A Research Study on

Impact of FTF ITT programs

Final Report

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Disclaimer

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ABBREVIATIONS

ACMV	African Cassava Mosaic Virus
AESA	Agro-Ecosystem Analysis
AFRISA	Africa Institute for Strategic Services and Development
AHITI	Animal Health and Industry Training Institute
AI	Artificial Insemination
ASDSP	Agriculture Sector Development Support Programme
ATVET	Agricultural Technical and Vocational Education and Training
BAWP	Back At Work Plan
BDU	Balk Dairy Union
BIRD	Bankers Institute Rural Development
CAADP	Comprehensive African Agricultural Development Program
CFTRI	Central Food Technology Research Institute
CFUGs	Community Forest User Groups
CIAE	Central Institute of Agricultural Engineering
CIMMYT	International Maize and Wheat Improvement Center
CIPHET	Central Institute of Post-Harvest Engineering & Technology
CMD	Cassava Mosaic Disease
COVID	Corona Virus Disease
CRIDA	Central Research Institute for Dryland Agriculture
CTCRI	Central Tuber Crops Research institute
DPR	Directorate of Poultry Research
EACMV	East African Cassava Mosaic Virus
EPA	Extension Planning Area
FAW	Fall Army Worm
FDA	Food and Drugs Authority
FFS	Farmers Field School
FTF ITT	Feed The Future India Triangular Training
GDR	General Directorate of Rubber
ICAR	Indian Council of Agricultural Research
ICMV	Indian Cassava Mosaic Virus
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
IIHR	Indian Institute of Horticultural Research
IIMR	Indian Institute of Maize Research

IIMR	Indian Institute of Millet Research
IPM	Integrated Pest management
KARI	Kenya Agricultural Research Institute
KES	Kenyan Shillings
KISAN	Knowledge-Based Integrated Sustainable Agriculture in Nepal
MAIL	Ministry of Agriculture, Irrigation and Livestock
MANAGE	National Institute of Agricultural Extension Management
MBC	Malawi Broadcasting Cooperation
ME	Methyl Eugenol
MEA	Ministry of External Affairs
NARO	National Agricultural Research Organization
NCDC	National Curriculum Development Centre, Uganda
NDRI	National Dairy Research Institute
NEPAD'S	New Partnership for African Development
NGO	Non-Government Organization
NHLP	National Horticulture and Livestock Project
NIAM	National Institute of Agricultural Marketing
NIPHM	National Institute of Plant Health Management
NPV	Nucleo-polyhedrovirus
NR	Natural Rubber
NTFPs	Non-Timber Forest Products
NYNCC	National Youth Network on Climate Change
OFSP	Orange Fleshed Sweet Potato
PDAFF	Provincial Department of Agriculture Forestry and Fisheries
PMU	Program Management Unit
POCs	Points of Contact
QDS	Quality Declared Seed
SDG	Sustainable Development Goal
SHG	Self-Help Group
SMEDI	Small Medium Enterprise Development Institute
UGX	Ugandan Shillings
UIRI	Ugandan Industry Research Institute
USAID	United States Agency for International Development
VFPCK	Vegetable and Fruit Promotion Council Kerala
WoFaAK	Women Farmers Association Kenya

I. Introduction

In several countries across the globe, agriculture contributes to the livelihood of majority ofthe population. In some countries of Africa and Asia agriculture supports up to 60-70 % ofits population. Many of these countries are conspicuous by their rich natural resource base and varied agro climatic conditions. At the same time, they are troubled by the problems of poverty, malnutrition, unemployment, traditional agriculture practice and fragmented land holdings.

The global scientific community is persistently working for the development and upscaling of new innovations and technologies suitable to meet the food security demands of the ever increasing population. Despite the technological advances, farmers are unableto utilize these technologies for increased crop production and better incomes. The key reasons being inefficient extension system and poor transfer of technology. A holistic approach to offer solutions to the problems of the third world country through addressing the training and capacity gaps of the officials involved in agricultural technology transfer in these countries is quite essential. This approach of training and capacity development should lay equal emphasis on production, environment and ecological concerns, processing and value addition, marketing and supply chain management and profitability through agri-business ventures.

After independence, the Indian agriculture industry has experienced a revolutionary breakthrough in food grain production. The once food deficient country, today India is self sufficient in its food grain requirement. The Indian agriculture has accummulated diverse experiences through the implementation of several programmes since independence. Starting from Grow More Food Campaign (GMF) - 1948, Community Development Programme (CDP) – 1952, Intensive Agricultural District Programme (IADP)-1960, Intensive Agricultural Area Programmes (IAAP)-1966), High Yielding Variety Programme(HYVP) -1966, Operational Research Project (ORP) - 1971, Lab to Land Programme (LLP) - State Agricultural Extension Projects (T & V) 1974-75, National Agricultural Research Project (NARP) 1980-88 in the pre-liberalisation era were primarily addressing the food security and employment issues. Post liberalisation measures, the programmes and the efforts in India were directed towards creating the agribusiness opportunities in Indian agriculture. As a result of this, several changes were seen capital formation, exports and imports, investment in new technologies and rural infrastructure, patterns of agricultural growth, agriculture income, employment, agricultural prices, food security, reduction in commercial bank, credit to agriculture, etc. Indian seed market opened up to global agribusinesses, encouragement to cash crop, and reduction of pesticide subsidy etc.

But in Africa, the scenario of agribusiness is different. Africa is now at a crossroads, from which Africa need to focus on the steps to realize its potential or else Africa will continue to lose employment, food security, competitiveness and missing a major

opportunity for increased growth (The World Bank, 2013). Many countries in Asia face similar challenges. These problems can be overcome by inclusion of more number of people in agriculture, value chain system, Agricultural cooperatives and with better policies. In this context, several successful Indian innovations and experiences in the field of agribusiness can be helpful to the agriculture sector in several African and Asian countries. This idea was taken up and field extension officers from Asian and African countries were trained on Indian experiences in expansive themes on agriculture and allied sectors so that, they can implement the successful Indian interventions in their countries.

Indian agriculture is highly appreciated and globally well known for its phenomenal success despite the vast challenges like numerous small holding farmers, high percent of agriculture dependent labor force for their livelihood, disguised unemployment, and migration of youth to urban areas, etc. Most of the countries in Asia and Africa witness many similar challenges and constraints. Therefore, it was thought that, the success of the Indian agriculture can be aptly replicated in many countries of Africa and Asia through the transfer of its successful innovations and technologies.

In this scenario, a new agriculture partnership was formed between the United States of America and India during the state visit of the US President to India in November, 2010. This partnership aimed to achieve Ever Green Revolution that will address the issues of Global Food Security through Triangular Cooperation. The effort included adapting technological advances and innovative solutions to address Food Security Challenges in Africa and Asia. Besides, it includes areas such as health, energy, women empowerment and sanitation under the statement of guiding principles on triangular cooperation for global development. This initiative gained impetus over the years and the effectiveness of Indian innovations and technologies for Africa wastested through a pilot project. The initial pilot project focused on three African Countries i.e., Kenya, Liberia and Malawi with potential to expand throughout the African Continentin later stages. National Institute of Agricultural Extension Management (MANAGE), Hyderabad and the National Institute of Agricultural Marketing (NIAM), Jaipur with the support of USAID India conducted seven training and capacity development programs to train 219 executives from Kenya, Liberia & Malawi. Feedback surveys of the participants from the beneficiary countries were awe-inspiring and showed the merit in expanding its scope to covering broad areas of agriculture.

To continue the good work under the pilot phase, the Feed The Future India Triangular Training (FTF ITT) was deasigned as part of the new agriculture partnership implemented by the USAID India representing US Government and National Institute of Agricultural Extension Management (MANAGE), Hyderabad representing Ministry of Agriculture, Government of India. FTF ITT had set a target of organising 44 training capacity development programmes for the field level officers of Africa and Asia during 2016-20. The partner countries in the programme included: Afghanistan, Bangladesh,

Botswana, Cambodia, Democratic Republic of Congo, Ghana, Kenya, Lao PDR, Liberia, Malawi, Mongolia, Mozambique, Myanmar, Nepal, Rwanda, Sri Lanka, Sudan, Tanzania, Uganda and Vietnam.

A comprehensive 'Demand Analysis' from the partner countries was carried out and the program was designed such that the needs of the target countries are addressed. As a result, the USAID India and Ministry of External Affairs (MEA), Government of India launched a program titled 'Feed The Future India Triangular Training' (FTF ITT) on 25th July, 2016 in New Delhi. The program was designed to organize 44 need based training programs which benefitted 1144 executives from 21 partner countries from Asia and Africa (Fig. 1) during the program period (2016 – 2020).

Fig. 1: Partner Countries under the FTF ITT Program

The impact of the training and capacity development is complete when the desirable change in the the knowledge, skill and attitude of the participant is put to practice. the FTF ITT training program implemented between 2016-2020 has possibly created an impact in partner countries because of their developmental efforts after the training program. Any positive outcome from such training and capacity development activities will lead to renewed interest among the donors for development initiatives. In this background, the present research study was undertaken to conduct the impact analysis of FTF ITT program with the following objectives.

Objectives of the study.

1) To know the impact of FTF ITT program on training and capacity development of agriculture extension officials from partner countries.
2) To measure the improvement in professional capacities of the executives trained under FTF ITT
3) To document the development initiatives undertaken by the trained officers under FTF ITT and document the successful cases of their efforts.

The research report is presented as chapters. The chapter on introduction gives the background of the FTF ITT project and rationale of the research study. The methodology chapter describes the steps and methods followed in data collection for

conducting the study. The results and discussion presents the salient impact created by the FTF ITT project through the efforts of trainees from different countries. The tools of data collection and other relevant information is presented as annexures.

II. Methodology

The FTF ITT training programs were organized in collaboration with premier national and international organizations of proven repute and subject domain expertise (annexure I). The FTF ITT programs were advertised phase wise through MANAGE website and emails to the respective Points of Contacts (POCs). The participants from all the 20 partner countries were nominated by the POCs of their respective countries. The POCs received the advertisement of the programs announced by the Program Management Unit (PMU), MANAGE, India and sent suitable nominations for the notified training programs. The PMU team at MANAGE scrutinized the participants according to their eligibility criteria and finalized the applications after telephonic verification. The logistics (transport and accommodation) facilities were arranged or facilitated by MANAGE during the 15-day training program at different partner training institutes in India. The trainings conucted druring 2016-2020 were participatory in nature emphasizing on practicals, field exposures and hands on demonstrations in the laboratories.

The impact analysis of FTF ITT was taken after the completion of the implementation of FTF ITT. In view of the objectives set for the study, the impact was assessed on extent of human and instituional capacity developed in different partner countries of the program, the change in the professional competence of the trainees and the development initiatives taken up by the selected countries though their Back at Work Plans.

To assess the impact of FTF ITT on human and institutional capacity, the number of officers trained in different countries, the sectors (Government, Non-Government/ civil society) from which the executives are trained and the themes of agriculture and allied disciplines addressed through FTF ITT. The change in professional competence was assessed by comparing the improvement in the scores obtained on pre-training test scores with the post-training test scores. The formula used to calculate the change in knowledge is as below.

$$\text{Change in Knowledge (\%)} = \frac{\text{(Post test Score-Pretest score) X 100}}{\text{(Pretest score)}}$$

The BAWP is a plan of work elicited through a set of 17 questions introduced to trainees as questionnaire.

The details of the questionaire designed is aimed primparily to facilitate the trainees to address one agriculture problem in their jurisdiction of work based on the knoweldge gained during their training under FTF ITT. Further questions will help the trainees for problem identification, analysis of problem, framing objectives of work plan, identifying actions/ follow-up actions of work plan, anticipate the developmental challenges in their country, working out strategies to work with superiors and subordinates, expected outcome and time required to achieve the objective/s of work plan. A theoretical framework of

BAWP is given in figure 2.

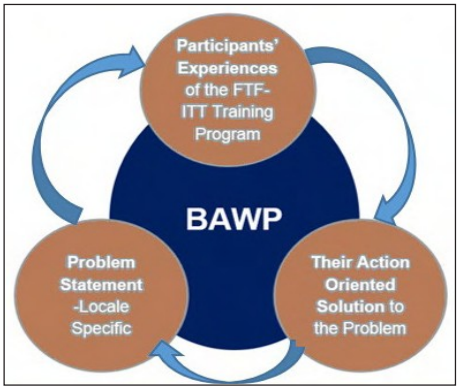


Fig 2. Framework of Back at Work Plan

The data collected through these questionnaires are triangulated through telephonic interviews and the best initiatives of the trainees are compiled as success stories. The selected works implemented by trainees are documented for their further dissemination among the extension functionaries in different partner countries. The BAWP proforma for identifying the work and reporting progress on BAWP are attached as Annexure II & III.

III. Results and Discussion

The results of the research study are presented in line with the objectives of the study. The results are presented under the following heads.

1. Impact of FTF ITT program on training and capacity development of agriculture extension officials from partner countries.
2. Extent of improvement in professional capacities of the executives trained under FTF ITT
3. Documentation of successful cases of the development initiatives undertaken by the trained officers under FTF ITT.

Impact of FTF ITT program on training and capacity development of agriculture extension officials from partner countries.

The FTF ITT program provided the opportunity for 1144 field level officials from 20 countries ofAfrica and Asia. These officials were selected and trained on their area of working under 13 important training themes mentioned in table 1. The country wise and gender wise participation of officials from all the partner countries are given in table 2.

Table 1: Training themes and number of trainings organized

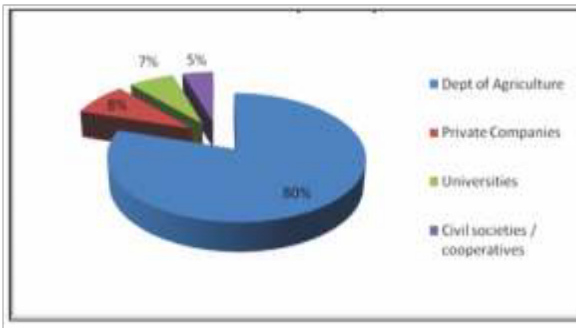
Sl. No.	Training Theme	No. of Trainings *
1	Post-Harvest Technologies and Value Addition	13
2	Agribusiness Management/Entrepreneurship Development	9
3	Horticulture (Tuber crops, Plantation crops, Spices)	8
4	Agriculture Extension/ ICT Application in Agriculture/ Creditand Agriculture Policy	7
5	Agricultural Marketing	5
6	Plant Health Management	4
7	Women Empowerment	4
8	Animal Husbandry and Dairy	3
9	Climate Smart Agriculture/ GAP	2
10	Natural Resource Management	2
11	Fisheries/ Poultry	2
12	Mechanization in Agriculture	1
13	Agroforestry	1

Sl.No.	Country	Male	Female	Total
1	Afghanistan	142	17	**159**
2	Bangladesh	10	5	**15**
3	Botswana	14	12	**26**
4	Cambodia	27	18	**45**
5	DR Congo	3	8	**11**
6	Ghana	38	18	**56**
7	India*	8	2	**10**
8	Kenya	70	55	**125**
9	Lao PDR	0	1	**1**
10	Liberia	45	35	**80**
11	Malawi	52	59	**111**
12	Mongolia	22	24	**46**
13	Mozambique	23	8	**31**
14	Myanmar	42	36	**78**
15	Nepal	64	13	**77**
16	Rwanda	0	0	**0**
17	Sri Lanka	35	22	**57**
18	Sudan	7	17	**24**
19	Tanzania	15	11	**26**
20	Uganda	91	74	**165**
21	Vietnam	1	0	**1**
	Total	**709**	**435**	**1144**

The officials trained under the FTF ITT represented the Government development departments, Universities, Non-government and private sectors. Majority of the respondents (80 per cent) attending the FTF ITT programs were working in the Government and Department of Agriculture sector, 8 per cent in private companies, 7 per cent in Universities and 5 percent belonged to civil societies and cooperatives. The representation of trainees attending the FTF ITT belonging to different sectors is given in table 3 and the adjacent graph.

Sector	Number of participants
Dept. of Agriculture	915 (80 %)

Private Companies	98 (8%)
Universities	78 (7%)
Civil societies / cooperatives	53 (5%)



Since, the majority development initiatives of the developing nations are designed and implemented by the government agencies, it is very apt that, the officers from the Government department are sensitised enough under the FTF ITT. Besides to give opportunity for participation in the development initiatives, the participants from academia and the civil society were also trained. This is an important strategy to ensure sustainable implementation of development initiatives in all developing countries.

Extent of improvement in professional capacities of the executives trained under FTF ITT

The cumulative results from all the 44 FTF ITT programs showed a significant improvement inthe level of their knowledge due to the training. The average cumulative change in knowledge (%) was found to be 52.07%. The figure gives an account of increase in the knowledge level of participantsfrom 43 training programs. Through the trainings, the FTF-ITT program has achieved considerable rate of success resulting in satisfaction ofthe trainees (9.08 on a scale of 10)

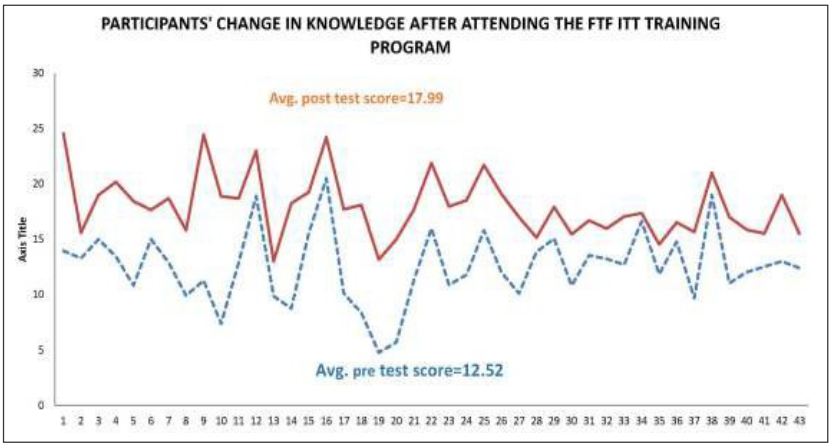


Fig. 3 Participants' change in knowledge after attending the FTF ITT training program

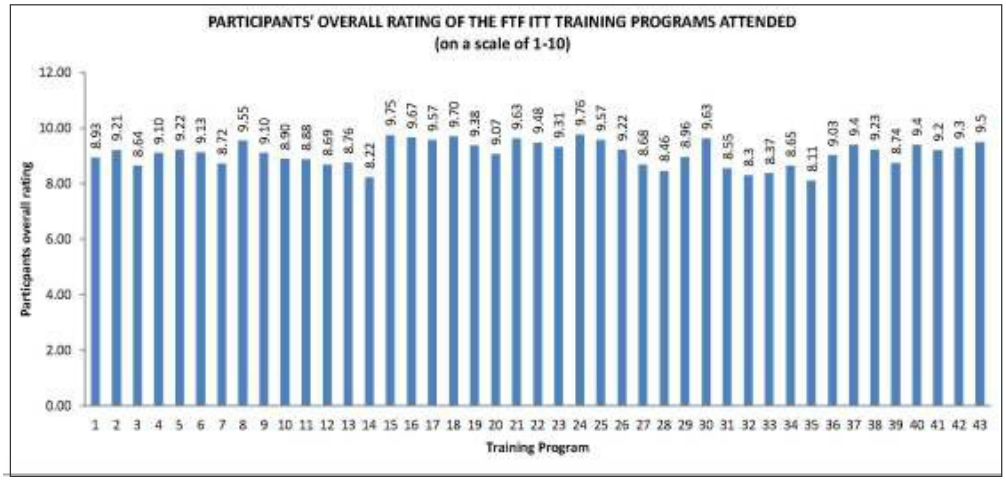


Fig 4. Participants' overall rating of the FTF ITT training programs attended

Documentation of successful cases of the development initiatives undertaken by the trained officers under FTF ITT

Based on all the successful execution of the BAWP received, the chosen stories are published representing different themes of agriculture and related disciplines. The broad themes identified for listing of the success stories are given below.

Sl. No	**Theme**
1.	Agriculture
2.	Horticulture
3.	Animal Husbandry, Dairy and Poultry
4.	Plant Health Management
5.	Post-Harvest Technologies and Value Addition
6.	Women Empowerment, Youth in Agriculture and Livelihood Security
7.	Information Communication Technologies (ICT) in Agriculture
8.	Mechanization in Agriculture
9.	Policy Impetus in Agriculture

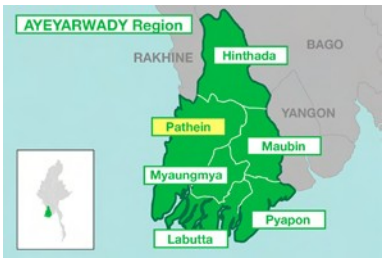
Agriculture

Increasing registered seeds production using foundation seeds at Thayaung Chaung seed farm in Myanmar

Ms. Kyi Kyi Oo from Myanmar working at Seed Production and Rice Research, Thayaung Chaung Seed Farm, Seed Division attended the 33rd FTF ITT program on 'Seed Production, Processing and Commercialization' during 12-26th February, 2019 at National Seed Research and Training Centre (NSRTC), Varanasi, Uttar Pradesh, India.

Ms. Kyi has implemented her Back at Work Plan on Rice Seed Production (Foundation Seeds to Registered Seeds) at Thayaung Chaung Seed Farm. The lessons learnt during the training on seed production were implemented at her region. The problem identified by Ms. Kyi is that the seed farm is located at Pathein City, Ayeyarwaddy Division at Lower region in Myanmar (see map). Ayeyarwaddy Division area happens to be a heavy rainfall zone and annually there was heavy flooding in Thayaung Chaung Seed Farm resulting in lodging and crop loss.

Map: Sagaing Division in Upper Region



Ayeyarwaddy Division in Lower Regions of Myanmar

(Map only for representation and not to scale)

To address this concern Ms. Kyi decided to go for quality seed production in 1 acre field in Thayaung Chaung seed farm to use the land for productive purpose. The Pawsan Yin variety was selected for seed production based on its characteristics such as rich aroma, slightly light photosensitive and high potential for export in Myanmar. Pawsan Yin variety is 145-150 days duration and cultivated in the Sagaing Division in upper region of Myanmar and Ayeyarwaddy Division and Mon Race in lower regions of Myanmar (see map).

The pre-sowing land preparation was done in the field on 13 June, 2019 as fig. 1.

Land preparation: Ploughing and Harrowing

Fig. 1 Ploughing

Fig. 2 Harrowing

The field was harrowed one to two times in second week of July 2019. Subsequently other agronomic practices such as weed removal, removing the after a year rice straw, repairing of bunds and careful leveling of the land was done according to the standard package of practices.

Clean Seed Production: Firstly, the Pawsan Yin seed was cleaned with water as shown in Fig. 2 and soaked in water for 24 hrs. by mixing 1-gallon water**:** 1 cc spoon Manda 31 liquid. They were placed on seed bed and incubated for 36 hrs under regular monitoring of water and fungicide (to prevent the soil and seed bone diseases). Ms. Kyi has followed the wet bed method of seed bed preparation and the germinated seed was broadcasted uniformly on the wet bed. Urea (N) 12.5kg/acre and Potash (K2O) 6.25kg/acre were applied at 14 days seedling stage. The rice seedlings (30days) were

1. Clean Seed Production

2. Seed Treatment

3. Fungicide Spray

4. Wet Bed Preparation

5. Nursery Bed

6. Transplanting

transplanted @ 2-3 plants per hill in the field on 18th July, 2019. The spacing followed was 20 x 20 cm between plant and row. By following this method Ms. Kyi has reported to have witnessed very uniform and good growth of the seedlings in the nursery stage. The advanced training on quality seed production has helped her to have a clean seed with good package of practices for higher crop yield.

Contact Details

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Story of change from growing grain to growing seeds in the 'Food Basket of Uganda'

Mr. Alfred Kilama, an Agricultural Extension Officer from Nwoya District, Uganda attended the 35th FTF ITT International Training Program on 'Agribusiness and Management' held during 18th June – 2nd July, 2019 at National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana, India.

