



# Feed The Future India Triangular Training Programme (FTF ITT) Production and Processing Technology for Tuber Crops

(April 4-18, 2017)

**FINAL REPORT**



**ICAR – Central Tuber Crops Research Institute**  
Sreekariyam, Thiruvananthapuram – 695017, Kerala, India



**Feed The future – India Triangular Training Programme**  
**“Production and processing technology for tuber crops”**  
**(April 4-18, 2017)**

**REPORT**

**Edited By**

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## From the desk of Director, ICAR – CTCRI



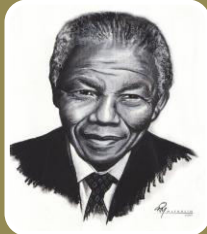
Greetings from ICAR – Central Tuber Crops Research Institute, Thiruvananthapuram. Tropical tuber crops like cassava, sweet potato, yams and aroid plays a crucial role in securing food and nutritional needs of several developing countries in the World. Tubers are one of the important staple foods in the World and positioned as “Savior Crops” owing their ability to provide good yields even under harsh climatic and soil conditions. The ICAR – Central Tuber Crops Research Institute, Thiruvananthapuram is a premier Institute in the World, focusing exclusively on tropical tubers. Since its inception in 1963, the Institute has developed several improved varieties, profitable agro-techniques, environment-friendly plant protection packages, value added products for farm, animal feed and human consumption. In the recent years, tubers have acquired a new status of “Industrial crops”, with the advent of high value products like hyderogels, biopesticides, bioactive pigments, bio-ethanol and diet foods.

The Feed The Future India Triangular Training on “Production and processing technology for tuber crops” held at ICAR-CTCRI during April 4-18, 2017 is an Inter-Institutional event organised in collaboration with MANAGE, Hyderabad. This unique programme was attended by 23 executives representing seven African countries of wide range of cultural diversity. The learning process was designed by integrating interactive lectures, field visits and hands-on experiences blended with cultural exposure. The impact of these unique learning experiences was reflected through feedback of the executives expressed both at the valedictory as well as in the WhatsApp messages. This FTF ITT has created a platform for frequent exchange of information and materials for developing sustainable livelihoods in the participating nations. I congratulate the organising team led by Dr. P. Sethuraman Sivakumar, Programme Coordinator for effective planning and execution of the programme. This report is a reflection of sincere and dedicated initiatives of ICAR-CTCRI and MANAGE & I wish to extend this collaboration to new heights in the near future.

**Archana Mukherjee**  
**Director**

## CHAPTER 1. INTRODUCTION

### 1.1. Background



Overcoming poverty is not a task of charity, it is an act of justice.

-Nelson Mandela, President of South Africa (1994-1999)

Global hunger is a serious issue affecting quality of human resources in the World's poorest countries. The Food and Agriculture Organization (FAO) estimates that about 795 million people of the 7.3 billion people in the world, or one in nine, were suffering from chronic undernourishment (Fig. 1.1.) in 2014-2016. Almost all the hungry people, 780 million, live in developing countries. As this hunger is rooted in poverty, there is an urgent need to alleviate poverty through a comprehensive collaborative initiative by en

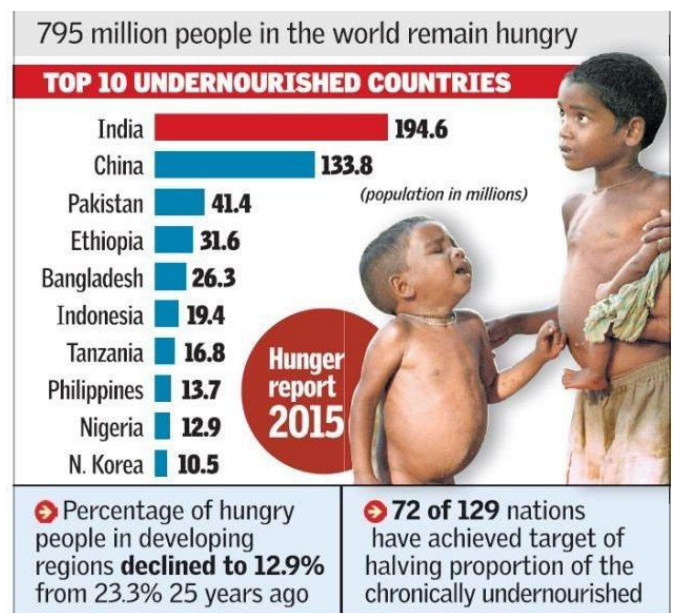


Fig 1.1. Hunger as a public health problem

#### a. Feed The Future – India Triangular Training

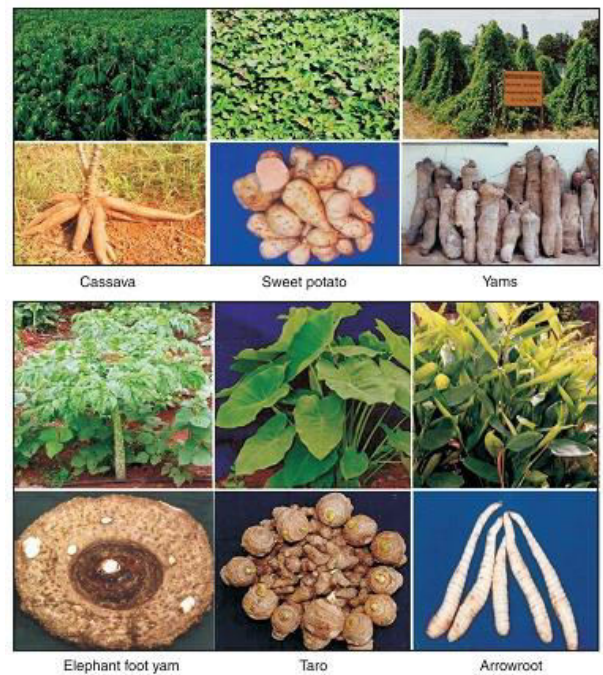
Feed the Future India Triangular Training (FTF ITT) program is a joint effort of USAID and Govt. of India for fostering triangular cooperation for adapting technological advances and innovative solutions to address Food Security Challenges in Africa. The programme is expected to enable India and the U.S. to share improved agricultural technologies worldwide, helping countries in Africa and Asia revolutionize their agriculture practices and ultimately, improve global nutrition levels. The FTF-ITT program

was launched on 25<sup>th</sup> July, 2016 at New Delhi. Flagged off in 25<sup>th</sup> July 2016, this program aims to build capacities of 1400 agricultural professionals from 17 partner countries of Africa and Asia by 2020. The National Institute of Agricultural Extension Management (MANAGE), Hyderabad is implementing the program in collaboration with various Subject Matter Institutions

### b. Tropical tubers for alleviating poverty

The tropical tuber crops, including cassava, sweet potato, yams, taro, elephant foot yam and other minor tuber crops (Fig 1.2) play a crucial role in providing food security for about 2.2 billion people in the World besides contributing to animal feeds and industry.

With a global per capita consumption of 110 kg in a year, these crops occupy a significant place in the food basket of developing nations. Among total World production, about 45% of root and tuber crop production are consumed as food, with the rest converted as animal feed or industrial products. The tropical tuber crops widely regarded as “food security” foods owing to their ability to provide sustainable yields even under adverse climatic and soil conditions, low input requirement, and ability to withstand natural calamities to provide



“life-saving” foods to people during and after disasters. Fig 1.2. Tropical tuber crops

### c. Tuber Crops Research and Development in India



The tuber crops research in India is largely undertaken by ICAR – Central Tuber Crops Research Institute, Thiruvananthapuram (Fig. 1.3.) with support from its Regional Centre at Bhubaneswar and 23 All

Fig 1.3. ICAR-Central Tuber Crops Research Institute



India Coordinated Research Project on Tuber Crops (AICRP-TC) centres spread throughout India. The ICAR - CTCRI, a premier institute under the Indian Council of Agricultural Research, New Delhi is the only institution in the world dedicated exclusively for research on tropical root and tuber crops.

Since its inception, ICAR-CTCRI has developed 53 varieties in all tropical tuber crops (Cassava -16; Sweet potato – 16; Yams – 12; Taro – 6; Elephant foot yam – 2 and Chinese Potato – 1); standardized agro-techniques of various tuber crops in different agro-ecosystems in India including North-Eastern region; nine resource conservation technologies including *in vivo* and *in vitro* protocols for quality planting material production; eleven Integrated management packages for tuber crops pests and diseases; eight value added food and industrial products from tuber crops and seven computer simulation models/ information systems for crop management. The Institute has a strong out-reach programme for transferring tuber crops technologies for various user group. Owing to its good work conducted in the last five decades, ICAR-CTCRI has received several recognitions at the national and international level.

## 1.2. FTF-ITT Training on tuber crops

As a premier institution working on tropical tuber crops, ICAR-CTCRI was assigned the task of training international executives from African nations. This FTF-ITT Training was designed to equip the executives with critical skills on tuber crops technologies for enabling them to maximize the contribution of tuber crops in securing food and nutritional security in their countries.



### a. Objectives of training

1. To introduce production system-specific technological advances of tropical tuber crops
2. To build capacities of participants on cultivating tuber crops in a profitable and sustainable way using improved technologies
3. To sensitize the participants on diversified applications of tropical tuber crops to improve economic security of farmers
4. To equip participants to identify and use potential value added tuber crops



technologies to develop sustainable businesses

### b. Key Focus Areas of the Training Module

1. Developing tuber crops varieties for food security and industrial use (Fig 1.4)
2. Production of quality planting materials of tuber crops



Fig 1.4. Nutrient-rich specialty sweet potato varieties

3. Agro-techniques for profitable cultivation of cassava, sweet potato, yams, aroids and minor tuber crops
4. Site-Specific Nutrient Management and customized fertilizer applications for tuber crop production
5. Tuber crops based farming systems
6. Organic farming of tuber crops
7. Technologies for developing bio-intensive pest and disease management
8. Primary and secondary processing equipments for processing of tuber crops
9. Extrusion processing of tuber crop starches/flour
10. Bio-chemical analysis of tuber crops and their products
11. Functional foods from tuber crops (Fig. 1.5)
12. Industrial products from tuber crops
13. Production and potential uses of cassava starch
14. Ready to eat bakery products from tuber crops
15. Technologies for production of high quality cassava flour (HQCF)
16. Strategies for increasing shelf-life of tuber crops
17. Technology incubation for entrepreneurship development
18. Participatory tuber crops technology development
19. Essential Business planning skills for creating tuber crops-based enterprises



Fig 1.5. Functional pasta

## CHAPTER 2: THE PARTICIPANTS

### 2.1. Selection of Executives

The programme was formally announced by the National Institute of Agricultural Extension Management (MANAGE), Hyderabad, India. The Programme Management Unit (PMU), FTF-ITT, at MANAGE has prepared the programme brochure (Fig 2.1 & Annexure I) initiated the process and provided good publicity in partner countries through their Point of Contact (POC), Indian Embassies, USAID Missions of respective countries, National Governments and previously trained Executives. The partner country agriculture and allied departments have nominated the executives and the PMU-FTF ITT of MANAGE has finalised the nominations.



Fig 2.1. Program Brochure

## 2.2. Profiles of the Executives

The programme was attended by 23 executives from seven countries of Africa) (Fig. 2.2.) A complete list of Executives is enclosed at Annexure-II.

