Technical Bulletin No. 95 (ICAR-CTCRI NEH project)

Commercialisable Technologies
Contract Research and Consultancy Services

भाकृअनुप - केन्द्रीय कंद फसल अनुसंधान संस्थान
श्रीकार्यम, तिरुवनन्तपुरम 695 017, केरल, भारत
ICAR – Central Tuber Crops Research Institute
Sreekariyam, Thiruvananthapuram – 695 017, Kerala

Commercialisable Technologies
Contract Research and Consultancy Services

भाकृअनुप - केन्द्रीय कंद फसल अनुसंधान संस्थान

श्रीकार्यम, तिरुवनन्तपुरम 695 017, केरल, भारत

ICAR – Central Tuber Crops Research Institute

Sreekariyam, Thiruvananthapuram – 695 017, Kerala

Diamond Jubilee Year

ICAR-Central Tuber Crops Research Institute
Sreekariyam, Thiruvananthapuram 695 017, Kerala, India
Tel.No.: (91) (471) 2598551 to 2598554
E-mail: director.ctcri@icar.gov.in
Website: https://www.ctcri.org

Published by
Dr. G. Byju
Director

Compiled and edited by
Dr. P. Sethuraman Sivakumar
Ms. Athira Krishnan L.R.
Ms. Gayathri B.R.

September 2023

Correct Citation
Sivakumar, P.S., Athira Krishnan, L.R., and Gayathri, B.R. (2023). Commercialisable Technologies, Contract Research and Consultancy Services. ICAR- Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram, Kerala, India, 39p.

From the Director

Dr. Byju
Director

It is with immense pride and pleasure that I welcome you to the forefront of innovation and advancement within our institute. As we traverse the ever-evolving landscape of technology, our commitment to pushing boundaries and catalyzing positive change remains unwavering.

Innovation, when nurtured and harnessed, has the power to transform lives, industries, and societies. ICAR-CTCRI has consistently been a crucible of ideas where creativity converges with expertise to birth revolutionary technologies. ICAR-CTCRI has bagged 14 rank among the 93rd ICAR Institutes for the combined years 2019-20 and 2020-21. The scientific credibility and quality of the research outcomes are evidenced from 247 publications, including 54 research papers in high impact international and national journals. The journey from conception to commercialization is a testament to our collective dedication. Our researchers, and experts have toiled relentlessly, pouring their passion into projects that hold the potential to disrupt markets and shape the future. As these technologies emerge from the laboratories and research centers, we stand at the threshold of an exciting transition – from academic excellence to real-world impact.

Our alliance with industry partners, investors, and entrepreneurs is integral to transforming these technologies into viable products and services. Through collaboration, we can bridge the gap between theory and application, ensuring that our innovations not only thrive in labs but also enrich the lives of people globally.

Our institute has always strived to be a catalyst for societal progress, and commercializable technologies provide a potent avenue to achieve this. As we embark on this commercialization journey, let us remain committed to our values of integrity, ethics, and responsible innovation. Let us uphold the reputation we have built over the years and ensure that the technologies we introduce to the market uphold the highest standards of quality and safety.

The legacy and impact of R&D programmes of tropical tuber crops will continue for many years! I thank all the staff for serving this national Institute with diligence and commitment to make our Institute scientifically momentous.

G. Byju
Director

Table of Contents

Table of Contents

Section 1
Tuber Crops Technology Portfolio and Commercialization Landscape

The tropical tuber crops include cassava, sweet potato, yams, taro, tannia, elephant foot yam, arrowroot, Chinese potato and few other starchy crops. These tuber crops are famine reserve crops due to their ability to withstand infertile soils, drought and heat, uncertain rainfall, coupled with probability to delay harvest of tubers as per the need of the farmers. These versatile crops provide food for the household, feed for livestock and raw materials for a wide array of value-added products, from coarse flour to high-tech starch gels to alcohol to biofuel to bioplastics.

The tropical tuber crops are important staples for about two billion people in the developing world and in India, they are sources of sustenance and livelihood security of about 200 million people across more than 20 different states and total value of output at current prices is Rs. 12500 crores.

From their primary role of food staples, these crops have transformed into industrial crops contributing to the national economy. The emergence of starch and sago industries in the 1970s in Tamil Nadu and Andhra Pradesh, has provided a lift for the cassava crop. While sago remained a food product, the starch and its variations has found application in a variety of fields including textiles, pharmaceuticals, packing, food and other industries. In the late 2010s, sweet potato has emerged as a "healthy food crop" owning to the development of biofortified varieties.

The ICAR-Central Tuber Crops Research Institute, established in 1963 at Thiruvananthapuram with its Regional Station at Bhubaneswar has developed improved varieties, production technologies and climate resilient cropping systems and ways to improve the livelihoods of farmers by strengthening the tuber crops value chain.

Technology Portfolio

The ICAR-CTCRI has developed a wide array of technologies which found an important place in the product portfolio of several industries. The technology portfolio of ICAR-CTCRI is depicted in Fig. 1.

Fig. 1. The technology portfolio of ICAR-CTCRI

Technology Commercialisation

Technology commercialisation at ICAR-CTCRI include technology licensing, contract manufacturing, contract research, consultancies and variety licensing. Details of technology services provided and the revenue generated are displayed in Figs. 2 and 3.

