An International Multidisciplinary e-Magazine www.sabujeema.com

Volume 2 | Issue 9| SEPTEMBER, 2022

TROPICAL TUBERS CROP FOR LIVELIHOOD SECURITY OF SMALL AND MARGINAL FARMERS OF ODISHA

B S Satapathy, S K Rautaray, S Pradhan and S K Mishra

"Read More, Grow More"



Sabujeema Sabujeema editorsabujeema@gmail.com sabujeema-international multidisciplinary-e-magazine





An International Multidisciplinary e-Magazine



TROPICAL TUBERS CROP FOR LIVELIHOOD SECURITY OF SMALL AND MARGINAL FARMERS OF ODISHA

[Article ID: SIMM0189]

B S Satapathy, S K Rautaray, S Pradhan S K Mishra ICAR-Indian Institute of Water Management, Chandrasekharpur,

Bhubaneswar-751 023

ropical tuber crops are considered as third important food crops of Odisha. Tuber crops have the higher biological efficiency and produce more dry matter per day per unit of area as compared to all other food crops. These crops have inherent capacity to withstand several adverse abiotic and biotic stresses. Crops like sweet potato and cassava can be grown profitably in marginal soil under rainfed ecosystem, whereas in waterlogged soil Colocasia is a good choice. Tuber crops not only gained importance as food crop but also considered as a good source of vegetable and can be used as feed and as raw materials in several agro based industries. In Odisha tubers of sweet potato, yams and Colocassia used as one of important ingredient in

of Hahaprasad Lord preparation of Jagannath at Puri and in other temples of state. Peoples of Odisha prefers sweet potato, Colacassia and Dioscorea tubers in social functions like Sradhochava and Havisannaas as holy food. The crops can be grown as pure crop and can be well fitted in to the prevailing cropping systems of Odisha. Cultivation of tropical tuber crops will ensure food, nutrition and livelihood security of small and marginal farmers under the changing scenario of climate.

Sweet potato (Ipomoea batatas), taro esculenta), greater (Colocassia yams (Dioscoria esculenta). vambean (Pachyrrhizus erosus), elephant foot yam paeonifolius), (Amorphophallus cassava (Manihot esculenta) and arrowroot (Maranta arundinaceae) are major tropical tuber crops grown in Odissa under different ecosystems. Among these sweet potato and cassava are cultivated as subsistence food crop whereas colocassia, yams, elephant foot yam and yam bean are grown as commercial crop in major agro climatic regions of Odisha. Being a cheap source of starch cassava, sweet potato and arrowroot have the tremendous potential to develop agro based industries in commercial basis. Feed requirement for animal husbandry and fishery sector can be met by the utilization of tubers and leaves of cassava and sweet potato. The short duration crop like sweet potato and yam beans can be well fitted in the prevailing rice-based cropping system. Elephant foot yam and yams are good choice in nutritional garden, back yard garden, rice field bunds, orchards and garden land for increasing the farm income. Proper selection of crop and crop varieties followed by adoption of appropriate agronomical practices are advocated to enhance the farm profitability and income of the farmers. The crop, varieties and optimum

•

Volume 2 - Issue 9– September, 2022

An International Multidisciplinary e-Magazine



growing seasons recommended for different agro climatic zones of Odisha are listed in the table.

Table: Recommended tuber crops and their varieties and growing season under different agro ecological zones of Odisha