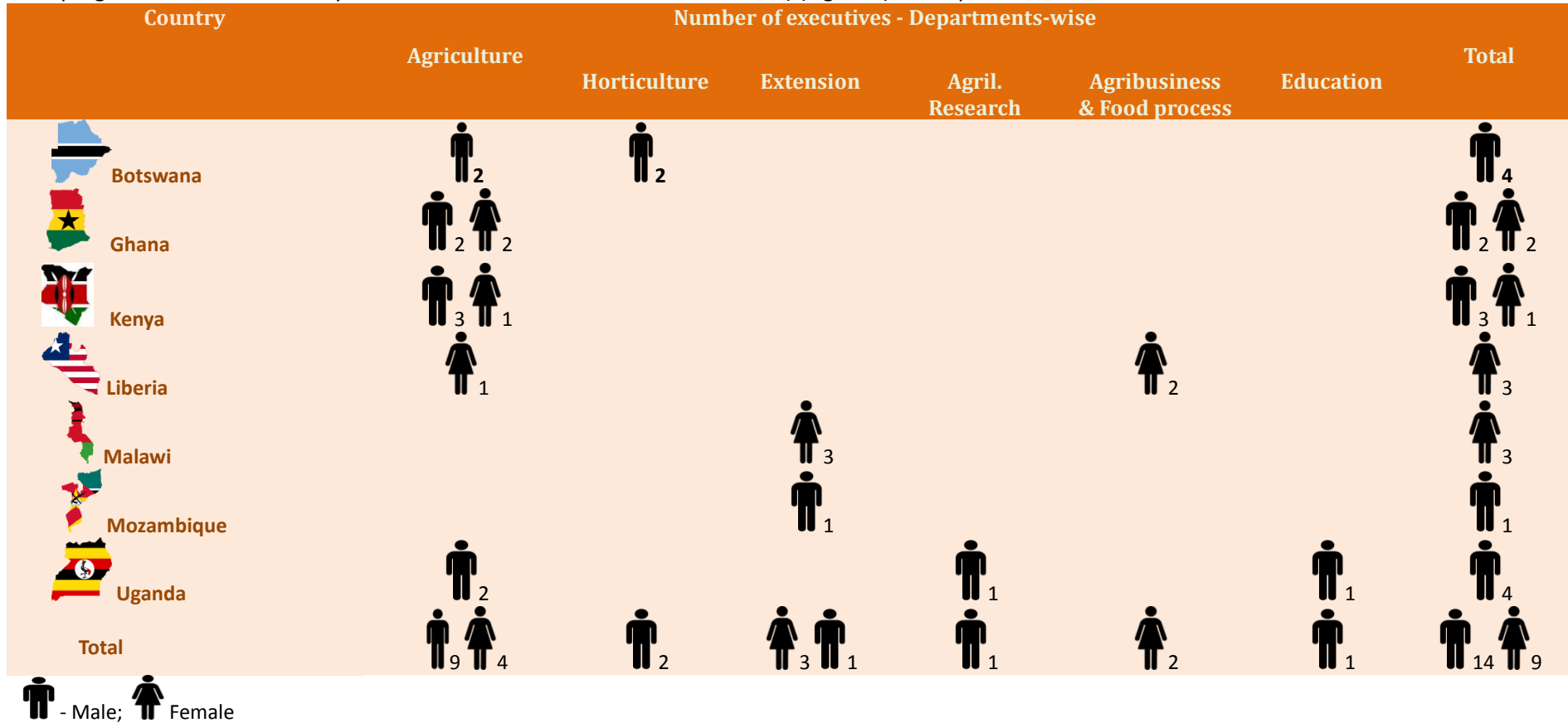


Fig. 2.2. Geographical and gender-wise distribution of executives

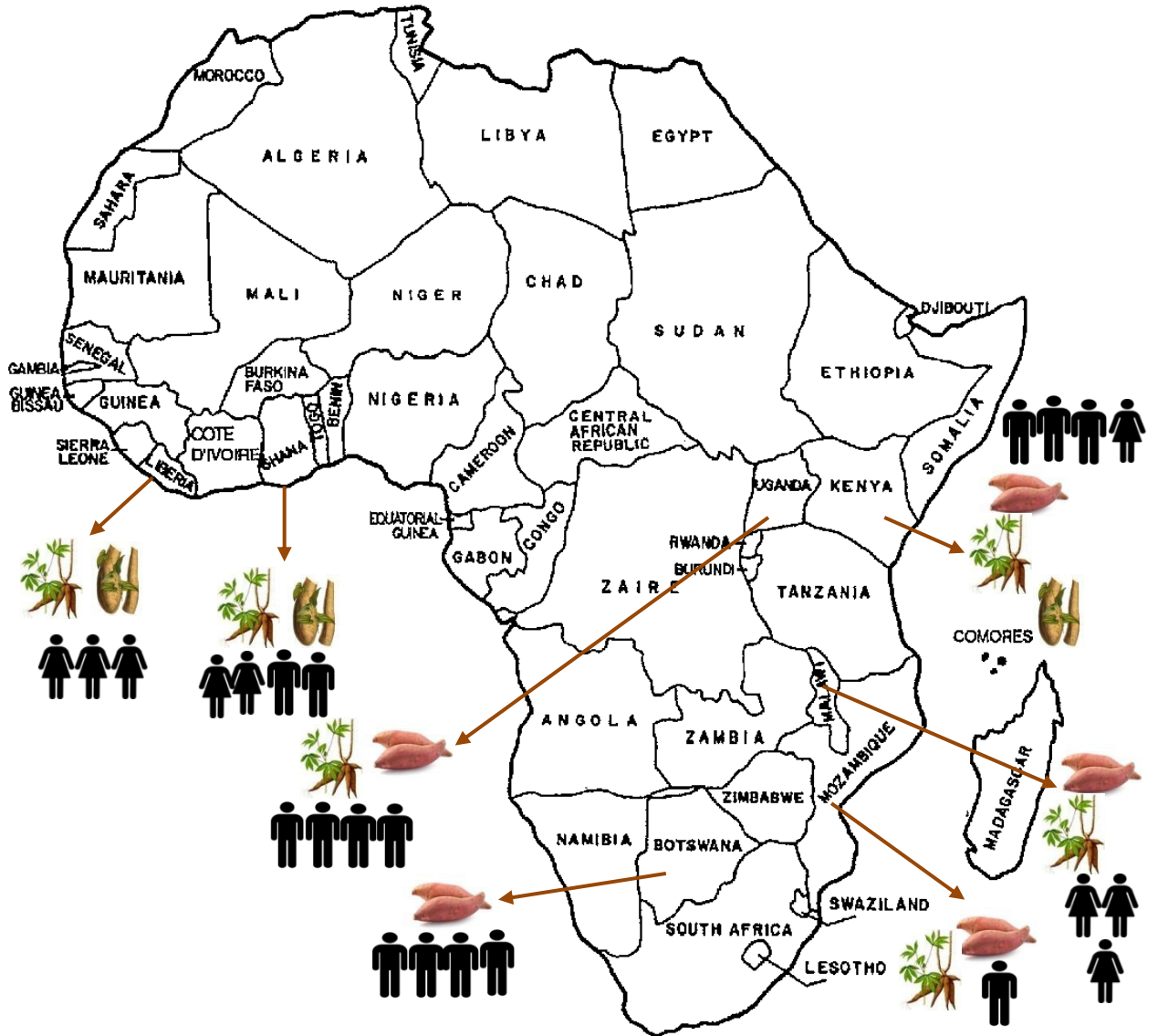


Fig. 2.3 Geographical, gender and crop-wise distribution of executives

## CHAPTER 3: INAUGURATION OF THE PROGRAMME

### 3.1. Inauguration

The inauguration of the training programme was held on 5-4-2017 at 10:00 AM in the Millennium Hall of ICAR-CTCRI. The programme was inaugurated by Mr. Samuel Karicho, Minister in the High Commission of Kenya, New Delhi.



The FTF ITT training will be of immense use for the African nations, as India has passed the path similar to those of us in achieving the present level of development. I am confident that the new learning acquired from India can easily be transferred to the conditions back home.

- Mr. Samuel Karicho, Minister in the High Commission of Kenya, New Delhi

During the programme, Mrs. V. Usha Rani, IAS Director General, MANAGE has delivered the Keynote address.



The FTF ITT programme is envisaged to build capacity of African and Asian Nations in agricultural and allied sciences using the expertise developed in India. By organising 44 training programmes by 2020, we wish to show the World that India can catalyse development in the economically-poor countries.

- Mrs. V. Usharani IAS, Director General, MANAGE, Hyderabad

Dr. (Mrs.) Archana Mukherjee, Director, ICAR-CTCRI has delivered the Opening remarks at the inauguration.



The FTF ITT training has opened up a window for sharing the tuber crops knowledge developed in India with our African counterparts. I would consider this Triangular training as a circular process, which helps us in co-construction of knowledge to mitigate malnutrition, reduce poverty and aid in sustainable development

- Dr Archana Mukherjee, Director, ICAR-CTCRI

Dr James George, Project Coordinator, All India Coordinated Project on Tuber Crops (AICRPTC) has delivered the Special address at the event.



ICAR - CTCRI is the first ICAR Institute to host an FTF ITT training programme. Considering the importance of tuber crops as primary staples in African countries, our technologies will of great use in Africa than India.

- Dr James George, Project Coordinator, AICRPTC

Dr. P. Sethuraman Sivakumar, Senior Scientist has welcomed the gathering and Dr Ravi Nandi, Program Manager, (PMU), Feed The Future India Triangular Training Program, MANAGE, Hyderabad has delivered Vote of Thanks. About 200 scientists, faculty members of academic Institutions, technical and administrative staff and students participated in the programme.

### 3.2. Expectations of the executives



#### Botswana

Cassava and yams are major tuber crops of Botswana. Being a low rainfall country, we wish to learn more about producing quality planting materials of tuber crops for rainfed cultivation. Post-harvest processing of tuber crops into value added products and associated machineries would be great use to improve the livelihood security of our people

- Mr. Makgale Nti Bashima, Botswana.



#### Ghana

In Ghana, cassava and yams are cultivated extensively, leading to surplus production of tubers which could be used for converting into value added products. The post harvest losses are amounting to 40% and we are desperate to reduce this wastage. We are looking for good quality tuber crops varieties and equipments for harvesting and post harvest processing.

- Mr. Owusu Michael, Ghana



#### Kenya

Our Kenyan farmers are looking for high yielding cassava varieties with mosaic tolerance. In Western Kenya, we are suffering great losses due to attack by moles and rodents. Any economic management measure to prevent their attack would be great use. In sweet potato, we are expecting to learn about protocols for producing quality vines as well as adding value to tubers.

- Mr. Oyunga Wycliffe Otieno, Kenya



#### Liberia

Cassava is the secondary staple food in Liberia. As we have plenty of cassava, we are looking for the techniques for minimising post-harvest losses and add value by processing tubers into diversified products. We are also interested in learning about value-added products from yam

- Ms. WonyeneRugie Barry, Liberia

## Malawi



Cassava is the second most important tuber crop in Malawi and primary staple in Lakeshore districts. As cassava is increasingly becoming popular as commercial crop in the recent years, we wish to develop good quality varieties. We are looking for technologies for quality planting material production, pest and disease management, processing and extending shelf life of tubers and processed products.

- Ms. Twailbu Amina, Malawi

## Mozambique



Cassava and sweet potato are major tuber crops in Mozambique. Our primary focus is on technologies for maximising productivity and processing of tubers into value added products.

- Mr. Luis Julio Maria Fernando, Mozambique

## Uganda



Cassava is a primary staple in Uganda which plays a crucial role in food and nutritional security of the people. In the recent years, cassava cultivation has suffered heavy losses due to brown streak disease. We wish to learn more on managing the viral diseases of cassava including brown streak, besides technologies for post harvest management and value addition into marketable products.

- Mr. Kaweesi Henry, Uganda



### Few Glimpses of Inauguration Function



Fig 3.1. Inaugural function – Lighting ceremony



Fig 3.2. Chief Guest, DG-MANAGE, Director CTCRI along with others addressing the gathering



Fig 3.3. Executives' introduction

## CHAPTER 4: LERANING METHODOLOGY

### 4.1. Effective learning experiences

The human learning is a complex process which is influenced by a multitude of perceptual, physiological and contextual factor. An effective learning is the key which aids in smooth transfer of learning to field conditions. Studies by educational researchers suggest that approximately 83% of human learning occurs visually, and the remaining 17% through the other senses - 11% through hearing, 3.5% through smell, 1% through taste, and 1.5% through touch. The retention of learning is also high when it is acquired by visual means. The retention was high in participatory mode where all senses are engaged in the learning process (Fig 4.1).

As the FTF-ITT is a “performance improvement” focused programme especially in the post-training phase, a combination of theory, demonstration, practice,

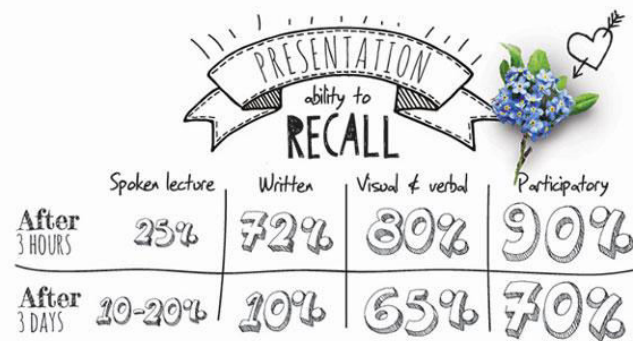


Fig 4.1. Retention of learning (Edgar Dale, 1969)

feedback and coaching or mentoring were used as this combination has already proved to be effective in skill learning (80-90% efficiency) and effective transfer of learning to the job (80-90% accuracy) (Joyce and Showers, 1981).

Using these principles of human learning, the training was delivered through a participatory mode through a combination of interactive lectures, panel discussions, case studies, and field visits. During the panel discussions, the participants were involved at every aspect and gathered information on the field problems specific to their country. The practical sessions were imparted through “hand-on” experiential learning

#### A. Interactive lectures

The executives took part in 28 interactive lecture sessions on various aspects of tuber crops – varietal development, agro-techniques, pest and disease management, post harvest management and value addition and entrepreneurship development. The lectures were

delivered in an interactive mode through inquiry approach to stimulate the thought process among the participants (Fig 4.2.). All classes were visually enriched and focused on stimulating multi-modal learning to enhance learning and retention. Each presentation was followed by question and answer sessions where the participants were allowed freely to interact with the faculty. The key questions and answers were recorded and distributed to participants to reinforce their learning (Annexure III).



Fig 4.2. FTF ITT Participants @ various interactive lectures

The practical sessions were organized to provide “hands-on” experience to executives (Fig. 4.3.)



Fig 4.3. Hand-on practical sessions

### B. Panel discussions

Two panel discussions on “Problems and prospects in the production of tuber crops in India and African countries” (10/04/2017; 10 AM – 1:00 PM) and “Tuber crops product diversification, value chains and entrepreneurship development” (13/04/2017; 10 AM – 1 PM) were conducted for in-depth discussion of tuber crops production and utilization systems in Africa. During these discussions, the Indian scenario was compared with that of African Counterparts to derive pressing problems in participant countries.

## Panel discussion 1: Problems and prospects in the production of tuber crops in India and African countries (April 10, 2017; 10:00 – 12:45 hrs)



### Chairman:

**Dr. Archana Mukherjee,  
Director, ICAR-CTCRI**

- Provided an overview of tuber crops production system in India and elaborated on the contribution of ICAR-CTCRI in improving livelihoods of tuber crops farmers.

### Co-Chairman:

**Dr. James George,  
Project Coordinator,  
AICRP on Tuber Crops**

- Explained about various techniques of rapid multiplication of tuber crops for producing quality planting materials.



### Member

**Dr. C.S. Ravindran,  
Principal Scientist & Head (Retd.),  
Crop Improvement, ICAR-CTCRI**

- As an Agronomist with long field experience he explained on vital aspects for sustainable tuber crops production.
- Provided a “practical-approach” for producing cassava under sustainable systems (Home-stead based system to attain food security).

### Member

**Dr. M. Anantharaman,  
Principal Scientist & Head (Retd.),  
Extension and Social Sciences,  
ICAR-CTCRI.**

- Explained about the genesis of agricultural development programmes in India with special reference to tuber crops.





**Member**

**Dr CA Jayaprakas,  
Principal Scientist & Head  
Crop Protection, ICAR-CTCRI**

- Provided a bird's eye view about various pests and disease affecting tuber crops in India
- Also explained about three bioformulations developed from cassava leaves and their insecticidal properties.

**Member**

**Sri. M. Subramonian,  
Deputy Director,  
Department of Agriculture  
Govt of Kerala**

- Narrated about various tuber crops development programmes implemented in the Kerala state
- Provided a brief idea about the functions and achievements of the Department of Agriculture, Govt of Kerala.



**Moderator:**

**Dr. V.S. Santosh Mithra  
Principal Scientist (Computer  
Applications)**

- Moderated the panel discussions and provided a summary of the discussion





After initial presentations by panelists, the executives have interacted with the panelists. The details of questions raised by executives along with answers provided by panelists are elaborated in Annexure III. Few glimpses of panel discussions are displayed in Fig 4.4.



Fig. 4.4. Panel discussion on tuber crops production is in progress

## Panel discussion 2: Tuber crops product diversification, value chains and entrepreneurship development (April 13, 2017; 10:00 – 12:45 hrs)



### Chairman:

**Dr. Archana Mukherjee,  
Director, ICAR-CTCRI**

- Provided an overview of the post harvest management, value addition and industrial development of tuber crops in India.
- Chaired the session and provided necessary directions for the participants to get required information

### Co-Chairman:

**Dr. JT Sheriff,  
Head, Crop Utilisation  
ICAR-CTCRI**

- Narrated the tuber crops technologies available for human food, animal feed and industries.
- Provided cases of how the industrial problems were solved through ICAR-CTCRI technologies



### Member

**Dr. G. Padmaja  
Emeritus Scientist – KSCSTE**

- Explained about various food products – snacks and savories, extruded and pasta products, developed at CTCRI.
- Provided a bird's eye view of the technologies for producing ethanol from cassava

### Member

**Mr Krishna Phalguna**  
**Proprietor**  
**M/S, Belgaum Minerals**  
**Belgaum, Karnataka**



- Narrated his experiences of shifting from mining to sweet potato farming and value addition.
- Explained about how reclaimed soils can effectively be used for cultivating sweet potato



### Member

**Dr. K.R. Ashok**  
**Professor (Agricultural Economics)**  
**Tamil Nadu Agricultural University**  
**(TNAU) Coimbatore, Tamil Nadu**

- Narrated the TNAU experiences in the value chain mapping and analysis of cassava in Tamil Nadu.
- Provided an idea of how cassava value chain works including its mechanisms and outcomes.

### Moderator

**Dr. P. Sethuraman Sivakumar**  
**Senior Scientist, ICAR-CTCRI**

- Moderated the panel discussions and provided a summary of the discussion



After initial presentations by panelists, the executives have interacted with the panelists. The details of questions raised by executives along with answers provided by panelists are elaborated in Annexure III. Few glimpses of panel discussions are displayed in Fig 4.5.



Fig. 4.5. Panel discussion on tuber crops product diversification and value chains is in progress

### C. Visit to farmer's field – Interaction with farmers and local extension agency

As a part of training programme, the executives were exposed to “real-life” farming situations to make them understand and feel the Indian farmers’ condition. A field visit to “Model Tuber Crops” farm owned by Mr M. Robinson, a progressive farmer from Kazhakuttam, Thiruvananthapuram district, Kerala was arranged on 8-4-2017. During the visit, the local extension officer Mr Manoj, Depart of Agriculture along with local informal

leaders were invited to interact with executives. During the interaction, executives were exposed to following technologies/ aspects

- Integrated farming system involving cassava, vegetables, coconut, banana and cattle
- Profitable cultivation of cassava under rainfed system
- Role of local extension agencies in supporting farmers in deriving maximum benefits of development programmes

Few glimpses of executives' visit to farmers' field are displayed in Fig 4.6 (a&b).



Fig. 4.6(a). Few glimpses of executives visit to progressive framers fields



Fig 4.6(b) A happy executive with the farmer



#### **D. Visit to Farmers Producer Organisation**

The Farmer Producer Organisations (FPO) consist of collectivization of Producers especially small and marginal farmers so as to form an effective alliance to collectively address many challenges of agriculture such as improved access to investment, technology, inputs and markets (Centre for Advanced Research and Development, 2017). These FPOs play a larger role in securing livelihoods of farmers to get the reasonable price for their produce besides helping them to reduce the post harvest losses considerably by converting the excess produce into value added products. Exposing the trainees to FPOs will help them to observe the activities, interact with officials and farmers and get hands-on experience to develop a critical understanding of FPOs and their role in farmers' livelihood security.

As a part of the training, the executives visited an FPO "Sanghamaithri Karshikolpanna Sambarana Vipana Sangam", popularly known as SANGAMAITHRI, located at Pallichal, Thiruvananthapuram district on April 11, 2017. Started during the year 2003 by a group of farmers with initial investment of Rs 12000/-, Sangamaithri has grown into a massive organization with an annual transaction exceeding Rs 25 crore. The company has over 20 retail outlets in the City where the farmers produce are directly sold to consumers at an affordable price.