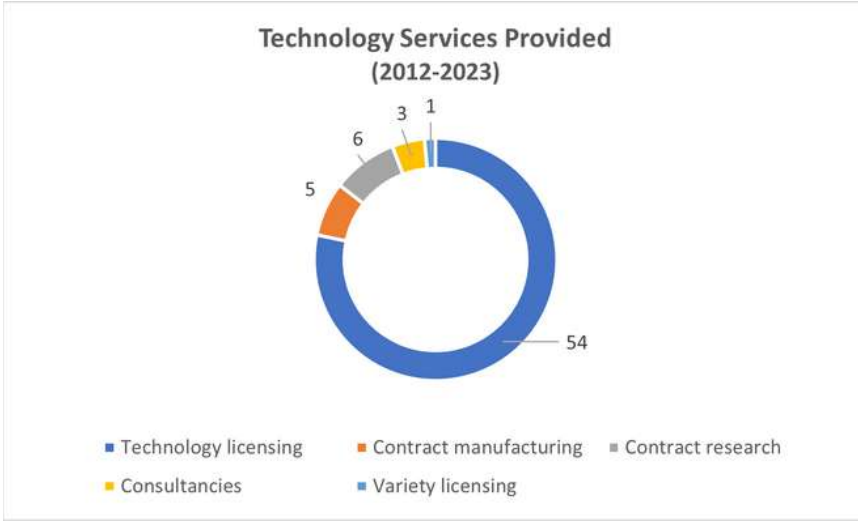


Fig 2. Technology services provided (2012-2023)

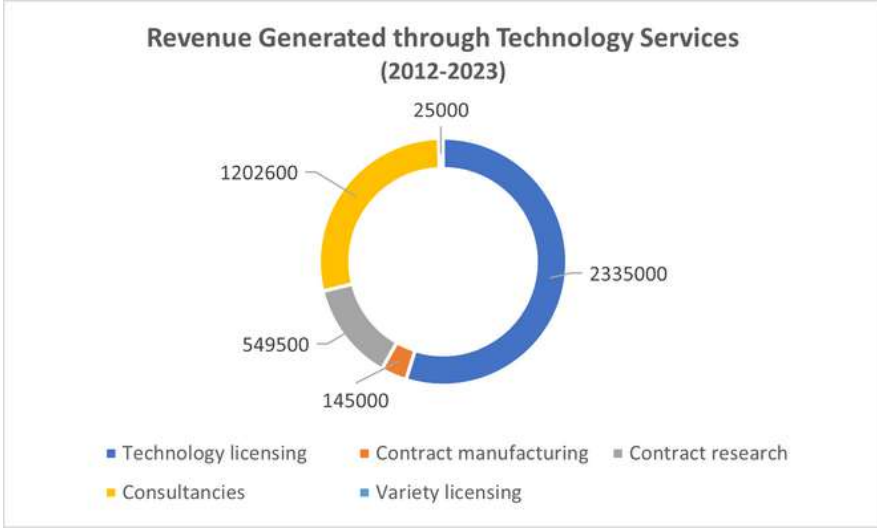
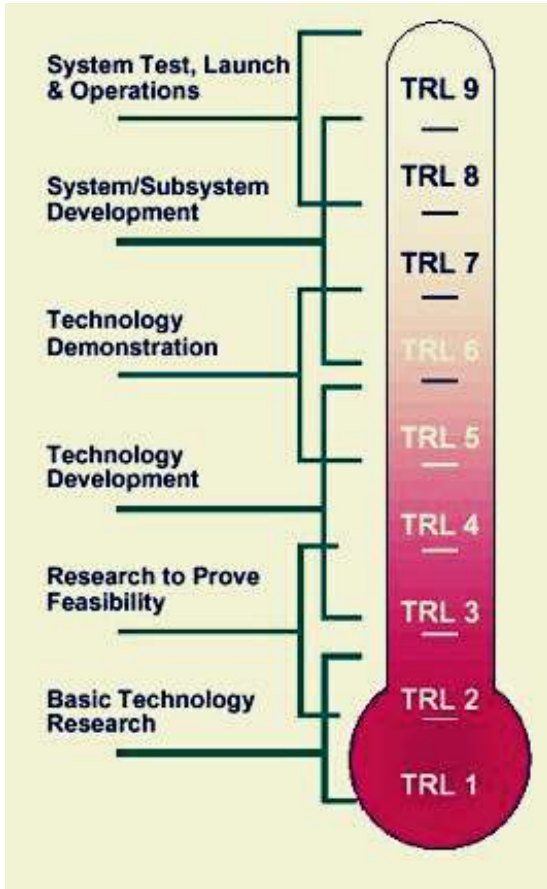


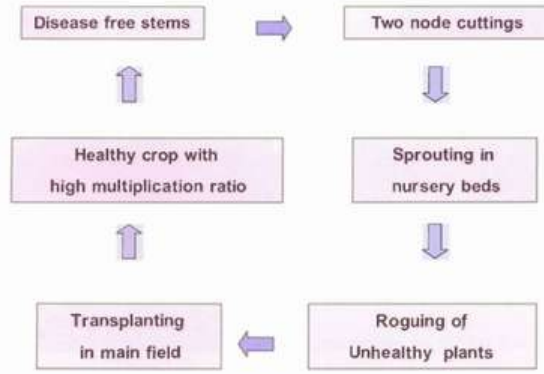
Fig 3. Revenue generated (Rs.) through technology services (2012-2023)

