

ISTRC

(1967-2017)



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Newsletter

VOLUME 29, MAY 2018



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This Newsletter is compiled by Prof. Maruthi M. N. Gowda, ISTRC Councillor for Publications, and edited by Prof. Keith Tomlins, ISTRC President.

President remarks

The ISTRC has now entered its 51st year in serving the global root and tuber crop community. There have been a number of positive events for the ISTRC since the last newsletter. Firstly, the 1st International Symposium of the Pacific Branch was successfully held from 24 to 27 April, in Nadi, Fiji. It was a very successful first Symposium and marked an important milestone in the South Pacific region. Associate Professor Mohammed Umar and Professor Satish Chandra organised the Symposium, and Dr Rup Singh, Editor on the ISTRC-PB Council edited the submissions.

We have some important events to look forward to. From 22 to 25 October 2018, the 18th International Symposium of the ISTRC will be held in Cali, Colombia and kindly hosted by CIAT. Plans are underway so please support this symposium.

The ISTRC has given its logo a golden appearance to celebrate our 50th and golden anniversary last year in 2017. We hope you like it.

Finally, please do feel free to contact the ISTRC Council members if you need any information about root and tuber crops and do feel free to interact with everybody on the ISTRC FaceBook Group.

I hope you enjoy reading this newsletter and thank you for supporting the society.



Keith Tomlins

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Communications

As well as this Newsletter, and website the ISTRC has other forms of communication.

- **ISTRC Website.** The ISTRC website is an open resource for members as well as general public to obtain information on the society. Council regularly updates important developments on root and tuber crops, advertise conference and symposia announcements and <http://www.istrc.org/>
- **ISTRC Facebook Group.** The ISTRC Facebook group has over 600 people signed up and is free to join. Here you can post news about your work on root and tuber crops, projects, share information and request information. <https://www.facebook.com/groups/221619034612519/>
- **ISTRC LinkedIn Page.** The ISTRC LinkedIn page has similar information to the Facebook group but has a wider circulation, in particular in China.

More information about ISTRC can be found at <http://www.istrc.org/> and <https://www.facebook.com/groups/221619034612519/>
More information about the WCRTC can be found at <http://www.gcp21.org/wcrtc/index.html>.

18th Triennial Symposium of the International Society for Tropical Root Crops (ISTRC)

When, Where and How will Tropical Root and Tuber Crops Lead the Next Agri-Food Revolution

22nd to 25th October 2018 at CIAT, Cali-Colombia.

Jointly Organized by ISTRC and CIAT

Background to the symposium

Both the International Center for Tropical Agriculture (CIAT) and the International Society for Tropical Root Crops (ISTRC) are celebrating 50 years of promoting, stimulating and investing in research for development on to tropical root crops to increase and ensure their contributions to food security, sustainable development, economic growth and poverty reduction.

Tropical roots and tubers (cassava, potato, sweet potato and, yams and aroids) are collectively the third most important food crops in the world (800 million MT) after sugar cane (1874 million MT) and maize (974 million MT) by production. These crops are play important roles in the livelihoods of hundreds of millions in the tropics making significant contribution for income generation, sustainable development and household food security. Their flexibility in cultivation in varied agro-ecologies under mixed farming system contributes to the versatility of the crops. Also, root and tuber crops are important source of animal feed and industrial products.

These crops have both challenges and opportunities in:

- Germplasm improvement
- New variety adoption/impact,
- Access to quality seeds,
- Effective management of pests and diseases,
- Crop nutrition and low soil fertility,
- Mechanization of planting and harvesting
- Climate Change
- Consumer preference and nutrition,
- Post-harvest losses, and
- Agro-processing and trade.

Strategies need to be developed to address these challenges to determine **“When Where and How will the Root and Tuber Crops Lead the Next Agricultural Revolution”**. Unquestionably, in the next 20 years, tropical root and tuber crops will play a significant role in ensuring a sustainable agricultural development in the tropics. Hence, this Symposium provides an opportunity for experts from around the world to meet and address

this agenda. The Symposium will be jointly organized by the ISTRC and CIAT.

The ISTRC was established in 1967. The Society's triennial symposia serve as a convening platform for interaction among scientists working on all tropical root and tuber crops from various backgrounds. This Eighteenth Symposium of the Society will be an excellent opportunity for those interested in root and tuber crops from around the world to come together to share and compare knowledge and expertise. It will be an opportunity for Colombia and other Latin American countries to showcase their expertise and for workers from other parts of the world to learn and experience first-hand.

CIAT was founded in 1967 by the Ford and Rockefeller Foundations with the help of the Colombian Government. Since its creation, CIAT has developed technologies, varieties, and knowledge that enable smallholders to be competitive and profitable while adopting sustainable and resilient farming practices. Headquartered near Cali, Colombia, CIAT conducts research for development in tropical regions of Latin America, Africa, and Asia. CIAT is part of the [CGIAR System](#) and (co)leads the CGIAR research program on [Climate Change, Agriculture and Food Security \(CCAFS\)](#), and on [Root, Tubers and Bananas \(RTB\)](#), the CGIAR [Big Data Platform](#), [HarvestPlus](#), a global bio-fortification project.

