The 1st Symposium of the International Society for Tropical Root Crops – Pacific Branch was a successful event from 24th of April to 27th held at the Tanoa International Hotel in Nadi, Fiji with 18 participants coming from different stakeholders representing government, regional organization, university and others around the Pacific. The symposium was jointly organized and funded by the University of the South Pacific and the International Society for Tropical Root Crops with the theme “Improving Root and Tuber Crops in the South Pacific Region”. The symposium was officially opened by Prof. Rajesh Chandra, Vice Chancellor and President of the University of the South Pacific and the participants were welcomed by Assoc. Prof. Mohammed Umar, the Head of the School of Agriculture and Food Technology of USP in Alafua Campus, Apia, Samoa. Both emphasized the important role of the USP in root and tuber crops production in the region through Research, Extension, providing quality education and trainings to students, farmers and other stakeholders. Prof. Chandra underscored the role of the USP as a regional university and the importance of collaboration not only within the Pacific but extending to other parts of the world since, there are a lot of research, information and technology already available which (cont...p.2)

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should actually be utilized to improve productivity and production of root and tuber crops in the Pacific. Accordingly, he acknowledged the relevance and timeliness of the symposium which is particularly fitting as the University is celebrating its 50th Founding Anniversary this year. The University has been involved in terms of teaching, research and extension through its School of Agriculture and Food Technology at the Alafua Campus in Samoa which is by the way, recorded an increasing number in students in the past years and continually reaching out and closely working together with the Samoan government. The success of an institution like USP operating in twelve countries in the South Pacific Region despite the complexities in terms of different cultures among its member countries is highly commendable and to date the university is even growing in terms of student number which is now about 30,000 and wider coverage of about 33 million km².

Disclaimer: This is a special SPAN issue, featuring the paper presented, participants and activities during the 1st Symposium of the International Society for Tropical Root Crops-Pacific Branch. Some of the photos and data were owned by the participants and used in their presentation.
The University of the South Pacific and the ISTRC-PB would like to acknowledge all stakeholders who have been supportive and instrumental for the success of the said event.
Economic importance of root crops around the world!

Prof. Satish Chandra, Councilor of the ISTRC Pacific, presented a very engaging talk on the economic importance of root crops in the world. He showed interesting photos of root crops taken in the countries like Nigeria, Fiji, Colombia among others. One of the highlights was the data he presented on the contributions of root crops in the economic growth of the PICs and challenges the region is facing to attain the optimum benefits from root crops. Among PICs, Papua New Guinea, the largest South Pacific Island Country, is also the largest producer of cassava, sweet potatoes, yams, taro and potatoes. It is renowned for its wide gene pool of both edible and non-edible aroids, in fact leading crop geneticists concluded that Papua New Guinea was also an important area for the early domestication of aroids. In addition, he mentioned that in the South Pacific Island Countries particularly, tropical root crops are very important food source with consumption rates exceeding 200kg per capita per year in ten countries. This is generally higher than in many other countries where tropical root crops are important staple foods. There are many challenges and opportunities in maximizing value chains in tropical root crops production and utilization in the South Pacific Island Countries. Several Governments in the South Pacific Island Countries are now promoting policies to improve the production and quality, as well as improve the export of fresh tropical root crops. In the long-term he concluded that tropical root crops have a huge potential to improve the livelihoods of large numbers of people in the South Pacific Island Countries.

