate is high ie., Rice 1:80, Maize 1:80 whereas the cassava seed multiplication rate is 1:10. Due to low seed multiplication rate released varieties take a long time to reach the farmers and other stakeholders.
2. **High volume of planting materials:** One minitruck (1500-2000 stems) is needed to carry planting materials for one ha area. Cassava crop often require a large amount of planting material because they are vegetatively propagated using stems. This can be a significant factor in the cost of cultivation and can pose a constraint to expand the area under cassava cultivation.

3. **Planting materials, being the stem:** It can be stored after harvest under shade for a maximum of 40 days only to ensure good viability. Cassava stems, used as planting material, require specific storage methods to maintain viability. Storing them horizontally under shade or vertically with the bottom buried in sand, and protecting them from pests and diseases are key practices. Proper storage ensures good sprouting and establishment during planting. Stems are placed upright with the base buried in sand and watered periodically.
4. **Ensuring cassava mosaic disease (CMS) free planting materials:** In cassava, the planting material requirement is mainly met through traditional seed system where farmers keep a portion of their produce as seed for next season. As a result of continuous use of same planting material year after year, the quality of seed/planting materials get deteriorated due to degeneration and lack of proper knowledge of farmers about the seed production technique. Ensuring that planting material is free from diseases and pests to improve crop establishment and yield.
5. **Fluctuations in demand for planting materials:** Due to price fluctuation of cassava tuber sale at the time of harvesting lead to more and less fluctuations in demand for planting materials of cassava at the time of planting. Availability of high quality planting material can also be a limited factor particularly for farmers at the time of planting season for expanding their area under cassava cultivation. Farmers often depend on recycled or farmers saved seed, which may be infected with disease like Cassava Mosaic Disease (CMD) leading to yield loss and reduction in quality.
6. **Lack of breeder seed standards and formal seed chain:** Without breeder seed standards it is difficult to ensure consistent quality and genetic purity of cassava planting material. The lack of breeder seed standards and a formal seed chain in cassava production poses significant challenges, including inconsistent seed quality, disease spread, and limited access to formal markets. This leads to reduced yields, farmer hesitancy to adopt improved varieties, which hinder development of a sustainable seed system. The absence of robust seed certification system hinders the ability of private seed producers to enter formal markets for cassava seed chain.
7. **Lack of interest among farmers for purchasing quality planting materials:** Farmers are often hesitant to purchase quality planting materials without clear quality assurance, impacting market confidence and adoption of improved varieties of cassava.

C. Way Forward

Seed requirements and replacement strategy in cassava

Cassava is mainly grown in four states viz., Tamil Nadu, Kerala, Andhra Pradesh and Nagaland in an area of 1.65 lakh ha (97.14%) in India. Total area under improved varieties in these states is 47817 ha (28.63%). The seed requirements of cassava (cassava stems) and seed replacement plan are given in Table 4.

Table 4. Seed requirements and replacement with improved varieties of cassava in India

State	Area (ha)	Seed requirements (lakh cassava stems of 5 m length)			
		100% seed replacement	50% seed replacement	25% seed replacement	10% seed replacement
Kerala	55870	1150	575	288	115
Tamil Nadu	98830	2033	1016.5	508	203.3
Andhra Pradesh	5220	107	53.5	27	10.7
Nagaland	4880	100	50	25	10
Total	**164800**	**3390**	**1695**	**848**	**339**

Proposed Seed Rolling Plan for 2025-2030

A detailed seed rolling plan through seed village programme for implementation in major cassava growing states viz., Kerala, Tamil Nadu, Andhra Pradesh, Arunachal Pradesh and Nagaland for next five years (2025-26 to 2029-2030) has been proposed and is given in Table 5. This programme will be implemented in collaboration with other stakeholders viz., AICRP TC, KVKs, Department of Agriculture/Horticulture, FPOs, Seed entrepreneurs etc.

Table 5. Proposed Seed Rolling Plan for Improved Varieties of Cassava

Year	State	District	Seed Village	Variety	ICAR-CTCRI/ AICRP TC centres involved	Planting materials, number of farmers and area coverage
2025-26	Kerala	Thiruvananthapuram	Parassala	Sree Annam Sree Manna Sree Pavithra Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
	Tamil Nadu	Salem	Attur	Sree Rekha Sree Kaveri, YTP-2 Sree Athulya	AICRP TC Yethapur	20000 stems 20-40 farmers 10 ha
	Andhra Pradesh	Kakinada	Peddapuram	Sree Kaveri Sree Reksha	AICRP TC Peddapuram	20000 stems 20-40 farmers 10 ha
	Arunachal Pradesh	Longding	Kanubari	Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
	Nagaland	Wokha	Wokha	Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
2026-27	Kerala	Thiruvananthapuram	Parassala	Sree Annam Sree Manna Sree Pavithra Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
	Tamil Nadu	Salem	Attur	Sree Rekha Sree Kaveri, YTP-2 Sree Athulya	AICRP TC Yethapur	20000 stems 20-40 farmers 10 ha
	Andhra Pradesh	Kakinada	Peddapuram	Sree Kaveri Sree Reksha	AICRP TC Peddapuram	20000 stems 20-40 farmers 10 ha
	Arunachal Pradesh	Longding	Kanubari	Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
	Nagaland	Wokha	Wokha	Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
2027-28	Kerala	Malappuram	Kootilangadi	Sree Annam Sree Manna Sree Pavithra Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
	Tamil Nadu	Namakkal	Namagirippettai	Sree Rekha Sree Kaveri, YTP-2 Sree Athulya	AICRP TC Yethapur	20000 stems 20-40 farmers 10 ha
	Andhra Pradesh	Kakinada	Peddapuram	Sree Kaveri Sree Reksha	AICRP TC Peddapuram	20000 stems 20-40 farmers 10 ha
	Arunachal Pradesh	Namsai	Namsai	Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha

