Empowering Farmers: Essential Guidelines for Propagation and Planting in Commercial Tropical Tuber Cultivation

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Underground modified stem and root tuber vegetables are major components of subsistence agriculture in many parts of this world including India. Africa, Asia and Southern America serve as reservoirs for the diverse range of tuberous vegetables and provide this crop to the entire world. India has been the ancestral home of numerous tropical vegetable crops for a long time. The crops cultivated in the tropical regions of this country and also found in the wild include cassava, sweet potato, elephant foot yam, colocasia, alocasia, tannia, greater yam, lesser yam, white Guinea yam, bitter yam, aerial yam and yellow yam. Tuber vegetables offer a greater amount of energy and nutrition per unit area and time when compared to other vegetables. They also demand less-intensive management techniques, especially in challenging climatic conditions. Additionally, tuber vegetables can be processed into a wide range of food, feed and industrial products. These are the reasons for the move from subsistence to commercial farming. Various regions in India engage in large-scale cultivation of cassava, sweet potato, elephant foot yam, colocasia and larger yam. All crops are commercially propagated by vegetative methods. The selection of appropriate planting material, the utilisation of effective propagation techniques and the implementation of suitable planting methods have a direct impact on the quantity and quality of the harvest. Cassava is propagated by mature stem cutting from old mother plant. All yams, including elephant foot yam, are commercially propagated via subterranean corm or cormels. In India, minisett technology is widely used to produce high-quality planting materials for larger yam and elephant foot yam. Sweet potato is largely propagated by vine cutting. Colocasia, alocasia and tannia are propagated via headsett, corm, cormel and sucker. These tuber crops are not so much tough to take care of unlike other vegetables, but regarding propagation and planting methods these crops are really exceptional as right technique of propagation and planting is very vital for effective crop development with quality yield.

Elephant Foot Yam

Propagation

The crop is a herbaceous perennial known for its edible underground modified stem, the corm. It is propagated commercially by whole or cut pieces with a part of the apical meristem. Mature healthy corm (8-9 months DAP) is best for seed purposes. Whole or cut pieces weighing 500 g are ideal for higher productivity and economic benefit. Seed corm treated with fungicides before planting yield better results, while treated with cow dung slurry and *Trichoderma* results in early and disease-free germination. Mini sett technology can be adopted to generate more planting materials in areas with scarcity. Generally, 100 g seed corm is planted at 30 cm × 30 cm spacing for optimal planting size.

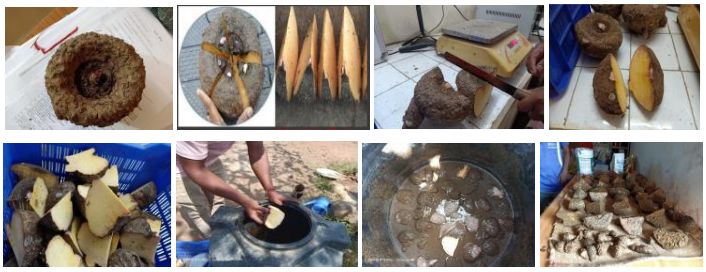

Fig 1: Preparation of seed corn and its treatment with Trichoderma and cow dung slurry

Planting

To ensure proper drainage, 2-3 deep ploughings are needed, followed by a raised bed method and double row planting on broad ridges. A basal fertilizer dose of 25 t FYM, 40 kg N, 60 kg P and 50 kg K is recommended for land preparation. The remaining 40 kg N and 50 kg K should be applied at 60 DAP. Pits should be filled with FYM and soil mixture before planting seed corms, with a common seed rate of 6 t/ha. Planting should be done with the apical meristem facing the sky.