Root crops on Food Security and Health in Samoa

It is very apparent in every household almost around the world the change in food consumption patterns, Pacific Island Countries included. Only 35% of food expenditure is spent to fruits and vegetables compare to about 56% food expenditure for can goods, wheat and rice, chicken and turkey tails. Consequently, it threatens public heath as well as food and nutrition security. Assoc. Prof. Umar and Dr. Fernandez presented a paper on the potential of root crops in mitigating nutrition related issues particularly that root crops are the staple food in many PICs. According to their paper root crops are considered as the most important sources for energy in Samoa and the key to poverty reduction since 70% of energy required in our diet is derived from carbohydrates. The other 30% is protein, vitamins and minerals. The energy in our diet derived from imported rice and flour, can easily be substituted by our root crops, banana and breadfruit. Samoa has the opportunity to develop the local energy food crops. In addition, processing of local products from taro, banana, breadfruit, taro palagi will improve sources of cash income and prevent post-harvest losses. Other than for human consumption, root crops also are processed for animal feed and industrial applications.
The USP Alafua Campus delegation to the 1st symposium of the ISTRC was composed of six (6) in total headed by the Campus Director Assoc. Prof. Mohammed Umar with three (3) academic staff namely; Dr. Sanjay Anand, Dr. Alminda Fernandez, Dr. Desai and Dr. Leslie Ubaub and one (1) staff from IRETA, Ms. Senira Su’a. There were four papers presented.

The economic aspect of planting sweet potato as alternative to Taro in Samoa was presented by Dr. Desai. While Assoc. Prof. Mohammed Umar and Dr. Alminda Fernandez reported the nutrition value of root crops and the possibilities of developing products from root crops through food processing. A paper on the potential of Entomopathogenic Nematodes as biological control agents against the sweet potato weevil was reported by Dr. Leslie Ubaub. On the other hand, Dr. Ubaub and Dr. Fernandez presented the paper of Mr. Falaniko Amosa on the effect of fast and slow release nitrogen, between the two fast release nitrogen fertilizers produced optimum heights and Chlorophyll Index. Dr. Anand presented two papers entitled “Influence of Selected Cover Crops and Biochar on the Yield Advantage of Two Taro (Colocasia esculenta) Cultivars in Samoa” and “Nutrient Use Efficiencies of Two Improved Cultivars of Taro (Colocasia esculenta) under Screen House Conditions in Samoa”
The use of Biochar in Root Crops Production

Soil degradation and nutrient depletion is one of the major constraints in root crops production in PICs. In the paper presented by Dr. Sanjay, he reported the potential of biochar in alleviating this problem. The use of biochar in agriculture has been well documented elsewhere in the world (Yang et al., 2017) however, its use in pacific agriculture has been obscure. In their study, they used Biochar produced from coconut shells incorporated at the beginning of the six-month fallow period, at a rate of 15 t/ha. Vegetation during the fallow was incorporated. They investigated the biomass production and nutrient uptake of selected green manure cover crops and biochar applied vegetation and evaluated the effect of this materials on the yields of fresh taro from two improved cultivars. They found out that biochar supported vegetation resulted in higher uptake of K than all the fallow practices. Higher uptake of Mg and the micronutrients (Fe, Mn, Cu and Zn) were also observed for the biochar supported vegetation however, in the high rainfall zone only. Biochar also gave comparable yields owing to its high K uptake.

ISTRC Symposium Participants Visit the MoA Research Station

Due to the flooding occurred two weeks before the symposium which mostly affected the farms in Nadi area planted with root crops, the participants visited the Legalega Research Station in Nadi instead. The research station houses the multimillion mushroom production facility funded by the Chinese Government. The technology uses the Giant Juncao Grass, *Pennisetum* sp., for the mushroom substrate. Study showed that this grass species is the most suitable substrate material for the growth of Oyster mushroom. To date, the research station is very active in conducting trainings on mushroom production using this technology up to food preparation to the different stakeholders in Fiji and neighboring PICs.
Sweet potato, *Ipomoea batatas*, is a least developed root crop in Fiji compared to major root crops such as Taro and Cassava. It has a lot of potential and is not properly tapped in Fiji: — resilience, processing & value adding, animal feed, food security, nutritional values. Taro and cassava have been developed in Fiji – Industry Plans are in place that mapped the industry direction for 5 – 10 years. Production constraints in Fiji for sweet potato includes consumer preference, low production of quality storage roots, lack of market access in Fiji, as most are sold at local markets, pest and disease, poor agricultural practices by farmers. However, there has been a significant amount of interest in the cultivation of this crop farmers in Fiji. Thus, the Ministry of Agriculture consider sweet potato production as a potential industry for mass production. Mr. Savenaca Cuquma reported these efforts which includes the improvements of sweet potato cultivation in the country. He presented the Fiji 2020 Agriculture Policy Agenda which aims to establish a diversified and economically and environmentally sustainable agriculture economy in Fiji. He reported that there were 44 varieties of sweet potato maintained in MoA, only nine of which are local but only five are commonly grown by farmers. In the efforts of crop improvement, there were new accessions developed through open pollination from 2015-2017. In addition, MoA introduced high yielding varieties from other countries and already determined the best varieties among the introduced ones. The MoA is closely working with ACIAR and SPC on sweet potato crop management research.
Mucuna pruriens, the “Miracle” Plant