Map of Nwoya District, Uganda

Nwoya County is popularly known as **'Food Basket of Uganda'**, with agriculture as the dominant sector in the economy. The Census revealed that a total of 5.8 million households engage in agriculture. More than two thirds (69 percent) of households derived their livelihoods from subsistence farming as the main source of income. In terms of employment, the majority of the working population (65 percent) are subsistence farmers. https://www.ubos.org/wpcontent/uploads/publications/2014CensusProfiles/NWOYA.pdf

As said in the census report, large number of farmers are engaged in subsistence farming. Earlier, cereals were grown only for grain purpose with less scope for seed multiplication in Uganda. The major challenges faced by rural Ugandan small-scale farmers in agriculture are shortage or lack of access and high prices for quality seeds. Within the community, many farmers find it difficult to buy improved seeds and hence they are highly dependent on indigenous/local (Self-grown) seeds. The majority farmers in Uganda cultivate mainly for grain purpose whereas, seed multiplication has least scope. The main reason behind the scenario is that farmers are not aware of seed multiplication and growing quality seed production techniques. Farmers who grow for grain purpose get very low yield due to poor-quality seeds used for sowing.

Mr. Aflred Kilama learnt about the prospect of seed production as an agribusiness opportunity, under FTF ITT international training on 'Agribusiness and Management' at MANAGE, Hyderabad, Telangana, India. Mr. Kilama took large interest in seed industry and their business in India during the sessions and practical exposure visits organized during the training. As a result of learnt lessons on production in the view of agribusiness and management, he took the initiation on sensitizing small farmers who were still practicing subsistence farming about commercial seed production technique to enhance their farm income. He conducted many trials and result demonstrations in the farm fields of small farmers of Nyowa district (County), Uganda with the help his subordinate officers to spread the idea of quality seed production in large scale.

The impact of the action was more than expected. As a result, production, productivity and quality of groundnut, soybean and rice seeds increased with sales even beyond the district boundary. He guided a group of farmers and other agriculture officers of the county and developed two (2) business plans.


Left: Government adjudicator for Business Plans Competition for funding for agriculture small grant
Right: The Hon. Minister Vincent Ssempijja B making his and Evaluation team during the sesame field inspection

The first business plan was for procurement of tractors at subsidized rates and another for storage facility and establishment of rice mill. Upon evaluation, the Ministry of Agriculture approved their business plan. In fact, Ugandan government has offered one tractor with disc harrow and disc plough to help the group to expand on seed production activity. As of now, the group has expanded acreages for seeds production from 30 acres to 160 acres. They have so far raised UGX 46 Million (Ugandan Shillings) per group in 3 months. The groups are using the money raised from hiring services to buy breeder and foundation seeds and offer as loan to members. They propose to buy another tractor from the proceeds of hire services and group saving from sales of seeds. Mr. Kilama thanks to the training in India for this idea on custom hiring centres.


Left: Hon Minister, Ssempijja Vincent discussing with officers along with DAO Mr. Kilama Alfred (addressing the performance of sector in development of the district and the county)

Right: Hon Minister Vincent Ssempijja touring the farm implements that NUAC farm can offer to the farmers

Due to the increasing demand of quality seeds by commercial and individual farmers, 6 more farmer groups have started local seeds business in the district under the guidance of Mr. Alfred Kilama & his subordinate extension officers. Mr. Alfred is the in-charge of carrying out quality assurance through field inspections of the seeds plots at least 2-3 times before harvest. After harvest, he picks the seed sample, carry out seed analysis and test in the mini laboratory and submit the result for acquisition of certification and seed labels to allow the groups to sell their seeds.

In total the 7 Local Seed Business farmer groups during last season produced and sold close to 785 MT of Quality Declared Seeds worth over UGX 2.3Bn. The group members' livelihood has greatly changed and members' asset base also increased with total self-actualization evidence. Though the Quality Declared Seed (QDS) are supposed to be sold only within the country, the overwhelming demands coupled with the trust built on LSB has attracted many customers from across the country who place order from the LSB on pre-season.

Storage facility and machine shelter at completion for Nwoya Cassava Growers Cooperative with funding from matching grant after successful a business plan

Major outcome:

- The adoption rate of techniques of seed production was found high and many farmers are engaged in seed production.
- Perception of farmers on subsistence farming to commercial farming changed positively due to the ideas such as custom hiring centres.
- The seeds business has triggered a different dimension of farming as a business within the district
- More than 240 ordinary farmers engaged in quality seed production within just two seasons as compared to undirected farming system.
- Assured markets for Quality Declared Seed (QDS) is established.

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Good Practices in fodder production and Co-operative marketing as impetus to increase milk production in Kenya

Since independence, Kenya has relied heavily on the agricultural sector which includes livestock production as the base for economic growth, employment creation and generation of foreign exchange. About 70% of the country's population lives in the rural areas and depends on agriculture and livestock production for livelihood. Livestock sector provides food and cash needs of farmers, employment to about 10 million people and contributes ten percent to GDP through sales of milk, milk products, eggs, and small stock like sheep, goats and chicken.

Kenya is one of the largest producers of dairy products in Africa with about 3.5 million improved dairy cattle, 9 million zebu, 900,000 camels and 12 million goats. Dairy industry in Kenya is a relatively more developed livestock sector compared to dairy industries in other countries of Africa. Dairy cattle are ruminants whose production is based on fodder. Majority of dairy herds in small holder farms in Kenya largely depend on natural tropical grass pastures and crop residues for nourishment.

The term Cooperative is used in different ways in different countries, as it covers different types of cooperatives which operate with different byelaws. Most definitions have been built upon certain formal organizational characteristics, like open membership, internal membership democracy, voluntary membership, and distribution of surplus according to turnover.

Mr. Stanley Njogu Humaiya from Kenya trained under the FTF ITT training program on 'Strategies for Enhancement of Farmers Income in Dryland Agriculture' held during 16th-30th January, 2018 at ICAR-Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad, India. He initiated the task of providing trainings for the farmers of Machakos County, Kenya with the objective to increase fodder acreage and facilitate milk marketing through cooperatives as an impetus to augment milk production locally.

The members of agricultural cooperatives are farmers and therefore primarily concerned with production. This requires a variety of support services. A cooperative can play an important role in meeting the needs of its members by providing them with services that help them optimize their production. When farmers do not produce for their own use but aim to sell their produce at the market, they might need additional services: for example, transporting and sometimes sorting and grading and adding value through processing. Another important group of services in which many cooperatives are engaged is related to the marketing of produce.

He organized the capacity building conservation program, registering dairy groups, acquisition of cooling facilities, fodder seed acquisitions and fodder conservation as a result of his efforts. The farmers were able to increase from 5 liters to 10 liters per cow per day-likewise the milk intake increased from 2500 liters to 5000 liters per day. The plant is in the process of making mala and yoghurt for sale in order to increase farmer's income.

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Harnessing legume intercropping in agriculture and food security in Tanzania

Ms. Mwaindi Iddi from Tanzania attended the 42nd FTF ITT International training program on 'Good Agriculture Practices for Sustainable Agriculture in Developing Countries' conducted during 11 -25th February, 2020 at International Crop Research Institute for Semi-arid tropics (ICRISAT), Hyderabad, Telangana, India. A report of the United Republic of Tanzania (URT, 2017) shows that Tanzania has started experiencing the impacts of climate change and variability like other developing countries. In order to make sure that agriculture is sustainable, several good agriculture practices, programs and policies have been recommended to develop resilience against climate-related shocks. For instance, techniques such as minimum tillage, mulching, intercropping, crop rotation, use of improved crop varieties and manure management can help to increase crop productivity and adaptation thus, food security will be achieved.

Ms. Mwaindi organized a training to sensitize agriculture tutors on different practices and technologies which can scale up agriculture and minimize shocks caused by climate-related risks. The plan also included the training of finalist agriculture students and establishment of demo plots but it was not successful because of Corona Pandemic in March 2020. Since the students went on lockdown during March to May, 2020 this plan will be renewed again during the next cropping season.

However, in April 2020 four plots were established in a highly nut grass (*Cyperus rotundus*) infested field to demonstrate the practice of intercropping. The 1st plot was planted with cassava only, 2nd plot was planted with cassava and cowpeas, 3rd plot was planted with maize and groundnuts and the 4th plot consisted with maize and cowpeas.

Hand weeding was done by uprooting the nut grass (dominant weed) and other weeds; black jack (*Bidens pilosa*) and quick weed (*Galinsoga parviflora*). This practice was accompanied by earthling up the crops using a hand hoe.

Harvesting of cowpeas leaves for fresh market was done twice at an interval of 12 days. The leaves were freshly harvested and sold to vegetables vendors.

Figure 1

Outcome

All the intercropping plots performed well in terms of weed control compared to the plot without intercropping as shown in figure 1 and figure 2.

Figure 2

The plant canopies of cowpeas and groundnuts in intercropped plots were well developed and covered the soil in such a way that

the emergence of new weeds was restricted (figure 1a and figure 2a). Thus, there was no need for other weeding compared to the plot without intercropping. The reduction in number of weedings helped to reduce the cost of weeding and saved time too which enable the farmer to attend other development activities.

Figure 1a

Intercrops not only aid in weed control and moisture conservation but also serves as security food in case of failure of the main crop. For instance, cowpea besides its ability to control weed, also helps in moisture conservation, and supplies nutrients to the soil. The cowpea leaves are consumed fresh especially during wet season and in dried form during the lean or dry season while the mature seeds are consumed as pulses. The leaves can also be sold at the market to get money for household income.

Figure 2a

In addition, the plots of maize and cowpeas, maize and groundnuts intercropping were observed to have minimum fall army worm (FAW) infestation compared to the nearby field without intercropping. Probably these legumes created a microclimate which was not conducive for FAW.

Conclusion:

Main crops such as cassava and maize can best be intercropped with cowpeas and groundnuts but intercropping with cowpeas has many benefits which not only serve as food security but also improves livelihood through sales of leaves as vegetables. Therefore, small holder farmers especially women taking up the cultivation of cowpeas as vegetable is a good proposition to augment their income.

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Adopting Indian urban and semi-urban farming practices in Kenya

Mrs. Shelmith Waruguru Mucoki is one of the participants of FTF ITT program on 'New Dimensions in Agriculture Extension Management' organized by MANAGE. During the training period at MANAGE, she attempted impactful initiatives in Agriculture Extension system that would make a difference among farmers that needed no funding to implement but required 3 things, knowledge, skills and the right attitude. After the training at MANAGE, she shared her back at work report with Ministry of Agriculture, Kenya and Livestock and Fisheries. Under her guidance, the Nakuru County Officials and a team from Egerton University and started the following projects:

1. Established kitchen garden with urban and peri-urban farming techniques which she learnt during the field visits to Vegetable and Fruit Promotion Council Kerala (VFPCK), Kochi and at IARI in New Delhi, India. She learnt improved kitchen garden establishment techniques and incorporated it with other Kenyan techniques like using empty small poultry feeds gunny bags which are plenty and cheap compared to the high cost of clay pots.

2. Trained all the Sub-County staff on the topic 'Urban and peri-urban farming experience in India'. She established a plot with these techniques outside the ministry office for training staff and farmers who visited the office. Same kitchen garden techniques have been transferred to farmers in various villages. Kitchen garden demonstrations competitions and kitchen garden field days have been conducted for 3 years in 7 sites covering 300 trained farmers.
3. In June 2018, she established The Nakuru farmers call Centre -ICT -Mobile use in agriculture information dissemination to farmers through Nakuru farmers call Centre. Now farmers can call/ SMS, send photos or questions through WhatsApp, Twitter and Facebook. This farmer's call center is supported by the county government of Nakuru which is in the process of making the call center toll free. It is the only one of its kind in Kenya.
4. She also wrote two research papers on her experiences from India along with her supervisors.

Outcomes:

- Established kitchen garden with urban and peri-urban farming techniques.
- Trained 7 officers and 300 farmers on urban and peri-urban farming experience in India. Established the Nakuru Farmers call Centre in Kenya.
- Published two papers.

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Participatory radio campaign on importance of soil health for sustained crop productivity in Malawi

The 17th FTF ITT International Training Program on 'Management of Technology and Extension for Soil Testing based Advisory Services to Farmers' was conducted from 30th January to 13th February, 2018 at ICAR-Indian Institute of Soil Sciences (IISS), Bhopal, Madhya Pradesh, India. After this training, one of the participant Mrs. Tuchitechi Hawonga, Program Manager from Malawi started a Participatory Radio Campaign on the importance of maintaining good soil health for sustainable crop productivity.

In Malawi, crop and livestock yield are far below the potential due to a number of natural and anthropogenic activities. Soils are in poor health due to physical and chemical degradation which has also affected the biological richness of the soil. Uptake of soil and water conservation technologies remains low due to the lack of information, knowledge and skills. In an effort to address this issue, Mrs. Tuchitechi started her back at work project in two districts of Malawi. The program was implemented in Karonga (area: 3,355 km^2; population: 194,572) and Chitipa districts (area: 4,288 km^2; population: 126,799) in the northern part of the country. Both districts together has 1,56,336 farmers. The program was aimed to teach farmers on soil health and sustainability related issues. She used the Participatory Radio Program as a tool to bring farmers and soil heath experts to a common platform. Her campaign was implemented in four different stages viz. introduction, discussion, decision making and implementation.

Mrs. Tuchitechi Hawonga during her campaign in radio station

A one hour live radio program was aired every Monday on Tuntufye Radio, a local radio station of Malawi. In the radio program, she invited the experts and guest speakers who talked about the current soil health status of the country and the targeted districts. They also provided information regarding the amount of soil lost in the two districts each year. Various case studies on the causes and consequences of poor soil health and subsequent reduction in crop productivity were discussed. Information was also provided to the farmers

regarding various strategies for maintaining good soil health and related agricultural practices.

As a result of this campaign, many farmers adopted the recommended soil conservation related agriculture practices in Malawi. Many farmers constructed physical soil conservation structures such as contour ridges, established grass hedgerows in their cultivated fields and adopted the practices like crop rotation, use of organic manure, etc. The beneficiary farmers of this campaign also shared their experiences regarding the advantages, challenges and major learnings after adopting these soil conservation practices.

Some of the observations of Mrs. Tuchitechi during her this back at work project are as follows:

- There was an active participation of soil health experts, government officers and scientists (Baka Research station as well as Karonga Agricultural Development Division Officers) of the concerned district.
- Significant numbers of farmer listeners showed their enthusiasm and need towards similar radio programs on various other agriculture related topics
- Farmers showed positive attitude towards adoption of recommended practices during the Participatory Radio Campaign

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Improving information dissemination and extension services in Southern Malawi

Ms. Diana Mayamiko Zambezi from Malawi was trained under the FTF ITT training on 'Entrepreneurship Development among Rural Women' held during 9th - 23rd May, 2018 at Kudumbashree, Thiruvananthapuram, Kerala, India. During the training she observed that farm mechanization approach leads to holistic development of Agriculture sector. Therefore, planning for agriculture development needs emphasis on development of farm mechanization as a priority. Smallholder production is derived almost entirely from family labour. Although labour is not considered a constraint for most farmers, labor shortages do occur during land preparation and harvesting periods, especially on larger holdings. Farm power was limiting smallholder production through the failure to meet crop labour requirements during critical periods (planting, fertilizing and weeding).

During the FTF ITT program, she also learnt about the use of draught animals and animal-drawn implements efficiently to reduce the labour requirements, resulting in increased labour productivity. Coupled with improved inputs, this led to improved land productivity through increased yields. African agriculture predominantly relies on waged labour. This problem is compounded by labor shortages arising from an ageing population, rural-urban migration, and diseases like HIV/ AIDS. Even in areas where rural population is increasing faster than the cultivated area, labor may be in short supply during critical field operations due to competition with more rewarding sectors, such as construction and mining.

Ms. Diana Mayamiko Zambezi inspecting the problem of irrigation equipment and fertilizers in the irrigated fields

One consequence of low farm mechanization is high labor drudgery, which disproportionately affects women, as they play a predominant role in weeding, threshing, shelling, and

transport by head-loading, and also makes the youth averse to take up farming. Sustainable intensification in sub-Saharan Africa appears unlikely if the issue of inadequate and declining farm power is not addressed.

She felt that Power supply could be increased through appropriate and equitable mechanization, while power demand could be reduced through power saving technologies. The improper use of agricultural machinery and equipment can increase pressure on already fragile natural resources and negatively impact employment, which is critical for the future of agriculture and rural areas in Africa.

Hence, Ms. Diana Mayamiko Zambezi took the initiative of spreading knowledge and skills that she gained from Entrepreneurship development among rural women training in India under Feed the Future. She expressed that the training has assisted her in implementation of learnings in the agriculture sector thereby improved her skills on delivering extension services in solving farmers problems. She has managed to improve Mkulumadzi irrigation scheme in Chasesa village, Tradition Authority Mlauli in Neno district of the Southern Region of Malawi. She applied the knowledge gained from India in a bottom up approach by discussing farmers' problems together with them and suggested solutions. Some of the problems identified were persistent droughts which make most of the farm families food-insecure and a solution to address that problem was to sow early maturity short duration varieties, planting of improved varieties, practicing irrigation, farming and application of manure in their fields. Another challenge identified was lack of irrigation equipment because of which the farmers were using pails while irrigating their crops which is hard and laborious. As a solution to this problem, the farmers were assisted with treadle pumps with the support from District agriculture department machinery and now they are using them as the easy way of irrigating crops.

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Farmers' Fields School (FFS) model of India for Ugandan farmers in tackling FAW

Fall Armyworm (FAW) scientifically called *Spodoptera frugiperda* is an insect pest native to tropical and subtropical regions of Americas. It is new to Africa and was first detected in Central and West Africa in early 2016. The pest was first reported in Uganda in June 2016 at Kayunga, Kasese and Bukedea districts. By end of 2017, the pest had spread to all the districts of Uganda. FAW is capable of feeding on more than 100 plant species with maize and sorghum being the most preferred hosts. In Uganda, the pest has been confirmed to be feeding on maize, sorghum, sugarcane, rice, millet, wild sorghum, cotton, napier grass, capsicum and rhodes grass by April 2018.

Ms. Geiga Pamellah Birungi an Agricultural Extension Officer from Uganda was trained under the FTF ITT International training program on 'Integrated Management Strategies for Major Crop Pests & Diseases in Developing Countries (With special focus on Fall Army Worm)' during 19th November- 3rd December, 2019 at National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana, India. The training theme was focusing on management aspects of Fall Army Worm through various methods and practices of agricultural extension like FFS, result demonstration, pest scouting and identification, etc. She picked up the concept of FFS from the lessons of the training program to disseminate knowledge on management of Fall Army Worm. The takeaways from the practical sessions during the visits to the research and development centers like National Institute of Plant Health Management (NIPHM), The International Maize and Wheat Improvement Center (CIMMYT) and Corteva Agriscience Pvt. Ltd. made her to gain complete knowledgeon principles and practices of fall army worm in Maize.

Demonstration on FAW in maize during the FFS demonstration

The Main Objectives of Back at Work Plan

- To form a farmer field school and sensitize members about effective FAW management through FFS.
- To spread awareness among the extension officers and farmers to control FAW.

Steps that were initiated to form a Farmer Field School:

- Farmers were sensitized and trained on the use and importance of farmer field school.
- Farmer field school was established at lower government level i.e. sub county level.
- Trained the officers on Good Agronomic Practices like seed bed preparation, seed treatment, seed sowing, planting rate manure application soil and water conservation practiced etc. in cereals especially maize and sorghum.

Ms. Geiga Pamellah during FFS in farmers plot

- Regular monitoring.
- Demonstration on management FAW through FFS in demonstration site/ farmers field.

Challenges

- Inadequate funds to cover a bigger area especially on transport.
- Lockdown due to Covid-19 curtailed the movement hence monitoring was affected.

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Training prison inmates on seedling production of agroforestry species in Uganda

Mr. Gawaya George, Afforestation Officer from Uganda was trained under 39th FTF ITT international Training on 'Agroforestry: Policy Practice and Impact' during 10 -24th October, 2019 at World Agroforestry Centre (ICRAF), New Delhi, India. In the training many agroforestry components were taught such as mini clonal technology, Hi-tech nursery, plywood, other wood-based industries, agroforestry and livelihood opportunities from Lac & Gum resin and value addition of plantation residues.

East Africa's population continues to grow and so does the demand for fuel-wood and wood products for construction and fencing. Wood is an embedded and vital part of the lives of most people in East Africa. Poor rural and urban communities, rely mostly on wood for energy and for construction. About 90% of this was fuel wood used for cooking and heating. Mr. Gawaya George realizes the scope of agroforestry and application part of agroforestry from the Indian experiences during the training. After he returned to Uganda, he committed to disseminate his learnt knowledge in unique way in his country. He chose to engage prisoners to work on his BAWP.

He identified the issue of inadequacy of seedlings for fuel wood production in Uganda Prisons. He decided to impart his knowledge and skills of cloning technology in eucalyptus spp. Hence, he took initiative to train the prison inmates of Uganda's prison about the skills of cloning in eucalyptus in the central tree nursery, Luzira located in Nakawa Division in southeastern Kampala, Uganda. He identified the fast growing as well high yielding species of eucalyptus for cloning and multiplication for further dissemination.

Activities:

- He conducted the sensitization meetings on agroforestry and production of seedlings among Ugandan prison service farm managers.
- Trained the prison inmates in different tree nursery operations.
- He taught prison inmates about cloning of Eucalyptus.

Eucalyptus clone mother garden

Eucalyptus tree nursery

Clones are genetically identical plants which are not reproduced from seed but by some other means such as rooted cuttings or tissue culture.

Prisoner being trained in disinfecting clone tubes before planting

Ready clones for planting

Prison inmates were skilled on modern seedlings production as part of the correctional service before the expiry of presentment terms / sentences. This initiative of Mr. Gawaya George intended to quadruple the quality seedling for bio fuels and to increase the seedling production by 75% in 2020.

Results of his activities

1. 15 prisoners trained in tree nursery operations
2. 16,000 Eucalyptus clones made ready for planting
3. 20,000 seedlings of indigenous agroforestry species being raised in readiness for planting in next season

The motive behind the successful implementation

The new idea conceived during FTF ITT Training helped Mr. Gawaya George to implement the acquired knowledge through prison inmates. The skills in cloning that he learnt during training at Tamilnadu Agricultural University (TNAU), Coimbatore, India was quite helpful to him. The availability of prisoner labor and their active participation made his BAWP implementation easy. Many other factors like goodwill of Government and Uganda Prisons services management, favorable policy framework for tree establishment, high demand for high quality seedlings, increasing demand for industrial timber and other wood products, increasing demand from niche markets for certified (legally sourced, sustainably managed forest plantations) wood products his cause. He continues his trainings by periodical training to sustain his plan of action. Thus, the prison inmates are skilled on agroforestry practices and making them happy about their employable skills.

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Awareness program on climate smart agriculture technologies and agroforestry system in selected area of Myanmar

Ms. Htay Htay Oo, Professor from Yezin Agricultural University**,** Myanmar attended 39th FTF ITT International Training Program on 'Agroforestry: Policy Practice and Impact' during 10-24th October, 2019 at World Agroforestry Centre (ICRAF), New Delhi, India. After she returned to Myanmar, she committed to organize an awareness program and research study for 'climate smart agriculture technologies and agroforestry system' in few selected areas in her country.

The objective

The objective of this study was to assess farmer constraints in the adoption of Climate Smart Agriculture (CSA) technologies and Agroforestry (AF) systems.