sı.	Agro-climatic zones	Сгор	Varieties	Growing season
1	North western plateau (Sundargarh, Deogarh)	Sweet potato	Kanjangad (110)*, Kishan (110), Bidhan jyoti (105), Kalinga (105),	kharif (Jul- Oct)
			Sourin (105), Bhusona (105), Goutam (105)	rabi (Oct-Feb)
		Greater yam	Odisha elite (240-270), Hatikhoja (210-270), Sree Keerthi (240-300), Sree Nidhi (210-240)	May - March
		Yam bean	Rajendra misirikanda 1(90)	Oct-Dec
		Elephant foot yam	Gajendra (180-210)	kharif (May- Dec)
2	North central plateau (Keonjhar, Mayurbhanj)	Sweet potato	Kanjangad local (110), Kishan (110), Bidhan jyoti (105), Kalinga (105), Sourin (105), Bhusona (105), Goutam (105) Gouri (105),	kharif (Jul- Oct) rabi (Oct- Feb)
		Greater yam	Odisha elite (240-270), Hatikhoja (210-270), Sree Keerthi(240-300), Sree Nidhi (210-240),	May-February
		Yam bean	Rajendra misirikanda 1(90)	Oct-Dec
		Elephant foot yam	Gajendra (180-210) Bidhan Kusum (200-210)	May-Dec
		Arrowroot	Local	May- March
		Colocassia	Muktakeshi (180), Telia (150), Manasaru (210), Topi (180)	May-Dec
3	North eastern coastal plain (Balasore, Bhadrak, Jajpur,)	Sweet potato	Kanjangad (110), Kishan (110), Bidhan jyoti (105), Kalinga (105), Sourin (105), Bhusona (105), Goutam (105)	Kharif (Jul- Oct) Rabi (Oct- Feb)
		Greater yam	Odisha elite (240-270), Hatikoja (210-270), Sree Keerthi (240-300), Sree Nidhi (210-240)	May-February
		Yam bean	Rajendra misirikanda (90)	Oct-Dec
		Elephant foot yam	Gajendra (180-210) Bidhan Kusum (200-210)	May-Dec
		Arrowroot	Local	May-March
		Colocasasia	Muktakeshi (180), Telia (150), Topi (180), Panisaru 1(180), Panisaru II (180), Jhankdi(180)	May-Dec, Feb-August
4	East & south-eastern coastal plain (Kendrapada, Jagatsinghpur, Khurda, Puri, Nayagarh, Cuttack)	Sweet potato	Kanjangad (110), Kishan (110), Bidhan Jyoti (105), Kalinga (105), Sourin	Kharif (Jul- Oct)
		(Cuttack, Jagatsingpur, Kendranada)	(105), Bhusona (105),Goutam (105)	Rabi (Oct- Feb)
		Greater yam	Odisha elite (240-270), Hatikhoja (210-270), Sree Keerthi (240-300), Sree Nidhi (210-240)	Kharif (May- March)
		Yam bean	Rajendra misirikanda 1(90)	Oct-Dec
		Elephant foot yam	Gajendra (180-210) Bidhan Kusum (200-210)	Kharif (May- January)
		Arrowroot	Local	Kharif (May- March)
		Colocassia	Muktakeshi (180), Telia (150), Topi (180), Panisaru 1(180), Pani saru II (180), Sankasaru (180), Sankhasaru (180)	May-Dec, Mar-August
5	North east Ghat (Kandhamal, Rayagada, Gajapati, Ganjam)	Sweet potato	Kanjangad l(110), Kishan (110), Bidhan jyoti (105), Kalinga(105),Sourin(105),Bhusona(105),Goutam(105)	Kharif (Jul- Oct) Rabi (Oct- Feb
		Cassava	Sree jaya (210, Sree Vijaya (210), Sree prakash (210)	Kharif (June- January)
		Greater yam	Odisha elite (240-270), Hatikoja (210-270), Sree Keerthi (240-300), Sree Nidhi (210-240)	Kharif (May- March)
		Yam bean	Rajendra Misirikanda 1(90)	Oct-Dec
		Elephant foot yam	Gajendra (180-210)	Kharif (May- January)
		Colocassia	Muktakeshi (180), Telia (150), Topi (180 , Sankasaru (180-210),	May-Dec, Feb-August
		Arrowroot	Local	Kharif (May- March)