The Mucuna, *Mucuna pruriens*, commonly known as mauritius bean and itchy bean is native to Southern China and Eastern India but now widely distributed in the tropics. The leguminous plant is referred as Magic Bean by Dr. Siosiua Halavatau of the Pacific Community because of its effect to the soil particularly on Higher Islands. Based on the results of the trials conducted by Dr. Halavatau and his team, the magic bean has resurrected the Taveuni taro industry and has also turned the sterile hills of Busrata in Malaita productive. Data shows that Mucuna increased the total organic carbon % in the soil after 12 months of application. However, according to Dr. Halavatau, there is a need to explore the use of Mucuna in Atolls to optimize its potential since based on their observation Mucuna did not perform in Atolls as much as it does in higher islands. Also, in the study conducted by Dr. Sanjay, nutrient uptake of taro was significantly higher in sites applied with Mucuna fallow systems compared to other cover crop used. This was due to the higher biomass production. In terms of yield, reasonable yield can be obtained under mucuna fallows with no supplementation of N.P.K. which did not significantly improve the yield of taro. They also concluded that Mucuna fallow system is better than the traditional fallows. (Photo credits: http://www.tropicalforages.info)

Home Gardens in Atolls Using targeted compost

Dr. Siosiua Halavatau also reported their trials in various Atolls using targeted compost technique. This effort involved research then followed by field trials using Babai food and rain-fed systems. Research on soil management such as performance of different sweet potato varieties under two soil management regimes and effect of compost on the yield of sweet potato. In addition, climate resilient varieties were also investigated. Targeted composting is recommended based on symptoms of nutrient deficiency manifested by the plants. Targeted composting is the combinations of different ingredients that will best give the optimum nutrients needed by the plant based on the analysis of each component. The result showed an improved corm size on taro. He concluded that the healthy home gardens on atolls are clearly adapting to climate variability especially increasing salinity with smart crop varieties and smart soil organic matter management. In addition, targeted composting is critical to improved production on atolls. And productivity is improved as well and nutrition of households in using targeted composting.
Dr. Nat Tuivavalgi has presented current situation, key issues and the future of root crops in the Federated States of Micronesia particularly in Pohnpei State. He mentioned that influence of indigenous practices such as religious belief related to indigenous religion, local knowledge and practical experience in the root crop productions of the area played a major part in the present agricultural environment in the state. In addition, farmers’ land ownership also affects the farming activities in Pohnpei. They are also continuously challenged by soil issues such as soil fertility and quality, soil degradation and having volcanic and atoll soils. Apart from the challenges Dr. Tuivavalgi presented, he also reported solutions their team has come up in order to alleviate constraints in crop production. One of the highlights of his presentation was the solutions on the issue on loss of preference to root crops especially among young generations which are very clever and practical as follows; introduction of the products starting at the early age and improvement of taste to best suit their preference through food technology.