The first action for the study

The study was conducted in two phases; the first phase of the study was to conduct the training at the Department of Agriculture (DoA), Tatkone Township in Nay Pyi Taw Council area of Myanmar (Fig. 1 & 2). The training focused on overview and status of CSA technologies and AF systems in India and possible lessons for Myanmar. The fourteen participants of the post graduate students from agronomy department, Yezin Agricultural University (YAU) and extension staff from DOA, Tatkone Township. The topics included in the training were: CSA technologies, role of agroforestry systems for climate change mitigation, role of agroforestry systems for environmental sustainability and variety of agroforestry systems for environmental sustainability. The staff and postgraduate students trained in the first phase were employed as interviewers for the second phase of study.

Indian experience learnt that can offer solution to the problem

Role of agroforestry in climate change mitigation, different types of AF systems and research and development for AF systems, etc.

Biggest motivation behind BAWP

1. To develop education and research capability in AF system of postgraduate students of Yezin Agricultural University and extension staff of DOA
2. To share knowledge about role of AF systems for small holder farmers

Methodology

Sixty farmers from Shauk Kone and Kyar Thay Aing villages were interviewed (Fig. 3 & 4) with structured questionnaires in November, 2019. The questionnaire includes demographic data of farmers, awareness of farmers on CSA technologies and AF systems and farmers constraints for adoption of CSA technologies and AF systems.

Results

The results of present study suggested that 47.8% of respondents were having an experience with CSA technologies including AF systems (Table 1). However, some constraints (e.g. availability of technical source, labor scarcity and difficulties in water source) can result in partial adoption of CSA technologies and AF systems. Therefore, farmers may be facing similar challenges worldwide and adoption can remain partial, thereby decreasing the benefits of such technologies. Thus, addressing impact on productivity, resilience and mitigation is highly relevant in future research studies.

Table 1. Farmers' awareness to CSA technologies and AF systems Variable

	Frequency (N=60)
Yes	29 (47.8)
No	31 (52.2)

In addition, the constraints that most farmers reported were scarcity of labor (34.4%), difficulties for technical sources (32.2%), less incentive price for crops (23.3%), less cooperation by adjacent farmers (16.7%) and small farm size (11.1%). Other respondents claimed that they have some risk for climate change (15.6%) as well as risk for cost and benefit (8.9%). On the other hand, some respondents reported that new technologies were time consuming (4.4%) and they have scarcity in water source (10%) and poor in capital input (2.2%) (Table- 2).

Table 2. Constraint of CSA technologies and AF systems by the respondents

Constraint of CSA	Frequency (N=60)
Scarcity of labor	31 (34.4)
Some difficulties for technical source	29 (32.2)
Less incentive price of crop	21 (23.3)
Less cooperation by adjacent farmers	15 (16.7)
Some risks for climate change	14 (15.6)
Small farm size	10 (11.1)
Scarcity in water source	9 (10.0)
Some risks for cost and benefit	8 (8.9)
Time consuming	4 (4.4)
Difficulties for capital input	2 (2.2)

Values in the parentheses are percentage, N = number of respondent

There was different awareness to the CSA technologies and AF systems among the respondents in the study area. Some farmers having an experience with CSA technologies and AF systems reinforce adoption. However, scarcity of labor, difficulties for technical sources, less incentive price for crops are the major constraints for a partial adoption or rejection of CSA technologies and AF systems. Based on the findings of this study, the

following recommendations are suggested

- Farmers must have easy access to information on CSA technologies and AF systems.
- Partnership between government and non-government institutions should be encouraged to create different channels of learning that will promote adaptation strategies with effective participation of farmers in adopting best CSA technologies and AF systems.
- Extension services should strengthen its efforts in promoting adaptation strategies and providing best CSA technologies and AF systems that could reduce the negative impact of agriculture on the climate change.
- Extension staff should be trained on CSA technologies and AF systems to be able to pass adequate information to farmers on appropriate adaptation measures or strategies.

Fig. 1. Giving training to postgraduate students and Extension staff at DOA, Tatkone Township

Fig. 2: Postgraduate students of YAU and extension staff of DOA, Tatkone Township

Fig. 3. Explaining about the objective of interview and questionnaire survey at Shauk Kone Village

Interviewing farmer by postgraduate students and extension staff at Shauk Kone village

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Utilising Mikania infected lands to grow fodder and forage by community forest user groups in Jalthal Jhapa District, Nepal

Mr. Murari Raj Joshi, Associate Professor from Kathmandu Forestry College, Nepal attended the 39th FTF ITT International Training Program on 'Agroforestry: Policy Practice and Impact' during 10 -24th October, 2019 at World Agroforestry Centre (ICRAF), New Delhi, India. The training comprised of various topics such as Agroforestry: Research and Development, and Policies, Agroforestry Practice for Livelihood, Nutritional and Environmental Security, and Impact, Agroforestry: Commercial & Value Chain Aspects, Case Studies and Field Visits. Among the lessons learnt, he choose to work on fodder and forage development in the forests of Jalthal Jhapa district of Nepal as his BAWP.

Objectives of Back at Work Plan

The main objectives of BAWP of Mr. Joshi was to demonstrate the effective control of Mikania weeds in community forest areas in Jalthal of Jhapa district Nepal.

Indian Experience and Motivation:

Silvi-pastoral systems developed in Jhansi India has offered solution to the Mikania weed problems of Nepal.

Implementation of BAWP

The Jalthal forest of Jhapa district, Nepal covers 6300 ha and has been handed over to 22 Community Forest User Groups (CFUGs). The project entitled Uprating Community Forest Management in Nepal: Enhancing Biodiversity and Livelihoods is working with these 22 CFUGs. This project is started with the aim of enhancing livelihoods of forest user group members through agroforestry and forest products based enterprise development and management and biodiversity conservation on sustainable basis through socially inclusive, gender mainstreamed and environmentally sound manner.

Fig. 1: Discussion with key informant and women group

Livestock are one of the main sources CFUG member's livelihood, which rely on paddy straw and maize stock during winter and early summer months. In addition, about 563.79 ha unproductive community forest areas are covered by Mikania (*Mikania micrantha*) weeds. Because of this, wild animals such as elephants were entering in village for feed resulting in human casualty and crop and house damage. Women respondents and key informants of all study CFUGs showed lot of interest in fodder and forage development programs for improving livestock based livelihood enterprises (Figure 1)

Community forest user groups had capacity to develop Mikania controlled community forest lands as community fodder and forage plots. To increase the supply of fodder and forage from community lands, the user group members are working together to prepare lands through cutting and cleaning Mikania covered forest areas (Figure 2).

Fig. 2: CFUG members cutting Mikania weeds

This fodder and forage development program can play a vital role in improving the livelihoods of poor and marginalized group members supporting their livestock farming system. In addition, wild animals including elephant will obtain feed in forest, which helps to reduce the human wildlife conflict. Women of Avimukteshwor CFUG had also suggested that 0.2-0.3 ha Mikania covered forest areas should be allocated to interested households to develop fodder and forage needed for their livestock.

The potential Non-Timber Forest Products (NTFPs), shade tolerant crops, forage species and trees identified for Mikania weeds infested plots were Citronella, Lemon grass, Palmarosa, Sarpaganda and wild Aparagus, Ginger, Turmeric, Bamboo. Other forage crops such as Mott Napier (Pennisetum purpureum), Forage peanut (Arachis pinotoi), Setaria (Seteria splendida), Mulato (Brachiaria brizantha x B. ruziziensis), Amriso (Thysanolaena maxima), Desmodium (Desmodium intortum) and Stylo (Stylosanthes guianensis), and tree species such as Lampate (Duabanga grandiflora), Jamun (Syzygium cumini), Harro (Terminalia chebula), Barro (Terminalia bellerica) and Karma (Adina cordifolia) etc to conserve and enhance biodiversity and improve livelihood and food security of the poor, women groups and disadvantaged households of the Jalthal community forest areas.

Results and Feedback

CFUG members are cutting and clearing Mikania weed covered forest areas and the project has also developed plan to develop fodder and forage, NTFPs and shade tolerant crops in Mikania controlled community forest areas. This fodder and forage development plan would be implemented in the coming monsoon season as some of the activities of the program were halted during the lockdown.

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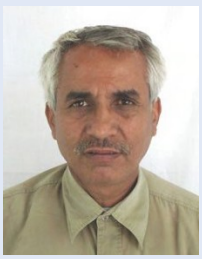


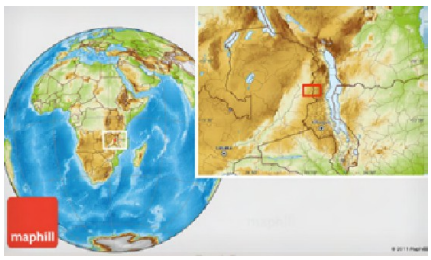
Horticulture

Enhancement of effective seed system and disease control mechanism for Cassava Mosaic Disease (CMD) of cassava crop in Mzimba North in Malawi

Cassava is a staple food crop for almost 30-40% of the population in Malawi contributing about 7% of total caloric intake. Cassava ranks second most important food crop and third as a cash crop. It is mainly produced by smallholder farmers and a few large-scale farmers. Cassava yields have increased by 4.6 % during the period between 1997 and 2007 despite the fact that it is produced on marginal soils with no chemical inputs. Cassava crop has numerous food and income benefits to farmers specifically in the communities at larger level. Nutrition and health importance as well as suitability of crop production n to marginal lands makes cassava a highly preferred crop. Hence, concerted efforts made towards maintaining a vibrant sustainability of cassava production are vital.

Cassava crop in the filed

In Cassava, insect pests and diseases are a major threat to cassava production in Sub-Saharan Africa as evidenced by several researchers. Cassava Mosaic Disease (CMD) is major hindering disease for the productivity. East African Cassava Mosaic Virus (EACMV), African Cassava Mosaic Virus (ACMV) and Indian Cassava Mosaic Virus (ICMV) are the three whitefly-transmitted Gemini viruses (Genus Begomovirus) known to be associated with CMD in Africa and the Indian subcontinent.



Map of Malawi

Mr. Phatiswayo Thole from Malawi was trained under the FTF ITT training program on 'Integrated Technology for Production, Processing and Value Addition in Tuber Crops' during 16th -30th September, 2019 at ICAR-Central Tuber Crops Research institute (CTCRI) Thiruvananthapuram, Kerala, India. He had identified CMD as the major problem affecting the production and productivity of cassava which is major food crop of Malawi. So, he considered this threat and started working to resolve the problem with the objectives to achieve the enhancement of effective seed system and disease control mechanism for CMD in cassava crop in Mzimba North in Malawi.

Mr. Phatiswayo Thole to achieve his objective of Back at work plan, first liaised with members of staff within the Ministry of Agriculture, Irrigation and Water Development. He also interacted with the farmers about the enhancement of effective seed system and disease control mechanism for CMD of Cassava crop in Mzimba North in Malawi. The knowledge gained during the training program at CTCRI, Kerala, India helped him to realize the method of controlling disease infestation. He also realized from learning that enhancing effective seed system and disease control mechanism is essential for minimizing occurrences of CMD thereby playing a role towards maximizing area (hectares), yield (Kg/Ha) and production (kilograms of fresh weight) of cassava.

The activity of enhancing effectiveness of seed system and CMD disease control mechanism has a potential of assuring steady increase in area and production of cassava in Mzimba North in Malawi both on short term and long-term situations. A big population of farmers in Mzimba North in Malawi have a high preference of sweet cassava varieties (for instance Mbundumali) that are highly susceptible to CMD. On the contrary, a high population of farmers in lakeshore areas in Malawi have a general preference of bitter cassava varieties (for instance Sagonja) that are highly resistant to CMD.

Mr. Phatiswayo Thole had instructed through the members of staff working in the agriculture sector on enabling effective seed system and disease control mechanism for CMD. The same message was taken to farmers in order to ensure that there is an efficient seed system and disease control for CMD.

Effective seed system has a role of providing seed source for production as regards seed multiplication. It also plays a role of ensuring a constant supply of planting materials for use during production of cassava tubers for food consumption. Capacity building activities were conducted in order to equip farmers with relevant technical knowledge about carrying out an effective seed system.

Pictures showing some of the cassava gardens

CMD is an example of viral disease in cassava that reduces production significantly. Therefore, control of this disease is crucial in the seed system to come up with disease free clean planting materials. Cassava planting materials that are disease-free play a contributory role as constituent of the ideal seed as well as food. Activities were carried to facilitate the farmers to acquire the needed skills and knowledge of harmonizing disease control mechanisms within the seed system.

Outcome:

- Promotion of activities involving farmers to pass on clean planting materials in order to increase participation of farmers in production of cassava.
- Twelve members of staff were trained on cassava seed systems.
- Around 724 farmers (254 males, 470 female) are carrying out activities under the program to pass on information to subsequent beneficiaries on approximately 18 ha of land in Mpherembe and Zombwe Extension Planning Areas.

Contact Details

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Promotion of vegetable production for income generation in Luweero District, Uganda

Ms. Nakito Sarah is working on improvement in training quality after getting exposed to the Indian innovations learn under the FTF ITT Training Program. She conducts capacity building activities with individual farmers, farmers' groups and self-help groups. She is training farmers on adoption and use of better farming technologies, Post-harvest handling techniques to reduce losses, good storage of their produce, Value addition and use of simple and friendly farming technologies. She trained various farmers groups namely Goshen Farm (Sweet pepper, chilli, tomato, and cucumber grower), Bajja Basaaga Women Group (Orange fleshed Potato growers) and Luyima mixed farmers (Vegetable growers).

MK Farmers Development Group
Activities: Mushroom like Cultivation, drying, packaging and selling

Musiige Farmers Development Group
Activities: Cultivation of Tomatoes, Egg Plant, Cabbage and Bitter Berries

She carried out a project **'Goshen Farm'** where training programs were conducted on greenhouse technology, plant health management technologies and approaches, intensification of production systems and diversification to fetch higher market price, management of crop failures due to prolonged drought efficient irrigation methods and water harvesting measures, etc.

Contract details:

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Mini set technology- Impact story in Uganda

Mr. Caleb Ngabirano, Uganda had participated in the 38th Feed The Future India Triangular training program on 'Integrated Technology for Production, Processing and Value Addition in Tuber Crops' during 16th-30th September, 2019 at ICAR- Central Tuber Crop Research Institute (CTCRI), Thiruvananthapuram, Kerala, India.

The training program mainly focused on tuber crops with special emphasis on cassava crop. The training program introduced a new technology called Mini Set technology which is used for preparation of short cassava stem cuttings of only two nodes for planting.

Cassava stem cuttings through mini set technology

Mr. Caleb was impressed with miniset technology during his training in India and decided to introduce the same in his country. He thought the farmers of Kanungu, Rukungiri, Kabale districts of Uganda where Mr. Caleb works will find it very profitable. The area is characterized by steep slopes and rough reliefs. Here most community farmers are low income earners and they carry planting materials on their head and shoulders. They cultivate the Cassava along the slopes, as bottom valleys are usually reserved for livestock and vegetable crops production. This situation of farmers at his work place made him to take Mini Set Technology as his Back at Work Plan.

As soon as Mr. Caleb returned to his nation, he called for one training program on mini set technology in Cassava cultivation. About 26 trainees from 5 sub counties of Uganda participated in this training program. Mr. Caleb demonstrated the technology in front of the trainees. This training program impacted the trainees and encouraged them to create awareness among the large number of farmers about mini set technology in cassava cultivation.

Later Mr. Caleb announced the technology training program on mini set technology in 'Community public address system'. Within 24 hours, close to 200 farmers confirmed their

registration towards training program. The training program was conducted on two days later of announcement. Finally to his surprise 273 farmers attended the training program. The trainees learnt the new technology in cassava cultivation and they also promised to adopt this technology in their routine cassava cultivation practices.


Adoption of mini set technology in cassava cultivation by farmers

After adopting this technology farmers are of the opinion that this technology is saving their time, cost, energy and also labor force. Mr. Caleb received an appreciation from the vice president of Uganda his excellence Julius Ssekandi.

Major outcome:

1. Enhanced the favorable attitude of farmers towards cassava cultivation with good agronomic practices
2. Saving in the production cost, time and energy for cassava farmers in Uganda.

Contact Details

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Awareness campaign of an extension officer from Malawi regarding the spice and herb cultivation

Ms. Prisca T. Kachigunda from Malawi participated in the 27th FTF ITT training program on 'Value addition in Spices' from 15th to 29th May, 2018 at ICAR-Indian Institute of Spice Research (IISR), Kozhikode, Kerala, India. After going back to her country, she decided to create awareness among the farming, administrative community regarding the spice and herb cultivation and its advantages.

Activities she carried out based on her back at work plan were:

- Sensitizing officers at her office, Department of Agriculture Extension Services; medical personnel at Lilongwe Bottom District hospital, Farmers in Lilongwe East at Nyanja Extension Planning Area (EPA); and spice vendors at 24 different marketplaces in Malawi.
- Wrote an article for Farmers magazine (Quarterly) well known as Za Achikumbi, and is written in one of the local language in the country known as Chichewa.
- Conducted radio interviews with three Extension workers who attended the training in India on value addition in spices, Extension workers and farmers at Champhira Extension Planning Area in Mzimba District in the Northern Region of Malawi. These interviews were included in the agriculture radio programmes which were aired on National Broadcasting Station (Malawi Broadcasting Cooperation- MBC).
- Identified a demonstration plot for spice production (especially ginger).
- Sourced spice seed for the demonstration plot from the nearby market.
- Discussed with specialists from the Department of Crops Development on how we can promote spice production can be promoted in Malawi during one of the horticultural message development meetings.

Her observations from the above-mentioned activities were:

- Many people in Malawi including farmers are not much aware of types of varieties grown, how to grow them, processing and utilization and the health benefits of spices.
- Most of the spices sold in Malawi are imported from neighboring countries and only few districts in Malawi (Mzimba, Ntcheu, Nkhatabay and Dedza) grow spices.
- Spices are sold at unaffordable prices for smallholder farmers in Malawi and also for the general public due to huge demand and low supply.

Major challenges of farmers regarding the cultivation of spices in Malawi are as follows:

i. Lack of quality planting materials as most spices are imported.

ii. High prices of spice seed.

iii. Inadequate trained manpower to conduct more radio interviews.

iv. Less allocation of resources to sensitise more people on the benefits of spices.

v. Low adoption of some stakeholders involved in horticulture production.

Ms. Prisca found the training very beneficial for her being an extension worker and to all Malawian farmers. She recommends that there is a need for sensitization on spice production and value addition through meetings and radio program. Therefore, she is also planning to start some other spice and herb related projects in some other parts of the country. She is optimistic that many farmers will start growing spices as one organization in collective effort.

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Sensitization on Good Practices in raising quality coffee seeds in Nazigo sub-county, Kayunga District, Uganda

Coffee plays an important role in the economy and livelihoods of Uganda's rural population. The coffee industry consists of low input-intensity smallholders with an average plot size of 0.2 hectares, providing the main source of income for an estimated 0.3–0.5 million households distributed over two-thirds of the country. However, over 2 million people are estimated to derive coffee-related incomes by living and working on coffee farms and other support and downstream activities, including processing, input supply, trading, and transport. About 40 percent of Uganda's total export earnings are derived from coffee exports. https://core.ac.uk/download/pdf/6337622.pdf

Coffee berries

The Ugandan coffee industry is facing some serious challenges, including low international prices in the international coffee market, aging coffee trees and declining productivity, and, more recently, the appearance of coffee-wilt disease, which have all contributed to the decline in both the quantity and value of coffee exports. Poor agronomic practice of picking of green unripe coffee berries by the coffee growers, inadequate technique of berries drying and poor handling are some of the other reasons leading to the poor quality of coffee.

Mr. Milya Douglas, an Agricultural Officer from Kayunga District, Uganda attended the FTF ITT training on 'Income Generating Enterprises in Plantation Sector' during 13th – 27th February, 2018 at ICAR-Central Plantation Crops Research Institute (CPCRI), Kasaragod, Kerala, India to work on coffee plantation in his country.

Mr. Milyas Douglas after returning back to his region Kayunga District, Uganda. The lessons on planation crops he learnt from the FTF ITT training made him to realize the urgent measures to be taken to improve the coffee productivity and quality production in Uganda. This also addresses to combat coffee industry's problems and reverse the declining trends in its productivity. Mr. Milyas Douglas committed to sensitize agricultural extension workers in the district and Uganda Coffee Development Authority to sensitize farmers on best agronomy practices through his efforts on training and sensitization efforts.

Mr. Milyas Douglas organized meeting regarding formation of Farmer Groups

Objectives:

To transfer skills and knowledge in raising coffee seedlings to farmers in Nazigo sub county.

- To improve on household incomes among farmers in Nazigo sub county.
- To promote participatory seed multiplication/ breeding with farmer involvement.

He mobilized farmers into groups, and trained them through practical demonstrations using participatory approaches, linking them to sources of agricultural credit, raising of quality coffee seedlings and finally distributing them to farmers so as to boost production and productivity of coffee in Nazigo Sub-county. He linked them to the sources of funding and followed up until fund sanction. Mr. Douglas established two coffee nurseries and raised 80,000 coffee seedlings of which 60,000 seedlings have been sold on contract basis to government coffee development agencies.


Mr. Milyas Douglas training the farmers group regarding seed bed preparation during nursery development

Place of Implementation: Wabirongo village, Nazigo sub-county, Kayunga district, Ntenjeru South Constituency.

Outreach: Two farmer groups, a youth group and a women group of 30 farmers were trained.

Impact: There is improvement in the income levels of the farmers, increase in production of coffee and coffee seedlings as well as the knowledge level of farmers in coffee production.

Challenges:

- The project took long period of time compared to the expected implementation period which increases costs of production.
- Marketing of coffee seedlings to private sector with good prices is a big challenge to farmers (government rate is shs 350/= per seedling compared to shs 100/= in private sector).
- Inadequate funds to facilitate continuous production are also a challenges.

High quality coffee saplings nursery developed by two farmers group to issue good quality coffee plants to the growers

Outcome:

- Two farmer groups were able to establish and register coffee nursery with district as community based organizations.
- Motivated by the training approaches in India, he organized ten trainings on good practices of coffee farming have been conducted
- Two farmer groups supported through women entrepreneurship program & youth livelihood program with Ugandan Shillings (UGX) 3,100,000/-
- He started his own coffee nursery to supply quality seeds to growers (raised 40,000 coffee seedlings and so far sold 30,000 coffee seedlings on contract to coffee development agencies.)
- Registered and partnered with other registered groups to ensure access to markets
- 60 kgs of quality coffee seeds were procured and planted.
- 60,000 coffee seedlings were sold to government coffee development agencies on contract.

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Training on improving agro ecosystem in rubber plantation to smallholder rubber farmers in Tbong Khmum province, Cambodia

Cambodia is a South East Asian country with an area of 181,035 sq. km., neighboring the two Natural Rubber (NR) producing giants –Thailand and Vietnam. The population of Cambodia was 15.5 million in 2012. They have a labor force of 8.053 million males and 3.808 million females. In Cambodia, NR industry is a prioritized sector after rice production.

Mr. Kou Phally, Deputy Director and Mr. Ouch Monirith, Official from Cambodia have attended the training program on 'Integrated pest management of major crops in the developing countries' conducted during 19th November-3rd December, 2019 at National Institute of Agricultural Extension Management (MANAGE) and National Institute of Plant Health Management (NIPHM) and ICAR-Indian Institute of Millet Research (IIMR), Winter Nursery Centre, Hyderabad.

After completing the FTF ITT International training program, Mr. Kou Phally has taken up the initiative to improve the agro ecosystem on rubber plantation. He observed lack of knowledge among the farmers regarding the cultivation of Natural Rubber and conducted a training program with the following objectives

1. To share a knowledge and experiences from international training program (FTF ITT) to smallholder rubber farmers
2. To improve and promote Agro Ecosystem Analysis capacity for smallholder rubber farmers,
3. To bring back biodiversity losses to rubber plantation

General Directorate of Rubber (GDR) is the government body functioning at the national level under the Ministry of Agriculture Forestry and Fisheries. Generally, GDR will conduct the training on the research and development and new innovation related to the rubber sector for the Provincial Department of Agriculture Forestry and Fisheries (PDAFF Rubber officers), stakeholders and smallholder rubber farmers.