Section 2
Technologies Ready for Licensing



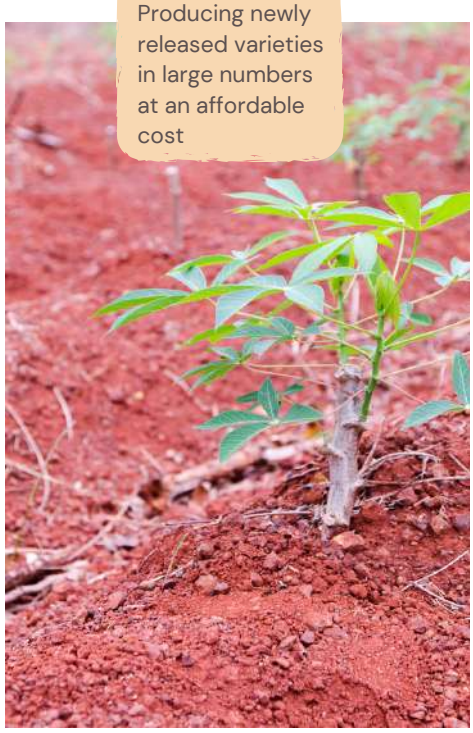
CROP MANAGEMENT TECHNOLOGIES

Quality Planting Material Production through Minisett Technology



Value proposition

Producing newly released varieties in large numbers at an affordable cost



- Rapid multiplication of tuber crop planting materials.
- Reduces cost of planting materials by 30-40%.
- Highly economical for seed producer-farmers.
- Multiplication ratio of cassava enhanced to 1:60 from 1:10.
- In yams, the multiplication rate increased to 1: 24 from 1:4.
- Multiplication rate of elephant foot yam increased from 1:3 to 1:15.

- License fee: India : Rs. 100000 + applicable taxes
- Overseas : Rs. 300000 + applicable taxes
- No of licenses - Nil

CROP MANAGEMENT TECHNOLOGIES

Micronutrient Foliar Formulations for Tropical Tuber Crops

Value proposition

Significant yield increase (>20%) and enhanced tuber quality.

Six multi-micronutrient formulations were developed for five tuber crops containing Zn, Cu, B, Fe and Mn as per crop requirements.

1. Cassava for acid soils
2. Cassava for neutral to alkaline soils
3. Elephant foot yam
4. Yams
5. Sweet potato
6. Chinese potato

- License fee – Rs 2,50,000 + applicable taxes (for products 1 to 5 as a package & Rs. 1,00,000 for product 6)
- No. of licenses granted - Two
- Revenue Generated - Rs. 3,50,000/-
- Total quantity distributed to beneficiaries: 47780 L

CROP MANAGEMENT TECHNOLOGIES

Customized Fertilizers for Tropical Tuber Crops

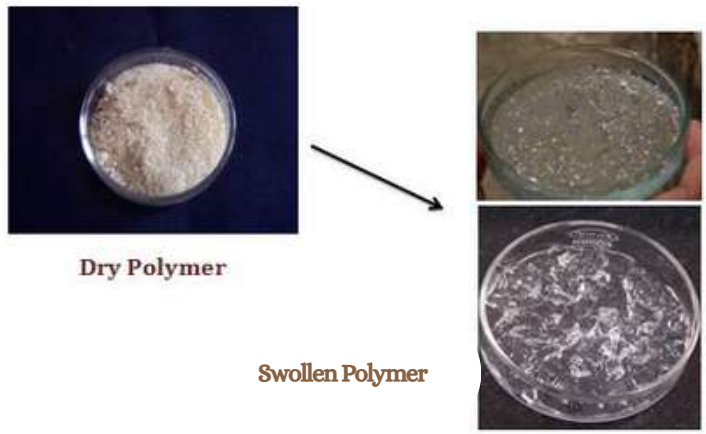
Value proposition

Crop specific and SSNM based fertilizer for high yield; nutrient use efficiency and environmentally sustainable.

- Customised fertilizers were developed for cassava, elephant foot yam, sweet potato, taro, yams and Chinese potato.
- These formulations provide all the required essential plant nutrients in a single fertilizer product at a specific ratio based on soil test results and yield target.
- Yield increase (Cassava - 22%, EFY - 26%, Sweet potato - 19%, Taro - 14%, Chinese potato - 15%).

- License fee - To be fixed
- No. of licenses granted - NA
- Revenue Generated - NA
- No. of beneficiaries/impact and spread of the technologies : NA

Super Absorbent Polymer from Cassava



Dry Polymer

Swollen Polymer

Value proposition

Effective water management for hi-tech nurseries and home gardens.

- Slow absorption and desorption of water, equilibrium absorbency - <350-400 g/g of the dry sample in two hours.
- Improves soil properties such as porosity, water holding capacity and nutrient status.
- Effective in soil moisture retention, especially in containers.
- Suitable for hi-tech agriculture - plant nurseries grown in green houses; and home gardens.

- License fee – Rs 5,00,000 + applicable taxes
- No. of licenses granted - One
- Revenue Generated - Rs 5,00,000/-
- No. of beneficiaries/impact and spread of the technologies : Nil

CROP MANAGEMENT TECHNOLOGIES

Bioactive Molecules from Cassava Crop Residues

Value proposition

Eco-friendly bioformulation with broad-spectrum pesticidal properties

- **ICAR-CTCRI Bioformulation: 1 (Menma)** - The bioactive molecules isolated from cassava leaves were standardized for stem injection to manage borer insect pests of banana & coconut.
- **ICAR-CTCRI Bioformulation: 2 (Nanma)** - The formulations were made with a unique combination of bioactive principles isolated from cassava, neem oil and surfactant. Standardized its concentration and dose against pseudostem weevil (*Odoiporus longicollis* Oliver) in banana as a prophylactic measure and also against sucking pests.
- **ICAR-CTCRI Bioformulation: 3 (Shreya)** - A formulation was developed to dissolve the mealy substance of the mealy bug. Application of the bioformulation dissolve the mealy coating and subsequently kills the pest.