Objectives

- Bring together leading root and tuber crops researchers and practitioners from a wide range of disciplines to review the state of the art on research and development activities involving these crops.
- Identify key research and knowledge gaps with the aim of stimulating new research for development that will realize the next agri-food revolution.
- Identify the research outputs that are ready to scale-up/out to contribute to food security, economic growth, poverty reduction and sustainable development.
- Propose appropriate policy interventions that will support the contribution of root and tuber crops translation to development outcomes.
- Propose how to strengthen public-private-partnerships for root and tuber agribusiness innovation and development.
- Assess 50 years of the impact research and development on roots and tubers research for improved livelihoods and nutrition.

Expected Outputs

- Updates on the latest state of the art scientific developments, innovations and technologies.
- Identifications of new areas of investment in research, development and value chain.
- Advise on strategies to engage on private-public-partnerships to increase capacity, dissemination and implementation of research and technologies and the impact roots and tuber crops on smallholder fields.
- Raise awareness on the importance of strengthening national agricultural development policies for sustainable roots and tubers production.

About the Venue

The ISTRC symposium will be held at the [CIAT Headquarters](#), Cali city, the Republic of Colombia. The venue is close to [Alfonso Bonilla Aragón International Airport](#) also known as Palmaseca International Airport, 5 minutes to Palmira and about 20 minutes from Cali, the capital of the department of Valle del Cauca in southern Colombia. The city of Cali has about 3 million inhabitants and is, after the capital Bogota, the largest city in the country. Cali is located at 1.000 meters above sea level. The climate is tropical, with temperatures ranging from about 22°C in the mornings and evenings to 26-35 °C in the afternoons.

About the Accommodation for conference participants

32 participants will be accommodated at CIAT's Guest House and other participants will stay in Cali. Please note that credit cards are NOT accepted at the CIAT's Guest House, hence payment for additional services such as snacks or laundry must be made in cash, using local currency or US dollars. Please find below the hotels that will be providing their services during the event. Please use the following information **for booking with special fares for the ISTRC**. These hotels are easily accessible (some hotels may offer a pick-up service at the airport, please consult this directly with the hotels.) and close to the venue, in the north of city:

CIAT's GUEST HOUSE

KM17 Recta Cali-Palmira, Palmira
Phone: +57 2 4450000
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l.v.moreno@cgiar.org
Web site: www.ciat.cgiar.org

INTERCONTINENTAL - CALI

Contact: Monica Maria Gallego Agudelo, Phone: (2) 8823225, E-mail: monicam.gallego@hotelesestelar.com
Address: Colombia # 2-72, Cali, Valle del Cauca

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gcuentacali2@spiwak.com

Hotel Spiwak Chipichape Cali, Avenida 6 D No. 36 N - 18

Reservas: +57 2 3959949 ; www.spiwak.com

HOTEL IBIS GRANDA

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Who are the participants?

Participants are practitioners who are interested in root and tuber crops with respect to research, policy, their uses and in industry

Exhibition

Hundreds of world class experts in root and tuber crops will be attending the 18th ISTRC symposium in Cali. The symposium organizers would like to invite you to present your company to this qualified audience. Sign up as an exhibitor at the Congress now, as the availability of exhibition booths is limited.

An exhibition booth at the 18th ISTRC symposium, you may display information about your company, organization/NGO, industry, a certain project or research and development, etc. More importantly, you will be able to directly interact with a highly attractive audience and make them aware of your of the shelf solutions.

Important dates

Pre-registration is currently open:

<https://www.eventbrite.com/e/istrc-18th-triennial-symposium-registration-43364957756>

Pre- registration **closes August 30th**

Call for abstracts Presentations and posters – **Closes**

June 30th. Template for abstracts is found here

<https://istrc18thtriennialsymposium.sched.com/>

Registration fees = \$ 490 (Industry); \$390 (Scientists); \$290 (Students) – registration fees are not refundable.

For registering your payment please contact:

Claudia Zuñiga: C.S.ZUNIGA@CGIAR.ORG

RESEARCH AND DEVELOPMENT UPDATES FROM COUNCIL MEMBERS FROM DIFFERENT REGIONS OF THE WORLD

Training Workshop on Taro Production and Export from Taveuni Island, Fiji

By Professor Mohammed Umar, President ISTRC-PB;
Professor Satish Chandra, Councillor South Pacific,
ISTRC; Professor Anabella Tulin and Dr Sanjay Anand



Photo 1. The training workshop participants and the resource persons at the opening ceremony.

Background

The Training Workshop on Taro Production and Export from Taveuni, Fiji was held over 5 days from 28 November to 2 December 2016 at the Government Building at Somosomo Village in the island of Taveuni. The Workshop was organised by the International Society for Tropical Root Crops – Pacific Branch (ISTRC-PB), and was funded by the School of Agriculture and Food Technology (SAFT) and the Institute of Research, Extension and Training in Agriculture (IRETA), of the University of South Pacific (USP), Alafua Campus, Apia, Samoa.

The USP has the mandate to organise and conduct such training workshops in the South Pacific Region. Since 2012 the Vice Chancellor and the President of USP Professor Rajesh Chandra has strongly supported the ISTRC-PB and the SAFT and IRETA in organizing and conducting training workshops in the tropical root crops in the South Pacific Region. The USP is a large and very well established South Pacific regional university which has 12 countries under its charter, and currently has over

40,000 students studying at various campuses in the Region.