Picture 1: all vegetation in rubber plantation have completely destroyed by large amount of herbicide

Picture 2: all vegetation in rubber plantation disturbing ecological balance is destroyed causing serious soil erosion

General Directorate of Rubber has organized the training on improving the Agro ecosystem in rubber plantation to smallholder rubber farmers in Tbong Khmum province on 30th January 2020. Twenty five (25) participants (20 male and 5 female) from three districts, in Memot, Ponhea Krek and Dambe districts attended the training.

Normally, smallholder rubber farmers sprayed herbicide (Glyphosate + 2,4D) 3 to 4 times per year to maintain their rubber plantation from immature to mature period. Due to this many other plant species in the rubber plantation were destroyed gradually from year to year causing poor ecological balance caused by reduced plant diversity and serious soil erosion and more (picture 1 & 2). After the training in India they realized the disadvantages of using large quantities of herbicides in rubber plantation that impacted on livelihood, nutritional and environmental security.

Mr. Kou Phally & Mr. Ouch Monirith introduced the farmers to practice mechanical methods that aids in the control of the weed. Field observation, weed intensity, soil moisture, weather condition, crop appearance and plant canopy etc., were demonstrated during the training. If all parameters showed non-suitable conditions for spraying herbicide, smallholder rubber farmers should choose other method to maintain their rubber plantation such as: weeding by hoe or spot spraying etc.

Demonstration in rubber plantation during the training

Expected Benefits:

a) Smallholder rubber farmers understand on the concept of Agro Ecosystem Analysis to improve livelihood, nutritional and environmental security;

b) Reducing application of herbicides in rubber plantation during immature and mature;

c) Reduction of greenhouse gases emission from rubber production;

d) Establishment of sustainable agro ecosystem in rubber plantation

e) Improve the knowledge for smallholder rubber farmers about agro ecosystem

Smallholder rubber farmers have practiced mechanical method in control of weed

Many plant species in forest

"If Farm Ecology and Economics go wrong, nothing else will go right in Agriculture. This is the principal message of the current agricultural crisis."

Contact Details	
	
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Natural fruit ripening technology- A boon to reduce the health disorders in Kenya

An investigative survey conducted at Kenya stated that fruit samples taken from three leading supermarkets and groceries in Nairobi and Mombasa showed the presence of traces of poisonous chemical used for making plastics. Wholesale traders in big fruit markets in Gikomba, Nairobi, Marikiti and Kongowea in Mombasa are using the chemical secretly. Calcium carbide is hawked at the busy Gikomba market for as little as Kenyan Shillings (KES) 20.00 a sachet.

Mr. Dominic M. Kitaka and Ms. Margaret W. Karuku, Kenya School of Agriculture, Nyeri participated in the 12th Feed The Future India Triangular Training program on 'Post-Harvest Technology in Horticultural Crops' for Extension Practitioners of African and Asian Countries during 6th-20th November, 2017 at ICAR-Indian Institute of Horticultural Research (IIHR), Bengaluru, Karnataka, India.

Mr. Dominic and Ms. Margaret, during their training program came across several advances and innovations of post-harvest technology at IIHR Bangalore. They identified natural fruit and vegetable ripening technology as a solution to the problem they decided to address in their country on harmful effects of artificial fruit ripening.

Air tight ripening chambers used in low cost ripening technology

The principle behind this technology is the artificial production of ethylene gas using growth regulators i.e., 2-Chloroethylphosphonic Acid (Ethrel/Ethephon) in addition with an alkali (Sodium Hydroxide). The fruits exposed to this ethylene gas will ripen naturally and with nil health hazards like ill effects caused by the use of calcium carbide in artificial ripening process.

This technology is having many advantages to farmers. Because, it can be operated with locally available materials, it can be affordable by low level of income holder, it is easy to handle, the amount of ethylene gas produced can be controlled, which results in uniform ripening.

Mr. Dominic and Ms. Margaret after returning to their nation, started to work on this technology. They targeted the groups of extension staff working in the banana and mango growing areas and also they targeted the banana and mango traders in major markets in Kenya. They organized demonstration and awareness workshops about the natural fruit ripening technology as a means to spread the knowledge about the importance of this technology among the traders and farmers. The fruit traders realized the impact of chemical usage in ripening of fruits. All the traders have agreed to adopt this technology in place of artificial ripening process

Major outcome:

1. Demonstration on natural fruit ripening technology
2. Trained the extension officers who are in contact with fruit growers
3. Trained the local traders of banana and mango

Contact Details	
	
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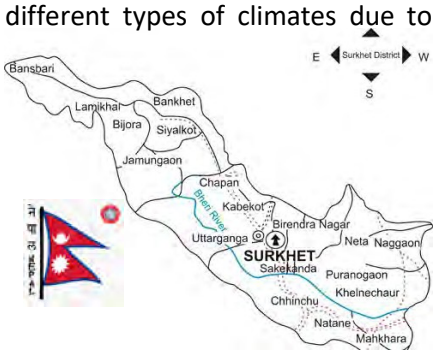
Sensitization of modern agro technology to enhance productivity of horticulture in Bheri Zone of Nepal

Mr. Navaraj Acharya, who is a Cluster Business Manager of KISAN II Project in Nepal had attended the 36th FTF ITT International Program on 'Agribusiness- Startup to Scale up' held during 10-24th July, 2019 at National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana.

Nepal has different ecological belts endowed with different types of climates due to its geographical locations for the production of horticultural crops. Government organizations were not in existence for the development of horticulture sector before 1950. However growing of fruits, vegetables, spices and flowers is in practice from decades. After the creation of Department of Horticulture during sixties, several horticulture farms were established in different agro-ecological zones where research and extension programs were launched and horticulture development took momentum. There is tremendous scope for commercial horticultural crops production to enter into the international market.



Problem statement: Low productivity of vegetables in Surkhet district of Nepal (14 Mt per ha. is below national average and below than the neighboring countries (India) due to subsistence farming system, poor infra-structure, transportation facilities, linkage to the international market and technical know-how, horticulture development could not gain momentum as expected. The productivity of horticultural crops in Nepal are also not comparable to the two neighboring countries China and India.

Nepal is mainly divided into **14 Zones** where the Surkhet district & other district lies in **Bheri Zone.** The districts such as Banke District (Nepalgunj), Bardiya District (Gulariya), Dailekh District (Dullu), Jajarkot District (Khalanga and Surkhet District). Mr. Navaraj Acharya keenly observed the productivity status of vegetables in Surkhet district of Nepal. Based on the lessons he learnt in FTF ITT training, he committed to address the issues of low productivity of vegetables and other problems of Sukhreth District of Nepal in horticulture. He decided to address the following issues in his BAWP.

- Lack of knowledge on modern & good agriculture practices among farmers & officials

- Lagging behind in adoption & dissemination technology
- Selection of extension workers & Training to them
- Training to farmers through Extension Workers
- Work through private sector organizations or cooperatives on cost sharing basis

Being cluster Manager, he has the responsibility of handling both program and administration/management of the project. He is responsible for monitoring and mentoring of field staff in his cluster.

Activities of BAWP

Mr. Navaraj Acharya organized meeting with his subordinates i.e., field extension workers (5 Junior Technical Assistants). He assigned them to report about the progress and challenges of technical trainings organized by KISAN II Regional office during 1st week of september, 2019. He also organized meeting with various stakeholders such as vegetable growers, extension officers and input suppliers. As per the decision concluded in the group meetings, he conducted three trainings on vegetable nursery management conducted through Extension Workers. 75 farmers (25 per training) participated in the training. Out of them 90% were female. Therefore, he trained all the participants on skilling them on commercial nursery management He established one demo plot of vegetable under plastic net house established in collaboration with Gurkakot Municipality (local government).

Nursery management training, field practice at Gurvakot -2, farmers group, Nepal

Demo on net house for tomato production

Place of Implementation:

1. Meetings were organised in K2 cluster office, Surkhet district, Karnali province.
2. Training on winter vegetable nursery management were provided at Gurvakot Municipality ward-8
3. Demo for tomato production under plastic net house at Gurvakot municipality-8
4. Stakeholders meeting took place at meeting hall of Ministry of Agriculture, Karnali Province

Challenges:

- Time management and inadequate funds for horticulture infrastructure.

Changes:

- After the trainings, farmers were well aware about soil treatment, seed sowing in line, seedling management, nutrition management in nursery and advantages of healthy seedlings in commercial success of nursery.
- Spread of the modern technology among the farmers.

Outcomes from the work:

1. Shared experiences among his team members about the lessons learnt from good nurseries around Hyderabad during training.
2. Shared the technology to local & provincial government official & seeking collaborating support from them.
3. Trained extension workers started providing technical training on vegetable nursery management to the farmers.

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Animal Husbandry, Dairy and Poultry

Co-operative and collective models of dairy sector of India in Uganda

Collectivism is the new strategy for addressing farming related problems. If not, the farming business will not keep pace with its potential to grow says Mr. Caku Benjamin. “I think cooperation and cooperatives can be a panacea for the pain of Ugandan farmers” explains Mr. Caku Benjamin, Animal Husbandry Officer from Arua, Uganda.

Mr. Benjamin gives credit of this critical learning to the FTF ITT International Training Program he attended in India on ‘Management of Dairy Cooperatives’ organized by MANAGE at ICAR-National Dairy Research Institute (NDRI), Karnal, Haryana, India. The program was held during 10th -24th April, 2018. During the program, he visited many successful dairy cooperatives in India and realized that such initiatives can also boost the livelihood of Ugandan farmers as well. Like India, Uganda is also primarily an Agro-based economy where the livestock sub-sector contributes about 20% of agricultural GDP. The country has congenial temperature, rainfall and other geographical situations which are ideal for dairy farming to flourish.

Artificial Insemination to improve short horn African Zebu

However, the dairy farmers in Uganda frequently faced following problems:

- Shortage of forage and drinking-water during the dry season
- Limited availability of seeds and other planting materials for improved production of grasses and legumes
- Increased incidence of disease because of decline in control measures and the rapidly rising cost of drugs and chemicals
- Poor genetic potential of indigenous breeds
- Irregular and unreliable access to markets for many producers
- Inadequate levels of institutional credit for small-scale dairy farm enterprises.

Since each of these problems are mostly related to the access of inputs to the farmers, the cooperatives can provide effective solution. Inputs can be mobilized on collective basis in cheaper process and farmers can have better bargaining power in the market. Hence, Mr. Benjamin started working towards establishment of a functional Dairy Cooperative in Arua district of Uganda. In this process he took the help of 18 extension functionaries and managed to sensitize around 400 dairy farmers and organized them into a cooperative society. Activities related to feeding, breeding, health & housing of the dairy animals are operational now in this cooperative society. The society has so far undertaken many activities such as;

- Artificial Insemination- So far about 60 dairy cows have been inseminated artificially.
- Design & Construction of farm structures-small structures like cattle crèche are established.
- Capacity building trainings for farmers on topics such as; selection of good quality dairy animals, pasture conservation techniques, silage making etc.

Farm Visit at Oluku sub-country with an extension officer

- Awareness events e.g. meetings, farm visits, radio shows on various dairy related themes.

This cooperative society has been continually improving the way the farmers perform dairy farming here. Incorporation of new techniques and technology (e.g. controlled breeding) has not only positively impacted their economy but also the health of the dairy animals. The region has shown improved welfare of animals in terms of feeding, housing, health. Average yield of milk per farmer family has almost doubled from 5-6 liters to 9-10 liters. Due to this initiative Ugandan companies have begun engaging directly with farmers in a bid to provide better prices for their dairy products. Besides the quality, the wellbeing of the animals has shown good results on the quality of the dairy products also.

Outcome:

- The efforts of Mr. Benjamin have boosted the profile of farmers' dairy business.
- Increase in dairy yields and enhanced economic welfare of the member farmers of the cooperative.

"With all my learnings from the FTF ITT Program in India, I have realized that sustainability is of prime importance. Hence, I will continue to spread the awareness among the dairy farmers to move forward collectively to attain sustainability in the dairy farming"

- Mr. Caku Benjamin, Animal Husbandry Officer, (FTF ITT Trainee) Uganda

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Contract farming in dairy sector: A Success of Balk Dairy Union (BDU) in Afghanistan

Mr. Najibullah Saeedi is a highly motivated man. Mr. Najibullah Saeedi attended the 32nd FTF-ITT program 'Modern Dairy Technology, Management and Cooperatives' during 5th – 19th February, 2019 at ICAR-National Institute of Dairy Research (NDRI), Karnal, Haryana, India. During the training program, he learnt the importance of contract farming agreements in providing a sustainable market for both parties by reducing price uncertainty for rural milk producers. Mr. Najibullah Saeedi, in the Balkh province of Afghanistan is being recognized as a dairy advisor among the farmers. Post his participation in the FTF ITT training in India, he is linking dairy farmers of this area with a dairy cooperative. Mr. Najibullah is facilitating signing of formal contract farming agreements between 200 female milk producers in this area with a renowned dairy cooperative, Balkh Dairy Union.

First Contact Farming Event at BLDU Conference Hall Place: Shirabad village of Dehdadi District/ Balkh-15th July, 2019

The Economic Impact of the Contracts:

- 200 female milk producers linked with Balkh Dairy Union through formal contract farming agreements.
- Backward and Forward linkages established between 200 female milk producers and Balkh Dairy Union.

- 200 female milk producers will supply 2400 liters of fresh milk to Balkh Dairy Union on daily basis.
- Balkh Dairy Union agreed to purchase the surplus milk of producers on current market price per liter / 22 Afghanis.
- Jobs opportunity created for 200 unemployed women who are living in rural areas of targeted districts. Majority of the beneficiaries are Female Headed Household.
- Balkh Dairy Union products such as milk, yoghurt, cream, butter, buttermilk were marketed; several TV and newspaper reports broadcasted by Media / TVs who participated the contract farming events.
- Support to National Priority Program 2 (SNaPP2) supported and equipped two milk collection centers one in Dehdadi and one in Nahri Shahi districts with necessity operational tools.
- SNaPP2 provided capacity building programs on cattle management, housing, nutrition, hygiene and marketing as well as provision of tool-kits for the contracted 200 dairy households.
- Transportation facility provided to milk producers through SNaPP2 and Balkh Dairy Union to transfer the livestock products from milk collection center to dairy processing plants.
- Losses or wastage of livestock products in the targeted districts decreased and income of female milk producers increased.

Due to this initiative, the dairy farming in this province is running as a profitable system and is also continually looking for cultural practices that are sustainable both environmentally and economically. The farmers also experiment with different techniques and methods to optimize their dairy farming practices.

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A Successful replica of Mulkanoor women's cooperative dairy in Malawi

Ms. Whayo Gama Rahaby Rarah, an Extension Worker from Malawi, participated in the FTF ITT Program on 'Agri-business and Management' conducted during 18th June -2nd July, 2019 at National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana, India. During the training program, she got exposed to one of the most successful model of Co-operative Society and its system at Mulkanoor, Warangal, Telangana.

In Malawi, a farmer group is called 'Salima Dairy Farmers Cooperative Society Limited' formerly known as 'Liganga Milk Bulking Group'. These farmers have been working since 2002 as a group but there was no great impact to motivate them because their main produce is milk. The quantity has been so low due to lack of better breeds and financial support.

Mainly the case of visit to 'Mulkanoor Cooperative, Warangal' arranged during the training program was a great eye opener for her to realise that, her farmers can also do better. Although it has been a challenge for this farmer group to show huge results, these farmers were lacking someone to impart them with new technologies and encouragement to have confidence on their venture and forge ahead to come up with better results and to have better living. She decided to dream on "a transformation from low living standards to a better living standards" after attending training on "Agri-business and Management" at National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana. It has widened her knowledge about the possibilities of Agri-business ventures through cooperatives.


Ms. Whayo Gama Rahaby Rarah during the training to her fellow dairy farmers

Outcome:

- Salima Dairy Farmers Cooperatives Society Limited formally known as "Liganga Milk Bulking Group" has managed to put an extra gear with adopting the approach of better technology adoption and planned commercial operations.

- Independency from government/NGO to set up office meetings and other infrastructure like milk coolants to reserve the milk and collection centers.
- Cooperative started procuring the maize mill in order to mill the left over maize ('Madeya' in Malawi) which will be used to make feed for the dairy animals at the cheaper fares.

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Training on advanced milk production technology and milk supply chain management in Mongolia

Ms. Battsetseg Damjin, Food Extension Specialist at National Agricultural Extension Center, Ministry of Food, Agriculture and Light industry, Mongolia participated in the 35th Feed The Future India Triangular training program on 'Agribusiness and Management' during 18th June to 2nd July, 2019 at National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana, India.

As part of the training program, the trainees were taken to visit the **'Mulkanoor women's cooperative dairy'** where dairy activity can be extensively seen with advanaced technologies in dairy farming. This visit made Ms. Damjin to learn all the advanced dairy technology for farmers in her province.

Ms. Damjin collected all the details at the dairy cooperative, during the visit. She planned to take her back at work plan on training the farmers with advanced milk production technology and milk supply chain management in mongolia at her work place.

Ms. Damijin presenting on advanced milk technology towards extension officers

Ms. Damjin during her visit came across the cooperative work in collection of milk, cold storages for milk, advanced machineries in processing of milk, simple handling machineries towards packaging of milk and transport facilities towards distribution of milk to different stakeholders.

Ms. Damjin desired to share all this information to farmers at her province. She organized a training program on 'Milk Production Technology' at Jargalant town, Khovd Province, Mongolia. Nineteen (19) agricultural specialists who were working at local level and 31 dairy farmers attended the training program on milk production technology.

Based on the learning experiences in India during the FTF ITT training, Ms. Damjin developed the presentations on Good agricultural practices of intensified dairy farming and presented in a meeting conducted by involving local farmers and press media. About 200 farmers attended the meeting.

Involvement of media to spread the awareness on advanced technology in dairy farming

Finally the knowledge gained in India through the training program on 'Agribusiness and Management' helped Ms. Damjin to prepare the presentation and documents on good agricultural practices as well as good dairy practices. Through this presentations, participants have developed positive attitude on the cooperative dairy farming, and she has motivated them to start a dairy cooperative at Khovd province.

Major Outcome:

1. 19 agricultural specialists at local level, who basically do extension work and
2. 31 dairy farmers had developed the favorable attitude towards dairy cooperatives.

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Value addition of milk through intervention of appropriate technology through training in Uganda

Mr. Matsiko Mark is a Senior Research Technician from Uganda Industrial Research Institute (UIRI). He was trained under 7th FTF ITT Training Program on 'Modern Dairy Technology and its Management' during 15th -29th April, 2017 at ICAR-National Dairy Research Institute (NDRI), Karnal, Haryana, India. During his training in India, he observed that milk prices in India are determined by the cooperatives which cater to the farmers' interest. Taking this lesson, he prepared his Back at work Plan on Promoting value addition to milk by use of appropriate technology.

About UIRI

The **Uganda Industrial Research Institute** (UIRI) is a parastatal organization, wholly owned by the government of Uganda.

Mandate: to carry out scientific and industrial research, develop competitive technical services, improve the capacity and competence of indigenous entrepreneurs to embark on sustainable industrial production, to produce high quality marketable products, for the benefit of Uganda's citizens.

Location: Nakawa Division of the city of Kampala

https://www.uiri.go.ug/

As per the back at work task he committed, he decided to work his company, the Uganda Industrial Research Institute (UIRI) which has the mission to catalyze the socio-economic transformation of Uganda. The mandate of his back at work plan was to identify appropriate and affordable technologies that will enhance value addition to local products. Participants were able to acquire knowledge and skills in Processing and packaging of various dairy products.

Theory session at the UIRI conference hall for target student group

AFRISA students packaging ice-cream during the practical session at UIRI Dairy Pilot Plant

Africa Institute for Strategic Services and Development (AFRISA) is a special institute of Makerere University in partnership with Government of Uganda functioning as a Centre of excellence to promote hands-on skilling, enterprise development, employment creation, value-addition, technology adoption and cooperatives.

Activities conducted:

Mr. Matsiko Mark trained a group of 48 students from 5th May – 2nd June, 2017 at the Uganda Industrial Research Institute (UIRI). Trained students groups were from the Africa Institute for Strategic Resources Services and Development (AFRISA) pursuing certificate, diploma and graduation programme in the dairy industry and were trained in various value addition technologies in milk.

Outcome:

- As a result of his action, the Indian lessons on milk and milk products were disseminated among dairy science students and experts in Uganda
- Students realized the significance of milk and its value addition in the country and Agri-business opportunities in dairy sector through value addition.

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Organic poultry farming in Kenya

Demand for the organic food is growing as the health consciousness among the middle and upper-class population is increasing rapidly. To encash on this trend, promoting the organic eggs as healthy food is an enterprising and rewarding idea. Dr. Mary Adhiambo Ochieng Ondieki, a veterinary officer picked this idea for his BAWP.

During the FTF-ITT International Training Program on 'Modern Poultry Management' held during 1-15th May, 2018 at ICAR-Directorate on Poultry Research (DPR), Hyderabad, Telangana, India, Dr. Mary Adhiambo Ochieng Ondieki learnt about the 'Backyard Poultry' in rural areas which is the best way of organic poultry production and she decided to help the small farmers.

Based on her learning experiences from India through the FTF ITT Training Program and as an action towards her Back at Work Plan, she sensitized the graduate students and interns of animal health and production, senior citizens, house wives towards the promotion and improvement of the productivity of poultry business among rural farmers in Kenya.

Depiction of picture practicing backyard poultry in organic local farmers of Nairobi

Dr. Mary with the technical knowledge obtained at FTF ITT program at Directorate on Poultry Research, Hyderabad has started training interested people on diseases management, feeding the poultry, profit and loss management in poultry management, created awareness about the zoonotic diseases and type of feed, type of medication and vaccines to be avoided etc. for becoming successful in organic egg production. Dr. Mary has taken the responsibility of educated farmers regarding critical part of brooding and vaccination in the poultry business and also promoting local poultry breeds among the farmers. With these interventions she has won over the hearts of the local people involved in organic poultry production.

Impact:

- Commercial production of broiler and layers is being adopted by more rural youth and women farmers in Kenya and farmers are willingly raising the local poultry breeds suitable for organic egg production.

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Broiler value chain group development through FPO model in Nairobi, Kenya

Dr. Mary Kerubo Morara is a Principal Agriculture Officer / County Coordinator, Agriculture Sector Development Support Programme (ASDSP) in Nairobi County of Kenya. Dr. Mary was trained on 'Agripreneurship Development among Farm Women' during 1-15th March, 2017 at Kudumbashree, Thiruvananthapuram, Kerala. At the end of the training Program, she choose to work on Broiler value chain group development to form Producer company in Nairobi. She was convinced about the successful working of 'Broiler Value Chain' in Kerala.

The word Kudumbashree in Malayalam (One of the languages in India) is a combination of two words 'Kudumba' meaning family and 'shree' meaning prosperity/wealth. Impressed by the word shree, she coined a term 'IMASHREE' for the producer company she started in Nairobi.

Dr. Mary having discussion with members after presentation

In Nairobi city county, the Agricultural Sector Development Support Programme (ASDSP) prioritized three value chains for cow milk, kales and broilers in 2013. The platform consists all value chain actors from the 3 value chains who are operating at various levels. After her training in India Dr. Mary conducted three meetings with the value chain actors in Kenya to sensitize them on how to adopt a simple traceability operation in the value chains using the IMASHREE Milk Producer Company.

For cow milk, there is a ready farm gate market but unable to meet market demand in Nairobi. The chair lady Ms. Nancy Karanja of Chakula Tele Group got interested with the idea of Dr. Mary and assured her support to do something related to cow milk such as package of pasteurized milk. For Broiler, member agreed to initiate register a saving and credit cooperative which will later be transformed to a marketing cooperative. This marketing cooperative will handle issues of branding and legal requirement. For Kales, it was discussed that group will focus on distribution of clean value added kale products, shredded and dried. The DoA assured to Dr. Mary & her team, that they contacted the County government to come up with model kiosks for hygienic handling and value addition to kales. This Kiosk are handled by individuals and not by groups for attaining sustainability.