- License fee – For full package : Rs 5,00,000 + Applicable taxes; Only formulations technology - Rs 25000 + Applicable taxes (Only for KVKs, govt sector etc.)
- No. of licenses granted - One
- Revenue Generated - Rs 5,00,000/-
- No. of beneficiaries/impact and spread of the technologies : >5000 farmers

Gluten-free Snack Foods from Cassava and Sweet Potato

- Prepared using composite flour based on cassava & sweet potato and have high nutritional values as well as textural quality.
- Technologies included (10 nos) - Tapioca hot fries, tapioca hot sticks, tapioca pakkavada (salty fries), salty delight, tapioca murukku, tapioca crisps, tapioca nutrichips (with egg), tapioca nutrichips (without egg), fried chips from tapioca and fried chips from sweet potato.

Value proposition

Gluten-free and protein-rich healthy snacks

- License fee – Rs 25000 + applicable taxes
- No. of licenses granted - 36
- Revenue Generated - Rs. 900000/-
- No. of beneficiaries/impact and spread of the technologies : 33 startups/MSMEs

High Protein and Low-fat Snack Foods from Sweet Potato

- Sweet potato fried snacks - Sweet potato sticks, Sweet potato murukku, Sweet potato crisp, Sweet potato nutri-papdi.
- Prepared using composite flour based on sweet potato and have high nutritional values as well as textural quality.
- High protein content - 5-10%
- Low fat content 18 to 28% for all products.
- Good levels of crude protein content nutri-papdi/murukku 5-10%.

Value proposition

Provide 2-5% additional micronutrients and dietary fibers..

•License fee – Rs. 50000/- (For three products)
•No. of licenses granted - Nil
•Revenue Generated : Nil
• No. of beneficiaries/impact and spread of the technologies : Nil

Sweet Potato Jams

Value proposition
Vit A and anthocyanin rich jams good for immunity boosting

- Beta-carotene rich and anthocyanin rich jams prepared from Bhu Sona and Bhu Krishna varieties respectively.
- Natural supplementation of anthocyanin which acts as antioxidant
- Beta-carotene (precursor of Vitamin A) helps to eradicate the Vitamin A deficiency
- Nutrition facts (per 100g): Energy: 247 kcal; Protein:1.3 g and Fat: 0.05g

•License fee – Will be available on request
•No. of licenses granted - Nil
•Revenue Generated : Nil
• No. of beneficiaries/impact and spread of the technologies : Nil

Sweet Potato Nutri-Jelly

(Anthocyanin and Beta-Carotene rich)

- This is a ready to use functional food having good texture and taste, made out of biofortified sweet potato extract.
- Available in two versions - Beta-Carotene rich jelly from var. Bhu Sona; Anthocyanin-rich jelly from var. Bhu Krishna.
- Natural supplementation of anthocyanin and it act as antioxidant

Value proposition

Vit A and anthocyanin rich jellys are good for immunity boosting

•License fee – Rs. 25000/- (For two variants) + applicable taxes
•No. of licenses granted - Nil
•Revenue Generated : Nil
• No. of beneficiaries/impact and spread of the technologies : Nil

Functional Bakery Products

Value proposition
Low oil and nutritious chips, good for people with life-style diseases

- Protein and fiber enriched gluten free functional cookies from orange and purple fleshed sweet potato prepared. They are rich in carotenoids and anthocyanin.
- Protein and anti-oxidant enriched sweet potato Muffins prepared.
- The cake made from orange fleshed sweet potato flour is an excellent source of β-carotene (6.3 mg/100g).
- Anthocyanin rich cake made from purple fleshed sweet potato flour is a good source of anthocyanin (39 mg/100g)

•License fee – Will be available on request.
•No. of licenses granted - Nil
•Revenue Generated : Nil
• No. of beneficiaries/impact and spread of the technologies : Nil

Sweet Potato Flour Nutribars

Value proposition

High protein and fibre content

- The sweet potato based energy bar with sweet potato, honey and jaggery, along with oats, puffed rice, Bengal gram, dhal and nuts was prepared.
- Nutritional content - Moisture 5.48 - 6.52%, ash 2.17 - 2.35%, crude protein 5.37 - 6.80%, crude fat 21.68 - 28.75%, crude fiber 1.29 - 2.45%, and carbohydrates 54.8 - 62.84% and energy 467.56 - 505.15 kcal/100g.

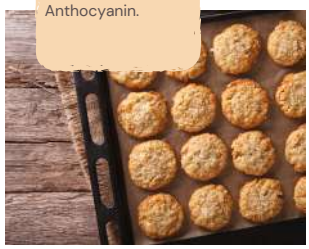
•License fee – Rs. 15000 + applicable taxes
•No. of licenses granted - Nil
•Revenue Generated : Nil
• No. of beneficiaries/impact and spread of the technologies : Nil

Gluten-free Sweet Potato Cookies

- Three variants - Gluten-free, rich in Beta-Carotene, and Anthocyanin.
- Gluten free cookies provide 8.02% protein, 10.33% fiber and 411kcal/100g energy and suitable for Celiac patients.
- Cookies with biofortified sweet potato provide carotenoids and anthocyanins, which have antioxidant properties.

Value proposition

Gluten-free, rich in Beta-Carotene, and Anthocyanin.