Photo 2. The village chief, Mr Waisale Mataitoga, during the opening program with Professor Mohammed Umar (left) and Professor Satish Chandra (right).

Objectives of the Workshop

The overall objective of the Training Workshop was to investigate and propose solutions for the declining taro export industry in Taveuni, Fiji. The Training was planned to include key farmer groups, traders, exporters, and research and extension staff of the Fiji Ministry of Primary Industry (MPI) who have a stake in the taro export industry in Taveuni. Taveuni is the third largest island in the Fiji Group and is often referred to as the “garden island” because of its rich volcanic soils and ideal climate to support the production of a range of food and industrial crops throughout the year.

The specific objectives of the Training were:

1. To equip the participants with information on the physical, chemical and biological aspects of soils.
2. To train the participants on nutrient deficiency diagnosis and inculcate in them the importance of using cost-effective fertiliser management to attain higher productivity, sustainability and profitability in farming.
3. To improve and enhance the capability of the participants in making soil management decisions based on their understanding of soil properties and crop requirements.
4. To enhance the capability of the participants to disseminate information on the importance of soil health, and integrated soil and crop management in taro and other crop production in Fiji.
5. To develop linkages between the farmers, researchers, scientists and extension workers.
6. To inform the participants on the role of the ISTRC-PB and ISTRC in the Training Workshop, and how to access valuable information for future needs in the root crops sector.

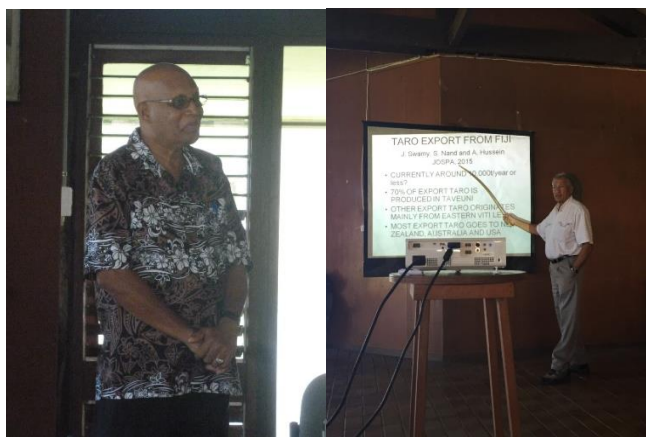


Photo 3. Professor Mohammed Umar (left) giving the overview of the training workshop to the participants. Professor Satish Chandra (right) giving his presentation on taro production and export from Taveuni, Fiji.

Rationale for the Training

From a peak export revenue of about FJD20 million per annum the Taveuni taro industry has been severely affected by falling yield and quality in recent years. The main problems on the production side are declining soil fertility, declining organic content of soils, declining use of high quality planting material, poor agronomic practices including monocultural production systems, and recent high increases in the price of fertilisers leading to substantially lower application rates than those recommended. On the export side the increased freight and bio-security processing costs have also affected the industry.

The impact of these problems at the farm level has been lower profit margins and declining interest in taro farming. At the local level the declining taro production industry means stagnating or even falling living standards for a large number of taro growers and traders.



Photo 4. Professor Anabella Tulin giving a presentation on nutrient diagnosis in plants.

Role of ISTRC-PB and ISTRC

The ISTRC-PB and ISTRC played important roles in the Training Workshop by providing resources and harnessing the skills of experienced facilitators. Professor Mohammed Umar is the President of ISTRC-PB and his leadership, skills and knowledge of the root and tuber crops in the South Pacific Region was critical to the success of the training. Professor Satish Chandra, Councillor South Pacific, ISTRC was the lead facilitator at the Workshop, and he gave the keynote addresses on the problems, constraints, challenges and opportunities in the taro export industry in Taveuni.

The key mandate of ISTRC-PB is to promote the development of root and tuber crops in the Pacific Region. The focus is on research, development, extension, consumption, utilisation, and commercial and enterprise development in root and tuber crops such as cassava, sweet potatoes, yams, taro and other aroids; and potatoes. These crops are the major staple foods of the Pacific people.

Another mandate of the ISTRC-PB, as written in its constitution, is to help develop a world-wide “community of practice” – i.e. a group of workers who have common interests in the research, utilisation, value chain development, consumption and promotion of root and tuber crops in the Pacific Region. This Training Workshop was central to the mandate of ISTRC-PB.

Maximising the production and utilization of root and tuber crops in the Pacific Region provides great opportunities to improve the social and economic livelihoods of large numbers of people. These opportunities relate to improving food security, increasing farm and enterprise incomes, maximizing value chains, improving human and animal nutrition, and opens-up challenges to mitigate the impact of climate change in the Pacific Region.



Photo 5. Dr. Sanjay Anand showed the participants how to use the Palin Soil Test Kit in analysing some important chemical properties of the soil.