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Prevention and control of poultry diseases through training the veterinary service providers in Kenya

Dr. Elijah Munyao Munguti is a senior scientific officer from Kerugoya, Kenya participated in 25th Feed The Future India Triangular Training program on 'Modern Poultry Management' during 1st – 15th May, 2018 at ICAR - Directorate of Poultry Research (DPR), Hyderabad, Telangana, India.

Dr. Elijah, identified that many poultry diseases found in poultry were making huge loss to poultry industries in her provision. The training program made her more competent to choose training of veterinary service providers on poultry farm management and biosecurity, prevention and control of poultry diseases for backyard chicken as her back at work plan.

Dr. Munyao trained students for their diploma and certificate course on animal health and production on Viral, Rickettsial, protozoan and parasitic diseases affecting livestock including poultry at Animal Health and Industry Training Institute (A.H.I.T.I) Ndomba, Kirinyaga County, Kenya. About 148 students participated in this certificate and diploma courses on animal health and production. A course with 40 lecture hours was organized to increase in the knowledge of occurrence, clinical presentation, control and prevention of viral diseases

Students undertaking Diploma courses in Animal Health Management Practices

As of 25 June, seven (7) trainings were done in the Busia district in the Buyengo, Buhasaba, Buhenye, Buhubaalo villages in Eastern Uganda. The villagers were trained in basic poultry husbandry practices like feeding, caring for the young, housing and disease prevention through vaccination. So far Dr. Elijah has trained 245 farmers and now moving into the next phase of implementation where farmers shall be visited to follow up if they are doing as trained. More demonstrations are to be organized to equip the farmers with the knowledge needed.

Training the farmers on animal health management

Major Outcome:

1. Diploma course was designed on animal health management and 148 students got benefited from the course
2. Training program on animal health management enhanced the knowledge of 245 farmers on animal health management.

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Implementation of artificial insemination on indigenous poultry to improve fertility and productivity in Botswana

Ms. Kegomoditswe Bula, a senior scientific officer from Botswana participated in the 25th Feed The Future India Triangular training program on 'Modern Poultry Management' during 1-15th May, 2018 at ICAR-Directorate of Poultry Research (DPR), Hyderabad, Telangana, India. She learnt the advanced technologies and practices like modern poultry feed system, artificial insemination in poultry, poultry marketing etc. during the training program.

In India, poultry breeders have adopted the technology of artificial insemination in poultry bird (hen) to improve the fertility rate of eggs. This technology is resulting up to 87 per cent of fertility rate in India. Whereas, in Botswana the same technology resulted up to only 70 per cent of fertility rate. Because, in Botswana sex ratio (M: F) of poultry birds is more. Also heavy breeds like Australop and upiton which were unable to complete the mating process resulting in low fertility rate in poultry.

Ms. Bula understood the importance of artificial insemination technology in poultry management to overcome the problem of poor fertility rate in poultry. She decided to implement this technology in her province and hence, she planned to choose implementation of artificial insemination technology in poultry as her back at work plan.

A pilot farmer was identified by 24th May, 2018. She was a local farmer rearing various avian species like local cross breed chickens, ducks, geese, guinea fowls, turkeys and a backyard egg production of 50 hyline birds. The farmer has got all the equipment and material needed for artificial insemination. The activity is using 95% of the farmer's equipment/ resources and manpower.

The poultry house was cleaned since the floor is not made of concrete. Karbadust was used to control parasites and a foot bath was prepared. Installation of cleaned and disinfected two tier cages was done on the 24th May 2018.

Incubators are installed in the selected site

Homemade Candler's

Ms. Bula selected 10 hens and 5 cocks on the 25th May, 2018 using the criteria like mature healthy cocks and hens, sexual active birds, birds free from diseases and parasites which may irritate the vent of the cock organ and make it painful to the bird.

The birds were de-wormed using pauperizing for internal parasites and dipped for external parasites with karba dip. New castle vaccine was administered on 4th June 2018 through drinking water to protect the birds against new castle disease which is normal prevalent in local birds during the month of July. Birds were fed with layers mash to stimulate egg production and supplement the nutrients deficiency. Every day, the birds were monitored and taken care with providing measured quantity of feed (120 g layers mash feed) and water.

On introducing the artificial insemination technology the poultry birds selected in the contact farmer poultry farm was started to result in the increased level of fertility rate in eggs. She is continuing to spread this practice through regular trainings and workshops in her workplace.

Major outcome:

1. Adoption of good agricultural practices and artificial insemination has led to improved production of eggs.
2. Contact farmer adopted the practice of record keeping in her poultry farm.

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Plant Health Management

Fruit fly trap awareness campaign in Afghanistan

Mr. Basir Ahmad Tabib is a Plant Protection Manager from Afghanistan working at Directorate of Agriculture, Irrigation and Livestock was trained under FTF ITT Program on 'Plant Biosecurity and Food Safety' held during 3-17th March, 2018 at National Institute of Plant Health Management (NIPHM), Hyderabad, Telangana, India. Fruit fly is responsible for 90 -100% loss in fruits and vegetables in several cases. Fruit flies are also major problem for export of fresh fruits and melon from Afghanistan. Control of Fruit flies using pesticide as spraying is very costly and not safe to the consumers and environment.

Demonstration of fruit fly trap

Farmers in India have effectively demonstrated on a simple and low-cost practice of trapping male fruit flies to reduce fertilization in female fruit fly which is mostly responsible for damaging the fruits like melon and vegetables. To solve problem of Afghanistan's farmers, Mr. Basir decided to introduce cost-effective Fruit fly pheromone traps which can be locally developed by using water bottles to trap the male fruit flies and use of sex pheromones such as Methyl Eugenol lure (ME lure) and cue lure which can be prepared for effective control of fruit fly in fruit like melon and vegetable fields.

After completing the FTF ITT training program, he organized fruit a fly trap awareness campaign at Herat province of Afghanistan. During the campaign, he demonstrated fruit fly lure preparation and explained the biology of pest and advantages of using fruit fly trap.

Outcome:

About sixty five women farmers got benefitted from the campaign and they have adopted low cost pest control methods.

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Promoting awareness on phytosanitary treatment through training programs in Kabul, Afghanistan

Mr. Shah Mahmood Hamidi, Afghanistan had participated in the 31st Feed The Future India Triangular Training program on 'Plant Health Management, Bio-security and Quarantine' during 27th November – 11th December, 2018 at National Institute of Plant Health Management (NIPHM), Hyderabad, Telangana.

As a national plant quarantine specialist, Mr. Shah has the mandate to avoid introduction of exotic pests, skill enhancement of the quarantine staff and traders to produce safe agricultural produces for national and international markets and also to improve the knowledge of the plant quarantine staff and traders on quarantine, agrochemicals, and fertilizers.

Training program on phytosanitary treatment for plant quarantine staff and traders

A phytosanitary treatment is an official procedure for the killing, inactivation or removal of pests, or for rendering pests infertile or for devitalization (FAO 2009). Mr. Hamidi, during the FTFITT training program learnt several new international agreements, policies, rules and regulations of phytosanitary treatments. This learning gave him an insight to enhance his coworkers' knowledge by sharing all the learnt information. Accordingly, he choose the capacity building of plant quarantine staff and traders towards phytosanitary treatment as his BAWP.

Inspsection and sampling of fresh/dry fruits export/import consignments

Mr. Hamidi conducted a national level training program on phytosanitary treatments in which the information related to pesticide hazards, pest introduction, quarantine guidelines,

standard agreements on agro-chemicals and fertilizers etc. was shared with trainees. Eleven (11) plant quarantine staff and twelve (12) traders were trained under this program. After the training program, the trainees expressed their satisfaction over the enhancement of their knowledge in quarantine policies and standard agreements due to the training program organized by Mr. Hamidi. He could serve as national level resource person due to his participation in the International training program on 'Plant Health Management, Bio-security and quarantine' under FTF ITT.

Major outcome:

1. Knowledge enhancement of trainees on rules and regulations of plant quarantine
2. Trainees got awareness on standard agreements related to agrochemicals and fertilizers
3. Mr. Hamidi Shah Mahmood received the certificate of appreciation from ministry of Agriculture, Irrigation and Livestock, Islamic republic of Afghanistan for his new job skill.

Contact details

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Sensitization about Maize Fall Army Worm (FAW) through information communication in Malawi

Mr. Elia Kazinga from Malawi has attended International Training on 'Plant Bio-security and Food Safety' during 3rd to 17th March, 2018 at National Institute of Plant Health Management (NIPHM), Hyderabad, Telangana, India. He has demonstrated effective control of Maize Fall Army Worm (FAW) to the farmers in his province.

Extension Planning Areas (EPAs)

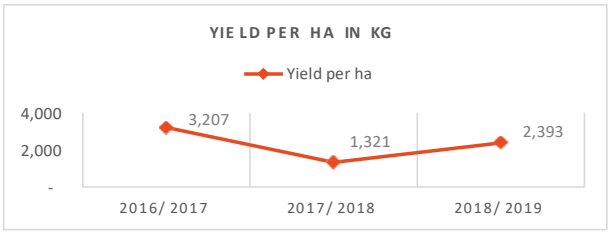
Each districts of Malawi are divided into 36 extension planning areas (EPAs) which are further subdivided into 596 sections.

Maize is the main staple food of Malawians. In the recent years it is heavily attacked by pests. With the coming of Fall Armyworm (*Spodoptera frugiperda*) in the Extension Planning Area (EPA) farmers were unable to find good ways of identifying, controlling and managing FAW and maize yield per hectare (ha) was heavily compromised. After farmers were trained on how to conduct pest surveillance, they are able to analyze the situation better. Now they have relied more on physical and cultural control as they are much better practice than just relying on inorganic pesticides which are hazardous to health and environment and enhance pest resurgence after building up resistance to them. Farmers are now opting to use botanicals e.g. Neem (*Azadirachta indica*) which are locally available and environmental friendly. These years, farmers have learnt better methods of identifying, controlling and managing Fall Army Worm. During the Agriculture Production Estimate Survey (APES) data consolidation, the EPA hybrid maize yield per ha of the 4th round of 2017/2018 season was less by 59 % over the 4th round APES of 2016/2017 season due to fall army worm infestation and the 4th round of 2018/2019 was higher by 43% over the 4th round 2017/2018 due to good pest management. As the program continues, the EPA expects to register better yield per hectare in kilograms than that of last season if all conditions remain constant.

Sl. No.	Season	Yield per hectare (ha) in kg	Remarks
1.	2016/2017	3,207	Normal year on average
2.	2017/2018	1,321	59% drop due to the fall army worm infestation
3.	2018/2019	2,393	43% increase over 4th round 2017/18 due to good management of fall army worm

This approach will likely change the livelihood of farmers implementing these methods of managing the pests since they will be food, nutrition and income secured. Below picture displays the method of analyzing and synthesizing the Agro-Ecosystem Analysis (AESA) by one farmer to their fellow farmers. Here the lead farmer has caught male moths of fall army worm in the pheromone trap and he is outlining how others could identify the *Spodoptera*

frugiperda moth. He has been aided with the information education communication materials (IEC) from the Department of Agriculture Communication. After that, farmers are encouraged to use local resources and integrated methods (physical killing, botanicals).



Graph 1: Year of production v/s Yield of Maize

Mr. Elia Kazinga explaining about FAW surveillance using poster on field day

Mr. Elia Kazinga is being interviewed by a News channel regarding FAW in Malawi

Mr. Elia Kazinga was on the popular Malawi TIMES TV explaining the importance of pest surveillance as well as pest identification, control and management through farmer field school (FFS) approach for his efforts. MANAGE and USAID India are happy to know the impact of the training on the job role of Mr. Elia Kazinga after his training in plant health management in India and contributing to the agriculture sector in his country. MANAGE wish Mr. Kazinga all the best in his efforts to serve the farmers in his region.

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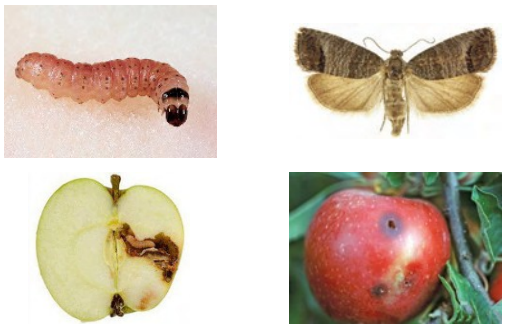
Combating codling moth with IPM approaches in apple farming in Afghanistan

Apple (*Malus domestica*) is one of the most potential crops in Afghanistan which majorly contributes in overall income from Horticulture sector in country. Afghanistan has a very high potential of producing apples which can be competitive in international markets. Codling Moth (*Cydia Pommnella*) is a major pest affecting the quality and production of apple in Afghanistan.

Mr. Mashwani Sadiqullah is Senior Integrated Pest Management Specialist from Kabul, Afghanistan. He attended 31st FTF ITT program on 'Plant Health Management, Bio-security and Quarantine' held during 27th November to 11th December, 2018 at National Institute of Plant Health Management (NIPHM), Hyderabad, India.



Common Name: Codling moth
Scientific Name: *Cydia pomonella* **(Lepidepteran family)**

As per Mr. Mashwani Sadiqullah, they have a remarkable apple production in his country but codling moth infestation is the major challenge faced by the apple growers. Farmers in Afghanistan generally use massive dose of chemicals for managing codling moth which is not a sustainable practice.

Mr. Mashwani Sadiqullah is creating mass awareness among farmers in his province Kate-Sakhi of Afghanistan regarding biological control and mechanical control of codling moth in Apple orchards. He is using television and radio as communication channel.

The demonstration on IPM for controlling codling moth

Placing the pheromone traps

The awareness campaign of Mr. Mashwani Sadiqullah also includes conducting demonstrations at farmers' filed during both winter and summer seasons right before the onset of this pest. The main activities under this initiative are to promote the usage of

pheromone traps, bagging of the fruit, trapping, and maintaining sanitation in the orchard.

Based on his training exposure and experience during the FTF ITT Training, he decided to take up Codling Moth control with his integrated approach. To achieve this objective, he selected around 400 demonstration farms of apple across the country. These all farms are under constant observations and trials.

Following interventions are being practiced in these farms each season:

1. Urea is sprayed only after 60 - 80 percent of leaf falls in the beginning of winter.
2. Usage of winter oil in the month of January.
3. Usage of Bordeaux mixture in the month of March.

Based on his work and results, Mr. Mashwani Sadiqullah mentions that "These methods of managing codling moth are very effective and are preparing the orchards to avoid the infestation in advance". Both winter and summer pest management of codling moth is ensuring that there is no infestation at all. Hence, the farmers in these areas are readily adopting this technique. Farmers in this area understand that the conventionally used insecticides are toxic in nature and negatively affect others and their own health as well. Owing to this initiative of Mr. Mashwani Sadiqullah, farmers in this area are also experimenting with different biological and cultural methods, planting configurations of pest management and optimizing their farm production.

Codling moth free apples

Contact Details

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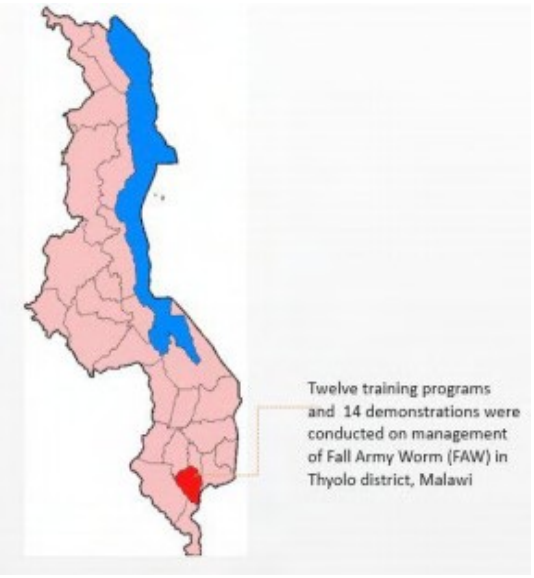
Fall army worm management in Malawi through creating master trainers

Ms. Kaitano Cathberity Rose is an Agriculture Extension Development Officer (AEDO) from Thyolo District of Malawi. She attended the 31st FTF ITT program on 'Plant Health Management, Bio-security and Quarantine' held during 27th November – 11th December, 2018 at National Institute of Plant Health Management (NIPHM), Hyderabad, India.

During the training program, she learnt about Agro-Ecosystem Analysis (AESA) based plant Health Management practices, ecological engineering for Plant Health Management, plant bio–security, pest risk management (PRA), pest surveillance, bio-Fertilizers, vermicomposting etc.

At the end of the training program, she took 'Fall Army Worm monitoring and its management' as back at work plan project. She chose this topic because of the emergence of FAW as a severe problem in her service area and even in most provinces of Malawi. Therefore, she realized that appropriate monitoring; surveillance and management activities need to be implemented for decision making and its effective control.

Sensitization: After gaining knowledge and appropriate skills at NIPHM Hyderabad India, Ms. Rose immediately started implementing the activities as per back at work plan objective and actions. She began with awareness campaigns regarding management of fall army worm and Integrated Pest Management (IPM) among the farmers of her area. Ms. Rose also created awareness among the officials on surveillance, monitoring and management of fall army worm, to get enough support from officials to achieve intended goal of eradicating fall army worm.



Demonstration: To show the effectiveness Integrated Pest Management (IPM) in managing the fall army worm, she divided the garden into 3 plots

1. Application of IPM Practices.
2. Application of Pesticides.
3. No treatment / control.

Maize plant field infested with fall army worms at Chibwana

Field demonstrations of signs of FAW infestation, control and its application of pesticides at Chibwana

Farmer Field-day on Integrated Pest Management

Based on the results, she demonstrated that, IPM practices are more effective as compared to pesticides. Thereafter, she motivated her staff to create awareness among the farmers on surveillance monitoring and management of fall army worm. Seeing the success of the impact of her demonstration plots and the results, she made demonstrations as an extension strategy and trained the staff on planning and implementing and showing the demonstrations successfully in her district.

Outcome

- As a master trainer she has directly trained 14 Officials.
- Sensitized 713 farmers about the methods of effective control of Fall Army Worm through results demonstrations.
- The region has witnessed effective control of fall army worm pest infestation in maize crop.

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Promoting effectiveness of IPM approaches over mechanical pest control measures in Afghanistan

Afghanistan has 3.2 million hectares under cultivation, which is almost equally divided between irrigated and rainfed agriculture. There is an irrigation system that dates back to hundreds of years that enables double cropping per year. The rainfed areas suffers from recurrent low precipitation and erratic distribution of rain resulting in frequent droughts. Wheat followed by rice or barley or vegetables can be grown regularly. Due to erratic rainfall pattern, prevalent drought and uncertain socio-economic situation, the Afghan farmers are presently focusing more on short-cycle crops that can produce immediate income such as vegetables, rather than on fruit orchards. Tomato is one of the most potential crops in the Afghanistan.

Mr. Ihsanullah was trained under the FTF ITT Training program on 'Plant Health Management, Bio-Security and Quarantine' held during 27th November – 11th December, 2018 at National Institute of Plant Health Management (NIPHM), Hyderabad, India. On returning back to his country, Mr. Ihsanullah was reported about the Army Worm infestation in Tomato crop in Basawal village of Mohmandra district. He perceived this problem as important and to implement the learnings during his training at India. He visited the infested field, recommended Nucleo-polyhedrovirus (NPV) and provided 6250 cc of available NPV to the farmers. Mr. Ihsanullah tutored large number of farmers regarding the use, safety, storage and handling of the NPV post spraying. Following the recommended pest management strategies for tomato army worm, the farmers were able to resolve the problem and were satisfied. Recurrent process of frequent communication, monitoring and follow up by Mr. Ihsanullah supported by Extension officer made this possible.

Mr. Ihsanullah pioneered the work of NPV in East Region of Jalabad, Afghanistan which was the hotspot for army worm. The work demanded laboratory set up for further scaling of the production of NPV for which Mr. Ihsanullah approached the higher authority to establish Biological Lab and immediately start working on NPV and was able to produce 80,000 cc of the NPV.

Sensitizing the farmers about the pest infestation in vegetable and its management

Promoting NPV for pest management in tomato

Traditionally, mechanical control of pests and diseases was practiced by the Afghan farmers at various districts of east region provinces for several years. This resulted in indiscriminate use of chemical pesticides. The intention behind promoting NPV among the farmers was to avoid excessive pesticide usage and promote judicious practice of control mechanisms. As a part of this, awareness campaign titled 'Winter Pest Management' was organized for IPM officers and farmers from the targeted area. The campaign demonstrated on the effectiveness of pest control strategies by following IPM approaches over mechanical control measures.


Campaign demonstrated on the pest control strategies through IPM approach.

Outcomes:

1. Farmers have fully understood the advantages of IPM and willingly use this approach at their field.
2. The IPM adoption has greatly helped the farmers in reducing the cost of the production.
3. This activity has been implemented through in NHLP (National Horticulture and Livestock Program) funded by World Bank for the Ministry of Agriculture, livestock and Irrigation.

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Promoting responsible use of pesticides in Ghana

Mr. Copperfield Kwami Banini, Deputy Director, Ministry of Food and Agriculture from Ghana, was trained under Feed The Future India Triangular Training (FTF ITT) Program on 'Plant Biosecurity and Food Safety' held during 3-17th March, 2018 at National Institute of Plant Health Management (NIPHM), Hyderabad, Telangana, India.

During the training program, he was exposed to National and International regulatory framework, skills on pest risk analysis, phytosanitary treatments, knowledge on food safety regulations, quality control of pesticides, pesticide residues in food, etc. He noticed that there have been reported cases and notifications of harmful organisms (thrips, false codling moth) in the Agro produce exported to the EU in recent times. This has led the farmers to use the chemical pesticides indiscriminately to be able to produce clean produce to get this lucrative market. As a result, most water bodies are polluted and aquatic animals are dying and it is also affecting human health. Food and Drugs Authority (FDA) confirmed the presence of pesticide residues in these produces. Sensing the urgent need to address this issue, he initiated his sensitization of farmers and officers through training.

Mr. Copperfield demonstrating and sensitizing farmers about pesticide usage in the field

Mr. Copperfield organized two training programs to train Agricultural Extension Officers at Adenta Municipal, Accra, Ghana and Gomoa East District, Swedru, Cape Coast, Ghana. He also trained 42 Agricultural Extension Officers. Further, he conducted two Farmer Field Schools (FFS) for the group of 34 farmers, focusing on pest control in chilly fields. The trainees of the FFS expressed their willingness to contribute to the environment safety measures in their agricultural practices.

Outcomes:

1. Farmers are now able to analyze the pest and natural enemy population before deciding to initiate the measures to control the pest.
2. Plant population per unit area is also enhanced since they now adopt appropriate planting distances.

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IPM against FAW- Success story of an agriculture extension officer from Malawi

FAW infestation is a big issue for Maize growers in Malawi as they solely depend on this crop for their livelihood. Due to serious outbreak of the fall army worm in Chitipa District of Malawi in the Maize fields, it resulted in poor yields and caused threat to food security of people. Over the time, farmers showed trust since Mr. Moses also organized awareness meetings with the local farmers and demonstrated positive effect of IPM practices in controlling FAW in their own fields. In the farmers' field, he demonstrated the effects of IPM module which included practices such as summer ploughing, pheromone traps erection and monitoring, inter cropping with Tephrosia, Bio pesticide application with Neem oil and finally with need-based insecticide sprays. The effect of this module was compared with fields with chemical control (Cypermethrin and Indoxacarb) and untreated control. He also promoted the practice of intercropping among the farmers.