During the visit, the executives were exposed to fruits and vegetable transaction process and price fixation at the marketing yard. They visited the cold storage facility and had a hands-on experience in the banana chips manufacturing unit located there. They interacted with the Directors of the company to understand its functioning. A video film on the FPOs genesis, functions and achievements were shown to executives. After interaction at the office, the executives visited the farmers' fields and interacted with them. Few glimpses of executives visit and interaction are displayed in Fig 4.7.



Fig. 4.7. Few glimpses of executives' visit to Sangamaitri – an FPO

### E. Visit to Industry – Tierra Foods Ltd, Adoor, Kerala

Agro-industries play a crucial role in securing livelihoods of farmers by (i) reducing post harvest losses, and (ii) converting the excess produce into value added products which provide assured income. Farmer-owned agro-enterprises are emerging agri-business ventures, where a farmer converts his/ her own or other farmers excess agro-produce into value added products. Several Central and State government agencies are promoting these farmer-led agri-ventures as they have direct bearing on livelihoods of farmers.

Tierra Foods Ltd was founded by Mr. Alex Thomas, a farmer turned entrepreneur, in 2011 to process the agricultural crops grown in Kerala into food products and market them across the globe. This company has functional collaboration with ICAR – CTCRI for development of high quality cassava chips.

M/S, Tierra Foods produces, *Kappo*, the “lite chip” is made from a special variety of cassava identified with the support of ICAR – CTCRI(Fig. 4.7). The “low carb” slices are processed in a fully automated plant, using healthier oil and flavoured with spices. Besides, they are also producing *Banano* a traditional banana chips variety popular in the state of Kerala.



Fig 4,7. *Kappo* brand cassava chips produced by M/S, Tierra Foods

During the visit, the executives interacted with the proprietor Mr. Alex Thomas, a farmer turned entrepreneur, who narrated the genesis and functioning of the company (Fig 4.8). After introduction, the executives visited various sections of the factory and had “hands – on” experience in banana chips production (Fig 4.9 a & b).



Fig. 4.8. Executives interacting with the proprietor





Fig. 4.9(a). Visiting different sections of the factory and “hands on experience”



Fig 4.9(b) Executives holding the products of M/S Tierra Foods

#### F. Hands-on experience at SFAC Techno-Incubation Center

The ICAR – CTCRI has a “Techno-Incubation Centre”, a technology demonstration and small-scale production unit of extruded products of tuber crops, caters to the training and local production needs of budding agripreneurs. This facility was sanctioned by Small Farmers Agri-business Consortium (SFAC), a Govt. owned agribusiness developer, in 2015 for creating rural entrepreneurship.

The incubation centre has facilities to produce value added foods like cassava sweet and savory snacks, pasta, noodles among several others (Fig 4.10).



Fig 4.10. Cassava based sweet and savory snack products produced from Techno-Incubation Centre of ICAR – CTCRI

The executives visited the incubation centre on three occasions for class room sessions, value added product demonstrations and hands-on experience in producing various value added foods. Dr M.S. Sajeev, Principal Scientist and Dr Shanvas, Technical person have

demonstrated the production of various value added products from tuber crops. During their visits, the executives spent over 15 hours on “hands-on” learning of various value added products. The executives also had a short interaction session with the rural entrepreneurs using the incubation facility.



Fig 4.10. Executives are learning to use equipments and producing tuber crops based value added products.

## 4.2 Course Material

The participants were provided with both hard and soft copies of all the presentations of the FTF-ITT well in advance for continues reading and clarifying doubts (Fig. 4.11)

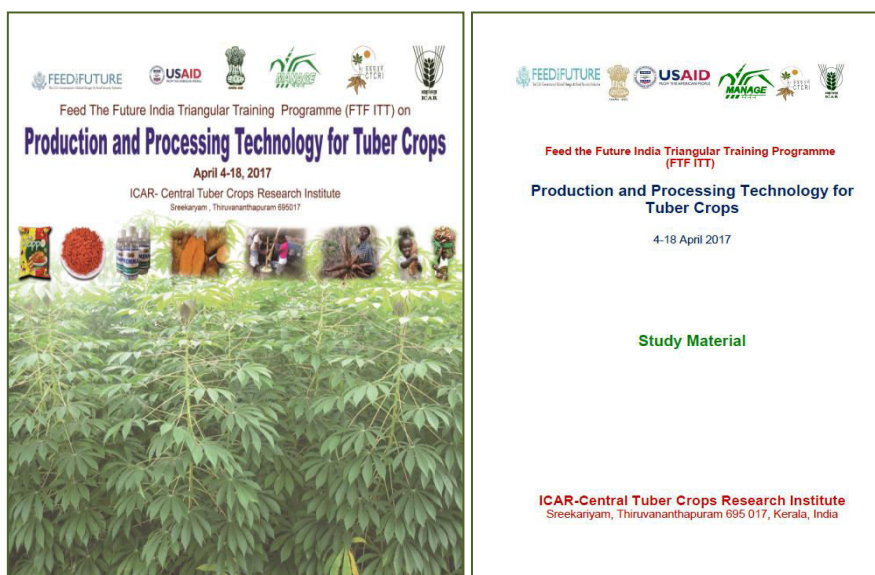


Fig 4.11. Cover page and inner page of the study material provided

The executives were provided full access to ICAR-CTCRI library - books, journals, newsletters, reports, technical bulletins etc. Besides they were provided Wi-Fi which enabled them to access to digital library of ICAR to browse and download papers from current and archived journals and magazines.

Along with the study materials, the executives were provided various support literature including brochure and leaflets, booklets, technical bulletins, class notes, video clips etc on improved tuber crops technologies to strengthen learning. Few support literature provide to participants are given in Fig 4.12.

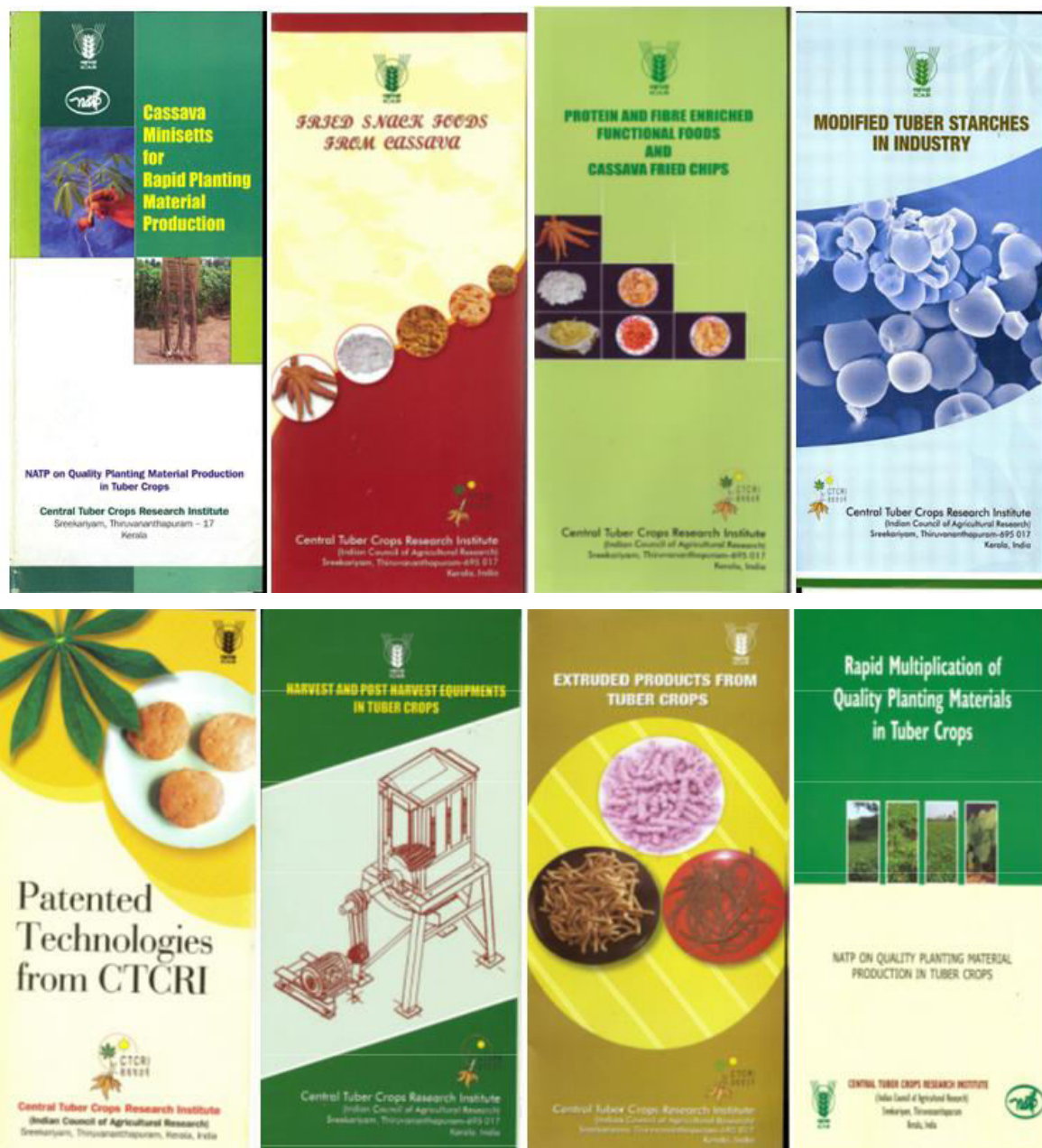


Fig 4.12. Few samples of the support literature provided to the executives

### 4.3. Resource Persons

Since ICAR-CTCRI is the only Institute conducting research exclusively on tuber crops in India, the resource persons were largely drawn from CTCRI scientists. Few external resource persons were invited for the panel discussions to provide a glimpse of Govt policies and regulations governing tuber crops production, processing and marketing, startup culture in India etc.

#### 4.4. Extra-curricular activities

##### Visit to places of Historical and Cultural importance

Visiting historical places of cultural importance is an essential component of any training programme of international importance. The travel to places is not only refreshing the minds and body of executives, but also it is releasing a vast amount of mental pressure accumulated through intensive learning process. As a part FTF ITT Tubers, the executives visited the following places on April 9, 2017.

##### (a) Padmanabhapuram Palace (Kanniyakumari district, Tamil Nadu)

Padmanabhapuram is the former capital city of the erstwhile Hindu Kingdom of Travancore in South India. The palace is complex inside with an old granite fortress constructed around 1601 AD by King Iravi Varma Kulasekhara Perumal of Venad kingdom.

At the palace, the executives were exposed to ancient architecture, king's life style, politics, art and culture, etc. Few glimpses of executives activities in the palace are displayed in Fig 4.13.

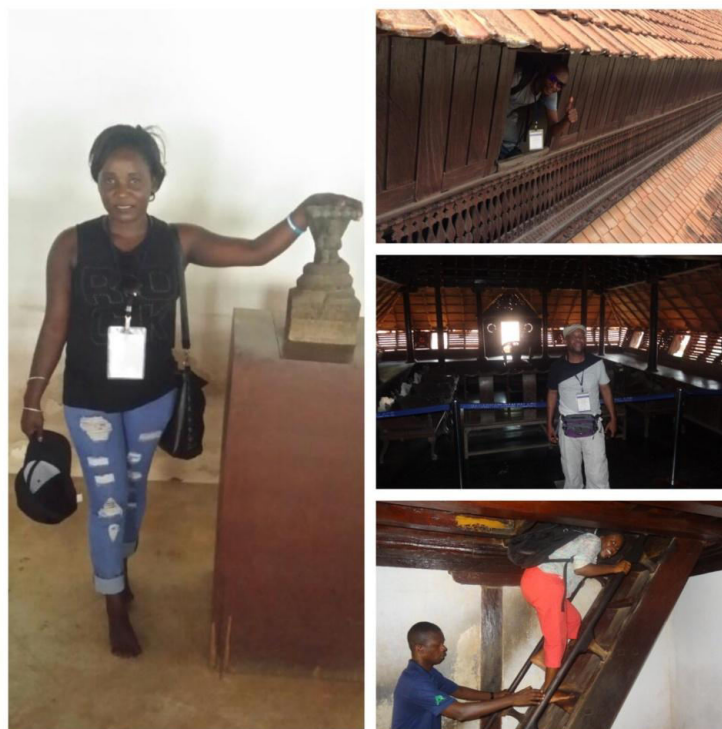


Fig 4.13. Executives at Padmanabhapuram place

### (b) Kanniyakumari (Tamil Nadu)

Kanniyakumari, a small town in Tamil Nadu state of India is located in the southernmost tip of peninsular India. Kanniyakumari has attained special significance because it's the only place on earth where three seas the Arabian Sea, Bay of Bengal, and Indian Ocean meet.



Fig 4.14. Few glimpses executives visit to Kanniyakumari

The executives visited Vivekanandhara rock memorial (a memorial built on Swami Vivekanandha – an youth icon saint of India who lived during late 1800s) and Thiruvalluvar status (a 95 ft statue of an ancient poet Thiruvalluvar who wrote Thirukkural – A classic Tamil book on life and ethics) by boat besides spending a good time at the sea shores (Fig 4.14).

### (c). Kathakali show

Kathakali is a 500-year-old form of dance-drama practiced in Kerala state of India which interprets ancient Indian epics. It is a “story play” genera of art, where the actors wear colorful make-up, costumes and facemasks.

The executives watched “*Rukmangadha Charitram*” kathakali organized by Drishyavedhi – an NGO. This show depicted the story of Rukmangatha, a King of Ayodhya Kingdom and his struggles with a witch wife. After the show, they interacted with the Kathakali artists to learn about their culture, life and struggles. Few glimpses of the Kathakali show are displayed in Fig 4.15.



Fig 4.15. Few glimpses of Kathakali show



#### (d) Experience with multicultural foods – Ethnic foods Potluck

Food is an instrument which connects diverse people to appreciate their uniqueness and develop a multi-cultural understanding among people across geographical regions and cultures. Indian cuisine encompasses a wide variety of regional and traditional cuisines native to India. Given the range of diversity in soil type, climate, culture, ethnic groups, and occupations, these cuisines vary substantially from each other.

The FTF ITT participants were exposed to different Indian foods and tasted a variety of food preparations (Fig. 4.16).



Fig 4.16, Indian foods tasted by executives

### Ethnic food potluck

Ethnic food potluck is a communal meal to which people bring their traditional food to share for a multi-cultural audience. Ethnic food potlucks are ways to bring diverse people together and share the unique food delicacies for the purpose of appreciating each other’s culture and uniqueness of their tradition. Considering a need to initiate this process, an Ethnic food potluck was organized on April 13, 2017. In this event, each country including India prepared one or two traditional dishes unique to their country. Few glimpses of ethnic food potluck conducted are displayed in Fig 4.17 a &b.



Fig 4.17(a). Food preparation is in progress

Various ethnic foods prepared from executives are displayed in Annexure IV. Few glimpses of the potluck are displayed below.



Fig 4.17(b). Ethnic foods at display



Fig 4.17(c). Traditional recipes displayed in the ethnic food potluck

The details of ethnic food recipes are given in Annexure IV.

### (E) Cultural Evening

The cultural evening is an event where the people from diverse culture perform and display the unique aspects of their traditional art forms. Considering the importance of cultural display, a cultural evening was arranged. The event started with performance of “Bharathanatyam – a traditional dance of South India” by ICAR-CTCRI staff. This was followed by performances from various countries. The cultural evening was presented by Mr

Henry, Uganda. Few glimpses of cultural programmes are displayed in Fig 4.18.



Fig 4.18. Few glimpses of cultural evening

#### (F). Meet the Entrepreneur

As a part of FTF ITT Tuber crops, the participants have interacted with two entrepreneurs. Sreejith T.S CEO environment measures and control which developed an Electronic Cassava Starch Indicator in collaboration with ICAR-CTCRI. Mr. Sreejith has demonstrated the Starch Meter and explained the procedure for measuring starch directly from cassava tubers. The executives also interacted with him and clarified their doubts (Fig 4.18a).



Fig. 4.18(a) Executives interacting with CEO, EMCON

The executives also interacted with Mr Nagaraj, M/S Ganesh Nagendra Mills, Kanniyakumari, Tamil Nadu to understand the scope of exporting cassava to India for further processing.

### (G) Special moments

Every training programme has few special moments for trainees. These moments, when captured will remind us of the fun and joy of trainees at the particular point of time. The FTFTT Tuber training also had its own share of special moments. Few special moments of executives are displayed in Fig 4.19 a & b.