Outputs and Outcomes of the Training

The 5-day Training Workshop achieved the following:

1. Equipped the participants with the important physical, chemical and biological aspects of soil and how to continue to maintain soil health.
2. Trained the participants on nutrient deficiency diagnosis and inculcated in them the importance of plant nutrition on the growth and development of taro.
3. Educated the participants on the various cultural, management and agronomic practices of taro production to enhance crop productivity and improve yield and quality.
4. Improved and enhanced the capacity of the participants in making decisions on organic agriculture and fertiliser management of taro.
5. Enhanced the capacity of participants to disseminate information on soil health, agro-forestry and permaculture.
6. Developed further linkages between researchers, scientists, extension workers, taro farmers and other stakeholders.
7. Informed the participants on the role of ISTRC-PB and ISTRC in accessing and disseminating root and tuber crops research and development (R&D) information, and also in linking South Pacific root crops researchers and scientists with international scientists.
8. Formed the Taveuni Taro Growers Association (TTGA), consisting of taro farmers and exporters in Taveuni, which is expected to promote the various activities of taro producers in Taveuni.



Photo 6. The training workshop participants and resource persons showing their certificates of participation and recognition during the closing ceremony.

Conclusions

The training was considered extremely successful as indicated by the written evaluation from the participants at the end of the Training. It is recommended that more such targeted training workshops, designed to help improve the production, utilisation and marketing of root and tuber crops, be held in Fiji and other South Pacific Island Countries. The SAFT and IRETA, together with ISTRC-PB and ISTRC, have the resources, knowledge and skills to conduct such training workshops in the Region.

RTBfoods executive summary

By Dominique Dufour

The emergence of new pests and diseases, climate change, soil erosion and depletion, as well as changes in consumption habits from rural to more urban lifestyles, compel breeders of roots, tubers and bananas (RTB crops) to develop new varieties better adapted (i) at the farm level to biotic and abiotic stresses and (2) at the post-harvest level to agro-industrial value chains.

Knowledge of the socio-cultural structures linking farmers, middlemen, processors and consumers of RTB crops is scarce in Africa. The understanding of preferences and needs of men and women participating in RTB value chains is incomplete and currently not available for RTB breeders. In this respect, many quality traits that determine user preferences and varietal adoption by stakeholders are to this day only partially studied, or even unknown. Consequently, many new varieties developed by breeding programs meet with significant problems of acceptability by the main stakeholders of RTB value chains. The processing ability and quality of end products are a common issue across improved varieties of RTB, hindering their adoption and dissemination.

The proposed investment will improve knowledge of the essential quality traits for successful RTB variety adoption all along the value chain. Multidisciplinary teams bringing together specialists of social sciences and food technologies will capture these essential quality traits through surveys conducted with users of RTB crops, i.e. processors and consumers, as well as farmers and traders or middlemen.

Some complex technological properties of the RTB materials are difficult to predict and will be studied in

more detail: texture, such as stickiness of doughs made with cooking bananas (matoke, ntuba) or with cassava (baton, chikwangue, fufu); and processing ability, such as smooth paste after pounding of some varieties of yam; behavior during water cooking (boiling) of pieces of cassava, yam, banana, potato, sweet potato; softening by steeping (retting) and de-fibering of some cassava varieties (fufu); or ability to process semolina-like products: gari or attiéké (cassava), wassa wassa (yam). New products using RTB crops will also be studied.

Twelve food products particularly important for RTB-based staple diets were selected for this project, in partnership with several African organizations in seven countries. Research activities will be organized in five work packages (WP) bringing together the skills and expertise of several world-class laboratories.

The key quality criteria identified through socio-cultural surveys and technological diagnostics of the selected food processes will be dissected and analyzed in order to understand the biophysical properties that underpin them: biochemical composition, structure of the food matrix, etc (WP1). To finely characterize chemical compounds of interest, specific biophysical analysis methods will be adapted or developed as needed (WP2). Based on these primary quantitative analyses, the investment will build databases to establish predictive equations and to calibrate high throughput phenotyping protocols (HTPP) in the different RTB variety improvement programs in sub-Saharan Africa (SSA) (WP3). In particular, near-infrared spectroscopy (NIRS) of new hybrids will enable simultaneous prediction of several quality traits, using a single in-situ spectral analysis of the fresh RTB materials, so as to select the most likely varieties to be adopted by end users. These HTPP will also enable genetic association analyses (GWAS: genome wide association study) and investigation of genes for quality QTLs. The investment will also enable significant reduction of phenotyping costs, and low cost analysis of the contribution of genetic factors, environmental factors, and cultivation and processing practices to the quality traits of RTB-based end products (WP4). The most promising varieties (clones) identified in this way will be tested under real-life conditions with users to validate the approach in partnership with the different RTB breeding programs in SSA (WP5).

The project is designed to complement the many other investments in variety improvement programs in SSA, in

particular, the projects NEXTGEN Cassava, BBB, SASHA, GT4SP, AfricaYam, and HarvestPlus, so as to enhance and/or optimize the impacts of these on-going investments.

MINISETT TECHNIQUE:

A farmer friendly technology for rapid multiplication of disease free planting materials in tuber crops

By James George



Figure 1. A minisett of cassava.