Fig 2: Raised bed planting: Digging of pits, placing of seed corm and covering with soil

Greater Yam

Propagation

This is a perennial herbaceous climbing deciduous plant with a winged spineless vine. It can grow up to 10 m in height and has edible underground stem tuber for propagation. Planting material should be collected from disease and insect-free plants after maturity and treated with fungicide and cow dung manure. Bulbils, true seed and vine cutting can also be used for propagation. Sett (tuber pieces) weighing 200-250 g are ideal for optimum yield, with each sett containing the maximum proportion of tuber skin. Minisett technology, which uses 20-60 g tuber pieces to produce seed tubers of 250-300 g, is popular for this crop.

Fig 3: Preparation of seed tuber and its treatment with fungicide and cow dung slurry before planting

Planting

To grow this crop, 2-3 deep ploughing is needed, followed by raised bed methods, row planting on broad ridges and mound planting over pits. A basal fertilizer dose of 25 t FYM, 40 kg N, 60 kg P and 40 kg K is recommended for land preparation. Pits should be filled with FYM and soil mixture before planting seed tubers, maintaining a planting depth of 10-15 cm. The most common seed rate is 3 t/ha, with spacing of 90 cm × 90 cm. March to May is the recommended planting time for most parts of India. Planting should be done with the brown skin facing the sky and one irrigation is needed immediately after planting. Mulching with paddy straw, sawdust or organic cover improves germination and total yield. Staking is necessary within one month of planting to protect against soil-borne diseases.

Cassava

Propagation

Cassava is a perennial woody shrub with a height of 3-4 m and erect branching stem. It is commercially propagated through stem cutting, with mature stems from 8-15 months old disease and insect-free plants being ideal planting material. Harvested stems should be tied in bunches, placed vertically on the ground in a shaded, dry area with a temperature range of 20-30 °C. Stored planting materials should be sprayed with insecticides and fungicides before planting. Stem cuttings should have 5-7 nodes and a minimum length of 20 cm. Latex exudation on stem cutting is positively correlated with maturity, making it a practical method for determining planting material maturity.

Fig 4: Selection of planting material and their storage

Planting

In Indian conditions, cassava is best planted with 3-4 deep ploughing followed by ridge planting. A basal fertilizer dose of 12.5 t FYM, along with 50 kg N, 50 kg P and 50 kg K, is recommended for land preparation. Top dressing by 50 kg N and 50 kg K is recommended 45-60 days after planting. The best time for planting is April-May, with 10,000-15,000 plants/ha.

Monocropping is common, with spacing of 90 cm × 90 cm for branching types and 75 cm × 75 cm for non-branching types. Irrigation is provided on planting day, followed by two irrigations at intervals of 3-5 days until plants are established. Vertical, slanting, and horizontal planting are adopted based on topographical conditions. Stakes typically sprout 15-20 DAP, but retaining two per plant at opposite sides can increase the number of tubers per plant. Planting stem cuttings in light to moderately wet soil is effective in protecting planting materials from scorching sun and heat in tropical regions.

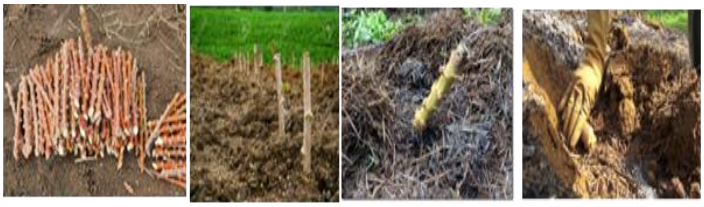

Fig 5: Mature stem cutting and their planting techniques (vertical, slanting and horizontal)

Colocasia

Propagation

This herbaceous perennial crop is commercially important for its edible underground corm, young leaf blade and petiole. It grows up to 1-2 m and consists of a central corm, leaves, roots, cormels and stolons. The root system is fibrous and mainly lies in the top one meter of soil. Dasheen and Eddoe types have large cylindrical central corms and small globular corms with several large cormels. Commercial cultivation uses Headsett/Top/Huli, corm, cormel and side suckers. Planting material should be collected from disease and insect-free plants and treated with fungicides before planting. Headsett with a diameter of 5-6 cm at the petiole base yields the highest yield. Corms can be used whole or as cut pieces and pre-sown corm and cormels are ideal. Medium to large suckers with intact corms are best for planting. Mini sett technology like yam is ideal for rapid seed corm multiplication