Fig 4.19 a. Special moments for executives during FTFTT Tuber



Fig 4.19 b. Special moments for executives during FTF ITT Tuber

#### 4.5. Back At Work Plans

The Back At Work is a component of the FTF ITT which ensures the effective transfer of learning by the executives after they return to their respective countries. The FTF ITT Tuber was organized to improve their knowledge and sharpen skills for the purpose of implementing the new learning on tuber crops for improving the livelihoods of people at African partner countries. This process will be executed, monitored for a period of six months after the training programme. Considering these aspects, the executives were requested to prepared their Back-At-Work plan based on following guidelines

- The Back At Work plan should be prepared to meet the immediate development objectives of their countries
- The plan should focus on aspects which are essential and easily implemented without demanding huge financial investments

- The focus will be on soft skills including knowledge as the materials technologies can't be transferred immediately as they require clearances from various departments.
- Each plan should have monitorable targets and achievable objectives.

In a long term, these plans should develop functional linkages between India and respective African countries to enable (i) technology and material transfer, (ii) offering consultancies, (iii) conducting contract research etc. Such linkages will help to establish collaborative co-construction of knowledge and materials for sustaining the benefits of collaboration for longer periods. Few glimpses of Back At Work plan presentations of executives are displayed in Fig 4.20.

The Back At Work plans of FTF ITT Tuber trainees are included in Annexure V.



Fig 4.20. Back At Work presentation by executives



## 4.6. Evaluation of training

Evaluation is an essential component of the training process, which helps to understand its effectiveness in terms of achieving training objectives and meeting the needs of the participants. In general, evaluation is the collection, analysis and interpretation of information about any aspect of a program of education or training as part of a recognized process of judging its effectiveness, its efficiency and any other outcomes it may have (Ellington et al., 1993).

Evaluation is often considered as taking place at four different levels (Kirkpatrick, 1998).

1. **Reaction:** What does the learner feel about the training? – Collected through oral/written feed-back, open ended questions/close ended questions.
2. **Learning:** What facts, knowledge and experiences did the learner gain? – Estimated through knowledge tests (knowledge gain), observation. etc.
3. **Behaviours:** What skills did the learner develop and what new information can the learner use on the job? – Collected through observation
4. **Results or effectiveness:** What results occurred? Did the learner apply the new skills to the necessary tasks and what results were achieved? – Assessed through implementation reports of Back At Work plans

### 1. Reaction

#### Feedback of executives on specific sessions

The executives' reaction on specific sessions was collected through a ten point scale where 1 indicates "Poor" and 10 as Excellent". For the feedback assignment, both theory and practical classes are combined. The executive's feedback scores are presented in Table 4.1.

Analysis indicated that the session on "Techniques of producing quality planting materials of tuber crops" (M = 9.65) was ranked first followed by "Developing agro-ecosystem specific tuber crops technologies through network research – AICRPTC experiences" (M = 9.61) and "Advances in the nutrient management of tuber crops" (M = 9.61). These results have corroborated with executive's expectations revealed during the inauguration (Section 3.2). All the average scores were above 8.5 indicating the importance of topic and delivery were





up to the expectations of the executives. A country-wise analysis indicated the similar rank structure except Botswana which preferred “Management of tuber crops pests and diseases of tuber crops” over others (Table 4.1).



Table 4.1: Feedback of executives on specific sessions

Sno	Name of the session	Average feedback score	Overall rank*	Country-wise rank*						
				Botswana	Ghana	Kenya	Liberia	Malawi	Mozambique	Uganda
1	Feed The Future Training – Overview (Dr Ravi Nandi)	9.52	4.00	2.00	1.00		1.00	One score for all		
2	An overview of advancements in the production and processing of tuber crops for achieving food and nutritional security ( Dr. Archana Mukherjee)	9.13								
3	Developing agro-ecosystem specific tuber crops technologies through network research – AICRPTC experiences ( Dr James George)	9.61	2.00	2.00	1.00	1.00	1.00			
4	Cassava varietal improvement for consumption and industrial utilization (Dr. M.N. Sheela)	9.26		2.00		2.0				
5	Seed certification standards for tuber crops in India (Dr. R. Muthuraj)	8.96							1.00	
6	Integrated Nutrient Management for cassava grown under Hill-agroecosystem ( Dr V. Ramesh)	9.13							1.00	
7	Varietal improvement in yams and aroids ( Dr. Asha KI & Dr. Asha Devi)	9.13								
8	Advances in the nutrient management of tuber crops ( Dr Susan John)	9.61	2.00		4.00	2.0	1.00		1.00	1.00
9	Cassava varieties – Field visit and discussion – Variety identification and case studies (Dr. C. Mohan)	9.04								
10	Varietal improvement in sweet potato for achieving food and nutritional security (Dr. Archana Mukherjee)	8.70								
11	Improved agro-techniques for commercial cultivation of cassava and sweet potato (Dr. V. Ravi)	8.96								
12	Demonstration of e-crop (Dr. V.S. Santosh Mithra)	8.87								



13	Panel discussion on Problems and prospects in the production of tuber crops in India and African countries	9.17				2.0			1.00	
14	Techniques of producing quality planting materials of tuber crops ( Dr James George)	9.65	1.00	2.00	1.00	2.0	1.00			1.00
15	Techniques of producing quality planting materials of tuber crops – Field visit, demonstration and hands On experience (Dr S. Sunitha & Dr. R. Muthuraj)	9.17			4.00				1.00	
16	Management of tuber crops pests and diseases (Dr CA Jayaprakas)	9.35		1.00		2.0			1.00	
17	Improved agro-techniques for sustainable production of yams and aroids (Dr. G. Suja)	9.00				2.0				
18	Integrated disease management strategies for tuber crops (Dr. M.L. Jeeva, & Dr. T. Makeskumar)	9.13				2.0			1.00	
19	Management of farming systems involving tuber crops (Dr. M. Nedunchezhiyan)	8.96							1.00	
20	Techniques of organic production of tuber crops (Dr. G. Suja)	9.04								
21	Panel Discussion on Tuber crops product diversification, value chains and entrepreneurship development	8.74							1.00	
22	Product diversification and value addition in tuber crops (Dr. JT Sheriff)	8.83							1.00	
23	Ready to eat bakery products from tuber crops (Ms. Pradeepika Chinta)	8.70								
24	Technological strategies for diminution of post harvest losses in perishable produce with special reference to tuber crops (Dr. S.K. Nanda)	9.00							1.00	
25	Preparation of cassava flour and high quality cassava flour (Dr. JT Sheriff)	8.87							1.00	
26	Industrial products from tuber crops (Dr AN Jyothi)	8.57								
27	Extrusion processing of tuber crop starches/flour (Dr. JT Sheriff)	8.83			4.00					
28	Functional foods from tuber crops (Dr. G. Padmaja)	9.09								



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29	Postharvest deterioration in cassava (Dr. Saravanan Raju)	9.09							1.00	
30	Production and potential uses of cassava starch (Dr. M.S. Sajeev)	9.04				1.00			1.00	
31	Food safety management system to enhance food export through improved supply chain management (Dr. K.P. Sudheer)	8.74								
32	Demonstration of starch processing machineries (Dr. M.S. Sajeev)	9.09		2.00						

\*Only top ranks are indicated;

## 2. Learning – Before –After test

The executives learning from the training was measured in terms of knowledge on tuber crops technologies gained from the programme. A teacher-made knowledge test was constructed on critical aspects of tuber crops technologies. The knowledge test was administered using a Before – After Quasi Experimental design. The executives gain in the knowledge was measured based on the test scores obtained before and after the training using the same test. A paired t test was performed to assess if the change in knowledge was significant. The results are indicated in Table 4.2.

Table 4.2.Change in knowledge level of executives

Variable	Knowledge level		Average percentage of correct responses		Mean difference in knowledge scores	“t” value	“p” value
	Pre-test	Post-test	Pre-test	Post-test			
Knowledge of improved tuber crops technologies	13.44	20.18	53.77	80.43	15.78	6.74	0.000

The results displayed in Table 4.2 indicates that there was significant increase in the knowledge level of executives in the post- training programme ( $t = 15.78$ ;  $p < 0.000$ ). These results proved the effectiveness of the training in increasing the knowledge level of executives.

## 3. Behaviours

The trainees’ behaviour during and after the programme also indicates its utility. In FTF ITT Tuber crops, this component was measured using event sampling observational methods. In this method, the trainees’ enthusiasm to learn more about a topic or practice a method was documented based on its repeat frequency. For example, if the executive asks for additional information about a topic, wish to discuss with the faculty, or requesting to practice a new method were considered as indicators and the number of trainees who follow such behaviour were counted. The results are indicated in the table 4.3.

Table 4.3. Frequency of repeat learning behaviour on specific topics

Topic/ aspect	Total number of repeated learning events (Country-wise)*			
	Liberia	Botswana	Kenya	Total
1. Quality planting material production of tuber crops	3	8	3	15
2. Hands on experience on using equipments for preparing sweet and savoury products from cassava	9	3	3	15
3. Visit to biopesticide production laboratory	3	6	3	12

\*Only the countries which requested more twice are listed

The executives' repeat learning behaviour indicates that both quality planting material production and savoury product preparation were highly preferred. While Botswana executives requested for planting material production frequently, the Liberia participants were keen to attain mastery in using equipments for producing sweet and savoury snacks. The Kenya and Botswana executives also preferred to learn more about biopesticides.

#### 4. Results or effectiveness

The results or effectiveness of FTF ITT will be assessed for a period of six months by monitoring the Back At Work plan implementation by trainees. Monthly reports, Whatsapp discussions and email communication will be used to address the issues in transferring new learning in their respective countries.

Apart from the above evaluation, the training was evaluated indirectly through executive's discussion in Social Media (in Whatsapp groups and facebook profiles). Few trainee feedback on the social media are displayed in Fig 4.21 (a&b).

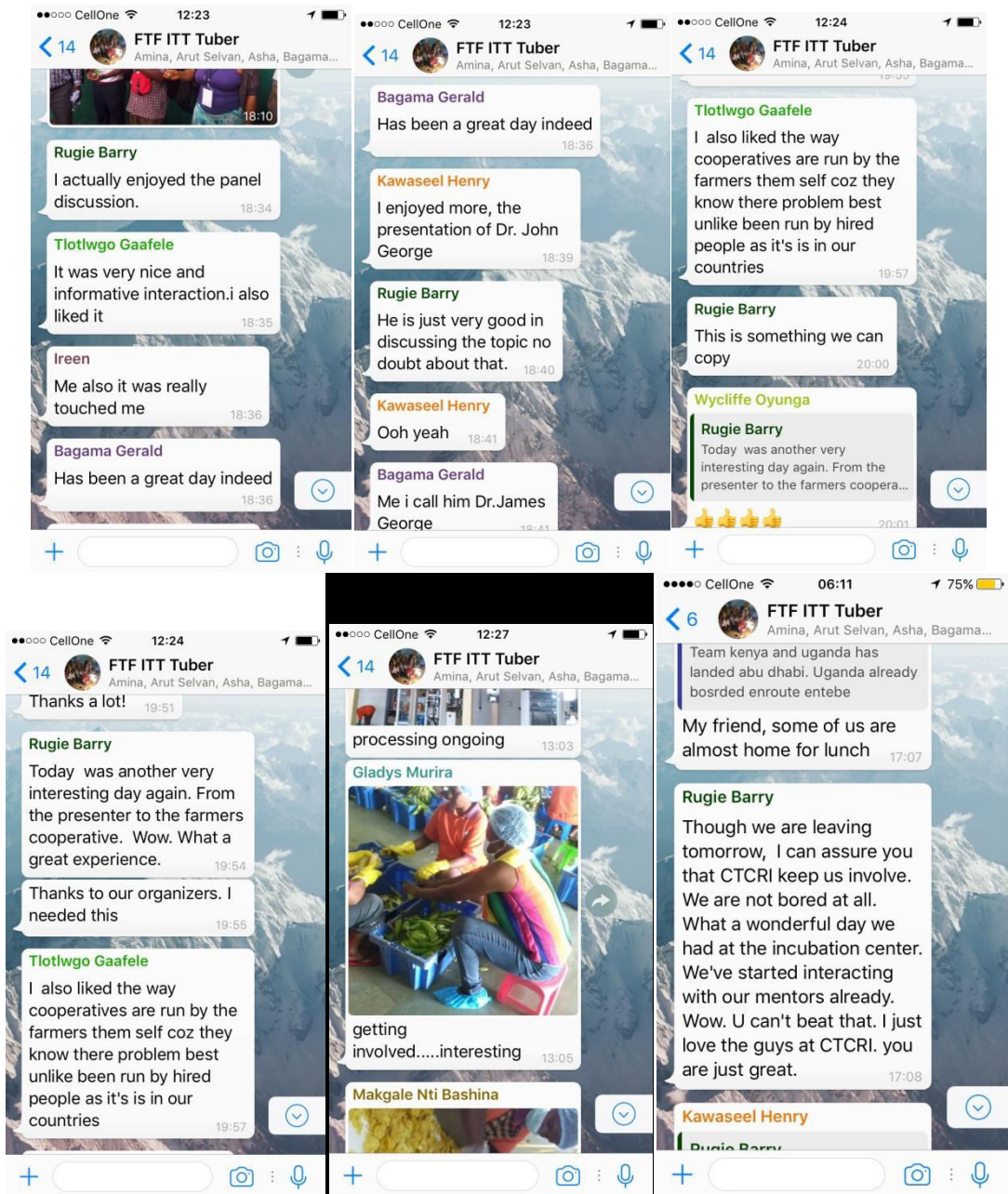


Fig 4.21(a). Few feedback messages posted by trainees in Whatsapp group

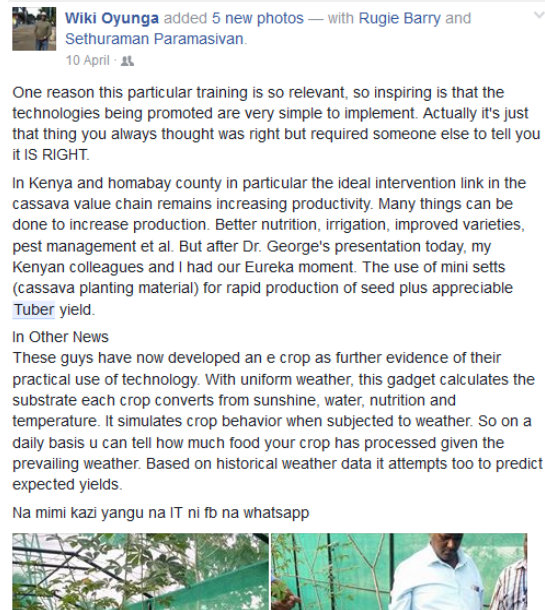


Fig 4.21(a). Few feedback messages posted by trainees in their facebook page





## CHAPTER 5. VALEDICTORY AND CLOSURE

The valedictory function of the FTF ITT was held on April 19, 2017. Shri. A. M. Sunil Kumar, Additional Director, Department of Agriculture, Govt of Kerala was the Chief Guest at the function. During the valedictory address, Mr Sunil Kumar stressed the need to develop international linkages to foster development besides helping to replicate the development models in other countries. He lauded the effects of MANAGE in developing such linkages and appreciated the efforts of ICAR-CTCRI in conducting this training effectively. Dr MN Sheela, Head, Crop Improvement & Director (i/c) has presided the function and requested the executives to maintain a sustained interaction with CTCRI after returning home. Following a formal feedback session by executives, Dr. Sheela along with Dr Sheela Immanuel, Head, Extension and Social Sciences distributed the participation and appreciation certificates. Dr. P. Sethuraman Sivakumar, Programme Coordinator has closed the training with a Vote of Thanks. Few glimpses of valedictory session are displayed in Fig 5.1.

After the formal valedictory programme, the executives spent their last few hours of stay in India during this visit, with the staff and students of ICAR-CTCRI. They informally thanked the organizing team individually and expressed their love and affection. Some of them visited various sections of CTCRI and recorded their joy and feeling of departure with the people, plants and other living creatures. Few glimpses of their interactions before their departure to their countries are displayed in Fig 5.2.