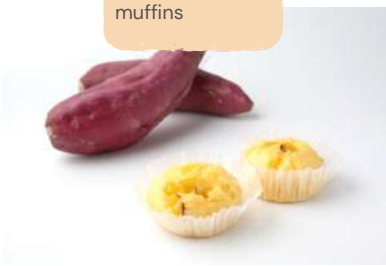


•License fee – Rs. 15000 + applicable taxes
•No. of licenses granted - Nil
•Revenue Generated : Nil
• No. of beneficiaries/impact and spread of the technologies : Nil

Sweet Potato Flour-supplemented Muffins

- Protein rich sweet potato based muffins was developed using 47% sweet potato flour, 03% whey protein concentrate and 50% wheat flour.
- These muffins provide 7.5% protein and 2.5% crude fiber.

Value proposition
High protein and dietary fiber muffins



•License fee – Rs. 15000 + applicable taxes
•No. of licenses granted - Nil
•Revenue Generated : Nil
• No. of beneficiaries/impact and spread of the technologies : Nil

Functional Pasta From Cassava / Sweet Potato

Value proposition

Gluten-free pasta with high protein and dietary fibre

- The fortified pasta – Four technologies (whey protein, dietary fibre, betanine, carotene enriched) prepared from cassava
- Gluten-free pasta has a medium glycemic index and provides 10 - 30% additional protein

- License fee – Rs 50000/ pasta type + applicable taxes
- No. of licenses granted - two
- Revenue Generated : Rs. 1,00,000/-
- No. of beneficiaries/impact and spread of the technologies : > 500 farmers

Functional Noodles from Sweet Potato/Cassava

Value proposition

Gluten-free noodles with high protein and dietary fibre

- Technologies – Four variants (banana starch, cassava starch, Green gram starch fortified) and annealed cassava starch fortified noodles.
- Gluten-free noodles

•License fee – Rs 50000 + applicable taxes/ technology.
•No. of licenses - One
•Revenue Generated : Nil.
• No. of beneficiaries/impact and spread of the technologies : Nil.

Ready-to-Cook Food Products from Sweet Potato

- **Paratha mix** - Major ingredients include sweet potato flour pearl millet and wheat flour.
- **Ladoo mix** - Purple fleshed sweet potato flour, Bengal gram flour.
- **Nutri-pasta** - Sweet potato flour, buckwheat flour, quinoa flour.

Value proposition

These products supply 2-5% additional micronutrients and dietary fibers..

•License fee – Rs. 50000/- (For three products) + applicable taxes
•No. of licenses granted - Nil
•Revenue Generated : Nil
• No. of beneficiaries/impact and spread of the technologies : Nil

Nutri-Meal Mix

- A healthy combinations of Cereals, Pulses, ragi, biofortified sweet potato and dry fruits.
- Nutritious, healthy and Gluten free product.
- Eight products are available with Elaichi (four no.) and Vanilla (four no.) flavours
  - *Bhu Krishna flour with sugar
  - *Bhu Krishna flour with Jaggery
  - *Bhu Sona flour with sugar
  - *Bhu Sona flour with Jaggery
- Suitable for all age group and healthy diet plan

Value proposition

Good ness of millets with anti-oxidants of sweet potato

•License fee – Will be provided on request.
•No. of licenses granted - Nil
•Revenue Generated : Nil
• No. of beneficiaries/impact and spread of the technologies : Nil

Resistant Starch (RS - 4 and RS - 5) from Cassava

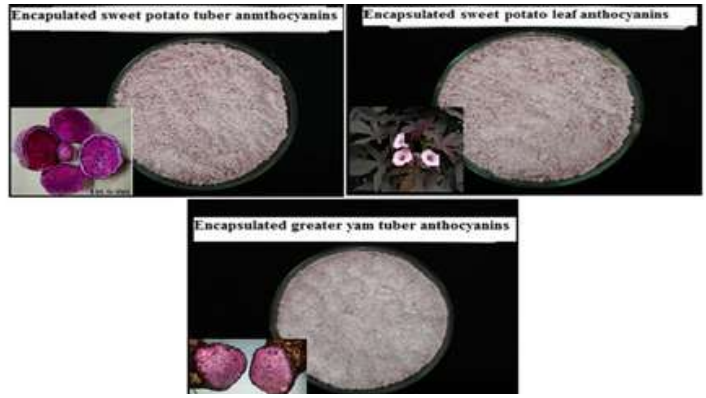
Value proposition

Slow-digestible starch suitable for patients with life-style diseases

- RS4 (Modified starch) and RS5 (starch-lipid complex) type resistant starches of cassava and sweet potato.
- RS is associated with low calories and behaves like dietary fibre.
- Causes minimal increase of postprandial glucose and insulin responses, helps the growth of essential colon micro-biota in the large intestine and thereby enhancing the short chain fatty acid production.

- License fee – Rs. 100000 + applicable taxes / RS type
- No. of licenses granted : NA
- Revenue Generated - NA
- No. of beneficiaries/impact and spread of the technologies : NA

Encapsulated Sweet Potato and Purple Yam Anthocyanins



Value proposition
Natural colourant with antioxidant properties. Enormous industrial benefits

- The encapsulated anthocyanins can be used as natural food colourant with the added advantage of antioxidant properties.
- Can also be used in developing anthocyanin supplements.
- **Anthocyanin extraction**
- **Sweet potato tuber** - (Var. Bhu Krishna) 165mg (cyanidin 3-glucoside equivalents) /100g FW
- **Sweet potato leaves** (Var. S-1467) - 190mg (cyanidin 3-glucoside equivalents)/100g FW
- **Purple yam tuber** (Var. DA 340) - 142mg (cyanidin 3-glucoside equivalents) /100g FW).