All tropical tuber crops are vegetatively propagated and hence the rate of multiplication of seed/planting material is very low as compared to cereals and pulses. Further, due to low multiplication rate, high yielding varieties released by Research Institutes take many years to reach the end user. The quality of planting materials also deteriorates due to biotic and abiotic factors and debility arising from continuous and repeated vegetative propagation. Minisett technology developed for rapid multiplication of tuber crop planting materials at ICAR-Central Tuber Crops Research Institute (ICAR-CTCRI) has produced significant results. Unlike cereals or pulses, the multiplication ratio in tuber crops is very poor. In cassava it is only 1:10 and added to it, the severity of Cassava Mosaic Disease has become a major problem in all cassava growing regions of the world. By adopting minisett techniques (2 node minisetts), the multiplication ratio in cassava could be enhanced to 1:60 from 1:10. In yam, multiplication ratio has been enhanced to 1:24 from 1:4 by using minisetts of 30 g size, while in Amorphophallus, it has been enhanced to 1:15 from 1:2 by using 100 g minisetts.



Figure 2. *Amorphophallus* (EFY) minisettts.

In order to obtain virus free plant in cassava, micro-propagation techniques used, have the potential of producing 16,500 to 17,000 plantlets in one year from one nodal explant. These could be further multiplied for producing nucleus planting materials under controlled conditions. The micro-propagation procedure when combined with minisett technique would augment production of quality planting materials, which farmers could use as planting materials safely for 2 to 3 generation after which it would be ideal to replace with fresh cassava planting materials. The technology developed has been transferred to tuber crop farmers by conducting seminars and training them at CTCRI, as well as at various Grama Panchayats. The reason for huge success among farmers is because this technique not only produce quality planting materials at a rapid pace, but also assures the farmer of high returns from a unit area, the B:C ratio being 1.5 to 6.5, depending upon the crop.

The technology developed at CTCRI has opened a new vistas for production of quality planting material in tuber crops which was not available, earlier. State Department of Agriculture in Kerala has implemented this programme through Grama Panchayat scheme in Pramadam of Pathanamthitta district and Poothakkulam of Kollam district. At Poothakkulam, a massive minisett multiplication programme was implemented during 2009-10, collaborating with CTCRI. Three major minisett nurseries (30x7 m each) of cassava were made at three locations in the Panchayat for planting 5 ha with the high yielding cassava varieties, Sree Vijaya and Sree Jaya. The new varieties introduced have since then spread to the entire Panchayat and further about 5 to 6 Panchayats, nearby. The Vegetable and Fruits Promotional Council of Kerala (VFPC) also took it up as a massive programme during 2011 Haritha Mithram, an NGO working among the farmers of Thiruvananthapuram district successfully implemented minisett multiplication program in *Amorphophallus* at Peringadavilla and Parassala Grama

Panchayats. Gajendra, a very popular *Amorphophallus* variety was given to the Haritha Mithram units in limited quantity as seed materials, which they multiplied through minisett technique and they could successfully market it during Onam festival. A wide coverage of this news was given by the popular English daily, The Hindu on 23 August 2010.



Figure 3. Cassava (left) and EFY (right) minisettts in nurseries

Mithranikethan, a leading KVK and NGO in Kerala, after acquiring necessary technical know-how from ICAR-CTCRI, have been implementing minisett technique for rapid multiplication of planting materials in yams, since 2007. Besides this, CARD, the KVK of Pathanamthitta district and KVK of Kottayam district have also taken up planting material multiplication programme through minisett technique since 2011 in cassava, *Amorphophallus* and yams. Two leading NGO's of Kerala, Bodhana based in Thiruvalla and the Neyyattinkara Integrated Development Society (NIDS), have supplied planting materials of Gajendra (*Amorphophallus*) and Sree Vijaya (cassava) to about 1000 farm families utilizing minisett technique. Raasi seeds, a leading seed company in South India, have also been benefitted by this new technique using which, they have been supplying healthy planting materials of cassava to a large section of farmers in the industrial belt of Tamil Nadu. Mithranikethan, a leading KVK and NGO in Kerala, after acquiring necessary technical know-how from ICAR-CTCRI, have been implementing minisett technique for rapid multiplication of planting materials in yams, since 2007. Besides this, CARD, the KVK of Pathanamthitta district and KVK of Kottayam district have also taken up planting material multiplication programme through minisett technique since 2011 in cassava, *Amorphophallus* and yams. Two leading NGO's of Kerala, Bodhana based in Thiruvalla and the Neyyattinkara Integrated Development Society (NIDS), have supplied planting materials of Gajendra (*Amorphophallus*) and Sree Vijaya (cassava) to about 1000 farm families utilizing minisett technique. Raasi seeds, a leading seed company in South India, have also been benefitted by this new technique using which, they

have been supplying healthy planting materials of cassava to a large section of farmers in the industrial belt of Tamil Nadu.

Realizing the success of the technology, the Government of Kerala has approved projects for reaching out this technology to all the 14 districts of Kerala and as a special package for Tribal areas of Kerala. So far the Kerala State Department of Agriculture has sanctioned an amount of Rs 200 lakhs (20 million US \$) for the rapid propagation of the newly released and high yielding varieties of tuber crops to all the farmers in Kerala. This model has been adopted by the Elephant foot yam growers association at Samastipur, Bihar for quality planting material production in elephant foot yam whose annual income increased from 1 lakh per hectare to 3.5 lakhs per hectare. The table below shows details of the technique. Among the 16 technologies accepted by the AGRI INNOVATE, New Delhi for commercialization from CTCRI, Minisett technique for Rapid Production of planting material in tuber crops was one of the technology.