The executives departed to their countries with a new understanding and perspective of tuber crops along with zeal to transfer them in their respective countries. Though they missed India, but cherished their memories of their stay during departure (Fig 5.3)

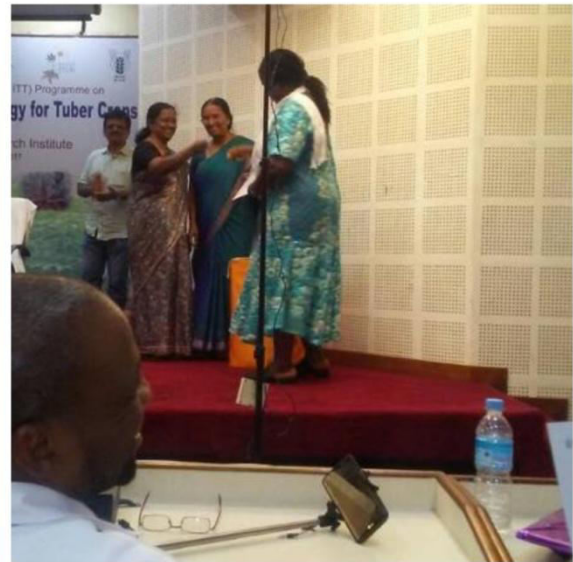
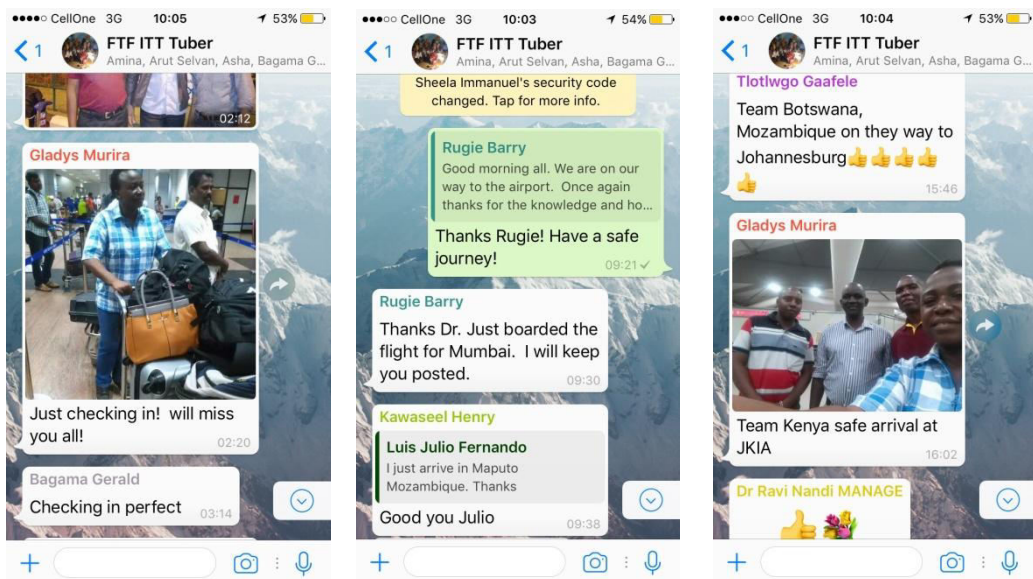


Fig 5.1. Few glimpses of the valedictory function





Fig 5.3. Executives departing from India





## CHAPTER 6. THE WAY FORWARD

The FTF ITT Tuber crops is one of the first programmes in the country to initiate functional linkages with African countries through capacity development. Though the executives learned a great deal of improved tuber crops technologies, there is an essential need to mentor them for multiplying the positive effects of the new learning. Though the Back At Work plans provide a channel to mentor the executives, there is an essential need to create a new platform for technology transfer and exchange visits. Many executives have indicated this need and one executive from Liberia has submitted a letter to enable the same (Annexure VI).

Considering the importance of tuber crops in the food and nutritional security of African nations, there is a need to open up new avenues through FTF ITT .

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**ICAR – CENTRAL TUBER CROPS RESEARCH INSTITUTE**  
THIRUVANANTHAPURAM, KERALA, INDIA



**Feed The Future India Triangular Training Program (FTF ITT)**

**On**

**Production and Processing Technology for Tuber Crops**

**Date: 04 – 18<sup>th</sup> April 2017 | Venue: ICAR – CTCRI**



**ICAR- Central Tuber Crops Research Institute, Sreekariyam,  
Thiruvananthapuram, Kerala, India**  
<http://www.ctcri.org/>



<b>Title</b>	Production and Processing Technology for Tuber Crops
<b>Date &amp; venue</b>	ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram
<b>Duration</b>	4-18 <sup>th</sup> April 2017
<b>Programme coordinator</b>	Dr P. Sethuraman Sivakumar, ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram

## Introduction

The tropical tuber crops, including cassava, sweet potato, yams, taro, elephant foot yam and other minor tuber crops play a crucial role in providing food security for about 2.2 billion people in the World besides contributing to animal feeds and industry. With a global per capita consumption of 110kg in a year, these crops occupy a significant place in the food basket of developing nations. Among total World production, about 45% of root and tuber crop production are consumed as food, with the rest converted into animal feed or industrial products. The tropical tuber crops widely regarded as “food security” foods owing to their ability to provide sustainable yields even under adverse climatic and soil conditions, low input requirement, and ability to withstand natural calamities to provide “life-saving” foods to people during and after disasters.

The ICAR - Central Tuber Crops Research Institute (ICAR - CTCRI), Thiruvananthapuram, a premier institute under the Indian Council of Agricultural Research, New Delhi is the only institution in the world dedicated exclusively to research on tropical root and tuber crops. Since its inception, ICAR - CTCRI has developed 53 varieties of all tropical tuber crops (Cassava -16; Sweet potato – 16; Yams – 12; Taro – 6; Elephant foot yam – 2 and Chinese Potato – 1); standardized agro-techniques of various tuber crops in different agro-ecosystems in India including North-Eastern region; nine resource conservation technologies including in vivo and in vitro protocols for quality planting material production; eleven Integrated management packages for tuber crops pests and diseases; eight value-added food and industrial products from tuber crops and seven computer simulation models/ information systems for crop management. The Institute has a strong out-reach programme for transferring tuber crops technologies for the various user group. Owing to its good work conducted in the last five decades, ICAR-CTCRI has received several recognitions at the national and international level.



### **Training Objectives:**

1. To introduce production system-specific technological advances of tropical tuber crops
2. To build capacities of participants on cultivating tuber crops in a profitable and sustainable way using improved technologies
3. To sensitise the participants on diversified applications of tropical tuber crops to improve economic security of farmers
4. To equip participants to identify and use potential value added tuber crops technologies to develop sustainable businesses

### **Key Focus Areas of the Training Module**






1. Developing tuber crops varieties for food security and industrial use
2. Production of quality planting materials of tuber crops
3. Agro-techniques for profitable cultivation of cassava, sweet potato, yams, aroids and minor tuber crops
4. Site-Specific Nutrient Management and customised fertiliser applications for tuber crop production
5. Tuber crops based farming systems
6. Organic farming of tuber crops
7. Technologies for developing bio-intensive pest and disease management
8. Primary and secondary processing equipment for processing of tuber crops
9. Extrusion processing of tuber crop starches/flour
10. Bio-chemical analysis of tuber crops and their products
11. Functional foods from tuber crops
12. Industrial products from tuber crops
13. Production and potential uses of cassava starch
14. Ready to eat bakery products from tuber crops
15. Technologies for production of high-quality cassava flour (HQCF)
16. Strategies for increasing shelf-life of tuber crops
17. Technology incubation for entrepreneurship development
18. Participatory tuber crops technology development
19. Essential Business planning skills for creating tuber crops-based enterprises





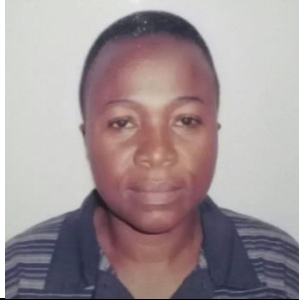


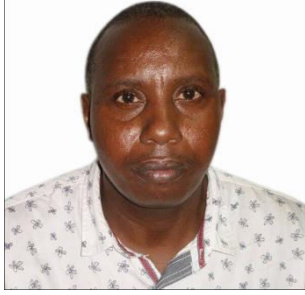


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**ANNEXURE II. COMPLETE LIST OF EXECUTIVES PARTICIPATED IN THE FTF ITT – TUBER CROPS**

<b>Botswana</b>	
	<p>Mr. Tlotlego Gaafele Principal Technical Officer, Department of Crop Production, Ministry of Agriculture, P.O.Box.15, GANTSI, Botswana Tel: 00267-75140841, 00267-74116975, 00267-73048280 (Emergency) Fax:00267- 6596217 Email: gtlotlego@gov.bw, gtlotlego@gmail.com</p>
	<p>Mr. SebonyweTshoganetso Agricultural Scientific Officer, Ministry of Agricultural Development and Food Security, P.O.Box.15, GANTSI, Botswana Tel: 00267-6596217, 00267-3925768 Fax: 00267-6596620/1 Email: tsebonywe@gov.bw, tsebonywe3@gmail.com,</p>
	<p>Mr. Makgale Nti Bashima Horticultural Officer, Department of Crop Production, District Agricultural Office, Ministry of Agriculture,P.O.Box.14, Machaneng Village, Gaborone, Botswana Tel: +267 4940238, 71706596, 75257052 Fax: +267 4940035, +267 4940257 Email: nmakgale@gov.bw, babagwasi@gov.bw,</p>
	<p>Mr. Polelo Joel Principal Horticultural Officer, Southern Rural Training Centre, Department of Crop Production, Ministry of Agriculture, Private Bag No.38, Labatse, Botswana Tel: +267 5440313, +267 76138042, +267-74608917 Fax: +267 3905096 Email: jpolelo@gov.bw, isebetwane@gov.bw,</p>
<b>Ghana</b>	
	<p>Mr. AmohKorang Paul Regional Crops Officer, Regional Agricultural Development Unit (RADU), P.O.Box. 3820, Kumasi, Ghana Tel: +233 03220-38565, +233-208631759 Email: radumofaash@yahoo.com, paulamohkorang@yahoo.com, paulkorang85@gmail.com,</p>

	<p>Mr. Owusu Michael Agriculture Officer, Directorate of Crop Services, Ministry of Food and Agriculture, P.O.Box.M37, ACCRA, Ghana Tel: +0248386529, +233 302662471 Email: micky05@yahoo.com, michaelowusu05@gmail.com,</p>
	<p>Ms. Quartey Naa Oyoe Agricultural Officer, Women in Agricultural Development Directorate, Ministry of Food and Agriculture, P.O.Box.M37, Ministries, ACCRA, Ghana Tel: +233 244966970, +233 240 440024 Email: naa_quartey@yahoo.com, jeffranklinme@gmail.com, addypolly@yahoo.com,</p>
	<p>Ms. Yelipoie Comfort Assistant Agricultural Officer, Directorate of Crop Services, Ministry of Food and Agriculture, P.O.Box.M37, Ministries, ACCRA, Ghana Tel: +233 242564484, Fax: +233 302662471 Email: yelipoiecomfort@gmail.com, <a href="mailto:oakoto2012@gmail.com">oakoto2012@gmail.com</a>,</p>
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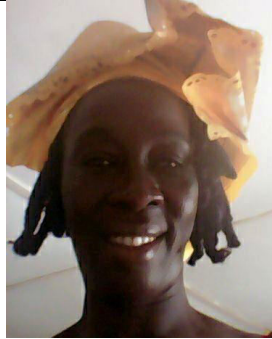


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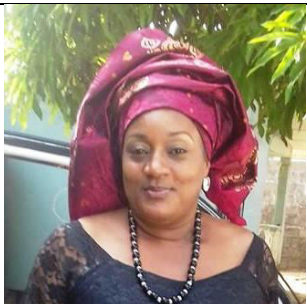
**Liberia**



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**ANNEXURE III**  
**KEY QUESTIONS AND ANSWERS OF INTERACTIVE LECTURES**

**Date: April 7, 2017**

Title of the session	Resource person
Varietal improvement in yams and aroids	Dr. Asha KI, Principal Scientist Dr. Asha Devi, Principal Scientist

**Question 1: Ghana**

Is *Dioscorea alata* the same as water yam in Africa?

**Answer:**

Yes.

**Question 2: Mozambique**

How many drought resistant varieties of yam have been released by ICAR-CTCRI?

**Answer:**

3 drought resistant varieties

**Question 3: Uganda**

What is the best way of staking climbing yam available?

**Answer:**

Plastic pipes (GI) are been used to stake yam due to its longevity but bamboo was used and after 5 years they deteriorate.

**Question 4: Bostwana**

In Kenya, some crops are planted with the yam purposely to serve as a support, is it practiced here?

**Answer:**

Not commonly practiced but in some places, farmers plant maize as stakes for the yam.

**Question 5: Uganda**

What are some of the pharmaceutical products obtained from yam?

**Answer:**

The mandate of ICAR-CTCRI is in relation to tuber crops production and processing and not the pharmaceutical aspects of tubers but the wild varieties which are high in steroidal sapogenins are used in pharmaceutical researches.

**Question 6: Mozambique**

Which part of the wild yam is used for genetic modification?

**Answer:**

Not much work has been done in that aspect but some work have been done on *D. Alata* and *D. Rotundata*.

**Question 7: Uganda**

What are some of the dwarf varieties?

**Answer:**

It will be shown in the slides during the presentation.

**Question 8: Ghana**

Is India self-sufficient in yam production?

**Answer:**

Yam production is not primarily stable and it is the second staple food which is mostly cultivated in the north eastern parts of India. Also, climate change has affected its production. Generally, India is not self-sufficient in yam production hence more work need to be done to boost production throughout India.

**Question 9: Ghana**

With the development of resistant varieties to taro leaf blight, are there other alternate methods to control the Taro Leaf Blight disease in taro?

**Answer:**

Yes, by the use of chemicals and bio-pesticides. In Kerala, organic production is what is been practiced with the use of bio-pesticides. It has been observed that some hybrid varieties under study show resistance to the disease so more work is been done to release these resistant hybrid varieties.

**Question 10:**

With the *Dasheen* type of taro, the stems and leaves are edible. Are there other varieties that are edible?

**Answer:**

Other varieties have high acidity but use of tamarind to make it edible.

**Question 11: Liberia**

How do you control pests in originally in taro?

**Answer:**

In India, pests are not a major problem in taro production. The major problem is the Taro Leaf Blight.

**Question 12: Ghana**

Do you have snails that feed on the taro on the field?



**Answer:**

No crops have been affected by snails. The African snail population is growing but it has not attacked any crop.

**Question 13:**

How do you control self-pollination in taro?

**Answer:**

Taro is a cross-pollinated crop and the female reproductive part can be receptive for a long time. Due to the non-synchronization in flowering, pollen are collected and cryo-preserved and used when pollination is required. The pollen collected can be viable till 15 days after collection.

**Question 13:**

Do you pollinate on the same day or you can do for a few days?

**Answer:**

It can be done for a few days (15 days). Pollen can be collected and used for 15 days.

**Question 14:**

How many times is the cross-pollination performed on the crop?

**Answer:**

The number of times of performing cross-pollination is dependent on the number of times the crop requires for a successful pollination. Also, if more flowers are present then more crossing is done within 15 days with the collected pollen.

Title of the session	Resource person
Advances in the nutrient management of tuber crops	Dr Susan John, Principal Scientist

**Question 15: Ghana**

To what extent do people in Kerala consume tubers? (**Observation: Kerala is a major state for tuber crops, I was expecting that tuber consumption should be very high but the people do not consume a lot of tuber crops from what we are eating**)

**Answer:**

Culturally tubers are very important in the cuisines of Kerala. Due to urbanization, the people of Kerala are changing their eating habits and consuming less tubers and consuming more fast foods. In view of this urbanization, ICAR-CTCRI are diversifying their methods and producing fortified crops such as the beta carotene sweet potato and cassava.

**Question 16: Uganda**

As researchers, share with us some of the problems found to be associated with chemical fertilizers and pesticides in yam production in Kerala before the practice of organic farming?

**Answer:**

Tuber crops are not the major staple food. In Kerala, tubers are mostly cultivated as an intercrop mainly for consumption with little to no fertilizer applied so adopting the organic farming was not difficult. Also, coconut, rice and vegetables are not grown on large scale since about only 25% of farmers in Kerala do commercial farming. In Tamil Nadu, tuber crops are cultivated as a sole crop mainly for industrial purposes.