- License fee – To be fixed
- No. of licenses granted : NA
- Revenue Generated - NA
- No. of beneficiaries/impact and spread of the technologies : NA

Quick Cooking Dehydrated Tubers

Value proposition

Ready-to-cook food - fast cooking and easy export.

- Quick cooking dehydrated cassava and elephant foot yam tubers were developed.
- The dehydrated cassava and sliced tubers prepared with appropriate pre-treatments which can be cooked within 3-5 minutes.
- This method to increases shelf life, reduce bulkiness during export and enables fast cooking.

- License fee – Rs 25000 + Applicable taxes
- No. of licenses granted - Three
- Revenue Generated - Rs. 75000/-
- No. of beneficiaries/impact and spread of the technologies : Three

TECHNOLOGIES FOR EXTENDING SHELF LIFE

Wax Coating Technology for Cassava Tubers

Value proposition

Extending shelf-life of cassava tuber by one month

- Rapid postharvest physiological deterioration is a challenge faced by cassava processors. The tubers lose market value within 24 hours and spoil after 72 hours.
- The surface coating of cassava tubers with paraffin wax/other suitable wax before packaging them into boxes can extend shelf life.
- Acts as barrier for the exchange of gases such as oxygen, carbon dioxide and water vapour and keeps the tubers fresh for up to one month.

- License fee – Rs 25000 + applicable taxes
- No. of licenses granted : Two
- Revenue Generated - Rs.50000/-
- No. of beneficiaries/impact and spread of the technologies : Two

Modified Starches
Cassava Starch Phosphate

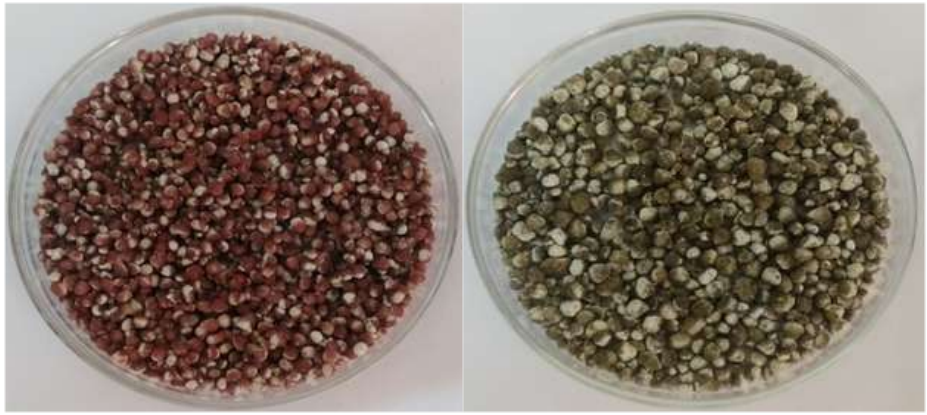
Value proposition

Good quality jellies from cassava starch

- Chemically modified starch esters with decreased gelatination temperature, enhanced solubility, water binding capacity and paste clarity were prepared.
- Suitable for applications where low temperature or minimum cooking conditions are required.
- Can be used as gelling agent in candies and jellies.

- License fee – Will be available on request.
- No. of licenses granted : NA
- Revenue Generated - NA
- No. of beneficiaries/impact and spread of the technologies : NA

Functional Sago from Wet and Reconstituted Cassava Dry Starch



- Conventional Sago is not a balanced food for human consumption as it is deficit in protein and vitamins

- Functional sago developed with enhanced protein, dietary fibre and antioxidant activity by incorporation of beetroot powder and sweet potato leaves powder.

- License fee – Will be available on request
- No. of licenses granted : NA
- Revenue Generated - NA
- No. of beneficiaries/impact and spread of the technologies : NA

e-Crop Based Smart Fertigation System (e-CBSF)

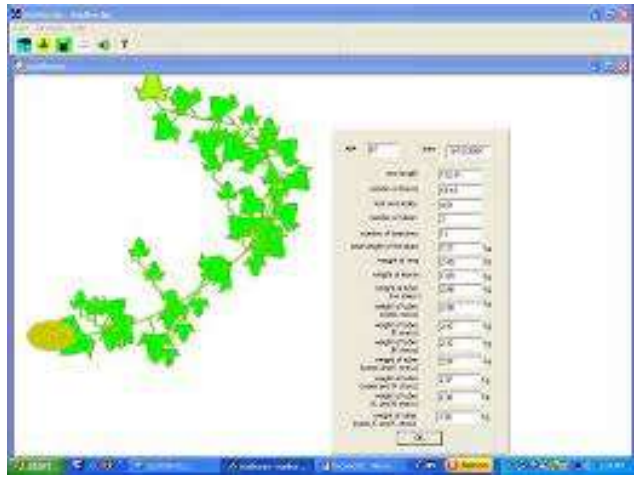
- Automating the application of water and nutrients in precise quantities as per the requirement of the crop.
- Attainment of potential yield by reducing yield gap will be an easy task with this product.
- Helps to reduce the cost of cultivation by reducing water and nutrient requirement as well as cost of cultivation

Value proposition

Effective and efficient irrigation system.