Figure 4. Transplanting cassava minisettts.

Contact

Project Coordinator
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Name of the Technology	Technology Details	Expected returns
Minisett technique for rapid multiplication of quality planting materials in Cassava	Indexed and meristem derived cassava stems are cut in to minisettts of two nodes and planted in nursery bed under a shade net house. Within a month, they are to be transplanted in the prepared main field on ridges at a spacing of 45 x 45 cm, accommodating 49,400 minisettts in a hectare of land.	Cost of Production: Rs. 1, 00,000 /ha. Returns: 50,000 stems/ha. Sale @minimum price of Rs. 5/stem will provide economic return of Rs. 2.5 lakhs as compared to Rs. 1.0 lakhs/ha, traditionally. B:C ratio is 1.5
Minisett technique for rapid multiplication of quality planting materials in Amorphophallus (Elephant foot yam)	Matured mother corm is cut in to minisettts of 100 g size, each sett bearing a portion of the central bud. They are then treated with <i>Trichoderma viridae</i> @ 5 g /kg corm weight and dried under shade. Planted straight in mounds, or transplanted on mounds formed over pits of 30x30x30 cm size at a spacing of 60 x 45 cm, accommodating 37,000 minisettts in a hectare of land.	Cost of Production: Rs. 2, 00,000/ha. Returns: 50000 kg /ha. SALE PRICE: Sale @minimum price of Rs.30/ seed corm will provide economic return of Rs. 15 lakhs /ha as compared to Rs. 7.5 lakhs/ha, traditionally B:C ratio is 6.5
Minisett technique for rapid multiplication of quality planting materials in Yams (<i>Dioscorea</i> sp.)	Selected mother yam is cut in to minisettts of 30 g size. They are initially raised in a nursery bed and later transplanted in the prepared main filed on ridges at a spacing of 60 x 45 cm. accommodating 37,000 minisettts in a hectare of land. About 20 to 25 tons of quality planting materials could be obtained from a hectare of land.	Cost of Production: Rs. 1, 50,000/ha. Returns: 25000 kg /ha. Sale @minimum price of Rs. 35/kg will provide economic return of Rs. 10.5 lakhs as compared to Rs. 5.25 lakhs/ha traditionally. B:C ratio is 6.0



Building a productive and resilient roots and tubers subsector in the Caribbean

By Denise Besai and Dr Gregory Robin, CARDI

The CARICOM Region has identified cassava, sweet potato and yam as the root and tuber crops with the highest potential for value-added development and for addressing the region's food and nutrition security needs. Under CARDI's new Strategic Plan 2018-2022, these commodities will continue to be the focus of research and development activities across the Region. The goal is to enhance productivity of these commodities through strategic interventions along their value chains. This will bolster domestic production, improve the crops export potential and have a positive impact on the livelihoods of farmers and consumers. Across the Region, CARDI will establish innovation platforms consisting of

value chain players from different disciplines to inform and guide the development of the value chains for these commodities.

CARDI will continue to conduct evaluation trials to identify suitable varieties to meet market demands. Apart from identifying high yielding varieties emphasis will be placed on the identification and selection of climate resilient varieties for adoption by farmers.

Over the years, the Institute has made significant strides in the development and maintenance of germplasm banks. During the current Strategic Period, these collections will be expanded and will continue to be used as a source of clean, high quality planting material for farming communities.



Figure 1. Sweet potato germplasm bank at CARDI Field Station, Antigua and Barbuda

A critical component of the CARDI roots and tubers programme is capacity building. Through partnerships and the development of ICT based tools, CARDI will train small scale farmers and processors in a range of disciplines including new technologies in production, management strategies for new and emerging pest and diseases, crop surveillance, value added development and food safety and handling. Training and capacity building initiatives are crucial to building a competitive, innovative and resilient sector.

Despite roots and tubers being part an important component of the diet in the Caribbean, their inclusion and use is often limited by their perishability. Emphasis will be placed on value added product development. The objectives will be to develop innovative new products that can be used in the food and related industries, to improve accessibility to a wider choice of healthier food preferences and to stimulate investment by the private sector. Parallel to this activity will be a promotion and education campaign lead by CARDI on the health benefits of roots and tubers in the diet. A series of investment profiles that seeks to demonstrate the economic potential for these crops and their value-added products will also be produced.



Figure 2. Training farmers on trellising in yams, CARDI St Lucia



Figure 3. Value added products

Over the last few years the Caribbean has been hit with many extreme weather-related events ranging from category 5 hurricanes to droughts, which have significantly impacted the agricultural sector. As part of the CARDI's Climate Change Mitigation and Adaptation sub programme, dedicated activities will be geared towards expanding the acreage under roots and tuber cultivation on CARDI Field Stations. These would assist in improving household food and nutrition security post disaster. Storage facilities to secure key staple foods and agricultural inputs that are at risk, will be designed and constructed. CARDI and other national stakeholders will manage this facility and distribute food (seed) to the affected population in times of crisis. Technologies for the quick construction of nursery and hardening facilities post disaster will also be developed. Roots and tubers will be targeted for production because of their hardiness and ability to thrive under stressful conditions.