Mr. Ngamba Moses Fwilachalo, an Agriculture Extension Development Officer from Malawi who is helping the farmers of Chitipa District of Malawi to fight against the infestation of Fall Army Worm (FAW). This pest has become a major problem for the Malawian farmers and has been swallowing their entire crop of maize, sorghum, millets and other staple crops. It is a voracious and fast spreading pest due to which farmers in Malawi are facing huge financial losses.

About Chitipa District of Malwai:

Chitipa is the northernmost district in the Northern Region of Malawi. The capital is Chitipa (formerly known as Fort Hill). The district covers an area of 4,288 km.², and has a population of 234,927. Chitipa borders fellow districts Karonga and Rumphi, as well as neighboring countries Tanzania and Zambia. The district is divided into five main areas known as Misuku to the east, Kameme to the north, Bulambia right at the centre while Wenya and Nthalire areas are situated to the south.

Map of Chitipa, Malawi
(map not to scale)

After attending the FTF ITT International Training Program on 'Plant Biosecurity and Food Safety' in November, 2018 at the National Institute of Plant Health Management (NIPHM) at Hyderabad in India, Mr. Moses decided to spread awareness regarding combating FAW efficiently. The training lessons taught him various IPM techniques to tackle the FAW. These techniques included practices like; deep summer ploughing, erection of pheromone traps, regular scouting and destruction of egg masses, intercropping with pulses, border cropping with Napier grass, using bio pesticides like neem oil, *Trichogramma*,

Beauveria bassiana, poison baiting technique with recommended pesticides, etc.

After returning back to his country, he shared his experiences of integrated and holistic Indian innovations to tackle FAW with his colleagues. They together organized many awareness programs for the farmers on the themes of integrated pest management, ecological engineering, deleterious effects of poisonous insecticides, pesticide residues,

Awareness meetings on IPM of Fall Army Worm in Maize in Tutwe model village, Chitipa District of Malawi

Pheromone trap installation

biological control of pests and diseases etc.

Owing to his efforts, now farmers in Tutwe model village, Chitipa District of Malawi are able to reduce the infestation of FAW significantly in their fields due to adoption of various IPM practices. They have installed pheromone traps in their fields (pictures) and are using various bio pesticides against FAW. They are also now intercropping maize with Tephrosia crop. Farmers in this region are now much more aware and are timely scouting, monitoring and are able to identify the early symptoms of FAW in their fields. The cost effective nature of these IPM practices is also another reason for their popularity among the farming communities here.

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Ecological engineering for the control of millipede infestation in crops in Mozambique

Millipede species are organic matter feeders. They play an important role in the breakdown and decomposition of plant litter. In field, millipede feeds on plant leaves, crop debris and dried grass and its excreta improve the nutrient content of the soil. This soil is rich in nitrogen and organic matter. However, when millipedes do not find organic matter to feed, they start to feed on domesticated crops in farmer's field. Mr. Joaquim Crimildo, Head of Rural Extension Services, Provincial Directorate of Agriculture and Food Security, Mozambique observed the similar problem in Chilacua valley (Massinga district, Inhambane province, Mozambique). Due to excess drainage of the crop fields witnessed dry conditions and subsequent loss of the habitat for the millipede. It lead to the millipede attack on the crops viz. banana fruits, vegetable and maize for feed. Now it has become a major pest and is causing reduced crop yields in Chilacua valley.

Millipede Pest on Banana Crop

Mr. Joaquim Crimildo got an opportunity to get trained on 'Plant Health Management Technologies and Approaches' held during 4th - 18th September, 2017 at National Institute of Plant Health Management (NIPHM), Hyderabad, Telangana, India. The program was held under the FTF ITT sponsored by USAID.

Earlier there was no recommended chemical pesticide to control this new pest. Various pesticides were introduced to control the pest, but they were ineffective to control the crop loss. He decided to work on this problem and he made it as an actionable work as part of his Back at Work Plan. He was motivated to help farmers to avoid the use of chemicals for the control of the pest using innovative Ecological Engineering method of **'Pit Trap'**. In order to control the pest, a 'pit trap' was developed by Mr. Joaquim Crimildo based on the knowledge gained in India during the FTF ITT training program. He created a rectangular pit trap of size 100 X 100 X 60 cm (60 cm deep) and filled it with dried grass and crop debris up to 40 cm and irrigated it thrice a week. Millipedes started getting attracted by the smell of decomposition and they started to move into the pit. In the same way, many pit traps were created to trap the pest. The collected pests were destructed by physical method on a regular basis. After decomposition of the crop debris, the organic matter produced by the millipede was used as organic compost. After the successful pest management, he visited many infested fields in the area and suggested the farmers to adopt the Pit Trap method. He also conducted the sensitization program

on millipede pest management by Ecological Engineering method Pit Trap. He sensitized 15 extension workers and 10 small farmers.

Outcome:

1. Low cost method helped farmers to adopt and use local materials and local solutions to pest control.
2. Farmers learned that there are number of effective local solutions for the pest control other than chemicals.

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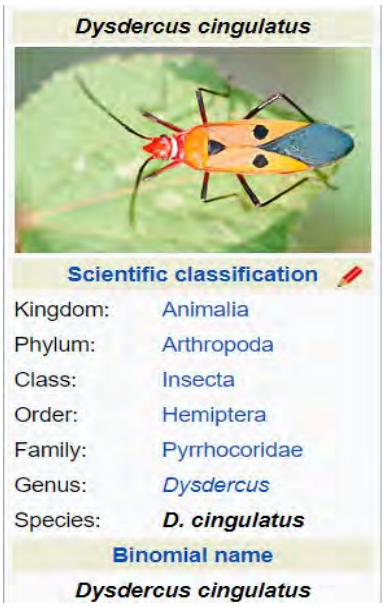
Sensitizing and dissemination knowledge on biological control of FAW to Extensionists in Kenya

Mr. Njuguna Peter Kamau from Kenya attended the 40th FTF ITT international training program on 'Integrated Pest Management, Extension, Training Strategies for major crop pests & Diseases in Developing Countries' (With special focus on Fall Army Worm) was conducted in November 19th to 4th December, 2019 at National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana, India. In the training the aspects like management and training strategies including Integrated Pest Management (IPM) are being taught. The training program also had practical sessions and visits to the institutes and research centers like various laboratories in National Institute of Plant Health Management (NIPHM), The International Maize and Wheat Improvement Center (CIMMYT) and Research & Development plant of Corteva Agri Science Pvt. Ltd.

Mr. Peter Kamau after reaching back to his country Kenya, committed to disseminate knowledge gained during the FTF training in MANAGE to his subordinate extension workers and farmers. In addition, he also attempted to rear Reduviid bugs (*Dysdercus cingulatas*) that are predacious and of considerable economic importance because they reduce the infestation of Fall Army Worm (FAW) and other pest population by killing the host quickly with their highly proteolytic saliva. In India, during training trainees had visited various state of art laboratories. The effectiveness of the reduviids as biocontrol agents has been demonstrated and the field releases usually resulted in quick and effective control of target pests. This will also aid in lowering indiscriminate use of chemical pesticide that end up eradicating predators.



Moreover, he committed himself to prepare the feasible and low-cost fruit fly traps and lure preparation. Tephritid fruit flies are responsible for post-harvest losses in fresh fruits and vegetables. In addition, they are also impediments to export of fresh fruits and vegetables. The *Bactrocera Dorsalis* fruit fly attacks mango, citrus, guava, papaya and other fruits.

This in the long run will provide sustainable livelihoods to farmers through cost effective technology for increasing their income and nutritional security.


Mr. Njuguna Peter Kamau rearing Reduivid bugs to use them as predators against FAW

Challenges encountered

Identification of Reduviid bugs and rearing of the reduviid bugs in Kenya has been a constraint to him. Earlier during the implementation of his Back-home plan, the issues like obtaining Methyl eugenol, which is a key chemical component in the preparation of the trap were problem for him. But he had continued to rear FAW for demonstration purposes to the farmers and is testing isolated botanicals against it (ovicidal, larvicidal, pupi cidal activities). He fed the FAW larvae with maize leaf and the adults with 10% honey solution as an alternative and succeeded in his objective.

Outcome:

- Mr. Peter helped Kenyan famers to identify and forecast the FAW pest on the crop.
- Farmers started using fruit fly trap as effective method of pest control.

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Biological approaches in surveillance and control of fall army worm in Malawi

Maize is a top subsistence crop in Malawi, grown by smallholder farmers for home consumption, and to a little extent as a cash crop. Food security in Malawi largely depends on maize production, which accounts for more than half of the caloric intake of households. While there are improved hybrid varieties of Maize available in the marketplace, most farmers (reported as 60–70% of farmers) cannot afford these and are using saved seed from previous years' indigenous varieties. The country largely depends on rainfed agriculture and maize cultivation is synchronized with the rainy season.

In September of 2016, Fall Army Worm (FAW) with a particular preference for maize, began to be reported in the maize fields in Malawi. At the same time that FAW was emerging as a national crisis, approximately 6.5 million Malawians were classified as food insecure and receiving food aid. Armyworm is an invasive pest from the Americas that has devastated crops in Africa since 2016. An armyworm invasion in 2017 forced Malawi to declare 20 of the country's 28 districts as disaster areas. They feed on cereal crops especially on maize, a staple food in Malawi.

Mr. Ngamba Moses Fwilachalo is an Agricultural Research Development Officer from Malawi and was trained under 31st FTF ITT on 'Plant Health Management, Extension, Management, Extension, Training, Biosecurity and Quarantine' during 27th November – 11th December, 2018 at National Institute of Plant Health Management (NIPHM), Hyderabad, Telangana. The FTF-ITT Training at NIPHM gave Mr. Ngamba a complete understanding about the life cycle of FAW and the integrated approaches of its effective control. He realized that chemical control alone will be counterproductive and may not offer a long term and sustainable solution to the menace posed by FAW. He learnt the IPM approaches and effective management of FAW during the training at NIPHM. After being trained under FTF training program on management of Fall Army Worm (FAW) in Maize, he committed to take up the issues in fixing problems based on the learnings of integrated pest management aspects during the training in NIPHM, Hyderabad, India.

Objective: To reduce the fall army worm attack to cops especially maize by integrated approach with special focus on use of available botanical remedies

Places: Tutwe model village, and surrounding villages of Malengwe, Muyombe and Ibuluma, Chambo section, Chisenga EPA, Chitipa DAO, Malawi

Activities:

- Awareness meetings to communities in Muyombe, Malengwe and Ibuluma villages.
- Briefing EPA field staff, local leaders and Chisenga ADC members
- Demonstrations on use of materials and equipments during spraying
- Mounting three plots of demonstrations with different treatments, conducting

field days, spraying two plots with pesticides and botanical control respectively also placing pheromone traps in the plots, in Model village and surrounding villages using lead farmers and follower farmers

Installation of trap as botanical control method

Demonstration to community

Beneficiaries: The farmers of Tutwe Model village and surrounding villages of Muyombe, Ibuluma and Malengwe (471 men, 515 women, total 986)

Results

Farmers have adopted the use of botanical control using TV and Delia for its less cost, the intercropping of maize with TV and higher yields are anticipated

Rewards

The introduction of locally available botanical control and intercropping maize with TV of which farmers in Tutwe model village have adopted Farmers and community around the model village appreciated the crop during field days

Key to Success

- The Use of locally available botanicals, organization of field days for mass awareness programs followed by three demonstrations mounted in rain fed and irrigated crop fields.
- The technical support from NIPHM, MANAGE, DAO, EPA.

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Training lead farmers and extension agents on safe use of pesticides in Ghana

The farmers are resorting to use more chemicals to enhance their yield. Similar situation can be noticed in Ghana and other African nations. In recent times this activity always disturbs the biosecurity and causes the environmental pollution.

Biosecurity is a holistic concept of direct relevance to the sustainability of agriculture, food safety, and the protection of the environment, including biodiversity. Biosecurity is a process of managing biological risks associated with food and agriculture in a holistic manner.

Mr. George Prah, from Ghana participated in the 22nd Feed The Future India Triangular Training program on 'Plant Bio-security and Food Safety' during 3-17th March, 2018 at National Institute of Plant Health Management (NIPHM), Hyderabad, Telangana. Mr. George during his training program understood the impact of continuous usage of chemicals.Mr. George voluntarily took the responsibility to spread the awareness on this issue. He planned to take 'creating awareness on ill effects of chemical usage in farming' as his back at work plan.

After the successful completion of his training program and upon his return to his country, Mr. George started to work on his BAWP. He conducted a capacity building training program on the responsible use of pesticides to Lead Farmers and Extension Agents.

Training program on responsible use of chemicals in farming

Twenty (20) Lead Farmers and Ten (10) Agricultural Extension Agents attended the training program at Zabzugu District in the Northern Region. During the training program, trainees learnt the recommended usage of chemicals as suggested by NIPHM, India. This training program made the trainees to take responsibility towards propagating the recommended usage of chemicals in their projects and programs at all the levels.

The knowledge of participants has enhanced about good practices in the handling of agro-chemicals. Practical sessions were conducted followed by discussions regarding the appropriate ways of spraying chemicals on the field.

Major outcome:

Discussion session on use of chemical fertilizers among the trainees

1. Twenty (20) lead farmers and ten (10) extension agents were trained as master trainers on ill effects of excessive use of chemicals in farming
2. Knowledge was enhanced on the importance of limited use of agro chemicals for lead farmers and extension agents.

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Post-Harvest Technologies and Value Addition

Value addition to cassava in order to enhance the income of small and marginal farmers in Liberia

Mr. Frank Friday Merriam, Agriculture Extension Officer of an NGO at Liberia attended the FTF ITT International training program on 'Agribusiness Startup to Scale up' during 10-24th July, 2019 at National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana. The training program that he attended was impactful and an eye-opener for him. As soon he returned to his country after the training program, he developed a concept note intended to address the problem he identified in his local area which is low value addition of Liberia cassava and strategies to empower local cassava growers who make over 80% of farming households across Liberia.

The knowledge and skills that he acquired during the training were shared for the 'Cassava Value Chain Development'. He conducted awareness campaign for the development of cassava value chain. Mr. Frank Friday started working with a local cassava farming group named 'Destiny Women' (https://www.facebook.com/destinywomenlib) consisting of 26 members under Farmers Empowerment and Educational Development (FEED).

Mr. Frank lecturing Cassava farmers about the importance of Cassava production and value addition

Mr. Frank monitoring and overseeing the clearing of weeds at one of the cassava farmers

During the sensitization meeting, he emphasized more about the benefits and profitability of cassava to the farmers owing to its multiple properties compared to other crops like Rice, Wheat, Maize etc. He conducted meetings with stakeholders and policy makers in the sector and the Ministry of Agriculture, expressing the need for local cassava farmers' empowerment. He started offering voluntary services by working with the twenty six farmers at Destiny Women farming group. He disseminated his knowledge through basic training, teachings and preparation of work plan for production process flow, which includes production of Fufu Powder, Cassava Starch, Deepah and Cassava Flour.

Mr. Frank was successful in motivating farmers in cassava value chain development regardless of the enormous problems in the sector. He encouraged farmers to continue

to hold together and supported them to form cooperatives, which would attract local and international assistance, local government attention to provide the necessary aids.

Mr. Frank Supervising GARRI Preparation and Processing for Local Commercialization with his team

Outcome:

As a result of information sharing, creation of awareness, commitment, dedication and passion in ensuring that low income earners (farmers) increase their income and make cassava farming a business in Liberia, more community dwellers and villagers where they operate are interested in cassava production.

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Sensitization of Kenyan farmers on smart foods

In Kenya, the food system is quite diverse and people depend on staples such as maize, rice, and wheat to fulfill their day to day dietary needs. However, it is sad to note that they eat these foods as some rely on fast foods such as fries and burgers without considering what is good for their bodies, the environment as well as the farmer. Having a crop that helps farmers and consumers is very important.

Ms. Winnie on meeting with county retail managers

Ms. Winnie Mashaghala Mwanyigha, Project Research Assistant from Kenya had attended the 42nd FTF ITT International Training Program on 'Good Agriculture Practices for Sustainable Agriculture in Developing Countries' during 11-25th February, 2020 at International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India.

Ms. Winnie observed that, the adoption of these nutritious crops, especially millet and sorghum, which have a wide range of benefits both for the person, plant, and farmer, is shallow. There is a lack of awareness of the merits of these crops, and there is a perception where these crops are regarded as orphan crops. Most individuals perceive these smart foods as old-fashioned foods or food for the poor and those who have health problems such as diabetes. Adoption of these smart foods will help Kenya tackle challenges such as malnutrition, diet-related health issues, rural poverty, which make 80% of the land surface, and climate change.

Ms. Winnie, who was hailed as Kenyan '**Smart Food Ambassador**' by ICRISAT, Hyderabad interacted with farmers in Machakos County on 9th March 2020. She revealed that the rural communities have little or no information regarding the advantages of smart foods. The communities are also not aware on how to diversify their diets with smart foods so that eating the foods doesn't cause fatigue and ill health. About 1% of those who were found planting millet complained about birds consuming the produce in the farm that leaves them with little or no harvest at all. Besides, they have also adopted western diet which do not have enough dietary benefits and could be bad for health.

Ms. Winnie visited supermarkets within Nairobi County and compared prices of millet and sorghum versus wheat and maize flour. The prices of millet and sorghum were approximately double the price of maize and wheat flour.

The price range of 2 Kgs:

Wheat flour was Kshs. 109- Kshs.120
Maize flour was Kshs. 112- Kshs. 154
Millet & Sorghum was Kshs. 200 & Kshs. 388 respectively

At the local market, the price or maize flow was Kshs. 80 while that of sorghum and millet was Kshs. 300 for 2 kgs, respectively. However, since coronavirus pandemic affected the country, the prices of foodstuffs in the country have risen, and Kenya is risking a looming food crisis.

Ms. Winnie decided to continue educate people on smart foods through blogging as well as utilizing social media platforms until the lockdown is over. The future plan is to promote the planting of smart foods among farmers to ensure availability to people from all walks of life. Because of the peoples' interest seen in the diversification of these foods, they have a Kenyan recipe document by smart food global, which they plan to share with the trainees after every training/interaction. This will make it interesting in incorporating the smart foods in their diets. Ms. Winnie prepared a video on the impact of the corona virus pandemic in Kenya on Agriculture, food security and general lifestyle at large to further her work on smart foods during the pandemic.

Ms. Winnie sensitizing people on smart foods

The video is uploaded on: https://www.smartfood.org/activities/kenya/

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Turning the pandemic caused crisis into an opportunity to upskill the youth of Uganda in processing and value addition in Uganda

Ms. Meeme Hadijah, Training Coordinator from Uganda Industrial Research Institute, Uganda has attended the FTF ITT training on 'Food Processing and Value Addition Technologies for Agripreneurship' during 4th to 18th March, 2020 at CSIR- Central Food Technology Research Institute (CFTRI), Mysore, Karnataka, India. The training program was intended to train the participants in the areas of post-harvest processing and value addition technologies for agripreneurs. In the training, concepts like post-harvest technologies for fruits & vegetables and their opportunities, preparation of fruit juice beverages like Mango Squash, Ready to Serve (RTS) and Ketchups out of tomato, preservation of fruits and vegetables (tomato, mango) as pickles, minimally processing technology and handling of advanced processing equipment were demonstrated with hands on experience to the participants.

Through this training, Ms. Meeme Hadijah realized the scope of technologies like RTS products such as ketchup, jam, tomato sauce and preservation techniques. In the training she also got the opportunity of hands on practice of preparation of fruit juice beverages like mango squash and tomato ketch up.

After returning to her country, she took the responsibility of transferring the learnt knowledge on food processing technology in CFTRI, Mysore during FTF ITT training. The global pandemic Covid- 19 was biggest hit in the economy of many countries, as it affected livelihood and income to the thousands of youths and famers. In this crisis period Ms. Meeme Hadijah took initiative to uplift the unemployed youth and fruits and vegetable farmers.

Objectives of the BAWP

1. To reduce post-harvest loss of mangoes and tomatoes, Improve farmers' household income
2. To increase the shelf-life of fruits and vegetables
3. To impart skill to youth to enable them start-up small scale food processing enterprises

Prior to conducting of training, she identified and selected prospective entrepreneurs to participate in the training. Later she purchased training materials and organized a 5 day hands on skills training in mango and tomato processing. She developed mango cordial, tomato ketchup and pickled cherry tomatoes. She taught the participating youths about minimally processing technology and post-harvest technologies for fruits & vegetables and their opportunities.

Beneficiaries: County youth, farmers, women and retired civil servants

Participants during the training for value addition to tomatoes at UIRI

Mango pulp extraction during training to participants at UIRI

Results:

1. Prevented post-harvest loss of 8 tonnes of mangoes and tomatoes during the COVID-19 lockdown
2. Empowered an elderly man and his son started making tomato ketch-up and pickled cherry tomatoes
3. Empowered a woman farmer to start-up a mango fruit processing business
4. Created business opportunities for youth who had lost their jobs during COVID-19

Pickled cherry tomatoes

Mango cordial

Recognition: UIRI, Nakawa has been recognized as a **Centre of Excellence** in East Africa

Reasons behind the successful Implementation

- She implemented an activity that was addressing a problem of post-harvest loss faced by many farmers during COVID-19
- She got timely support from the management of the Institute i.e. UIRI, Uganda and technical support from CFTRI, Mysore and MANAGE, Hyderabad, India
- Ms. Hadija's own personal commitment promised for BAWP and self-motivation.
- The interest showed by the participants in the training to become skilled during the pandemic.

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Food processing and value addition in ragi which changed the scenario of small & marginal farmers in Kenya

Finger millet (*Eleusine coracana* (L.) Gaertn) is a staple food crop grown by subsistence farmers in the semi-arid tropics and sub-tropics of the world under rainfed conditions. The name is derived from the seedhead, which has the shape of human fingers. Locally, the crop is called ragi (India), koddo (Nepal), dagussa tokuso, barankiya (Ethiopia), 'wimbi', mugimbi (Kenya); bulo (Uganda); kambale, lupoko, mawale, majolothi, amale, bule (Zambia); rapoko, zviyo, njera, rukweza, mazhovole, uphoko, poho (Zimbabwe); mwimbi, mbege (Tanzania) and kurakkan (Sri Lanka).

Millet production in Kenya thrives well in marginal areas, owing to its drought tolerance. The main types of millet grown include bulrush, finger millet, foxtail and proso. Kenya largely produces finger millet variety. Finger millet (known as 'wimbi' in East Africa) has historically been grown by small holders in Kenya to meet their subsistence food requirements. Wimbi is predominantly cultivated in western Kenya around Lake Victoria and some parts of the Rift Valley. The famers' primary goal is to satisfy household needs and where possible, generate a surplus for sale. The crop is grown on either pure or mixed stands. Farmers mainly grow their local types which are differentiated by color; either brown or black

Nutritionally, finger millet is primarily consumed as **porridge** in Africa but in south Asia as bread, soup, roti (flat bread) and to make beer. Interestingly, new food products made from finger millet are also becoming popular among younger people, including noodles, pasta, vermicelli, sweet products, snacks and different bakery products. In some nutritional components, finger millet is a superior crop compared to some major cereal crops especially polished rice

Ragi Porridge

Porridge (historically also spelled porage, porrige, or parritch) is a food commonly eaten as a breakfast cereal dish, made by boiling ground, crushed or chopped starchy plants typically grain (Ragi) in water or milk. It is often cooked or served with added flavorings such as sugar, honey(dried) fruit or syrup to make a sweet cereal.

Mrs. Lucy Karimi Gachanja, Apiarist and Agripreneur from Nairobi, Kenya was trained under the FTF ITT International Training on 'Food Processing and Value Addition Technologies for Agripreneurship' during 4-18th March, 2020 at Central Food Technological Research Institute (CFTRI), Mysore, Karnataka, India. She decided to share her post training experience in food processing and value addition amongst her stakeholders and with fellow farmers on what she learnt at CFTRI in Mysore, India.