- License fee – Will be available on request.
- No. of licenses given - NA
- Revenue Generated : NA
- No. of beneficiaries/impact and spread of the technologies : NA

SPOTCOMS - Sweet Potato Growth Simulation Model

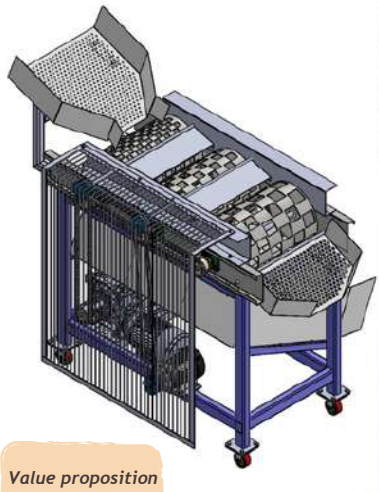


- SPOTCOMS is a growth simulation model of sweet potato which predicts the crop phenology in response to environmental factors.
- It mimics the growth and development of sweet potato and helps to study crop growth and to calculate growth responses to the environment.
- This model is validated for nearly 30 Indian varieties and other varieties of Uganda, Indonesia, Vietnam, China and Philippines.

Value proposition
Effective agro-advisory services for largescale cultivation of sweet potato

- Nature of License: Non-exclusive.
- Duration of the License: Global: Three years (For research/ academic use – Non-commercial Use)
- Licensee fee: Global : USD 3000 + applicable taxes (For research/ academic use – Non-commercial Use)
- Training support: Training will be provided on demand by the licensee and the fee will be charged as per the institute norms.

Power Operated Size Based Chinese Potato Grader



Value proposition

Easy grading at field level reduces labour requirement.

- Chinese potato tubers are sorted into four sizes namely small (less than 20 mm), medium (20.1-30 mm), large (30.1-40 mm) and very large (greater than 40 mm).
- Reduces labour requirement.

- License fee – Rs 10000/-
- No licenses granted – One
- Revenue generated – Rs 10000/-
- No of beneficiaries – 200 farmers
- Patent application filed: Patent Application No. 202241043900 dated 01/08/2022

PRE- AND POST-HARVEST MACHINERIES

Arrowroot Starch Extractor

Value proposition

In situ production of arrowroot starch and easy to use

- A machine for *in situ* production of arrowroot starch and value addition near the farm site is developed.
- Provision for easy transportation and a place to store peeled tubers available

- License fee: Rs. 10000/-
- No of license - One
- Number of beneficiaries - 200 farmers

PRE- AND POST-HARVEST MACHINERIES

Cassava Chipping Machine

Value proposition

Extending shelf-life of cassava tubers in dried form for export.

- The shorter shelf life of cassava tubers (up to 7 days in ambient conditions) limits their marketability and prevents farmers to transport them to long-distance markets to obtain good prices.
- The cassava chipping machine helps the farmers to extend the shelf life of cassava tubers in dried form. Produces chips of circular shape and desired thickness

- License fee : Rs. 10000/-
- No. of licenses granted – Two
- Revenue Generated – Rs. 20000/-

PRECISION AGRICULTURE TECHNOLOGY

e-Crop Based Smart Farming (e-CBSF)

- An IoT and crop model integrated technology that simulates crop growth in response to weather and soil parameters and also generates an agro-advisory that is sent to the farmer's mobile by SMS.
- Based on the climate and soil data, it calculates the requirements of fertilizers, water, agronomic and cultural practices to be followed to get more yield.
- Using sensors, the solar-powered device collects real-time data on the maximum/ minimum temperature, solar radiation, RH, precipitation, soil moisture, wind velocity, and wind direction. The data are sent to a central server through a modem and run through a simulator to generate the advisory.

Value proposition

Effective agro-advisory services for large farms

- License fee – India: Rs 50000/- Overseas: Rs. 700000;
- No. of licenses given - Two
- Revenue Generated : Rs. 100000/-
- No. of beneficiaries/impact and spread of the technologies : 200 farmers
- Patent application field: Patent Application No. 1388/CHE/2014

Arrowroot Ladoo

- Arrowroot laddu, popularly known as Palua ladoo, is a sweet dessert which is healthy and gluten-free.
- Prepared in natural process without any addition of preservatives or binding agents, keeping natural arrowroot starch nutritious quality intact.
- This ladoo is rich in carotene, iron and folate (vitamin B9)

Value proposition

Goodness of arrowroot with high iron and folate

•License fee – Incubatee product
•No. of licenses granted - Incubatee product
•Revenue Generated : Nil
• No. of beneficiaries/impact and spread of the technologies : One startup

Vacuum-fried Chips from Biofortified Sweet Potato Varieties

- Vacuum fried chips from ICAR-CTCRI released orange (Bhu Sona) and purple-fleshed (Bhu Krishna) sweet potato varieties developed.
- These chips are lower in fat content and higher in bioactive compounds like β-carotene and anthocyanin.