A new project to tackle climate change and cassava virus diseases in Africa

By Maruthi Gowda, NRI, UK

NRI has recently won an African Union Commission-funded project “Dual-resistant cassava for climate resilience, economic development and increased food security of smallholders in eastern and southern Africa” or in short “DualCassava”. The aim of the project is to mitigate the impact of El Niño effects seen recently in eastern and southern Africa, and to minimise the impact of two virus diseases of cassava on food security and economic development of poor farmers. The project is led by Prof Maruthi Gowda of NRI and implemented in collaboration with local partner in Tanzania and Malawi.

Cassava is a key food security crop in sub-Saharan Africa and increasingly offers opportunities for income generation from the sale of fresh roots and diverse processed products. The crop is highly tolerant to drought and can be grown in poor soils with minimal rainfall and inputs which makes it one of the highly resilient crops grown for food in Africa.

However, the total fresh root production of >250 million tonnes is increasingly constrained by the two biotic constraints, cassava mosaic disease (CMD) and cassava brown streak disease (CBSD). In recent years, there have been rapid and devastating outbreaks of CBSD, especially in parts of Uganda, Kenya and Tanzania near to Lake Victoria, severely affecting cassava production and food security in the region. The severe form of CMD that was reported in mid 1990s in Uganda has continued to expand to new regions affecting the locally grown cassava varieties causing significant reduction in yields. Many cassava farmers are women and currently experience high levels of poverty. The damages caused by CMD and CBSD are therefore disproportionately felt by these groups.

DualCassava was set up with multiple objectives; to better understand the social and economic impact of droughts, CMD and CBSD on women and smallholders, and to identify solutions to the problems by deploying drought-tolerant virus-free cassava in predominantly maize-grown drought-prone areas as a way of crop diversification and thus increasing food security. We will use advanced molecular biology techniques such next generation sequencing techniques to speed up the process of identifying virus resistance genes in African cassava lines, which can then be used to transfer the

identified resistance to farmer-preferred varieties. The physical and human capacity of local partners will be enhanced by education, training and setting up of molecular biology laboratories and tissue culture technologies.



Figure 1. Symptoms of CMD on cassava leaves (left) and root rot damage caused by CBSD (right)

We aim to mitigate the impacts of recent El Niño effects on subsistence farmers in Tanzania and Malawi by introducing drought-tolerant improved cassava lines into the predominantly maize-grown areas. Maize is highly susceptible to drought and the farmers predominantly growing maize in drought-prone areas are vulnerable to the vagaries of climatic variations. We will introduce virus-free, drought-tolerant cassava varieties to selected areas as an insurance against drought for increased food security. We will train maize farmers on how to grow cassava, how to process cassava roots locally and connect them to processing factories for selling excess cassava produced. This will increase food security as well as income generation of farmers.

Another major contribution of the project includes catalysing the value chains by training farmers and industrial partners in using cassava for economic gains. We have identified cassava as a cheap source of calories and thus an effective substitute for expensive maize in poultry feed production. We will train farmers on cassava processing and demonstrate the advantages of using cassava in feed production to feed manufacturers, which will increase income generation for both farmers and industry. In DualCassava, we have taken a holistic approach to address the entire cassava value chain from pre-harvest to post-harvest issues for safeguarding the livelihoods of subsistence farmers in Tanzania and Malawi.

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First Symposium of the International Society for Tropical Root Crops – Pacific Branch (ISTRC – PB)

Professor Satish Chandra¹, Associate Professor Mohammed Umar² and Dr Rup Singh³

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Outline of the Symposium

The International Society for Tropical Root Crops – Pacific Branch (ISTRC-PB) held its First Symposium between 24 – 27 April, 2018 at the Tanoa International Hotel, Nadi, Fiji. The theme of the Symposium was “Improving Root and Tuber Crops in the South Pacific Region”. It was organised by the Institute of Research, Extension and Training in Agriculture (IRETA) of the University of the South Pacific (USP), together with the ISTRC Councillor for the South Pacific. Participants from 6 regional countries, including Fiji, Samoa, Vanuatu, Tuvalu, Cook Islands and Australia attended and presented scientific papers, over 3.5 days, which also included a half-day fieldtrip. The full Proceedings of the Symposium will be published in due course.

Opening Address

The Symposium was officially opened by Professor Rajesh Chandra, the Vice Chancellor and President of the USP. Professor Chandra has been an enthusiastic advocate of the ISTRC-PB and was instrumental in its establishment in March 2012. Since the inception of ISTRC-PB, Professor Chandra has fully supported its activities including regional training workshops, research activities and farm advisory. Professor Chandra has also contributed with keynote addresses which usefully guided the research agenda for regional training and research activities on tropical root crops (TRC) over the last several years.