Corm Cormel Headsett Sucker

Planting

Commercial cultivation involves wetland, lowland and dryland methods. Wetland cultivation is preferred in areas with abundant water, where soil is heavy enough to prevent water loss through percolation. Headsett and suckers are preferred for this system, with propagating materials planted 10-15 cm deep in soil. Spacing of 45 cm × 45 cm (49,000 plants/ha) is recommended. Corm yield is higher with minimal weed growth. Staggered planting and throughout-year production are possible. Fertilizers and organic manures are applied basal at land preparation and then by split dose 3-4 months after planting. Dry-land taro is rain-fed, with drip, sprinkler or furrow irrigation used to supplement rainfall. Soil should be deep and friable for better corm growth. Crops are grown on flat beds, raised beds and ridge-furrow systems. Corm yield is lower but maturity is earlier than wetland production. Fertilizers and organic manures are applied similarly to low land methods.

Sweet Potato

Propagation

Sweet potato is a perennial vine crop with trailing or twining thin stems measuring 1-5 m in length. Its edible storage roots are rich in carbohydrates and β-carotene and its flesh colour varies from white to orange. Commercially propagated by stem cutting. Freshly harvested vines from mature and healthy crops are best for planting. Apical and middle cuttings produce more tuber than bottom vines, with 20-40 cm apical cuttings having 5-7 nodes being the best yielders. Primary and secondary nurseries are required for quality planting materials. Storing vine cuttings in shade for at least two days prior to planting improves tuber yield and vine growth.

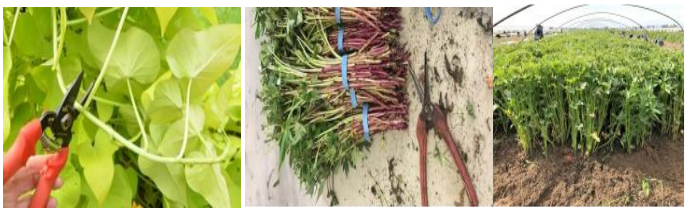

Fig 7: Sweet potato planting materials and its nursery

Planting

Planting a crop requires 2-3 deep ploughing, followed by flat bed, ridge and furrow, raised bed and mound plantation. A basal fertilizer dose of 10 t FYM, 40 kg N, 40 kg P and 60 kg K is recommended for land preparation. In tropics and sub-tropics, the crop is planted during the beginning or end of the rainy season. In India, planting occurs in Spring (Feb-March) and Autumn-Winter (Sep-Dec). The most common plant population is around 83000 vine cuttings/ha, with spacing of 60 cm × 20 cm. Two irrigations are provided at intervals of 4-6 days until plants are established. Vertical, slanting and

horizontal plantings are commonly used, with planting depths of 7-10 cm.

Fig 8. Different planting methods: Planting of vine cuttings in flat bed (trench method), ridge and furrow system and mound plantation

Conclusion

Tropical tuber vegetables like cassava, sweet potato, elephant foot yam, colocasia and greater yam are crucial for diet systems and subsistence agriculture in developing countries. Commercially cultivated in India, these vegetables are a cheap source of nutrients and are essential for tribal communities. Proper propagation techniques and planting methods are crucial for successful crop stand, yield and harvest quality.

Future Thrusts

Propagation and planting techniques are crucial for commercial tropical tuber cultivation, as they optimize material utilization, leading to higher yields per unit area. Using healthy, disease-free planting material minimizes crop loss risks and ensures consistent produce quality. Promoting best practices through extension services, training programs and farmer-to-farmer exchanges enhances farmers technical skills, enabling them to make informed decisions and adopt innovative practices. Proper propagation and planting techniques produce premium-quality crops that meet market standards and consumer preferences, enhancing market access and profitability. Investing in research, extension and capacity-building can unlock the full potential of tropical tuber cultivation, contributing to food security, economic development and environmental sustainability.

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