Value proposition
Low oil and nutritious chips, good for people with life-style diseases

•License fee – Incubatee product
•No. of licenses granted - Incubatee product
•Revenue Generated : Nil.
• No. of beneficiaries/impact and spread of the technologies : One startup

SECTION 5: CONSULTANCIES

SNo	Consultancies	Organisation	From	To	Amount (Rs.)
1	Consultancy services in Cassava	Tierra Food India Pvt. Ltd. Ansal Riverdale, Eroor P. O., Cochin 682306	20.09.2011	19.09.2012	200000
2	Promotion of Orange Fleshed Sweet Potato in Gajapati and Rayagada districts of Odisha	Programme for Rural Awareness and Very Action (PRAVA), Komati Street, Parlakhemundi 761200, Gajapati district, Odisha	01.04.2013	31.12.2013	160000
3	Promotion of Orange-fleshed sweet potato cultivation technology	South Orissa Voluntary Action (SOVA), Koraput, 764 020, Odisha	01.03.2014	31.12.2014	90000
4	Consultancy Services for Sweet Potato	M/S, Belgaum Minerals 91 Vinaya Nagar, Hindalga Road, Belgaum 591108	27.02.2015	26.02.2017	952600

SECTION 6: CONTRACT RESEARCH

Sl. No.	Technology	Contracting Party	Date	Total Project Cost (Rs.)
1	R&D, promotion, commercialization of technology for Cassava papad production	M/s Boosters International, 7-72/2, Nedumangadu Road, Aralvaimozhi-Via, Chenbagaramanputhur, Kanyakumari Dist., Tamil Nadu 629 304	06.01.2014	1,09,500
2	R&D, promotion, commercialization of technology for mineral & bio-mineral fertilizer from minimizing waste	M/s Swamy Engineering Consultants, 22 A, Kumar Nagar South, IIIrd street, tirupur 641 603, Tamil Nadu	31.07.2014	2,46,000
3	R&D and commercialization of Process for High Quality Cassava Flour (HQCF) and continuous wet Cassava pressing machine for production of HQCF	M/s Verds Fab Products, No. 535 Ponnamalle High Road, Arumbakkam, Chennai- 600 106	17.07.2016	3,55,800
4	R&D of Jackfruit –Cassava Gluten Free Pasta	Mr. Subash Koroth, M/s. Artocarpus Foods, Pvt. Ltd, Plot No. F Kinfra park, Nadukani, Kannur, Kerala	21.03.2017	32,000
5	R&D of process for the Cassava-jack fruit bulb flour based pasta	Smt. Rajasree , R., Harimangalaththekkathil, Panayil, PO., Nooranad, Alapuzha (Dist.) – 690504, Kerala	22.12.2017	60,000

SECTION 6: CONTRACT RESEARCH

Sl. No.	Technology	Contracting Party	Date	Total Project Cost (Rs.)
6	Research on Development of pasta & cookies from "Sprotone" added with tuber starches as binding agents	M/S, Moza Organic Private Limited, A-3 , 3rd Floor, Aroma Gardens, Near Town Hall Metro Station , SRM Road, Ernakulam, Kochi -682018, Kerala	17.11.2021	1,76,646
7	Contract research on developing SOP and HACCP for starch and sago production	M/s. SAGOSERVE, Jagir Ammapalayam (Post), Omalur Main Road, Salem-636302, Tamil	9.11.2022	31,11,490
8	Contract research on "Development of value added products from Mudali (Colocasia esculenta) and Kone (Dioscorea)"	M/s Spudnik Farms Private Limited, Doddavalagamadhi Village, Bangarpet Taluk,Kolar District, Karnataka	22.7.2023	6,48,174

SECTION 7: PATENT PORTFOLIO

S No	Title of Patent	Patent Application Number	Date of filing	Date of Grant	Valid upto	Current status
1	Apparatus & process for extraction of biopesticide from Cassava bio wastes	653/DEL/2012	05/03/2012	09/06/2021	4/03/2032	Patent granted (Patent Number :368943)
2	Power Operated Size Based Chinese Potato Grader	202241043900	01/08/2022	NA	NA	FER response submitted
3	A process for the production of low-moist gelatinized dough	3514/CHE/2015	09/07/2015	NA	NA	Yet to be granted
4	Electronic Crop- an electronic device for providing realistic agro advisory to the farmers	1388/CHE/2014	17/09/2014	NA	NA	FER response submitted
5	Bioactive Multinutrient Rock Mineral Fertilizer	6247/CHE/2014	11/12/2014	NA	NA	Yet to be granted
6	Multinutrient Rock Mineral Fertilizer	6248/CHE/2014	11/12/2014	NA	NA	Yet to be granted
7	A process for making high protein carotene rich pasta from orange fleshed Sweet Potato	3951/CHE/2011	2011	NA	NA	Yet to be granted

SECTION 7: PATENT PORTFOLIO

S No	Title of Patent	Patent Application Number	Date of filing	Date of Grant	Valid upto	Current status
8	Process of isolation of cyclo (Pro-tyr) from bacteria associated with a novel entomopathogenic nematode its antimicrobial property	2114/CHE/2010	26/07/2010	NA	NA	Yet to be granted
9	A novel cyclic dipeptide from bacterial symbiont of rhabditis sp-process of isolation & its antimicrobial properties	1686/CHE/2010	17/06/2010	NA	NA	Yet to be granted
10	A low cost biotechnique to extract starch flours from Cassava	1820/DEL/96	16/08/1996	09/02/2006	15/08/2016	Expired
11	Starch based Biodegradable Plastics	EP9810151 (European Patent)	09/03/1995	09/02/1996	08/03/2015	Expired
12	Ethanol from Cassava	160842	1980	1983	2000	Expired (Patent Number : 160842)

Tuber Crops for.....
Food, Health, Wealth and Prosperity

हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद
Agrisearch with a human touch

Azadi Ka Amrit Mahotsav

INTERNATIONAL YEAR OF MILLETS 2023

G20 भारत 2023 INDIA

ICAR- Central Tuber Crops Research Institute

Sreekariyam, Thiruvananthapuram 695 017, Kerala, India
Phone: (91) (471) 2598551 to 2598554
E-mail: director.ctcri@icar.gov.in
Website: https://www.ctcri.org

भाकृअनुप ICAR

ctcri