Tropical Root Crops in the South Pacific Island Countries

The main TRC in the South Pacific Island Countries (SPIC) are potatoes (*Solanum tuberosum*), cassava (*Manihot*

esculenta), sweet potatoes (*Ipomea batatas*), yams (*Dioscorea rotunda* and *D. alata*) and taro (*Colocasia esculenta*) from the aroids family. Other less important aroids are tannia (*Xanthosoma sagittifolium*), giant taro (*Alocasia macrorrhiza*) and giant swamp taro (*Cyrtosperma murkessi*).



Participants at the First Symposium of the International Society for Tropical Root Crops – Pacific Branch. Seated centre is Professor Rajesh Chandra.

In the SPIC TRC are very important staple food source with consumption rates exceeding 200kg/ capita/year in ten countries, namely (in alphabetical order) - Cook Islands, Fiji, Niue, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Vanuatu, and Wallis and Futuna Islands, with a range from 312kg/capita/year in the Solomon Islands to 209kg/capita/year in Vanuatu. Almost all the TRC produced in the SPIC are consumed as fresh foods.

Of all the TRC consuming regions in the world, the South Pacific region ranks highest on per capita consumption. TRC are strategically very important for food security and nutrition at the household, village and national levels. Without TRC the SPIC would have major threats to food security and risks to public health and nutrition.

Papers, Fieldtrip and Best Paper Awards

Altogether 20 scientific papers were presented at the Symposium by researchers, academics and extension officers working in the Region. The papers can be grouped under: (a) general, (b) country - specific on a particular crop, (c) food security, health and nutrition, (d) soils, nutrients, fertiliser responses and farming systems, (e) agronomy, breeding and germplasm (f) pests and diseases, (g) managing the impact of climate change, and (h) economics of TRC.

The Editor of the ISTRC-PB Council edited each paper as presented. This was a novel innovation and needs to be

encouraged for future Symposiums and Regional Training Workshops. All the edited papers will be published as Proceedings and which will also be available on the USP website.

The fieldtrip was to the Legalega Research Station, Nadi, managed by the Research Division of the Fiji Ministry of Agriculture, and to the Nadi Market. A public-private joint venture high tech farming system was showcased at the Station. At the Nadi Market participants were able to observe and talk to market vendors about their TRC products for sale, which included various varieties of cassava, sweet potatoes, taro, yams and taro leaves, amongst many other fresh products for sale. Markets in the SPIC are the best places to observe the types and quality of TRC for sale.

Two best papers awards were presented at the Symposium. The first award was to a young scientist who is awaiting the result of his Ph.D thesis on taro and sweet potatoes completed at the SAFT, USP and is now located at the Department of Agriculture in Tuvalu. The second best paper award was to an academic staff of the SAFT, USP for her innovative research on sweet potatoes. All other papers presented at the Symposium were also of very high quality and their results and conclusions make significant contribution to the stock of knowledge on TRC in the SPIC. It is noteworthy that more than half of the presenters had PhDs. The Symposium also benefited by the exchange of ideas on TRC presented by very experienced international and field experts.

Key Conclusions of the Symposium

The key conclusions and recommendations emanating from the diversity of research findings presented at the Symposium are listed below. Recommendations identified with ** need to be addressed with urgency and those with * are for medium term. These recommendations would be useful to regional governments, and donor and funding agencies for developing country programs and strategic development plans for the TRC sector. The upcoming future activities of the ISTRC-PB will also be shaped by some of these recommendations.

- 1. Major challenges in the TRC sector include climate change, pest and diseases, low consumer preference, limited marketing opportunities and low productivity.
- 2. There is a huge potential for the development of TRC in the Region due to revolving stocks of genetic plant materials, growing body of scientific knowledge,

technical expertise, human capital and strengthening research institutions.

- 3. The Region needs to develop high-quality and relevant economic research on TRC. These include comparative advantage analyses, experimental studies, gross margin analyses, inter-sectoral studies, feasibility studies and value-chain analyses.
- 4. There is a sizeable gap between the North and South Pacific related to institutional exclusivity, political will, health and nutritional education, resource management and production technology.
- 5. Relevant agencies must promote TRC as agents for improving health and nutrition, as well as for food and income security.

Recommendations

- 1. Seek funding to promote developmental activities of ISTRC-PB and formalise smaller internal-groups (with specific terms of references) to conduct activities in collaboration with other governmental, regional and technical agencies*.
- 2. Conduct participatory, scientific and relevant research as well as pragmatically adopt existing body of knowledge from the Region and beyond**.
- 3. Train ISTRC-PB members on writing winning-research proposals, scientific writing and facilitate country-specific research during fieldwork with the SAFT, USP*.
- 4. Countries to enhance productivity of TRC and/or improve connections to manufacturing and tourism industries**.
- 5. Develop and strengthen marketing opportunities and trade of primary and processed TRC products through enhancing collaborations and networks within and outside domestic markets**.
- 6. Promote innovation for integrated farming systems and climate-smart agriculture throughout the Region, with consolidated interventions for all Pacific Island Countries**.
- 7. Raise awareness on protocols for accessing TRC germplasm and support countries to conduct and document country-specific evaluations of available germplasms*.

Next ISTRC-PB Symposium

The Second Symposium of ISTRC-PB will be held in 2021 in one of the SPIC. The likely venue will be dictated by the support from the local partner, travel logistics and costs. Further announcement will be made in due course.