**Question 17: Uganda**

Where do the varieties of taro released for both higher altitude and the southern parts of India perform best?

**Answer:**

They do perform well in both places. The varieties are more suitable for sub-moisture conditions but with drip irrigation it can also perform well in the higher altitude areas. Irrigation can be done twice a week to obtain good yields.

**Question 18: Malawi**

What is the spacing for planting and the type of planting materials used?

**Answer:**

The spacing for taro is 65cmX40cm on both ridges and mounds and the planting material used are the corms. The spacing for tannia and elephant foot yam on mounds is 90cmX90cm.

**Question 19:**

Are you getting enough tubers from harvesting tannia?

**Answer:**

Yes and if not harvested the corms develop into roots.

**Question 20: Ghana**

Aside from the use of cow dung as organic manure, do you use poultry manure?

**Answer:**

No. This is because soils in Kerala are acidic and poultry manure is highly acidic due to the uric acid present in it but it has a lot of nutrients. It has no effect on cassava since it is highly tolerant to acid and high levels of aluminium and its calcium efficient. Also, a farmer who applied poultry manure to his field lost his entire elephant foot yam farm since elephant foot yam has low acidity tolerance.

**Date: April 10, 2017**

<b>Title of the session</b>	<b>Resource person</b>
Panel discussion on Problems and prospects in the production of tuber crops in India and African countries””	Chairman: Dr. James George, Project Coordinator, AICRPTC Panelists: <ul style="list-style-type: none"><li>• Dr. C.S. Ravindran, Principal Scientist &amp; Head (Retd.), Crop Improvement, ICAR-CTCRI</li><li>• Dr. M. Anantharaman, Principal Scientist &amp; Head (Retd.), Extension and Social Sciences, ICAR-CTCRI.</li><li>• Dr. C.A. Jayaprakas, Principal Scientist &amp; Head, Crop Protection, ICAR-CTCRI</li><li>• Sri. M. Subramonian, Deputy Director, Department of Agriculture, Govt of Kerala</li></ul> Moderator: Dr. V.S. Santosh Mithra, Principal Scientist

**Question 1:**

**How do you overcome challenges between researchers and department of Agriculture relationship?**

**Answer**

There exist a co-operative relationship between the research station and the department of agriculture. The department of agriculture help the research stations in the dissemination of new technology. For specific programs the department provide massive assistance.

**Question 2:**

**What is the adoption rate of Indian farmers and what are some of the extension modules?**

**Answer:**

There is a strong linkage between all levels from central level to farmers’ level. There are also so many programs available for farmers. The adoption rate in tuber crops in Tamil Nadu is about 80% because they produce a lot of cassava for industrial purposes. Farmers are mostly interested in high revenue crops so for farmers to adopt a new technology or variety at a high rate all the important parameters need to be defined to the farmers.

**Question 3:**

**Where is your balance between high input agriculture and sustainable agriculture and what is the way forward?**

**Answer:**

We have sandy loam soil and with proper soil management and maintaining soil fertility we have to add a lot of organic manure 12.5 tonnes in addition to 100-50-100 NPK per hectare for higher yield. There should be continuous supply of soil nutrients and soil moisture for higher nutrients. Green revolution was a blessing to India because it is produced higher yield. Where green revolution failed was the abuse of chemicals because farmers believed that adding more fertiliser will increase yield so the recommended rate was not used. So it is not green revolution didn't fail, humans made it fail. So it was decided to promote sustainable agriculture to famers because the fertiliser was destroying the soils.

**Question 4:**

**How will you reach farmers at places where it is difficult to access roads?**

**Answer 4:**

Terrain farming is practiced on sloppy areas. There are district and community extension services who can access these places. There are extension systems such as Internal Development Tribal Program (IDTP) where tribal settlements are linked.

**Question 5:**

**What does the Indian government do to motivate farmers to produce more to market?**

**Answer:**

In reality, we have developed a system where we have link all producers to farmers with contact details. The government has protection prices to some of the crops produced and regulatory farmers and also for highly commercial crops there are a number of cold stores. Government is trying to make marketing policies also.

**Question 6:**

**Most farmers have small farm sizes, how can the farmer insure food security?**

**Answer:**

Most farmers are into mechanised farming and also tuber crops are relatively free from diseases and pests.

**Question 7:**

**How long does it take CMR100 variety to mature?**

**Answer:** 7 months.

**Question 8:**

**With clonal multiplication, is not an advantage to maintain the same genotype?**

**Answer:** It is true-to-type but degeneration may occur over time.

**Question 9:**

**Does 45cmX45cm apply to branching varieties in cassava?**

**Answer:**

No it does not. 45cmX45cm planting distance is recommended for non-branching cassava varieties.

**Question 9: What are some of the cultural practices for taro leaf blight in taro?**

**Answer:**

Proper field sanitation, improve drainage, crop rotation, pre-application of *trichoderma* and tuber treatment.

**Question 10:**

**What is the difference between *Phytophthora palmivora* and *Phytophthora infectans*? Answer:**

*Phytophthora palmivora* in the soil only affect the tubers but *Phytophthora infectans* affect the tuber crops from the leaves to the tubers.

**Question 11:**

**How is the *Trichoderma* isolated from the soil?**

**Answer:**

Soils are collected from all over India. 10g of soil is mixed with lots of water and sieved to obtain juice and the through lab techniques *trichoderma* is separated and multiplied.

**Question 12:**

**How do you dispose infected plant materials from the field?**

**Answer:**

Mostly by burning them. It can be used for composting but the disadvantage is some of the propagules of the fungi may be present so it is advisable to burn all.

**Date: April 11, 2017**

Title of the session	Resource person
Visit to Sangamaithri – A Farmers Producer Organization	Dr. P. Sethuraman Sivakumar, Senior Scientist & Programme Coordinator Representative from FPO

**Question 1:**

**Do member of the organization pay membership dues?**

**Answer:**

No. if a farmer bring produce worth 100rupees, 5% is taken as commission. 3% for maintenance and 2% is deposited at the bank and returned to the farmer during festive seasons.

**Question 2:**

**Is there no wastage of produce?**

**Answer:**

Farmers know the quantity needed, time for such produce and price for the produce.

**Question 3:**

**Where do the funding for the institute come from?**

**Answer:**

It is a government institute established to uplift farmers so funding do come from central government, banks and donations.

**Question 4:**

**Apart from buying produce from farmers, what other services does the institute offer to farmers?**

**Answer:**

The institute organizes periodic trainings with help from research personnel. It helps in the dissemination of new and improved technologies to farmers and provides quality planting materials. It also assist farmers acquire loans from banks.

**Question 5:**

**Do you have executives?**

**Answer:**

Yes. Farmers are the executives and before a farmer can be an executive, he/she must produce a minimum of 2t/ha. No involvement of politics or religion is allowed.

**Question 6:**

**Are the executives given salary for their services?**

**Answer:**

No. It is purely a service he/she is rendering to the members.

**Question 7:**

**How are the produce handled from field to the institute and keeping them fresh for longer periods?**

**Answer:**

There are 5 cold tracks that can take up to 7t/cold track.

**Question 8:**

**Are the produce graded when brought?**

**Answer:**

Yes they are graded as it has been purchased from the farmer and the farmer is given the full amount for the quantity he supplied.

**Question 9:**

**What support does government give?**

**Answer:**

It is a government institution/program. Farmers produce and sell directly to retail outlets and about 70% or more on the sale of his produce.

**Question 10:**

**What is the capacity of the banana fryer?**

**Answer:**

50kg/hr.

**Question 11:**

**What is the ratio of men to women?**

**Answer:**

100% men.

**Date: April 13, 2017**

Title of the session	Resource person
Techniques of organic production of tuber crops	Dr. G. Suja, Principal Scientist

**Question 1:**

**Can farmers afford the cost for fertilizers in relation to recommended fertilizer rates after soil testing?**

**Answer :**

Yes if it is continuously cultivated in a location where farmers can invest more because they produce on very large lands for industrial purposes.

**Question 2:**

**How do you control contamination of water bodies by conventional farming in organic farming?**

**Answer:**

It is very difficult to control contaminations. There are clusters of organic farmers coming up at various community so less contamination along those places if more are in organic farming.

**Are organic farmers able to get premium prices for their produce?** Yes they are able to get premium prices. Organic products are 20-40% high premium prices than other produce.

**Question 3:**

**How do you ensure that organic manure from livestock used in organic farming are not contaminated conventional farmers through the use of medicines?**

**Answer:**

There is no way to ensure that.

**If there are antibiotics in the animal manure, will there be a bacteria present in the mature crop?** No.

**Question 4:**

**Can organic farming feed the population where less people are into agriculture?**

**Answer:**

No. this is because there is not much resources present, availability of inputs and price. Also, green manuring depends on the weather conditions, soil and climate. Hopefully in some years to come it can be able to feed the population. Producing for consumption is mainly organic farming which is sufficient for the household but for commercial farming it is mostly conventional farming.



**Question 5:**

**What is the content of starch or tuber crops under organic farming?**

**Answer:**

Dry matter content, protein content, starch content among others showed slight improvement with numerically higher figures. For industrial purposes, conventional farming is highly recommended.

**Question 6:**

**Are there markets for both organic and conventional farming?**

**Answer:**

Yes.

Date: April 13, 2017

Title of the session	Resource person
Panel Discussion on “Tuber crops product diversification, value chains and entrepreneurship development”.	Chairman: Dr. Archana Mukherjee, Director, ICAR-CTCRI Co-Chairman: Dr. JT Sheriff, Head, Crop Utilization Panelists: Dr. G. Padmaja, Emeritus Scientist – KSCSTE Mr. K. Venu, Belgaum Minerals, Belagavi Dr. K.R. Ashok, Professor (Agricultural Economics), TNAU, Coimbatore Moderator: Dr. P. Sethuraman Sivakumar, Senior Scientist

**Question 1:**

**How to ensure farmers not being exploited by along the value chain?**

**Answer:**

In value chain addition we have various types. There are small value chains with smaller processing unit for smallholder farmers where there are no middle men. This ensures that the optimum benefits from the value addition goes to the farmer. In Tamil Nadu, we have small industries for small producers, big industries for big producers, brokers who connect farmers to industries and farmers also can sell directly to industries. At every stage of the value chain there are specialised personnel who ensure that the value chain process is effective.

**Question 2:**

**Is the farmer cooperative associations such as Sanghamythy Farmers Producer Co. Ltd where farmers are required to produce a specific ton of produce and all collected and sold as fresh produce and some processed into chips where all farmers benefit not better than value chain where there are specialized personnel at every stage?**

**Answer:**

With the cooperative association some of their technology are not working well. They will help members of the association get new technologies and adopt them but they will not do it the proper way.

**Question 3:**

**What are some of the experiences from encouraging farmers to add value to produce because I believe it is better to let farmers concentrate on producing crops so that the value addition is done by processors?**

**Answer:**

Most of the farmers produce and sell to brokers who buy and sell to industries but a few farmers have small unit processors. About 60-70% farmers are small marginal farmers. There is also an auction system where produce are auctioned but farmers do not get much through that because of lower prices and also tubers cannot be stored for a longer time. The best option is to establish small farmer processing units since tubers have very short shelf-lives to convert the tubers to flour to store it for longer periods. Also, excess produce can be cut into chips and sun dried and can be kept for long durations.

**Question 4:**

**Have you had a situation where farmers increase their produce because they know that industries depend on them?**

**Answer:**

Industries determine the prices in India and there are a lot of farmers present in the market so if one farmer's produce is expensive the other farmer's produce which is lower if purchased. Also, it is advisable to have storage systems to buy produce when there is a glut and also have more than one source for purchasing produce.

**Question 5:**

**Have you tried cassava bread and using fermented cassava for cassava with wheat flour for bread?**

**Answer:**

In India there is no need to supplement cassava with wheat because there is a lot of wheat in the country. Cassava has been used to produce cakes, cookies among other but it is not very popular now. It can be used but the quality is low unless protein and other nutrients are added but it is not common.

**Question 6:**

**How can cassava be a food crop when all are being processed into chips as snacks?**

**Answer:**

Cassava is not even the second staple crop of India so value is added to turn them into snacks. More rice and wheat based foods are produced and consumed. Some 20 years back when rice and wheat production was low in India, more cassava was consumed by boiling but as the production of rice increased, consumption of tubers reduced. In Tamil Nadu, 90% cassavas are for industrial purposes.

**Question 7:**

**To what extent is fermented cassava flour used in India?**

**Answer:**

Fermented cassava is not used in India. Cassava is fermented to produce beer in the northern part.

**Question 8:**

**After how many days is cassava classified as fermented?**

**Answer:**

Cassava is very susceptible to microbial activity. If cassava is not exposed to direct sunlight in 3-4 hours it is like to be fermented so it is dried immediately. Once the sour taste develops in the cassava it is thrown away.

**Question 9:**

**Does the government of India assist farmers to acquire planting materials at least every 3 years?**

**Answer:**

There are no formal seed systems for cassava in India. There exist many varieties with different qualities such as CMD resistant, higher yield, early maturity. Farmers usually take planting materials from previous cropping season and also varieties that have good qualities are used continuously.

**Question 10:**

**If one want to setup a simple processing unit in his/her country, what role can CTCRI play?**

**Answer:**

MOU has to be signed by both countries first. Then CTCRI can assist with the technology transfers and manufacturing of the machinery.

**Date: April 15, 2017.**

Title of the session	Resource person
Functional foods from tuber crops	Dr. G. Padmaja, Emeritus Scientist – KSCSTE

**Question 1:**

**Is it possible to use cassava starch in pasta preparation for adhesion?**

**Answer:** Yes.

**Question 2:**

**Can peanut flour be used?**

**Answer:**

Yes, but oil has to be removed then it can be added as a protein.

**Question 3:**

**Anthocyanins can prevent hypertension, can it help with someone already suffering from hypertension?**

**Answer:**

Basic hypertension cannot be controlled.

**Question 4:**

**How much nutrient is lost when food is boiled for long?**

**Answer:**

Water soluble nutrients can be lost such as vitamins and proteins. For cassava, cutting them into smaller pieces and boiling with lots of water (1kg/5lt water) can eliminate the cyanide present.

**Question 5:**

**Is brown rice and bread recommended for diabetic patients?**

**Answer:** Yes.

**Question 6:**

**Can hereditary diseases be cured by functional groups?**

**Answer:**

No, but it can prolong disease advancement.

**Question 7:**

**How is colour transferred to new generation?**

**Answer:**

Colour can be transferred through hereditary or transgenic/genetic modification.

**Question 8:**

**Does corn have gluten?**

**Answer:**

Yes, so as barley, rice and sweet potato.

**Question 9:**

**What are some of the spices and their properties?**

**Answer:**

Chilli has antioxidant activities and fenugreek has steroid principles.

**Annexure IV**  
**Ethnic food recipes prepared by participants at the**  
**Tuber Crops Ethnic Food Festival**



**Botswana - Mabele Ka Seswaa with cassava**

- Pounded meat with boiled mashed cassava
- As the national dish of Botswana, seswaa is served at weddings, funerals, and other celebrations.



**Ghana - Bankye Akrako**

- Bankye Akrako, made from grated cassava, is one of the savory dishes from Ghana.
- Very crunchy and normally eaten with dried coconut.



**Kenya - Ugali with Nyama Choma**

- UGALI - Thick porridge made from maize/ cassava flour; popular staple food in the African Great Lakes region and Southern Africa
- NYAMA CHOMA - Roasted meat often eaten on special occasions, such as a weekend family get-together, with the Ugali.