She disseminated knowledge on some nutritional and health benefits of the Ragi grain, importance of sorting, selecting and crushing the grains in order to achieve the full benefits of value addition to their stakeholders. She was able to identify a Ragi crusher, sorter and separator machine that is used by small holder farmers at the village level. Growing ragi has been practiced for a long time in Kenya. Since ages it has been crushed using two smooth stones traditionally, a task reserved for elderly women in the village. The traditional method has disadvantage in many terms like skilled labor, manpower and time consumption.

Woman farmer using traditionl method for making flour out of Ragi

Outcome:

Results of her Dissemination of knowledge on processing of Ragi to their stakeholders made them aware about importance of value addition in ragi for higher income. Also because of better infrastructure at village level like having electricity supply, machines were made to improve the livelihoods of both men and women. With this initiative, the small scale farmers are able to produce large quantities of Ragi grains. A portable Ragi crushing, sorting, and selecting machine was made to support the small scale Ragi farmers. It added value and process the grains at the shortest time available. The machines are available either a diesel operated or an electric operated fitted with a motor. Now the automated machine made the farmers to get a better quality and quantity flour.

A portable small scale machine for milling and processing Ragi

Outcome:

1. Small farmers are able to produce fine quality as well as larger quantity of processed Ragi in a short span of time.
2. The Demand for machine processed Ragi enhanced resulting in improving income of small farmers.

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Encouraging adoption of onion storage technology in East district of Greater Accra region of Ghana

Agriculture in Ghana is an established economic sector and produces variety of agricultural products. It provides employment to large population on a formal and informal basis. Ghana produces a variety of crops in various climatic zones which range from dry savanna to wet forest and which run in east–west bands across Ghana. Agricultural crops, including yams, grains, cocoa, oil palms, kola nuts, and timber, form the base of agriculture in Ghana›s economy. In the horticulture sector vegetable and fruit crops like tomato, onion, shallots, okra, local spinach, eggplant and bananas, pineapples, dates, figs, olives, and citrus respectively. In 2013 agriculture employed 53.6% of the total labor force in Ghana.

Onion (*Allium cepa*) is a vegetable and valued highly in Ghana and many parts of the world for Flavoring, seasoning foods and for medication. The food habits of Ghanaians are such that a bulb of onion is used in almost every food preparation. Ghana's onion consumption needs exceed its onion production and so about five million dollars is spent annually to import dry onion bulbs from neighboring countries (Ghanaweb, 2012). Commercial onion farming in the river Afram basin of the Eastern Region which contribute to Ghana onion production have several limitations. These include seasonal production, adverse environmental conditions (weather extremities), inadequate access to inputs and insect pest and disease attack.

Mr. Emmanuel Amanor Yirenkyi, Assistant Agricultural Officer from Greater Accra, Ghana was trained under the FTF ITT International Training on 'Post-harvest Technology in Horticulture Crops' held during 6th-20th November, 2017 at ICAR-Indian Institute of Horticultural Research (IIHR), Bengaluru, Karnataka, India. He has been trained on post-harvest technology, preservation and value addition in fruits and vegetables. Seeing the scope of importance of working on reducing the loss of onion during storage, he was committed to solve the problem of post-harvest loss of peri-urban vegetable growers, especially onion growers.

Problem in his service area:

The major problem in the service area of the East District of the Greater Accra Region among crop producers is post-harvest losses in onions. Farmers in this part of the region are mostly peri-urban vegetable growers. Onions are one of the major vegetables grown in this area.

Sensitization on the dehydration technology to the vegetable growers in the GA East District area in Ghana

ICAR- IIHR, India's Dehydration technology learnt during his training period helped and motivated him to take up the issue to reduce the post-harvest loss. He mainly concentrated onion growers in the catchment area of

Accra Region of Ghana. During the trainings, he approached the target beneficiaries and explained the principles and practices of storage and dehydration technology in onion. From the mentors of FTF ITT training at IIHR Bengaluru formulated the various strategies and stages of the dehydration technology process.

Feedback of the trained onion growers

They were impressed by different onion storage technology structures in India, he convinced some resourceful farmers in lower Manya district to put up a cool chamber for onion storage in scientific way. In some cases, he also demonstrated the construction of low cost onion storage construction of low cost onion storage structure without using steel or any other metal.

Indian experience, a cheaper Storage made from bricks can be constructed to benefit local vegetable growers in the area

Chart 1: Brief hierarchical representation of onion dehydration

*KMS: Potassium metabisulphite

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Women Empowerment, Youth in Agriculture and Livelihood Security

Poverty eradication measures through women groups in Uganda

Mr. Dominic was impressed by the model of collective action for better livelihood of women during his training at Kudumbashree. Mr. Gumisiriza Dominic Joram is Agriculture Tutor from Uganda, was trained under 13th Feed the Future India Triangular Training Program on 'Entrepreneurship Development among Rural Women' during 13-22nd November, 2017 at St. Augustine Training Institute, Nsambya, Kampala, Uganda.

After successfully completing his training, he conceived the idea of women collectivization and self-employment through self-help groups (SHG) and decided to implement the same in his institution among students, teachers and non-teaching staffs. Initially he organized sensitizing programs in the villages to form a group. After formation of few groups, group members sensitized other people to form groups. He formed 16 women groups, 7 in institutions and 9 in the neighboring villages. Out of these, 13 groups are running successfully with their projects. Under his guidance, student groups are growing vegetables, fruits, rearing piggery and apiary. Neighboring village groups including those HIV patients and visually impaired persons are also undertaking the works like handicrafts, goat rearing, piggery rearing, apiculture, ghee making, brick laying, and poultry to support their livelihood.



Picture showing student groups are growing vegetables, fruits, rearing piggery and apiary

Student members engaged in piggery

Members of the group engaged in horticulture field

All members of the groups, fine-tuned their skills with the help of Mr. Dominic. He trained them on best agricultural practices, financial management and leadership development. They efficiently made use of available resources manpower, land and time to achieve their objectives like combat poverty among families, to promote better methods of agriculture, to increase family income among women, to empower women with opportunities for development and to increase food security measures in families.

Sl. No.	Group Name	Members	Activities
1.	Katooma Women's Group	15	Goat rearing, Ghee making and Horticulture
2.	Kanyigiri Women's Group	16	Piggery, Agriculture and Poultry
3.	Nyakayojo Women's Group	15	Brick laying and Horticulture
4.	Nyakayojo Women's Group	13	Horticulture and Piggery
5.	Nyakasa Women's Group	13	Horticulture and Piggery
6.	Akashanda Women's Group	12	Piggery, Poultry and Vegetable growing
7.	Kibingo Women's Group	15	Piggery Goat rearing and vegetables growing
8.	Bishop Stauart core PTC women group	10	Piggery
9.	Bishop Stauart core PTC female students' group	70	Piggery, Apiculture, Horticulture
10.	Mamita Institute female students' group	20	Piggery, Vegetables Growing, Goat rearing
11.	St. Georges Ibanda Core PTC female students' group	60	Piggery, Vegetables Growing, Goat rearing and Cattle rearing
12.	St. Paul's primary school female staff group	10	Piggery and Horticulture
13.	Coloma primary school female group	12	Weaving Baskets, Mats and Table Cloths

Outcome:

As a result of these activities, women became financially Independent, more confidant and many of them leading the groups their own without any assistance from Mr. Dominic now.

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Charcoal briquette from farm waste-A mechanisation initiative in Uganda

Ms. Nakitto Sarah from Uganda participated in the International Training Program on 'Farm Mechanization for Small Farmers' during 11-25th April, 2017 at ICAR-Central Institute of Agricultural Engineering (CIAE), Bhopal, Madhya Pradesh, India. After she returned to her country, she started charcoal briquette making project as she learnt the mechanization aspects from the training program conducted in CIAE, Bhopal, India. Charcoal is their main source of fuel for the quickly growing urban population of Uganda. An estimated at 0.85 million tons of charcoal is consumes annually in urban Uganda, each household taking a share of one ton annually. In aggregate, this is the same charcoal consumption of the whole of Europe. (http://www.southsouthworld.org/blog/46-solution/2282/green-charcoal)]

There is currently a lot of farm waste in the Katikamu Parish in Wobulenzi Town council area which is mismanaged through burning. The Katikamu Women's Development Group added value to this wastes through innovations of Charcoal Briquettes Production. The principal product comes from milling the husks themselves where it creates a more efficient and heat-radiating briquette. It also sources other abundant, otherwise discarded agricultural waste such as coffee husks, maize (corn) cob and rice husks to make a briquette.

The carbonized briquette is dried using 'environmentally sustainable solar driers' and packed in affordable 25 kg packs. Since briquettes are created from compressing combustible materials, they are denser, harder, and more compact. They have high specific density and bulk density compared to loose biomass. Thus, they offer a more concentrated form of energy than firewood or charcoal. Five bags of Charcoal Briquettes produced per week. The produce is sold immediately as the market is readily available for the product. The group has confessed that this Project helped lot of women family in sustainable daily financial needs of their families. The demand for the charcoal rises as the people found it clean and smokeless.

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Empowering women farmers through capacity building in Ghana

Ms. Atchulo Azara, Assistant Agricultural Officer from Ghana has participated in FTF ITT training program on 'Farm Mechanization for Small Farmers' at ICAR-Central Institute of Agricultural Engineering (CIAE), Bhopal, Madhya Pradesh, India during 11th –25th April, 2017. Once she returned to her country after the training program, Ms. Atchulo Azara trained three women farmer groups, namely Bilsi-kura, Nwoŋpei and Old Buipe. These group have about 129 women farmer members. These groups were trained on women friendly technologies of harvesting, processing and utilization of soya, orange, and sweet potato.

As a result of her efforts in training, now every group is working collectively on the field for the production of the crops by using women friendly technologies for harvesting, processing and utilization of soya, orange and sweet potato. As a result, the cost of production is reduced and profits are made, due to scale of economy and reduction of several transaction costs in input procurement, intercultural operations, processing and marketing.

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Empowering young girls to supplement the household income in Uganda

Ms. Yagala Julian is a coordinator in Women Development Office, Kaguma village, Buheesi, Kabarole, Uganda. She was trained under 13th FTF ITT International program on 'Entrepreneurship Development among Rural Women through Kudumbashree at St. Augustine Training Institute, Kampala, Uganda during 13-22nd November, 2017. After the training program, as a Back at work project, she took two assignments. One is '**Empowering young girls in skills to supplement on the household income**' and another is '**Empowering women in kitchen gardening and general household hygiene**'. A brief description of her achievements in the back at work plan are given below.

People in rural areas of Uganda depend on farming as the main source of income. In addition to agricultural engagements, rural women are also responsible for the managing of their families. Julian recognized the power of women groups and self-employment after she attended the Feed the Future India Triangular Training (FTF ITT) International Training Programme on 'Entrepreneurship Development among Rural Women' held during 13th - 22nd November 2017 at St. Augustine Training Institute, Nsambya, and Kampala, Uganda. She focused her efforts to implement the Kudumbashree model in Fort Portal.

She was particularly motivated to implement the women empowerment program when she recognized that the women cannot support their children at school and in most cases, girls drop out of school to help out in domestic work or to get married. Ms. Julian selected 10 girls aged between 16 to 19 years hailing from the poor and vulnerable background, who were motivated to something new and they studied in different schools within Fort Portal Town. They, like many of their peer group, have the same basic needs – financing their education and expenses related to schooling.

Financial Independence: Bank accounts for all the members of the group

Julian visited them and took permission for enrolling the girls in the group (performing non-Hazardous work) from the girls' guardians. She also briefed the parents on Kudumbasree model and the changes that she expected to bring about in their society. After having formed the group, the girls decided on making and selling quick snacks to their fellow school mates.

Group Meetings of the members

A trainer was arranged free of cost to train the girls in snack making. Since the girls were unable to raise money themselves, Julian approached well-wishers and raised 70,000 Ugandan Shillings as seed capital. Space and cooking materials for manufacturing the snacks were provided by Julian. The main product is "Mandazi" which has had the highest demand from the consumers as well. Each of the members was given a sales target and they were mostly able to achieve it consistently. The proceeds from the sale were pooled religiously and were deposited to a bank account formed on behalf of the group. The formal banking system ensured that the girls were able to track their transaction and be updated on the savings. The girls have expanded the category to cakes, meat pies and other snacks besides Mandazi.

Mandazi are similar to doughnuts, having a little bit of a sweet taste. Mandazi are made by briefly cooking the dough in cooking oil. The ingredients typically used to make mandazi include water, sugar, flour, yeast, and milk. Coconut milk is also commonly added for sweetness. However; they are typically less sweet than the United States style of doughnuts and are usually served without any glazing or frosting. They are frequently made triangular in shape (similar to samosas in India), but are also commonly shaped as circles or ovals. When cooked, they have a "fluffy" texture.

Mandazi are commonly referred to as mahamri or mamri. Ground peanuts and almonds, among other ingredients, can also be used to add a different flavor.

Empowering women in kitchen gardening and general household hygiene in Uganda

The average Ugandan woman spends 9 hours a day on domestic tasks such as preparing food, clothing, fetching water and firewood, caring for the elderly and the sick. To supplement their income, rural women may engage in small-scale entrepreneurial activities. However, due to their day to day engagements they can spare very little or no time for these income-generating activities.

Tip for hand washing and cleanliness

Therefore, Julian concentrated on empowering the homemakers to lead their respective domestic life in a healthy manner. She appraised the homemakers of Kaguma village and succeeded in forming a group named Bakyara tweyimukye Kudumbashree group, comprising of 18 women. Household hygiene was adopted as the main agenda because it emerged as the single most aspect of daily life that required immediate attention. Julian replicated the farming model of Kudumbashree in this group and sensitized about household hygiene. After forming the group, the women started their income generation through kitchen gardening and it also serves as a source of nutrient-rich vegetables for their consumption.

Sensitization on household hygiene

Impressed by Kudumbashree model the group members meet, save and also help neighbors to meet and maintain the hygiene. In every meeting, the members make minutes, discuss their financial positions, and lends money to needy members to support in construction, gardening, and maintenance of hygiene at the members' premises. Women have been trained on construction of drying racks for storing their household utensils, making tip taps for washing hands after using was rooms, construction of energy saving stoves that reduce smoke and to save firewood. Depending on their need, they were offered training in household hygiene, kitchen gardening and village level savings.

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Waste management in organic farming for the socio-economic empowerment of rural women in Nepal

Ms. Bindu Poudel Bhattarai from Nepal participated in the 30th FTF ITT International training program on 'Entrepreneurship Development among Rural Women' during 2018 conducted at Kudumbashree Mission, Kerala, India. During the training program she learnt about small scale entrepreneurship for the empowerment of rural women with the locally available resources.

Post-training, she decided to help the rural women to improve the socio-economic status through small scale entrepreneurial activity especially the indigenous and marginalized women group (Tamang and Dalit). Her mode of transfer of technology was to impart knowledge on vermicompost preparation and sale. Vermin-composting is an environment friendly approach of manufacturing natural fertilizer by using assorted species of earthworms for decomposing waste materials. It is also an imperative profitable endeavor for sustainable and high-yielding farming along with mechanism for waste management that can be regulated with less investment.

Ms. Bindu Poudel demonstrating about the vermi-compost making

Ms. Bindu conducted several trainings on preparation of compost to the rural women at Bukhel ward, Southern part of Lalitpur District of Nepal. Most of the practical teachings and hands on training type of methods were able to reach the women at rural areas. Ms. Bindhu provided skill training and follow up, input support and counseling to beneficiaries about the manufacturing of vermicompost, strategy to improve their business and encourage thrift in cooperative mode, support for packing and labelling, registration support for enterprises and exposure visit/cross learning and sharing activities.

Ms. Bindu Poudel teaching about the layers of farm waste in making vermi-compost to the marginal women group

This practical teaching comprehends the following elements:

- Technique to construct vermin-bed by using plastic sheets, utensils, organic wastes material
- Decomposing waste materials for 15 days and then, introducing a red earthworms in those decayed waste materials.
- Enclosing vermin beds with plastics to sustain its temperature and moisture and to safeguard earthworms against birds and other creatures etc.

Outcomes:

1. The women who have been trained by project and have been provided with the initial technical input support to successfully start their enterprise.
2. Out of 13 women were trained on the vermicompost, many started their own enterprise.
3. She is appreciated with an appreciation letter from the Bukhel ward and Vermi compost expert/specialist, Prof. Dr. Ananda Shova Tamrakar of Nepal.

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Tackling malnutrition through promotion of consumption of orange fleshed sweet potatoes in Uganda

Mr. Orishaba Alex from Uganda was trained under the FTF ITT international training program on 'Integrated Technology for Production, Processing and Value addition in Tuber Crops' during 16-30th September, 2019 conducted at ICAR-Central Tuber Crops Research Institute (CTCRI), Thiruvananthapuram, Kerala, India.

Mr. Alex credited the FTF ITT training for his new confidence with the exposure to advanced technologies and innovations from ICAR-CTCRI, Thiruvananthapuram, Kerala, India. After going back to his country, he committed to address the major problems like nutritional insecurity and mortality of children in his districts. He utilized the knowledge and learnings from the training program on tuber crops and sensitized the Head Masters and School principals and parents about the nutritional importance of orange fleshed sweet potatoes at Kaharo Sub County, Kabale district in Uganda. Orange fleshed sweet potato variety rich in vitamin-A is popular crop and becoming an important strategy to improve vitamin-A deficiency across Uganda. He sourced the tubers (planting materials) of improved varieties of orange fleshed sweet potatoes from National Agricultural Research Organization (NARO-KACHWEKANOZARDI).

He organized the field demonstration at both school gardens and selected model farmer fields. He conducted awareness activities to demonstrate the school students, their parents, neighbors, teachers, pregnant and breast feeding mothers about the cultivation and importance of consumption of Sweet Potatoes. He himself distributed the tubers of improved varieties of orange fleshed sweet potatoes to the parents, school management authority, and rural community people. He also monitored and gave technical backstopping for rural communities in the agronomical aspects of cultivation of orange fleshed sweet potatoes. He demonstrated and taught how to prepare and cook these orange fleshed sweet potatoes to minimize the loss of nutrients. By this activity, he aimed at reducing the nutrient deficiency of children who are less than six years age.

The efforts of Mr. Orishaba Alex were imparted to 5000 pupils of five primary schools and also more than 2000 parents especially women. He could able to establish 20 acres of orange fleshed sweet potatoes gardens in Kaharo Sub County. He received huge appreciation for his initiative by the school officials for contributing his knowledge in order to reduce the malnutrition and improving on food security among the vulnerable categories of people.

Mr. Alex is sensatizing parents of school children regarding nutitional importance of Orange Fleshed Sweet Potatoes

Mr. Alex dessiminating the knowledge to farmers on Orange Fleshed Sweet Potatoes

Outcome:

Mr. Alex was encouraged by the District Administration to scale up this technology to other districts by training through other fellow agriculture officers. MANAGE, USAID India are happy to know the progress of Mr. Alex and wish to him to do more on spreading his knowledge gained from the training at CTCRI in his workplace.

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Canteen / Café units and delivery services by empowering women in Kenya

Ms. Leah Wanja, Policy and Programs Officer, Women Farmers Association of Kenya participated in FTF ITT training program on 'Entrepreneurship Development among Rural Women' held during 9th - 23rd May, 2018 at Kudumbashree, Thiruvananthapuram, Kerala, India. She learnt about Indian Self-Help Groups (SHGs) and group dynamics among the women groups, entrepreneurship activities etc., during the training program. She was motivated from the Indian Kudumbashree model of women groups and their entrepreneurial activities.

After returning to her country, she took the initiative to form women and youth groups into undertaking microenterprises and encouraging micro financing towards improved livelihoods and wealth creation. Formation of food canteen units selling indigenous traditional foods like the Café Kudumbashree was the agenda. Building capacities of women and youth on aspects like entrepreneurship, record keeping, value addition for increased profitability through training and mentorship was focused on. Later her plans up scaled to the other 8 regions of Kenya

Agriculture is largely undertaken by women, particularly the production segment of the value chain. Therefore, it seeks to empower the women farmers to sustainably increase food and nutritional security, and incomes through her three pillars approach of 'Capacity building, Mentorship and Entrepreneurship development (wealth creation). The objectives include: women farmers', professionals and entrepreneur's mobilization, organization and capacity building to undertake viable farm enterprises. Her work is in line with the global development targets '**Sustainable Development Goals** (SDGs)' with the organization focus areas mainly being on *1 **SDGs 1, 2, 3 and 5.** It also contributes to the realization of New Partnership for African Development (NEPAD's) Pan African Policy Framework (Comprehensive African Agricultural Development Program (CAADP)) that aims at ensuring growth and transformation of the agricultural sector which cannot be realized if

Women farmers involving in micro-enterprises for sustainable livelihood

*1 Sustainable Development Goals (SDGs)
Goal 1: No Poverty
Goal 2: Zero Hunger
Goal 3: Good Health and Well-being
Goal 5: Gender Equality

women are excluded. Our work is also anchored on the country's development blueprint 'Vision 2030' and one of the Big Four agenda on Food and Nutrition Security.

The activities undertaken

a. Sensitization of women, youth and members of Women Farmers Association of Kenya through creation of awareness campaigns during village fellowships, church meetings and youth picnics on the Kudumbashree concept(s), training experiences gathered through the class work, field visits, success stories, presentations and networking.

Ms. Leah Wanja along with members of her group

b. Demonstration of importance of group mobilization, formation of groups, thrifts and credit (the collective/ participatory approach of micro financing (weekly contributions, internal lending, saving for projects and book keeping) to improve the living standards of communities and eradicating poverty through empowering the women and the youth.

c. CAADP (Comprehensive Africa Agriculture Development Program) and ATVET (Agricultural Technical and Vocational Education and Training) For Women and WoFaAK: Women Agripreneurs workshop by GIZ.

d. Experience dialogue workshop, leadership and dairy training of farmers between WoFaAK and the Bavarian Rural Women Farmers Association.

Outcomes:

She formed 80 groups with an average of 20 members each in 8 Economic Blocs/regions (Eastern, Mt. Kenya, Nyanza, Western, Central/ Nairobi, North Rift Valley, South Rift Valley and Coast). They have also registered as members of the Women Farmers Association (WoFaAK) and held county elections to elect their leaders.

The activities like mobilization of women and youth groups were also established in 22 registered groups in Siaya, 19 groups in Kakamega, 22 groups in Bungoma, 2 groups in Nakuru, 3 in Kiambu and 1 cooperative in Embu. The groups thrive on various enterprises like the bananas, vegetables, potatoes, nuts, cereals, poultry and dairy value chains. The members were trained on good governance, leadership, communication, lobby and advocacy. The groups conducted county elections and formed county boards.

Value added products of the group and display of products by group members during rural women's day celebration.

The Women Farmers Organization of Kenya (WoFaAK) organized the Rural Women's Day in Siaya, Bungoma and Kakamega and she planned to have more such in other counties. During the functions, the women farmers were able to petition the county governments on water, a factor that affects women.

Impact of the Back at Work Plan

a. The women are now more confident and operating their activities more profitably.
b. Income generation, adoption and scaling-up of Climate Smart Agriculture Initiatives and technologies (such as use of scanners to test soils, water and weather), increase in yields and crop varieties.
c. Creation of more jobs and policies, information awareness and knowledge sharing, access to funds and markets through various WoFaAK's platforms.
d. Number of Extension Functionaries reached 500
e. Number of Farmers reached 1600. Their future target is to establish 200 women groups each with at least 20 members and work with more partners.

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Women empowerment through imparting training on entrepreneurship in Uganda

Mrs. Rosemary Naggujja Mugerwa from Uganda attended the 26th FTF ITT International training program on 'Entrepreneurship Development among Rural Women' held during 9-23rd May, 2018 at Kudumbashree, Thiruvananthapuram, Kerala, India.