Mr. Kepa won the Best Paper Award during the 1st symposium of the ISTRC

Mr. Taniela Kepa Siose, a PhD candidate of the University of the South Pacific presented three award-winning papers entitled;

“Effect of Organic and Inorganic and their combination on Yield and Dry Matter Partitioning of Sweet potato (Ipomoea batatas L.) in Samoa”;

“Effect of Organic and Inorganic and their combination on Yield and Dry Matter Partitioning of Sweet potato (Ipomoea batatas L.) In Samoa”, and;

“Effect of Organic Amendments on Sweet potato (Ipomoea batatas L.) Yield in Calcareous Sandy Soil of Samoa”

These papers are the output of his dissertation. He is expected to received his PhD degree this year. Mr. Kepa received certificate of recognition and cash prize from the ISTRC-PB and USP.
Cook Islands is composed of 15 islands which are either volcanic, raised or low lying atolls with total land area of 237 sq. km. Like other PICs, Taro is very important commodity in the islands and it is part of their culture. In fact, it is highly valued commodity for social functions including weddings, church activities, funerals and other occasions. Mr. William Wigmore reported that Taro is cultivated under paddy or raised-bed conditions and it is highly priced commodity in the country. The current price is NZ$5.00/kg and their main export market is New Zealand and Australia where numbers of Cook Islanders migrated. With this reason, Cook Islands has been an active participant to the going Taro Improvement Programme in the region. A total of 14 local selections from the country were included in the breeding programme. Harvested Taro from the breeding programme were subjected to taste testing. In addition, screening for Taro Leaf Blight tolerance was also conducted. There were a total of 28 lines from the Cook Islands programme tested. All lines had some level of susceptibility to the pathogen, *Phytophthora colocasiae*, where in five crosses showed relatively tolerant to the pathogen compared to Samoa 2 which is used as control. Consequently, this five crosses were recommended for further breeding work. To date, there is a continuous breeding activities, field screening for *P. colocasiae* tolerant in Samoa and conservation of selected lines from the breeding programme in Cook Islands at SPC CePaCT.
The potential use of Entomopathogenic nematodes against insect pests

One of the most important agricultural constraints is the presence of pests and diseases. Ways to manage pests and diseases problems are usually coupled with environmental risks such as the use and misuse of pesticides. Data showed that the use of synthetic chemicals caused resistance build up within the population, resurgence and breakout of secondary pests in addition to contamination to drinking water and many cases of poisoning. In order to combat the dreaded insect pests of crops without using synthetic chemicals, there should be an alternative tactic. The paper presented by Dr. Leslie Ubaub was from the result of their study in the Philippines using entomopathogenic nematodes (EPNs) since many insect pests inhabit soil either all throughout their life cycle or during pupation. EPNs are soil-dwelling organisms which attack a wide range of soil-borne insect pests as well as insect pests that occur in cryptic habitats (Hazir et al., 2003). EPNs from the families Steinernematidae and Heterorhabditidae have proven to be the most effective as biological control organisms (Kaya and Gaugler, 1993). EPN isolates in the Philippines were found to be effective against sweet potato weevil, an insect pest of sweet potato. With the 97-99% mortality on larvae and 83-88% on pupae after 3-5 days of inoculation under laboratory condition. In the greenhouse trial, damage by the sweet potato weevil in tubers was significantly lower compared to tubers treated with synthetic insecticide. There is now an ongoing field trials of the most effective isolates of EPNs in sweet potato growing areas in the Philippines. This technology can be adapted in PICs using indigenous EPN species especially that the use of synthetic chemicals in the region is restricted if not totally prohibited. This ensures an abundant EPNs in PICs’ soil awaiting to be isolated and to be used to its full potential as biological control agent.