**Liberia - Cassava bread with Gbasa Jamba**

- GBASA JAMBA/ CASSAVA LEAF AND RICE - A sauce/ stew made from cassava leaves; Often served with rice
- CASSAVA BREAD - Traditional food of Liberia made from cassava flour



**Mozambique - Cassava candy**

- A relatively new ethnic food which has high potential in the snack food market
- Prepared from cassava tubers



### Malawi - Rice with chicken and vegetables

Rice with chicken curry and vegetables is a traditional form of popular food in Malawi



### Uganda - Rice with chicken stew (Enkoko Ya Suupu)

- A traditional and popular dish of Uganda
- Bland in taste



### India - Cassava and fish curry

- A traditional and popular dish of Kerala state, India
- Delicious food





### Annexure V

## Back At Work Plans: FTF-ITT on Production and processing technology for tuber crops

(April 4-18, 2017; ICAR-CTCRI, India)

SNo	Botswana	Title
1	Mr. Tlotlego Gaafele	Introduction and promotion of tuber crops in Botswana (e.g. Cassava & Sweet potato)
2	Mr. Sebonywe Tshoganetso	
3	Mr. Makgale Nti Bashima	
4	Mr. Polelo Joel	
<b>Ghana</b>		
5	Mr. Amoh Korang Paul	
6	Ms. Quartey Naa Oyoe	Processing cassava into flour for consumption using the soaking method
7	Mr. Owusu Michael	Production of cassava planting materials at the ASUANSI agriculture adaptive trails station and linking farmers to planting materials of improved varieties
8	Ms. Yelipoie Comfort	
<b>Kenya</b>		
9	Mr. Ndubi Mike O.R.	Farmer capacity building on utilization of mini-sett technology for the rapid multiplication of clean healthy cassava planting material
10	Ms. Mwafungo Gladys Murira	<ul style="list-style-type: none"><li>Promote rapid multiplication of healthy cassava planting materials through use of mini sett technology</li><li>Promote processing of assorted cassava based processed products</li></ul>
11	Mr. Tica Nelson Ngugi	

12	Mr. Oyunga Wycliffe Otieno	Farmer capacity building on utilization of mini-sett technology for the rapid multiplication of clean healthy cassava planting material
<b>Liberia</b>		
13	Ms. Famatta Kamara Jebbeh	Tuber Crops production with legume intercropping (cow pea)
14	Ms. Woheel Annie Yamah	Organic farming
15	Ms. Wonyene Rugie Barry	Empowering women in the cassava value chain (CVC)
<b>Malawi</b>		
16	Ms. Chisesa Emelesi	Processing, preservation and utilization of cassava and sweet potato tubers
17	Ms. Twaibu Amina	
18	Ms. Waluza Ireen	
<b>Mozambique</b>		
19	Mr. Luis Julio Maria Fernando	Quality planting material production of tuber crops
<b>Uganda</b>		
20	Mr. Sserwanga Joseph	Production and Training of Trainers in Quick Multiplication of Improved Cassava and Sweet potato Variety Material
21	Mr. Katumba Joseph	Multiplying certified cassava planting materials and disseminating the technology amongst farmers
22	Mr. Kaweesi Henry	Mass propagation of improved clean cassava, using the mini-setts technology.
23	Mr. Baguma Gerald	Evaluating and upscaling different improved cassava production technologies for increased production of high quality cassava planting materials and availing them to farmers for increased income

## BOTSWANA – TEAM PROJECT



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## BOTSWANA – TEAM PROJECT



1. Name of the activity	:	Introduction and promotion of tuber crops in Botswana - Cassava & Sweet potato
2. Problem in the service area	:	<ul style="list-style-type: none"> <li>• Low production of tuber crops mainly sweet potato to a lesser extent. Cassava, yams and other tubers are currently not cultivated</li> <li>• Unavailability of planting material for tuber crops.</li> <li>• Lack of knowledge about tuber crops</li> <li>• Lack of research technology innovations</li> </ul>
3. Appropriate solutions learned from FTF ITT	:	<ul style="list-style-type: none"> <li>• Protocols for quality tuber crops planting material production</li> <li>• Technologies for product diversification and value addition</li> </ul>
4. Place of implementation	:	Ghanzi District, Southern District and Central District
5. Target group	:	Farmers, Extension Officers, Research Institutes
6. Duration	:	One year
7. Expected end results	:	<ul style="list-style-type: none"> <li>• Increase in numbers of farmers producing tuber crops</li> <li>• Availability and easy access of planting materials for farmers.</li> <li>• Good extension linkage between research and farmer</li> <li>• Increased number of farmers cultivating tubers and adopting new technologies.</li> </ul>
8. Mentors	:	Not indicated
9. Any other information	:	Nil

## GHANA



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1. Name of the activity	Promote quality planting material to increase productivity of cassava and yams
2. Problem in the service area	<ul style="list-style-type: none"> <li>• Scarcity of planting material of cassava and yams</li> <li>• Repeated use of diseased planting materials</li> <li>• Uneven growth of cassava in the field</li> </ul>
3. Appropriate solutions learned from FTF ITT	<ul style="list-style-type: none"> <li>• Protocols for quality tuber crops planting material production in cassava and yams</li> </ul>
4. Place of implementation	In all 30 districts of Ashanti region of Ghana
5. Target group	30 district officers, 30 demonstrations on farmer fields
6. Duration	Eight Months (May – December 2017)
7. Expected end results	<ul style="list-style-type: none"> <li>• Increased knowledge and skills of district officers and farmers in selection of disease free planting material of cassava and yams</li> </ul>
8. Mentors	Dr JT Sheriff, Head- Crop Utilisation (Expired) Dr Shanavas, Technical officer Dr James George, Project Coordinator, AICRPTC
9. Any other information	Nil

## GHANA



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1. Name of the activity	Production of cassava planting materials at the ASUANSI agriculture adaptive trails station and linking farmers to planting materials of improved varieties
2. Problem in the service area	<ul style="list-style-type: none"> <li>• Scarcity of planting material of cassava</li> <li>• Repeated use of diseased planning materials</li> </ul>
3. Appropriate solutions learned from FTF ITT	<ul style="list-style-type: none"> <li>• Protocols for quality planting material production in cassava</li> <li>• Creating a Directory of planting materials producers for easy access for farmers</li> </ul>
4. Place of implementation	Asuansi Agriculture adaptive trials station; secondary planting materials multiplication sites.
5. Target group	All cassava farmers (both smallholder and commercial farmers)
6. Duration	One year (May 2017 – April 2018)
7. Expected end results	<ul style="list-style-type: none"> <li>• Enhanced farmer access to planting materials of improved varieties to increase crop yield</li> <li>• Enhance income and improved livelihood of farmers to ensure food security</li> </ul>
8. Mentors	Not indicated
9. Any other information	The directory will contain information such as the telephone numbers of the planting materials producers, their locations, types of varieties, expected yield of the varieties and contact persons of the producers. Copies of the directory will be made available to all cassava producing districts in the country.

## GHANA



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1. Name of the activity	Processing cassava into flour for consumption using the soaking method
2. Problem in the service area	<ul style="list-style-type: none"> <li>High post-harvest losses of cassava</li> </ul>
3. Appropriate solutions learned from FTF ITT	<ul style="list-style-type: none"> <li>Processing into flour and developing recipes and conduct recipes on them</li> </ul>
4. Place of implementation	Greater Accra Region, Ghana
5. Target group	Cassava processors and Farmers
6. Duration	Six months (May - October 2017)
7. Expected end results	It is expected that after successful trials on processing of flour and recipe development, and the technology extended nationwide (will fall on the regional WIAD officers) achieving a reduction of post-harvest losses across the country.
8. Mentors	Dr JT Sheriff, Head- Crop Utilisation (Expired) Dr G. Padmaja, Emeritus Scientist - KSCSTE
9. Any other information	-

## KENYA



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1. Name of the activity	Farmer capacity building on utilization of mini-sett technology for the rapid multiplication of clean healthy cassava planting material
2. Problem in the service area	Reduced cassava acreage due to insufficient clean planting material
3. Appropriate solutions learned from FTF ITT	Application of mini-sett technology to replace conventional cuttings in cassava planting material production
4. Place of implementation	Ugunja Sub-county, Siaya County, KENYA
5. Target group	Cassava producing farmers and farmer groups in the lower parts of Kabondo-Kasipul
6. Duration	One year (May 2017 – April 2018)
7. Expected end results	<ul style="list-style-type: none"> <li>• Increased acreage under cassava</li> <li>• Enhanced availability of clean planting material</li> </ul>
8. Mentors	-
9. Any other information	-

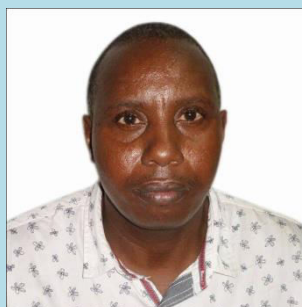


## KENYA



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1. Name of the activity	<ul style="list-style-type: none"> <li>a. Promote rapid multiplication of healthy cassava planting materials through use of mini sett technology</li> <li>b. Promote processing of assorted cassava based processed products</li> </ul>
2. Problem in the service area	<ul style="list-style-type: none"> <li>a. Inadequate/insufficient and low quality cassava planting materials</li> <li>b. Limited types of cassava based processed products</li> </ul>
3. Appropriate solutions learned from FTF ITT	<ul style="list-style-type: none"> <li>a. Rapid multiplication technology using mini setts to propagate cassava by first establishing nurseries.</li> <li>b. Use of tissue culture technology to propagate disease free foundation plants</li> <li>c. Cassava based processed products – starch, crisps, pasta etc</li> </ul>
4. Place of implementation	Kilifi County, Kenya
5. Target group	<ul style="list-style-type: none"> <li>a. Seven cassava cuttings production groups of Rimato Cooperative Society in Kilifi North Sub County- Train them on rapid multiplication of cassava planting materials</li> <li>b. Scientists at Kenya Agricultural &amp; Livestock Research organisation (KALRO), Mtwapa – Sensitize them on Tissue culture technology for clean cassava planting material production</li> <li>c. Two Cassava cottage processing groups (Rimato coop) in the county</li> </ul>

6. Duration	One year (May 2017 – April 2018) Rapid cassava planting materials production- 6 months; Tissue culture sensitization- 3 months; Cassava processing- 6 months
7. Expected end results	<ul style="list-style-type: none"> <li>a. Use of mini setts adopted by the cassava planting material producer groups and quality planting materials readily available to cassava producers</li> <li>b. Tissue culture technology for production of foundation planting materials adopted by KALRO scientists</li> <li>c. Wide variety of cassava based processed products available in the market</li> </ul>
8. Mentors	<ul style="list-style-type: none"> <li>• Dr James George, Project Coordinator, AICRPTC - Rapid Multiplication of cassava planting materials</li> <li>• Dr. Sajeev- Processing</li> </ul>
9. Any other information	To roll out the technologies to the remaining six sub counties after a successful adoption.

## KENYA



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1. Name of the activity	Farmer capacity building on utilization of mini-sett technology for the rapid multiplication of clean healthy cassava planting material
2. Problem in the service area	<ul style="list-style-type: none"> <li>• Reduced cassava acreage due to insufficient clean planting material</li> <li>• Reduced productivity due to CMVD and CBSV</li> </ul>
3. Appropriate solutions learned from FTF ITT	<ul style="list-style-type: none"> <li>• Application of mini-sett technology to replace conventional cuttings in cassava planting material production</li> <li>• Use of nurseries/shade nets to raise mini-setts before transplanting</li> </ul>
4. Place of implementation	Kabondo-Kasipul Sub-county, Homa Bay County, Kenya
5. Target group	Cassava producing farmers and farmer groups in the lower parts of Kabondo-Kasipul
6. Duration	One year (May 2017 – April 2018)
7. Expected end results	<ul style="list-style-type: none"> <li>• Increased acreage under cassava</li> <li>• Improved cassava productivity/yield</li> </ul>
8. Mentors	-
9. Any other information	<ul style="list-style-type: none"> <li>• Focus is on increasing production quantity and regularity with the view to supporting value addition</li> <li>• This will be achieved by increase of acreage and productivity</li> </ul>

## LIBERIA



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1. Name of the activity	Tuber Crops production with legume intercropping (cow pea)
2. Problem in the service area	<ul style="list-style-type: none"> <li>• Low adoption rates of new technologies by farmers</li> </ul>
3. Appropriate solutions learned from FTF ITT	Intercropping leads to less usage of inorganic fertilizer and manure (through nitrogen fixation), but also controls weeds and increases crop productivity.
4. Place of implementation	Compound one, Grand Bassa County, Republic of Liberia
5. Target group	Lead farmers
6. Duration	Six months (May – Oct 2017)
7. Expected end results	The intercropping system will improve soil fertility, suppress weed hence saving farm labour, control soil erosion, and improve family nutrition.
8. Mentors	Dr Susan John, Principal Scientist – Soil Science Dr Asha Devi, Principal Scientist – Crop Improvement Dr Asha KI , Principal Scientist – Crop Improvement
9. Any other information	Adoption of this technology by Lead farmers will encourage the community farmers in the next farming season to do the same.

## LIBERIA



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1. Name of the activity	<ul style="list-style-type: none"> <li>• Organic farming</li> <li>• Processing and value addition</li> </ul>
2. Problem in the service area	<p>a. Constant growing of crops in the same location has cause the soil to be depleted.</p> <p>b. The cost of chemical fertilizer is too high.</p> <p>c. Organic tuber last longer than the chemical product.</p> <p>d. Liberians are yet to understand that cassava can be use for industrial purposes like starch and biochemical pesticide with the proper equipment.</p>
3. Appropriate solutions learned from FTF ITT	Intercropping leads to less usage of inorganic fertilizer and manure (through nitrogen fixation), but also controls weeds and increases crop productivity.
4. Place of implementation	Grange Bong County, Liberia
5. Target group	To train women from five communities on organic farming Tohnlo women for processing and value addition
6. Duration	One year (May 2017 – April 2018)
7. Expected end results	<p>As we are aware that cassava is the 2<sup>nd</sup> staple food in Liberia, if grown organically, the farmers will have good harvest.</p> <ul style="list-style-type: none"> <li>• Economically their lives will change.</li> <li>• Taxes will be paid to the government.</li> <li>• More jobs will be created.</li> <li>• Tohnlo women will be able to prepare starch out of cassava to make paper glue and hair styling gel.</li> <li>• Small skill enterprises will develop. Finances will increase.</li> </ul>
8. Mentors	-
9. Any other information	-

## LIBERIA



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1. Name of the activity	Activity 1: Training of women farmers in High Quality Cassava Flour (HQCF) Activity 2: Awareness and multiplication of the planting materials of Orange flesh sweet Potatoes.
2. Problem in the service area	A. Post harvest losses and lack of information on processing methods. B. Poor awareness on the importance and nutritional value of orange flesh sweet potatoes
3. Appropriate solutions learned from FTF ITT	The $\beta$ Carotene rich Orange Fleshed Sweet potato can effectively be used to as nutritious food
4. Place of implementation	Moipa Town, Bong County, Liberia
5. Target group	Beneficiary women farmers of African Women Entrepreneurship Programme – Liberia (AWEP-L)
6. Duration	Four months (May – August 2017)
7. Expected end results	Activity 1: i. Reduction in Post harvest Loss ii. Value added to the crop iii. Increase in income Activity 2: i., Women farmers will understand the nutritional value of the orange flesh sweet potatoes ii., Farmers will begin to grow the crop.
8. Mentors	-
9. Any other information	-

## MALAWI



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1. Name of the activity	Processing, preservation and utilization of cassava and sweet potato tubers
2. Problem in the service area	There is always food shortage in Malawi in the period November to March  Few high value products of cassava and sweet potato are not available in Malawi
3. Appropriate solutions learned from FTF ITT	Processing and utilization of high value products like chips from cassava and sweet potato
4. Place of implementation	Extension planning areas of Malawi Mitundu, EPA, Malawi

5. Target group	Vulnerable groups (women, youth, elderly and disabled) and small farmers
6. Duration	Ten months (May 2017 – February 2018)
7. Expected end results	<ul style="list-style-type: none"> <li>• Improved living standards of the people</li> <li>• Increase in utilization of the tuber crops</li> <li>• Extended shelf life of cassava and sweet potato</li> </ul>
8. Mentors	-
9. Any other information	<ul style="list-style-type: none"> <li>• Awareness campaigns</li> <li>• Group formation</li> <li>• Demonstrations on cassava and sweet potato processing and preservation and food displays.</li> <li>• Introduction of Elephant foot yam.</li> <li>• Trainings on nursery establishment using cassava minisets</li> </ul>



## MOZAMBIQUE



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1. Name of the activity	Minisett demonstration field
2. Problem in the service area	In Mozambique, the smallfarmers all season are using vegetative material with disease, and long maturing cultivars
3. Appropriate solutions learned from FTF ITT	<ul style="list-style-type: none"> <li>• Cassava Minisett production</li> <li>• Identify varieties which has tolerance or resistance to diseases</li> <li>• Conduct demonstrations.</li> </ul>
4. Place of implementation	Chongoene district, Gaza Province, Mozambique
5. Target group	Extension Workers and smallfarmers
6. Duration	One year (May 2017 – April 2018)
7. Expected end results	The small famers can use the minisett method in their farms to multiply vegetative disease free material of cassava
8. Mentors	-
9. Any other information	The cassava varieties which are selected for multiplication are tolerant or resistant to CMD and CBSD