	Nagaland	Tuensang	Tuensang Sadar	Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
2028-29	Kerala	Malappuram	Kootilangadi	Sree Annam Sree Manna Sree Pavithra Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
	Tamil Nadu	Namakkal	Namagiripettai	Sree Rekha Sree Kaveri, YTP-2 Sree Athulya	AICRP TC Yethapur	20000 stems 20-40 farmers 10 ha
	Andhra Pradesh	East Godavari	East Godavari	Sree Kaveri Sree Reksha	AICRP TC Peddapuram	20000 stems 20-40 farmers 10 ha
	Arunachal Pradesh	Namsai	Namsai	Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
	Nagaland	Tuensang	Tuensang Sadar	Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
2029-30	Kerala	Kollam	Anchal	Sree Annam Sree Manna Sree Pavithra Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
	Tamil Nadu	Kallakuruchi	Chinnasalem	Sree Rekha Sree Kaveri, YTP-2 Sree Athulya	AICRP TC Yethapur	20000 stems 20-40 farmers 10 ha
	Andhra Pradesh	East Godavari	East Godavari	Sree Kaveri Sree Reksha	AICRP TC Peddapuram	20000 stems 20-40 farmers 10 ha
	Arunachal Pradesh	Anjaw	Anjaw	Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha
	Nagaland	Mon	Mon	Sree Reksha	ICAR-CTCRI Thiruvananthapuram	20000 stems 20-40 farmers 10 ha

The projected area under improved varieties of cassava in next five years through seed village programme would be 50 ha, 450 ha, 3,650 ha, 29,200 ha and 46,720 ha respectively if 100% of quality planting materials are used with a multiplication ratio of 8. Hence, concerted efforts by all the stakeholders are required to cover the entire cassava area of the country under improved varieties of cassava on a sustainable basis.

Table 6. Projected area coverage (ha) under improved varieties of cassava through seed village programme

States	Varieties	2025-26	2026-27	2027-28	2028-29	2029-30
Kerala	Sree Annam	10	80	640	5120	-
	Sree Manna	-	10	80	640	-
	Sree Pavithra	-	-	10	80	-
	Sree Reksha	**10**	**90**	**730**	**5840**	**-**
Tamil Nadu	Sree Reksha	10	80	640	5120	40960
	Sree Kaveri	-	10	80	640	5120
	YTP-2	-	-	10	80	640
	Sree Athulya	**10**	**90**	**730**	**5840**	**46720**

Andhra Pradesh	Sree Kaveri	10	80	640	5120	-
	Sree Reksha	-	10	80	640	-
		-	-	10	80	-
		10	**90**	**730**	**5840**	**-**
Arunachal Pradesh	Sree Reksha	10	80	640	5120	-
		-	10	80	640	-
		-	-	10	80	-
		10	**90**	**730**	**5840**	**-**
Nagaland	Sree Reksha	10	80	640	5120	-
		-	10	80	640	-
		-	-	10	80	-
		10	**90**	**730**	**5840**	-
Total		**50**	**450**	**3650**	**29200**	**46720**

Conclusion

- Standardization and popularization of protocols for rapid multiplication of quality planting material production in cassava.
- Capacity building of stakeholders on quality planting material production of cassava.
- Establishment of seed villages in major cassava growing regions of the country.
- Involvement of DSMs in production and supply of quality planting materials of cassava.
- Strengthening collaboration with major stakeholders' viz., AICRP TC centres, KVKs, Department of Agriculture/Horticulture, FPOs, progressive farmers etc.
- Establishment of Tuber Park with newly released varieties in major cassava growing regions.

References

FAOSTAT. 2022. Food and Agriculture Organization, Rome, Italy, https://www.fao.org/home/en

James, G. 2011. Production techniques in tuber crops for production of disease free quality planting materials. In National consultation on production of disease free quality planting material propagated through tubers and rhizomes (Singh, B.P. Dua V.K. and Brajesh Singh Eds.) Malhotra Publishing House, New Delhi, India. pp. 85-92.

James, G., Shyam S., Nair and Sreekumari, M.T. 2004. Rapid multiplication of planting materials in tuber crops. NATP Booklet, ICAR-Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram, Kerala, 40 p.

Muthuraj, R., Jaganathan, D., Byju, G. and Sheela, M.N. 2021. Quality planting material production of cassava. Technical folder. ICAR-Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram, Kerala.

Muthuraj, R., Jaganathan, D., Prakash, P. and Byju, G. 2023. Seed villages for quality planting material production in cassava: A success story. Technical folder. ICAR-Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram, Kerala.

Muthuraj, R., James George and Ravi, V. 2016. Seed certification standards for quality planting material production of cassava, sweet potato, lesser yam and taro. *Journal of Root Crops,* 42(1): 3-8.

Prakash, P., Jaganathan, D. and Sheela Immanuel. 2024. Production, trade and future prospects of tropical tuber crops, *Current Science,* 127 (09): 1100-1107.

Policy Brief No. PB-05/2025

Quality Planting Material Production in cassava: Current Status, Challenges and Way Forward

July 2025

Published by
G. Byju
Director

भाकृअनुप– केंद्रीय कंद फसल अनुसंधान संस्थान
(भारतीय कृषि अनुसंधान परिषद्)
श्रीकार्यम, तिरुवनंतपुरम 695017, केरल, भारत

ICAR-CENTRAL TUBER CROPS RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
Sreekariyam, Thiruvananthapuram - 695 017, Kerala, India
Tel. No. : 91 (471)-2598551 to 2598554; E-mail: director.ctcri@icar.org.in, Website: https://www.ctcri.org