editorsabujeema@gmail.com



Volume 2 - Issue 9– September, 2022

An International Multidisciplinary e-Magazine

6	Eastern Ghat highland (Nabarangpur, part of Koraput)	Cassava	Sree Jaya (210), Sree Vijaya (210), Sree Prakash (210), H-165 (240)	June-January
		Greater yam	Odisha Elite (240-270), Hatikhoja (210-270), Sree Keerthi (240-300), Sree Nidhi (210-240)	May-March
		Yam bean	Rajendra misirikanda 1(90)	
		Elephant foot yam	Gajendra (180-210) Bidhan Kusum (200-210)	May-January
		Arrowroot	Local	Kharif (May- March)
		Sweet potato	Kanjangad (110), Kishan (110), Bidhan Jyoti (105), Kalinga (105), Sourin	Kharif (Jul- Oct)
			(105), Bhusona (105), Goutam (105)	Rabi (Oct- Feb)
7	South eastern Ghat (Malkangiri, part of Koraput)	Sweet potato	to Kanjangad I (110), Kishan (110), Bidhan jyoti (105), Kalinga (1050), Sourin (105), Bhusona (105),Goutam (105)	Kharif (Jul-Oct)
				Rabi (Oct- Feb)
		Cassava	Sree jaya(210), Sree rakas(210), Sree rakash (210), H-165(240)	June-January
		Greater yam	Odisha Elite (240-270), Hatikoja (210-270), Sree Keerthi (240-300), Sree Nidhi (210-240)	May-March
		Colocassia	Muktakeshi (180), Telia (150), Topi (180) , Sankasaru (180-210)	May-Dec, Mar-August
		Yam bean	Rajendra misirikanda 1 (90)	Oct-Dec
		Elephant foot yam	Gajendra (180-210)	May- January
8	Western undulating zone(Kalahandi, Nuapada)	Elephant foot yam	Gajendra (180-210) Bidhan Kusum (200-210)	May- January
		Cassava	Sree Jaya (210), Sree Vijaya (210), Sree Prakash (210),	June- January
		Sweet potato	Kanjangad (110), Kishan (110), Bidhan jyoti (105), Kalinga (1050), Sourin	Kharif (Jul- Oct)
			(105), Bhusona (105),Goutam (105)	Rabi (Oct- Feb)
		Yam bean	Rajendra Misirikanda 1 (90)	Oct-Dec
9	Western central table land (Baragarh, Bolangir, Boudh, Sonepur, Jarsuguda, Sambalpur)	Arrowroot	Local	May-March
		Elephant foot yam	Gajendra (180-210) Bidhan Kusum (200-210)	May-January
		Yam bean	Rajendra Misirikanda 1 (90)	Oct-Dec
		Colocassia	Muktakeshi, Telia, Jhankdi, Sankasaru	June-Dec
10	Mid-central table land (Angul, Dhenkanal)	Sweet potato	Kanjangad (110), Kishan (110), Bidhan Jyoti (105), Kalinga (105), Sourin (105), Bhusona (105), Goutam (105)	Kharif (Jul-Oct)
				Rabi (Oct- Feb)
		Greater yam	Odisha Elite (240-270), Hatikhoja (210-270), Sree Keerthi (240-300), Sree Nidhi (210-240)	May-March
		Yam bean	Rajendra Misirikanda 1 (90)	Oct-Dec
		Elephant foot yam	Gajendra (180-210) Bidhan Kusum (200-210)	May-January

*The number in parenthesis indicates the duration of crop

Agro-techniques of Tuber crops:

- 1. Sweet Potato
- Season: Kharif and Rabi

Planting time: Under rainfed condition, second fortnight of June to July is optimum time of planting, October-November is optimum for planting of *Rabi* sweet potato in upland and December –January is suitable for irrigated summer crop.

Seed rate: 33000-34000 vine cuttings/acre.

Selection of vines: Cuttings obtained from the apical portion of vine is preferable for planting.

Seed treatment: Vine dipping in chloropyriphos @ 25ml in 10 litres of water for 30 minutes.

Methods of planting: Make ridges of 25-30 cm height at 60 cm apart and plant the cuttings at 20 cm spacing on the ridges.





Nutrient management:

Rainfed *Kharif* crop: (Basal: FYM 2t + urea 22kg + SSP 125kg + MOP 25kg)/acre and

Volume 2 - Issue 9– September, 2022

An International Multidisciplinary e-Magazine



(top dressing at 30 DAP: Urea 22kg + MOP 25kg)/acre

Irrigated crop: (Basal: FYM 2t + urea 33kg+ SSP 125kg+MOP 25kg)/acre and (top dressing at 30 DAP: Urea 33kg +MOP 25kg)/ acre.

Weed management: First intercultural operation followed by hand weeding at 25-30 DAP and second-hand weeding at 40-45 DAP if required.

Water management: Irrigated *Rabi* and summer crop needs 4-6 irrigation depending on soil type. Do not allow water stagnation in sweet potato field during *kharif* season. Soil moisture during initial one month of crop is critical for sweet potato tuber yield.

Harvesting: Remove the vines and dig out the tubers without injuring the tubers. In a well-managed crop farmer can get tuber yield of 6-10 t /acre.

2. Elephant foot yam

Season: Kharif

Soil type: Well drained sandy loam or sandy clay loam soil with a near neutral soil reaction.

Planting time: Under rainfed condition, second fortnight of May to first fortnight of June is optimum. March is optimum time for planting of irrigated summer crop.

Seed rate: 2000-2500 kg of seed tuber/acre.

Seed tuber treatment: Dip the tubers in a slurry prepared from 1 bucket of water + 2kg cow dung + 25ml of chloropyriphos + 25g of mancozeb and shed dry treated tuber before planting.

Seed tubers: Whole tuber or cut tuber of 400-500 g weight.

Methods of planting: Plant the treated seed tuber vertically in a pit of $45 \times 45 \times 45$ cm. Shallow planting is preferred.