Photos taken during the conduct of research in VSU, Baybay City, Philippines (Photo credit: Dr. Ruben M. Gapasin)

Sweet potato as substitute for Taro: the Samoan perspective

It is a common knowledge in the region that export earnings of Samoa from Taro started to decline in 1993 due to Taro Leaf Blight outbreak and also it affected the supply of food in the country. Due to this setback an alternative root crop has to be planted to feed the people. One of the potential root crops is Sweet potato. It is a short-term crop of minor importance in PICs. Serves as substitute food crop in locations experiencing low fertility, saline and drought. While it is known to have high nutritional value, it still received very little attention by Samoan farmers. Dr. Nandakumar Desai presented a paper showing the results of the analysis of economic performance of Taro and Sweet potato. Based on their study, they have confirmed that even though Sweet potato is a short -term crop of minor importance it has a potential as a substitute food crop in low fertility, saline and drought stricken locations. It can also be one of the technical interventions to transform root crops cropping system to be more sustainable. There are possibilities of increasing the productivity of PICs traditional root crop cropping systems using Sweet potato and it generates farm employment opportunities in Samoa.

Dr. Ubaub of USP-SAFT Alafua

Dr. Desai of USP-SAFT Alafua
The participants visited the vibrant Nadi vegetable market and experienced the dynamics of vegetable vendors and buyers haggling for a good and reasonable price. Women, men and kids alike greeting their customers with smile and answers to all the queries their customers will ask. Varieties of root crops such as Taro, cassava and sweet potato together with vegetables of different kind, colors and smell were on display (Photos taken at the Vegetable Market in Nadi, Fiji).
ISTRC Symposium: A success!!!

After three and a half days between 24-27 April 2018 at the Tanoa International Hotel in Nadi, Fiji Islands of interesting discourse for the improvement of root and tuber crops production in the South Pacific Region among 18 participants from different stakeholders in the region during the first symposium of the International Society for Tuber Crops – Pacific Branch jointly organized and funded by ISTRC-PB and USP-IRETA, conclusions and recommendations were drawn as follows;

Conclusions

1. Major challenges for TRC include climate change, pest and diseases, low consumer preference, limited marketing opportunities and low productivity.
2. There is huge potential for developing TRCs in Pacific due to revolving stock 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 TRCs. These include comparative advantage analyses, experimental studies, gross margin analyses, intersectorial 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 TRCs 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, conducting scientific research and facilitate country-specific research during student fieldwork with School of Agriculture and Food Technology, USP.
4. Countries to enhance productivity of TRCs and establish/ 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 atoll 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.

Group discussion of the participants during the 1st symposium of the ISTRC-PB
The threat of White-footed Ants and homopterous insects in Fiji

In 2016 complaints have been received by the Ministry of Agriculture in Fiji on the alarming presence of a black ant species in their household and gardens. According to the Ministry of Agriculture personnel, investigation has been done and they have identified the Ant species to be the White-footed Ant either *Technomyrmex albipes* or *T. difficilis*. Both species are native in Madagascar and South Asia. The WFA do not bite nor sting and not even reported to cause structural damage instead they are considered as nuisance. The threat that comes with WFA is coming from Homopterous insects such as Mealybugs, Scale insects and Aphids of which they have symbiotic relationship with. Ants feed on the honeydew these homopterous insects produce while being protected by Ants. Further, this group of insects are common vectors of serious plant diseases aside from the sooty moulds the grows and feed on honeydews, which also affects physiological processes in plants such as photosynthesis.

Dr. Leslie T. Ubaub of USP-SAFT visited the MoA Research Station in Koronivia, Fiji and met Dr. Apaitia Macanawai, Director of Research, to assess the status of the insect pest infestation, to determine the present effort the MoA of Fiji in managing the pest and to discuss possible research collaboration for sustainable management strategies. After the discussion they come up with the agreement that USP-SAFT will look into the management of the homopterous insects since there were already management methods in placed for the WFA.

Presently, households in Suva commonly use insecticides to control Ants however, the effect is only temporary. Thus, there is a need to explore indigenous species of biological control agents against the WFA and the homopterous insects.
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