## UGANDA



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1. Name of the activity	Production and Training of Trainers in Quick Multiplication of Improved Cassava and Sweet potato Variety Material
2. Problem in the service area	<ul style="list-style-type: none"> <li>• Shortage of good planting material</li> <li>• Fake planting materials</li> <li>• Low yield of root crops due to inferior planting material</li> <li>• Low acreage under root crops</li> </ul>
3. Appropriate solutions learned from FTF ITT	<ul style="list-style-type: none"> <li>• Acquired knowledge in rapid multiplication of planting material</li> </ul>
4. Place of implementation	Bukalasa Agricultural College, Uganda
5. Target group	<ul style="list-style-type: none"> <li>• First year Certificate students</li> <li>• First year Diploma students</li> </ul>
6. Duration	Six months to One year (May 2017- April 2018)
7. Expected end results	<ul style="list-style-type: none"> <li>• Well trained trainees in rapid multiplication of root crop planting material.</li> <li>• Production of vigorous and quality planting materials.</li> <li>• Production of big amounts of planting material in limited space.</li> </ul>
8. Mentors	<ul style="list-style-type: none"> <li>• Dr James George, Project Coordinator, AICRPTC</li> </ul>
9. Any other information	<ul style="list-style-type: none"> <li>• Multiplier effect from students serving as Trainer of Trainers</li> <li>• Trainees will directly benefit from multiplied planting materials .</li> </ul>

## UGANDA



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1. Name of the activity	Multiplying certified cassava planting materials through minisetts and disseminating the technology amongst farmers.
2. Problem in the service area	Shortage of good planting materials of cassava
3. Appropriate solutions learned from FTF ITT	<ul style="list-style-type: none"> <li>• I have learnt the technology of rapid multiplication of cassava planting materials through use of minisetts. When I returns home, I will establish a cassava demo for multiplication of clean planting materials.</li> <li>• With the experience obtained from this training, I will able to use such innovations so that I will create a change in mind set of farmers towards production and post harvest technologies of this important crop.</li> </ul>
4. Place of implementation	Bukakata Farmers, Uganda
5. Target group	<ul style="list-style-type: none"> <li>• First year Certificate students</li> <li>• First year Diploma students</li> </ul>
6. Duration	One year (May 2017- April 2018) and later
7. Expected end results	<ul style="list-style-type: none"> <li>• Through my intervention, the farmers will adopt the technology. This will result in reduction of food insecurity and increase the household income in our communities.</li> </ul>
8. Mentors	<ul style="list-style-type: none"> <li>• Dr James George, Project Coordinator, AICRPTC</li> </ul>
9. Any other information	I also wish to disseminate technologies related to post harvest handling of cassava through training and imparting hands on skills

## UGANDA



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1. Name of the activity	Mass propagation of improved clean cassava, using the mini-setts technology
2. Problem in the service area	Inadequate farmer access to clean cassava seed (that is resistant and tolerant to especially CBD and CMD).
3. Appropriate solutions learned from FTF ITT	Rapid multiplication of clean cassava seed, using the mini-setts technology in green houses.
4. Place of implementation	Nakasongola district in Central Uganda.
5. Target group	1). Training at least 15 Agricultural Extension Agents/Workers in the mini-sett approach, to act as ToTs. 2). Train 11 progressive farmers to act as Community Based Facilitators
6. Duration	Six months (May 2017- October, 2017).
7. Expected end results	Mass propagation of improved cassava seed using mini-setts will be promoted and popularised for adoption, to reduce disease incidence hence improving rural household food security and income.
8. Mentors	<ul style="list-style-type: none"> <li>• Dr James George, Project Coordinator, AICRPTC</li> </ul>
9. Any other information	The challenge I expect is the need to procure green houses with small nets that can control whiteflies (as multiplication structures). These are expensive back home, for the average farmer. However, where there is a will, there is a way.

## UGANDA



**Mr. Baguma Gerald**

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1. Name of the activity	To evaluate and upscale different improved cassava production technologies and best management practices through different agronomic technologies
2. Problem in the service area	<ul style="list-style-type: none"> <li>• Lack of good cassava planting materials and cassava</li> <li>• The diseases like cassava mosaic disease and cassava brown streak which hinder cassava production</li> </ul>
3. Appropriate solutions learned from FTF ITT	Through training, I learned the techniques like rapid multiplication of cassava planting materials using minisett, disease identification and their management
4. Place of implementation	Kabale, Kanungu and Rukungiri districts, Uganda.
5. Target group	Small scale and large cassava farmers and agro-processors
6. Duration	One year (May 2017- April 2018) and later
7. Expected end results	Farmers will be equipped with knowledge on different agronomic practices such as rapid multiplication of cassava planting materials.
8. Mentors	<ul style="list-style-type: none"> <li>• Dr James George, Project Coordinator, AICRPTC</li> </ul>
9. Any other information	General agronomic practices in relation to cassava production techniques and its management like minisett techniques, pest and disease management are very useful.

# ANNEXURE VI

## Media Coverage of the FTF ITT TUBERS

- 1. Name of the publication/Date : Deccan Chronicle 7 - 4-2017
- 2. Language of publication : English
- 3. Place of publication : Thiruvananthapuram

### 2-week training programme

Thiruvananthapuram: A two week triangular training programme on production and processing technology for tuber crops began at ICAR-CTCRI, Thiruvananthapuram on Thursday. As many as 23 delegates from various African countries are participating in the training programme, which aims at utilising innovative ideas in tuber crops research for the benefit of food security in African nations. Minister in the Kenya High Commission Samuel Karicho inaugurated the programme. Director-general of MANAGE, Hyderabad Usha Rani delivered the keynote Address. ICAR-CTCRI director Dr. Archana Mukherjee and project coordinator Dr. James George also spoke. The triangular training programme involving India, U.S. and Africa was first mooted during the visit of then United States President Barack Obama.

- 1. Name of the publication/Date : Deepika 6 - 4-2017
- 2. Language of publication : Malayalam
- 3. Place of publication : Thiruvananthapuram

### കേന്ദ്ര കിഴങ്ങുവിള ഗവേഷണ സ്ഥാപനത്തിൽ അന്താരാഷ്ട്ര പരിശീലന പരിപാടിക്ക് തുടക്കം

തിരുവനന്തപുരം: ഉഷ്ണമേഖല കിഴങ്ങുവിളകളുടെ ഉത്പാദനവും സംസ്കരണവും ആഫ്രിക്കൻ രാജ്യങ്ങളിൽ ഗവേഷകർക്കുവേണ്ടി ഒരുക്കിയ കേന്ദ്ര ഗവേഷണ സ്ഥാപനത്തിൽ നടക്കുന്ന അന്താരാഷ്ട്ര പരിശീലന പരിപാടിക്ക് ഉദ്ഘാടനം ചെയ്തു.

നിത്യർ സാമുവേൽ കരിച്ചാ ഉദ്ഘാടനം ചെയ്തു. വിവിധ ആഫ്രിക്കൻ രാജ്യങ്ങളിൽ നിന്നുള്ള 23 പ്രതിനിധികൾ തങ്ങൾ ചേർന്നു പരിശീലന പരിപാടിയിൽ പങ്കെടുക്കുന്നുണ്ട്. കേന്ദ്ര കൃഷി മന്ത്രാലയത്തിന്റെ കീഴിൽ ഹൈന്ദാവത്ത് ആസ്ഥാനമായി പ്രവർത്തിക്കുന്ന ചേരയിൽ എന്ന സ്ഥാപനത്തിന്റെ ഡയറക്ടർ ഉദ്ഘാടനം ചെയ്തു.

നൂറ്കളുടെ രാജ്യാന്തര ചേരയിൽ സിംഗിൾ ക്രോസ്ബ്രഡ്ഡ് വെറോയും മറ്റും ഉൾപ്പെടെയുള്ള കോ-ഓർഡിനേറ്റ് വെറോയും ഉൾപ്പെടെയുള്ള പ്രദർശനങ്ങളും ഉദ്ഘാടനം ചെയ്തു. മൂന്ന് അമേരിക്കൻ പ്രസിഡന്റ് ബറാക്ക് ഒബാമയുടെ ഇന്ത്യ സന്ദർശനത്തിനിടെ

ഒരു ആശയമെടുത്തു. ഇന്ത്യയും അമേരിക്കയും ആഫ്രിക്കയും ചേർന്നുള്ള ഈ ത്രികോണ പരിശീലന പരിപാടി കഴിയുമ്പോൾ ഗവേഷണ രംഗത്തെ നൂതന സാങ്കേതിക വിദ്യകൾ ആഫ്രിക്കൻ രാജ്യങ്ങളിലെ കേന്ദ്ര ഗവേഷണ സ്ഥാപനത്തിൽ പ്രദർശനം ചെയ്യാൻ ഇവർ പരിപാടിയിലൂടെ കേന്ദ്രം



ദേശീയ ഗവേഷണ സ്ഥാപനത്തിൽ നടക്കുന്ന അന്താരാഷ്ട്ര പരിശീലന പരിപാടിക്ക് ഉദ്ഘാടനം ചെയ്യുന്ന സമയത്ത്. ഇടം വശത്ത് നിൽക്കുന്നത് സമുവേൽ കരിച്ചാ ഉദ്ഘാടനം ചെയ്യുന്നു. മധ്യം, ജെ.എസ്. ജോർജ്ജ്, ഡോ. അർച്ചന മുഖർജി, ഉദ്ഘാടനം ചെയ്യുന്നവർ സിംഗിൾ.

- 1. Name of the publication/Date : **Mathrubhumi** 7 - 4-2017
- 2. Language of publication : Malayalam
- 3. Place of publication : Thiruvananthapuram

## ആഫ്രിക്കയുടെ ദക്ഷ്യസുരക്ഷയ്ക്കായി കിഴങ്ങുവിള ഗവേഷണകേന്ദ്രത്തിൽ പരിശീലനം

തിരുവനന്തപുരം: കിഴങ്ങുവിള ഗവേഷണത്തിന്റെ നൂതനസാങ്കേതികവിദ്യകൾ ആഫ്രിക്കൻ രാജ്യങ്ങളുടെ ദക്ഷ്യസുരക്ഷയ്ക്ക് പ്രയോജനപ്പെടുത്തുകയെന്ന ലക്ഷ്യത്തോടെ ശ്രീകാര്യം കേന്ദ്ര കിഴങ്ങുവിള ഗവേഷണകേന്ദ്രത്തിൽ അന്താരാഷ്ട്ര പരിശീലനപരിപാടി തുടങ്ങി.

പരിപാടി കെനിയൻ ഹൈക്കമ്മീഷനിലെ മിനിസ്റ്റർ സാമുവേൽ കരിചോ ഉദ്ഘാടനം ചെയ്തു.

പരിപാടിയിൽ വിവിധ ആഫ്രിക്കൻ രാജ്യങ്ങളിൽ നിന്ന് 23 പ്രതിനിധികൾ പങ്കെടുക്കുന്നുണ്ട്.

മുൻ അമേരിക്കൻ പ്രസിഡൻ്റ് ബരാക് ഒബാമയുടെ ഇന്ത്യാ സന്ദർശനവേളയിൽ ഉദ്യമിയിടത്തെ ആശയമായിരുന്ന ഇന്ത്യ-അമേരിക്ക-ആഫ്രിക്ക ത്രികോണ പരിശീലന പരിപാടി.



കേന്ദ്ര കിഴങ്ങുവിള ഗവേഷണകേന്ദ്രത്തിൽ തുടങ്ങിയ അന്താരാഷ്ട്ര പരിശീലന പരിപാടി കെനിയൻ ഹൈക്കമ്മീഷനിലെ മിനിസ്റ്റർ സാമുവേൽ കരിചോ ഉദ്ഘാടനം ചെയ്യുന്നു.

സി.ടി.സി.ആർ. ഡയറക്ടർ അർച്ചന മുഖർജി, റൂർ ഡോ. ജയിംസ് ജോർജ്ജ്, പ്രൊജക്ട് കോ-ഓർഡിനേറ്റർ വർ സംസാരിച്ചു.

- 1. Name of the publication/Date : **Deshabhimani** 6 - 4-2017
- 2. Language of publication : Malayalam
- 3. Place of publication : Thiruvananthapuram

### കിഴങ്ങുവിള ഗവേഷണ കേന്ദ്രത്തിൽ അന്താരാഷ്ട്ര പരിശീലനം

തിരുവനന്തപുരം > ശ്രീകാര്യം കേന്ദ്ര കിഴങ്ങുവിള ഗവേഷണ സ്ഥാപനത്തിൽ അന്താരാഷ്ട്ര പരിശീലനം തുടങ്ങി. കെനിയൻ ഹൈക്കമ്മീഷൻ മിനിസ്റ്റർ സാമുവേൽ കരിചോ ഉദ്ഘാടനം ചെയ്തു.

രണ്ടാഴ്ചത്തെ പരിശീലന പരിപാടിയിൽ വിവിധ ആഫ്രിക്കൻ രാജ്യങ്ങളിൽ നിന്ന് 23 പ്രതിനിധികൾ പങ്കെടുക്കുന്നു. ഹൈക്കമ്മീഷൻ 'മാനേജ്' ഡയറക്ടർ ഉഷാ റാണി മുഖ്യപ്രഭാഷണം നടത്തി. സിടിസിആർഐ ഡയറക്ടർ ഡോ. അർച്ചന മുഖർജി, പ്രൊജക്ട് കോ ഓർഡിനേറ്റർ ഡോ. ജയിംസ് ജോർജ്ജ് തുടങ്ങിയവർ സംസാരിച്ചു.

മുൻ അമേരിക്കൻ പ്രസിഡൻ്റ് ബരാക് ഒബാമയുടെ ഇന്ത്യാ സന്ദർശനവേളയിൽ ഉദ്യമിയിടത്തെ ആശയമാണ് ഇന്ത്യയും അമേരിക്കയും ആഫ്രിക്കയും ചേർന്ന ത്രികോണ പരിശീലന പരിപാടി. കിഴങ്ങുവിള ഗവേഷണ രംഗത്തെ നൂതന സാങ്കേതികവിദ്യകൾ ആഫ്രിക്കൻ രാജ്യങ്ങളിലെ ദക്ഷ്യ സുരക്ഷയ്ക്കായി പ്രയോജനപ്പെടുത്തുകയാണ് ലക്ഷ്യം.

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April 18, 2017

Dr. Archana Mukherjee  
Director, ICAR-CTCRI  
Trivandrum, India

Dear Dr. Mukherjee

I write representing the Liberia business Incubator and the African Women Entrepreneurship-Liberia Chapter extending my heartfelt thanks and appreciations to USAID, the Indian Government, Manage and CTCRI for the organizing, sponsoring and the implementing the Feed The Future India Triangular Training (FTFITT) program.

Being a beneficiary of this program from Liberia, I have come to the conclusion that post harvest loss has to be curtail if any country want to have food security. And this can only be done effectively through proper planting methods and food preservation/value addition of those foods that will be grown.

Secondly, the importance of the orange flesh sweet potatoes and its benefit is yet to be explore in Liberia. Lack of Vitamin A deficiency can reduce in children if more emphasis is placed on the cultivation and consumption of this crop.

My project in Liberia is to work with female farmers/entrepreneurs in adding value to locally grown products, create awareness on the importance of Orange Flesh Sweet Potatoes as well as multiply the vine to the farmers for planting.

In this regards, I am kindly requesting for the following items to help accomplish my Work Plan.


Technologies such as Chips making machines, Slicer, extruder, pasta making machine and a packaging (weight, seal and cut) machine be provided to establish a mini processing center for value addition purposes.

Dr G. Padmanja and Dr. Sajeev to serve as my mentor to assist me in establishing mini processing center and to conduct hands on training to the women in adding value to tuber crops.

Orange Flesh sweet Potatoes Vines are provided as planting materials for multiplying.

In conclusion, I will once again say thank you for this opportunity given me. An opportunity that will be very useful to the Liberian women entrepreneurs and farmers.

Sincerely yours

  
Ms. Rugie Barry Wonyene

CEO Liberia Business Incubator/AWEP-Liberia