Spacing: 90×90 cm



Mulching: Planting followed by mulching with dried leaves or paddy straw or agricultural polythene is beneficial and enhances tuber yield. Mulching with *dhaincha* green manures crop found superior.

Nutrient management:

Rainfed *Kharif* crop: (Basal: FYM 4t + SSP 125kg, 1st top dressing at 30-45 DAP: Urea 44kg + MOP 33 kg, IInd top dressing at 60-65 DAP: Urea 44kg+MOP 33kg)/acre.

Irrigated summer crop: (Basal: FYM 6t +SSP 250 kg +MOP 25kg, Ist top dressing at 30-45 DAP: Urea 66 kg +MOP 50 kg; IInd

Volume 2 - Issue 9– September, 2022

An International Multidisciplinary e-Magazine

BUJEEMA

top dressing at 60-75 DAP: Urea 66 kg +MOP 50 kg)/ acre.

Weed management: First intercultural operation followed by hand weeding and earthing up at 30-45 DAP and second-hand weeding at 60-75 DAP.

Water management: Irrigated summer crop needs 4-6 irrigation depending on soil type till the onset of monsoon rain. Do not allow water stagnation in elephant foot yam field during *Kharif* season. Drip irrigation proved highly economic and enhances tuber yield.

Harvesting: The crop becomes ready in 6-8 months after planting. The crop attains maturity when total senescence takes place and dig out the tubers without injuring the tubers. In a well-managed crop farmers can get 20-24 t of tuber /acre.

3. Greater Yam

Season: Kharif

Soil type: Well drained fertile soil and do not come up well in water-logged condition.

Planting time: Under rainfed condition, second fortnight of May to first fortnight of June is optimum time of planting. April is optimum time for planting of irrigated summer crop.

Seed rate: 600-800 kg of seed tuber/acre.

Seed tuber treatment: Dip the seed tubers in a slurry prepared from 1 bucket of water + 2kg cow dung + 25ml of chloropyriphos + 25g of Mancozeb followed by drying under shed for 5-6 hours before planting.

Seed tubers: Whole tuber or cut tuber of 150-200 g weight.

Methods of planting: Plant the treated seed tuber vertically in a pit of $45 \times 45 \times 45$ cm. Shallow planting is preferred.

Spacing: 90 × 90 cm

Mulching: Planting followed by mulching with dried leaves or paddy straw or agricultural polythene is beneficial and enhances tuber yield. Mulching with *dhaincha as* green manure crop found superior.



Nutrient management:

Basal: FYM 4t + SSP 150 kg, 1stTop dressing at 20-30 DAP: Urea 35 kg + MOP 27 kg per acre, IInd top dressing at 50-60 DAP: Urea 35kg + MOP 27kg/acre

Weed management: First intercultural operation followed by hand weeding at 20-30 DAP and second-hand weeding at 50-60 DAP.

Staking: Staking with bamboo poles, coir rope is beneficial for maximizing the tuber yield. Maize is recommended as inter crop for grain yield as well as for staking of yams



An International Multidisciplinary e-Magazine

BUIES

Volume 2 - Issue 9– September, 2022

Water management: Irrigated summer crop needs 4-5 irrigation depending on soil type till the onset of monsoon rainfall. Do not allow water stagnation yam field during *kharif* season. Yam responds well to drip irrigation.

Harvesting: The crop becomes ready in 8-10 months after planting. The crop attains maturity when total senescence takes place and dig out the tubers without injuring the tubers. In a well-managed crop farmer can get 8-10 t of tuber /acre

4. Taro

Season: Kharif and summer.

Soil type: Taro comes up in all types of soil, but performs better in well drained soils.

Planting time: Under rainfed condition, second fortnight of May to first fortnight of June is optimum time of planting. March-April is optimum time for planting of irrigated crop. February-March is optimum for planting of *Sankasaru* in rice field under irrigated ecology

Seed rate: 600-800 kg/acre.

Seed tuber treatment: Dip the tubers of sankasaru in a slurry prepared from 1 bucket of water + 2kg cow dung + 25ml of chloropyriphos + 25g of Mancozeb followed by drying under shed for 5-6 hours. For kujisaru or panisaru seed tuber treatment with *Tichoderm*a dust formulation or carbendazim @ 2-3g/kg of tuber is beneficial.

Seed tubers: Whole tuber or cut tuber of 20-25 g weight. Cormels are preferred than mother corm for planting.

Methods of planting: Plant the treated seed tuber vertically in furrows at shallow depth.

Spacing: 60×30 cm for *kujisaru, panisaru,* 60×45 cm for *sankhasaru*.

Mulching: Planting followed by mulching with dried leaves or paddy straw or agricultural polythene is beneficial and enhances tuber yield.



Nutrient management:

Basal: FYM 4t + SSP 150 kg, 1stTop dressing at 20-30 DAP: Urea 35 kg + MOP 27 kg per acre, IInd top dressing at 50-60 DAP: Urea 35kg + MOP 27kg.

Weed management: First intercultural operation followed by hand weeding at 20-30 DAP and second-hand weeding at 50-60 DAP.

Water management: Irrigated summer crop needs 6-8 irrigation depending on soil type till the onset of monsoon rainfall. Do not allow water stagnation yam field during *kharif* season. Taro respond well to drip irrigation. Tuber initiation and tuber bulking are critical stage for irrigation.

Harvesting: The crop becomes ready for harvesting in 5-7 months after planting depending on varieties. The crop attains

An International Multidisciplinary e-Magazine



maturity when total senescence takes place and dig out the tubers without injuring the tubers. In a well-managed crop farmer can get 8-10 t of tuber /acre

5. Cassava

Season: Kharif

Soil type: Cassava grows on all types of soils, but saline, alkaline and ill-drained soils are not suitable

Planting time: Under rainfed condition first fortnight of June is optimum time of planting. Under irrigated condition it can be grown throughout year except extreme winter days.

Seed rate: 5000 setts/acre.

Ideal planting material: 15-20 cm length, 2-3 cm diameter setts from matured and healthy stems.

Methods of planting: Plant the setts vertically to 5 cm depth at 90×90 cm for branching/ semi branching type and 75×75 cm for nonbranching/erect type.

Gap filling: Replace the dried-up setts with fresh sets of longer size as early as possible.





Nutrient management:

Basal: FYM 5t + Urea 44kg+ SSP 125 kg + MOP 33kg/acre, Top dressing at 30-45 DAP Urea 44 kg + MOP 33 kg per acre.

Weed management: First intercultural operation hand weeding followed by mound making at 30-45 DAP and second-hand weeding at 60-75 DAP.

Water management: Cassava normally grown under rainfed condition. Do not allow water stagnation yam field during *Kharif* season. Sufficient soil moisture at branching and tuber bulking phase enhances tuber yield.

Harvesting: The crop becomes ready in 7-10 months after planting depending on varieties. Dig out the tubers without injuring the tubers. In a well-managed crop farmer can get tuber yield of 12-20 t/acre.

6. Yambean

Season: Pre rabi

Soil type: Fertile, well drained sandy loam soil is best suited for cultivation of yam beans.

Sowing time: Under rainfed condition second fort night of August to September is optimum time of planting. Under irrigation condition sowing can be continued during October. July is optimum time of sowing of seed crops.

Seed rate: 8-16 kg of seeds/acre depending of time of sowing.

Methods of sowing: Sowing of seeds on ridges at 30×30 cm spacing with sowing depth of 5-6 cm results better tuber yield



An International Multidisciplinary e-Magazine





Nutrient management:

Basal: FYM 4t + Urea 53kg+ SSP 150 kg + MOP 40kg/acre, Top dressing at 30 DAS: Urea 53 kg + MOP 40 kg per acre,

Weed management: First soil loosening and weeding should be done at 25-30 DAS. If needed second weeding can be done at 40-45 DAS.

Nipping: Nipping of flower either manually or by spaying 2,4-D (50ppm) at flower initiation results better yield of tubers.

Water management: Yam bean normally grown under rainfed condition. Do not allow water stagnation in yam bean field. Maintain sufficient soil moisture at tuber initiation and bulking stage for optimum tuber yield.

Harvesting: The crop becomes ready in 90-100 days after sowing. In a well-managed crop farmer can get 12-14 t/ acre.

Conclusion: Tuber crops are primitive crops of Odisha, and the soil and climatic condition favors for its cultivation on commercial basis. There is tremendous scope for popularization and adoption of tubers crops in different agro-climatic zones of Odisha. Selection of suitable crop, varieties, land type and season and adoption of appropriate agro-techniques will ensure the enhancement of productivity and profitability of production system which ultimately will be reflected in the farm Tropical tuber crops can be income. promoted as an alternative to prevailing major cereal crops as a source of staple food for human beings as well as for balanced feed for the domestic animals. The regeneration capacity of most of the tuber crops and its quality to tolerant various adverse abiotic stress will establish themselves as a climate resilient crop under present scenario of climate change.

Grow More