Kudumbashree is the poverty eradication and women empowerment programme implemented by the State Poverty Eradication Mission (SPEM), Government of Kerala. The name Kudumbashree in Malayalam language means 'prosperity of the family'. Mrs. Mugerwa during the training was exposed to the cooperative society, leadership development and capacity building of women. She aimed at improving the access to financial services, methods of savings, credit and lending through capacity building, leadership and entrepreneurship among local women in Wakiso and Kassanda districts of Uganda. She attempted to implement the learnings of the training program in these two districts. She is able to set up five cooperative groups through which she could simplify the saving and crediting system among the local women. She also trained them to gain confidence, leadership and entrepreneurial skills to set up a book manufacturing enterprise in 2019.

Mrs. Mugerwa is distributing training material to her group members

The main reasons for the success of the implementation of the group were the cooperative was duly registered and members were fully trained. She always appreciate KUDUMBASHRE's amazing reputation with well-organized enterprises and projects mostly led by women which pushes her to work harder. She is aspired to see more jointly organized enterprises to boost the status of women.

Mrs. Mugerwa during the meeting with group member disseminating knowledge on saving and credit system

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Capitalizing on the experiences of Kudumbashree mission to strengthen market linkages through micro enterprises in Nepal

Mr. Prakhyat Jung Thapa, Senior Business Opportunities Manager working in Knowledge-Based Integrated Sustainable Agriculture in Nepal (KISAN) II project in Nepal was one of the active participants of the 30th FTF ITT Training Program on 'Entrepreneurship Development among Rural Women' held during 6-20th November, 2018 at Kudumbashree, Thiruvananthapuram, Kerala, India. Based on his working experience in Nepal with KISAN-II project, he found that the marketing and supply chain links he observed by the microenterprises in Kudumbashree was worth implementing. He thought that this solution would benefit both the producers and consumers. He expected that, the micro-enterprises in local level can solve the problem of food wastage, market failure, and unemployment in Nepal.

KISAN-II project in which Mr. Prakhyat Jung Thapa works aims to increase resilience, inclusiveness, and sustainability of income growth in the area of working under Feed the Future. It also has the objective of enabling vulnerable communities to act on business opportunities within selected market systems. Therefore, Mr. Thapa took keen interest in adopting the experiences of developing, strengthening, and guiding micro-enterprises among the project partners in KISAN II. Through these, microenterprise, they have partnered with 150 different actors, namely agro vets, cooperatives, millers, and traders working in KISAN II commodities (Rice, Lentil, Goat, Maize, Vegetables).

He is using the experiences of learning from the Kudumbashree model of women entrepreneurship, where they support the partners to expand their business and services in a profitable manner while ensuring that all the customers that interact with them are equally benefitting through improved products and services. In the second half of their project, KISAN-II can strengthen these enterprises and scale the learnings to a wide range of relevant stakeholders. Mr. Thapa has further requested for the expertise of Kudumbashree on providing multi-dimensional support to rural microenterprises, and explore possible synergies where they could collaborate and strengthen the micro-enterprise ecosystem of Nepal.

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Nutrition security for lactating women and children under 5 years of age in Uganda

Ms. Akankunda Loydah, Kabale district, Uganda had participated in the 38th Feed The Future India Triangular Training Program on 'Integrated Technology for Production, Processing and Value Addition in Tuber Crops' during 16-30th September, 2019 at ICAR-Central Tuber Crop Research Institute (CTCRI), Thiruvananthapuram, Kerala, India.

Kabale is a district in the Western Region of Uganda. Kabale hosts the district headquarters. It was originally part of Kigezi District, before the districts of Rukungiri, Kanungu, and Kisoro were excised to form separate districts. Kabale is sometimes nicknamed "Kastone" as in the local language Rukiga, a 'kabale' is a small stone.

The province of Ms. Akankunda is majorly suffering from stunting disorder among children of below 5 years and also lack of nutriarich food for lactating mothers. This training program helped her to realize the solution for the problem that their province is facing. She planned to include one nutririch food in regular meals of women and children. i.e., Orange Fleshed Sweet potato (OFSP) vines.

The vines of Orange Fleshed Sweet Potato

Before the inclusion of orange fleshed sweet potato vines in their regular meals, there is a need to produce the vines at higher quantity for mass consumption. Hence, increasing the production of orange fleshed sweet potato vines was taken as her back at work plan in the training program. Then she organized trainings and established a demonstration sites at farmers gardens through use of Farmer Field Schools in Kitumba Sub County, Kabale District, Uganda.

Ms. Akankunda met the facilitators of farmer field school (FFS) and convinced them about the importance of nutririch food. She explained the objectives, modalities and benefits of OFSP vines to FFS facilitators. Later Ms. Akankunda with the help of FFS organized a training

program on agronomical aspects of OFSP vines to the local farmers. She established a demonstration unit towards the production of OFSP vines and distributed the harvested vines to the selected farmers for the rapid multiplication of vines in the selected farmers' plots.

Sensitization of farmers on rapid multiplication techniques of Orange Fleshed Sweet Potato vines

The inclusion of this OFSP vines among farmers in their regular farming benefited the pregnant women, lactating mothers, children under 5 years of age and farmers (members of the Farmer Field School) and the surrounding community members with respect to their consumption of nutritious food.

Major outcome

- Fifty (50) farmers have been trained in the rapid multiplication of OFSP vines; production and sale of orange fleshed sweet potatoes.
- Multiplication center towards production of OFSP vines were established at farmers' field.

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Information Communication Technologies (ICT) in Agriculture

Demonstration of 'Plantix App' for crop pest and disease management in Uganda

Mr. Nzamuhiki Justus has attended the 40th FTF ITT International training program on 'Integrated Management Strategies for Major Crop Pests & Diseases in Developing Countries (With special focus on Fall Army Worm)' during 19th November-3rd December, 2019 at National Institute of Agricultural Extension Management (MANAGE), Hyderabad, India. Mr. Justus is an Agricultural Officer in the Production and Marketing Department of Rubanda district of Uganda. During his training he has learnt about the Plantix app, an android based mobile app for diagnosis of crop pests and diseases at ICRISAT.

Plantix is a mobile crop advisory app for farmers, extension workers and gardeners. Plantix was developed by PEAT, a Berlin-based Artificial Intelligence (AI) startup. It can diagnose pest damage, plant disease and nutrient deficiencies affecting crops and can offer corresponding treatment measures.

After his return to his country, Mr. Justus has organized a stakeholders' meet on the sensitization of Plantix app among the sorghum/barley farmers and suppliers who supply the produce to breweries for beer making.

During the meeting, demonstration of the functioning of the Plantix app was done by Mr. Justus and the stakeholders belonging to financial institutions like Stanbic Bank that supports farmers with agricultural development loans and SASAKAWA, an African based NGO that supports cereal farming in sub-Saharan Africa along with other Government officials and farmers have shown keen interest to understand the working and usefulness of the Plantix app for improved crop pest and disease management, fertilizer use efficiency and other best agronomic practices for their crops.

Mr. Nzamuhiki Justus disseminating awareness on Plantix Mobile App through Radio talk (popular media in Uganda)

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Using mass media effectively to create awareness about controlling maize fall army worm in Malawi

Mr. Dominic Amon Nyasulu from Malawi has attended the 40th Feed the Future Training Program on 'Integrated Management Strategies for Major Crop Pests & Diseases in Developing Countries (With special focus on Fall Army Worm)' during 19th November - 3rd December, 2019 at MANAGE, Hyderabad. During the training program that was organized jointly by National Institute of Agricultural Extension Management (MANAGE), National Institute of Plant Health Management (NIPHM) and ICAR-Indian Institute of Maize Research (IIMR), Winter Nursery Centre, Hyderabad, India the participants were given hands on experience on methods of controlling Fall Army Worms in Maize.

Activity 1: Fall Armyworms Awareness, Scouting, Monitoring and Tree Planting

As a take away lessons from the training Mr. Dominic, National Coordinator, National Climate Smart Agriculture Youth Network under the umbrella and mother network, National Youth Network on Climate Change (NYNCC) organized the Fall Armyworms Scouting and monitoring field visit and also tree planting exercise on 11th January, 2020.

FAW scouting by Mr. Dominic and his team

The main aim of this activity was to raise awareness on the dangers of FAW and also enhance knowledge among young farmers and youth leaders on how to manage the threat. After the FAW awareness field visit, the youth farmers and leaders were also engaged in the tree planting work in the same maize field. The awareness and field visit mainly centred on the physical management of FAW that included but not limited to the collection of larvae during evening and morning time, separation of white dead larvae and others, white infected larvae as source of bio-agent, use of healthy larvae for rearing fungus or to feed poultry, sand or sand + lime application in whorl and also egg mass destruction. Dominic Amon Nyasulu, coordinated the activity and also made an on field presenta tion on FAW management. About 50 (28 male and 22 female) youth farmers and leaders of the age range between 17 to 35 years took part in this exercise and about 1500 trees were planted during this exercise in Lilongwe.

Activity 2: Live Radio Talk Show on FAW Armyworms on 17th January, 2020, Dominic Amon Nyasulu was the guest panelist during the live Radio Talk show. The talk show was featured on Youth in Politics Program. The live radio program is an hour and weekly program aired every Friday, from 3:30 to 4:30 pm on Transworld Radio. The program addresses various social economic, political, cultural and other issues affecting young people and also features

change makers. The program also allows an interaction and contributions from listeners through sending of text messages, WhatsApp messages and also the audience can ask questions or contribute through a phone call.

During this live talk show, the topic for discussion was mainly centered on the status of Fall Armyworms in Malawi, impact and also its management. On the management of FAW, the discussion was centered on physical and Agro-ecological options for FAW management. On physical method, the collection of larvae during evening and morning time, separation of white dead larvae and others were highlighted. White infected larvae as source of bio-agent, use of healthy larvae for rearing fungus or to feed poultry, sand or sand + lime application in whorl and also egg mass destruction and planting at recommended/optimal time, Plant Nutrition, Intercropping with compatible companion crops or fertilizer trees, Conservation Agriculture are some of the Agro-ecological options for FAW management. About 25 youth farmers managed to participate through phone in while about 255 text messages were received.

Live Radio Talk Show on FAW Armyworms by Mr. Dominic Amon Nyasulu

MANAGE is happy to note that Mr. Dominic Amon Nyasulu could take bold decision to assume the role of an expert on tackling FAW in his country after his training at MANAGE under FTF ITT. PMU team at MANAGE wish to see him doing these things more frequently in the coming days.

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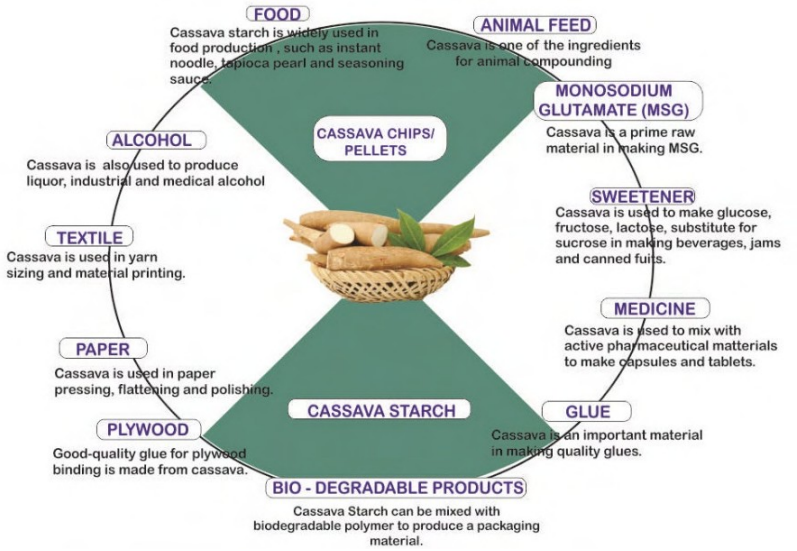
Information Communication Technology (ICT) to improve production and productivity of cassava in Kenya

Cassava is an important staple food for consumption and income generation for farming communities in Western Kenya. The region grows and consumes 60% of the national cassava production. In Kenya, cassava is grown in Western, Eastern/Central and Coastal regions. The crop provides 9% of the total calories in the diet of Kenyans (Republic of Kenya, 1990). Cassava is mainly grown as intercrop with beans, maize and bananas. Cultivation and production of cassava crop in the region is constrained by biotic and abiotic factors. Non-use of healthy planting materials, and improved agronomic practices and limited range of improved processing technologies affect production of the crop. The most devastating abiotic factor in the recent years is Cassava Mosaic Disease. Between the years 1994 – 1995 a virulent form of Cassava Mosaic Disease devastated all traditional cassava varieties. Production and productivity of the crop completely declined. The yield loss incurred in 1998 due to CMD was estimated at 15,000 tons valued at US$ 10 million. In response to the magnitude of the problem, many agricultural organizations like Kenya Agricultural Research Institute (KARI) collaborated with International Institute of Tropical Agriculture to mitigate Cassava Mosaic Disease and other important agronomic characteristics.



Source: http://www.cassavatradefair.com/home

Ms. Naomi Wangeci Kihara from Kenya participated in the FTF ITT International training program on 'Integrated technology for production, processing and value addition in tuber crops' held during 16th – 30th September, 2019 at ICAR-Central Tuber Crop Research Institute (CTCRI), Thiruvananthapuram, Kerala, India. From the learnings of the training program Mr. Naomi Wangeci Kihara was motivated and started applying the knowledge in the context of Kenya.

Ms. Naomi decided to disseminate the knowledge about tuber crops to the cassava growers of her region (Nyamira County in Kenya) through the Information Communication Technologies (ICTs). The main objective/ motive behind the initiative is to increase production and productivity of cassava from 7.5 to 10 MT/ha against the current productivity as the CMD accounts major barrier in the production of Cassava. The major activities undertaken in view of implementing the knowledge were

- Created profile of Best Practices from Research Institutions and their dissemination
- Mobilised Stakeholders to develop profile of value chain actors
- Creating website/WhatsApp/common interest group platform(s)
- Timely dissemination of Cassava Best Practices and Technologies to the targeted growers in the Nyamira County.

Outcome:

The results of her efforts in disseminating the knowledge on cassava yielded into finalized development of the National Roots and Tuber Crops Strategy and updating it to National Agriculture Website; *i.e.,* www.kilimo.go.ke and TV Shows, infomercials and cassava documentary. Organized policy dialogues, products and recipes exhibitions, updated potato production training guide and Development of a Tuber crops Website; www.cassavatradefair.com etc. were also in place. She was recognized and appreciated for development of the National Roots and Tuber Crops Strategy and was nominated as the female country counterpart by National Commission for Science and Technology in 4 years regional programme.

Overall Beneficiaries include about more than 3000 producers, Processing and service SMEs, Traders, Stakeholders and Partners.

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Mechanization in Agriculture

Promotion of cassava harvesting machine in Malawi

Cassava is the second-most important staple food crop after maize in Malawi. The availability of different varieties of cassava allow for both commercial use and household consumption of cassava to hedge against food insecurity. Malawi is prone to drought due to climate change vulnerability, poor agricultural practices and high population growth making cassava, a drought-resistant crop as an attractive option.

Mr. Jethro Fraser Esau Chikafa, Crop Protection Officer from Malawi has attended FTF ITT International training program on 'Integrated Technology for Production, Processing and Value Addition on Tuber Crops' during 16-30th September, 2019 at ICAR-Central Tuber Crops Research Institute (CTCRI), Thiruvananthapuram, Kerala, India. After the training Mr. Chikafa identified that the core problem is the harvesting mechanism in Cassava that affects the cost and consume time of cassava growers. Hence, he had set an objective to promote the use of Cassava Harvesting Machine amongst cassava growing farmers to increase awareness on processing and value addition of tuber crops for better income at household level at Dowa District across 6 Extension Planning Areas (EPAs).

He educated farmers regarding the mentioned thrust areas and started sensitizing them on use of Cassava Harvesting Machine to reduce losses during harvesting. He conducted awareness meeting on the availability of harvesting machines for root and tuber crops like cassava. He conducted meeting with famers growing cassava, sweet potatoes and potatoes to orient them about the processing, value addition machines of Cassava, Sweet Potatoes, Potatoes, Tomatoes, Mango and other horticultural crops at Small Medium Enterprise Development Institute (SMEDI) Mponela Dowa District.

Educating farmers on post-harvest mechanism in Cassava crop

Outcome:

- As a result of awareness campaigns and orientation on post-harvest mechanism, 5 groups of farmers were motivated and linked to agro processing machines of cassava, sweet potatoes, potatoes, mangoes and tomatoes at Small Medium Enterprise Development Institute (SMEDI) – Mponela Dowa district.
- Three individuals within the groups have registered with SMEDI to be trained on values addition of cassava, sweet potatoes, potatoes, mangoes and tomatoes plus gemstone machine cutting. Kind appreciation to the superior officials for the logistic support rendered during sensitization meetings, transport to fellow farmers to SMEDI for orienting on cassava processing machines and value addition is acknowledged.
- Six groups of farmers have started growing potatoes than concentrating on cassava alone.

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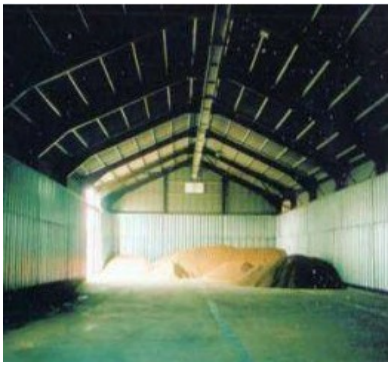
Sensitization and staff training regarding modern storage technique in Malawi

Increasing usage of modern inputs such as quality seeds and chemical fertilizer is essential for boosting staple crop production and increasing smallholder food security in Sub-Saharan Africa. However, in addition to increasing productivity, it is essential to recognize that food insecurity does not simply end at harvest because susceptibility to pests during storage can cause tremendous post-harvest dry weight (quantity) losses of up to 30 per cent in six months of storage of grains. Therefore farmers face a rational trade-off at planting time between choosing an improved variety that may boost production but where the harvested maize is more susceptible to pests when stored vs. choosing a traditional variety that is lower yielding but less vulnerable to pests in storage. Nevertheless, issues related to post-harvest loss are often overlooked in the country like Malawi.



Improved Storage Structure

Mr. John Frank from Malawi, got trained under the 9th International Training Programs on 'Modern Storage Technologies in Agriculture' during 1-15th September, 2017 at ICAR - Central Institute of Post-Harvest Engineering & Technology (CIPHET), Ludhiana, Punjab, India. He committed to conduct sensitization meetings for local leaders and some staff members particularly in safe crop/produce storage for long period without compromising the quality. In this regards, staff members were trained first in order to reach more farmers with relevant knowledge and skills in Modern Storage Technologies in Agriculture.

Outcome:

- Agriculture extension staffs are trained with modern storage technologies
- Farmers are aware about storage techniques and its importance
- Farmers enhanced their knowledge on storage pests and its effects on post-harvest losses.

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Policy Impetus in Agriculture

Policy promotion for agricultural mechanization strategies and package for dry land agriculture in Afghanistan

Agriculture remains critical to the livelihoods of a large share of Afghan men and women. It accounts for 25 percent of the National Gross Domestic Product (GDP), employs about 45 percent of the national workforce, and provides a source of income for 44 percent of households. For 28 percent of households it is the most important source of income.

Mr. Mohammad Qasim Wesal, Agricultural Mechanization Directorate, Ministry of Agriculture, Irrigation and Livestock (MAIL) from Afghanistan was trained under the FTF ITT Training program on 'Farm Mechanization for small farmers' held during 11th - 25th April, 2017 at ICAR-Central Institute of Agricultural Engineering (CIAE) Bhopal, Madhya Pradesh, India. Based on the experiential learning during the training, Mr. Qasim prioritized the objective to promote Sustainable Agricultural Mechanization. The motto behind his plan was to increase the level of agricultural mechanization, enhance capacity building, provision of support to the concerned institutions for coordination and support investments on Agriculture Mechanization.

The Afghanistan Agricultural Mechanization Policy is willing to consider the inputs and learning's discussed during the training program at CIAE at Bhopal and also from the other parts of the world where significant transformation of the agricultural mechanization sector is taking place. Afghanistan's vision of developing policies and programs to realize Afghanistan's aspirations of Zero Hunger under the SDGs is the need of the hour. This approach entails the identification and prioritization of relevant and interrelated elements to help the country develop a strategy and practical development plan that will create synergies in line with the agricultural transformation plans and realize Sustainable Agriculture Mechanization in Afghanistan. Therefore, Mr. Qasim initiated to promote Indian mechanization systems in all provinces of Afghanistan especially for the horticulture, cereal and vegetables crops and also for promotion and implementation of effective plans that can build their capacity and learn more. He expressed that this FTF ITT program is a golden opportunity for them to learn new techniques and innovation as well sharing experience will give success in agriculture mechanization and horticulture systems in Afghanistan.

Objectives

- Promote the Agricultural Mechanization Policy and Strategies for Small Farmers
- Mechanization Package for Dry-Land Agriculture

Major Activities

- Mapping the policy priorities for agriculture mechanization in Afghanistan that identifies relevant bodies and documentation
- Analyzing the technical and legal aspects of the identified documents and policy papers
- Developing systems and documents of agriculture mechanization
- Advising how to distribute the services of agriculture machineries that are available in various departments of mechanization in the provinces
- Preparing materials for training and extension of agriculture mechanization
- Steering discussion on the draft of agriculture mechanization policy for Afghanistan with all stakeholders for finalization and approval by ministry of MAIL.
- Made an implementation plan for services available for the machineries of Agricultural Mechanization Development.
- Prepared necessary document and comments about conservation agriculture machinery (Dry-Lands)
- Led the technical group about rice mechanization with Japan International Cooperation on Agriculture (JICA).

Beneficiaries

The beneficiaries are small and medium landholding Farmers, Cooperatives, Seed companies, Private sector and the Ministry of Agriculture, Irrigation and Livestock.

Outcome:

- The Agriculture Mechanization Policy for Afghanistan is operational
- The Mechanization Package For Dry-Land Agriculture is prepared and about to start the implementation and operation of Machinery on Dry-Lands Farms
- Introduced potato planter and harvester for the first time in Afghanistan
- Designed a proposal for a training center for agriculture mechanization
- Participating in the research and scientific conference

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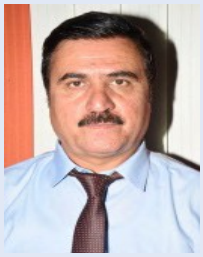

Introduction of Indian model agricultural credit and cooperative system in agriculture curriculum of Uganda at National Curriculum Development Centre

Mr. Mulumba Mutema Mathias is a Curriculum Specialist (Agriculture) in the National Curriculum Development Centre (NCDC) in Uganda. He possesses authority to bring the changes or upgradation in the curriculum of agriculture studies for the schooling and university students in the country. In 2018, he was trained under FTF ITT International training program on 'Agricultural Credit for Sustainable Livelihood' during 6-20th February 2018, at Bankers Institute Rural Development (BIRD) at Lucknow, Uttar Pradesh, India.

After learning the Indian lessons on agricultural credit system, banking and insurance policies and financial services by small groups like Self-Help Groups during the training program, he thought of implementing the Indian lessons into the agriculture curriculum of Uganda. He thought that upgrading the curriculum will help to impact the banking and finance concepts into the young minds of the country. So that they are employable or create better agribusiness opportunities as self-employed.

Training for National facilitators to support implementation of new Curriculum

Meeting conducted regarding National Curriculum implementation

He started his action with the objective to incorporate the topics into the syllabus and creating awareness of the role of agricultural credit and use of financial services to support agricultural development and sustainable livelihood. Mr. Mulumba Mutema Mathias sensitized the stakeholders and incorporated topics like Value Addition, Biosafety, Water Shed; Agroforestry, Fish Farming, Poultry Farming, Cereal Growing, Fruit Growing, Financial Services and Money in Agriculture Cooperatives and Self-Help Groups in The Lower Secondary Curriculum by integrating an agribusiness orientation to all these. His actions also involved in sensitizing the NCDC staff, subject panel members and teachers on agricultural credit for sustainable livelihood; cooperatives and self-help groups; water shed development.

Target Beneficiaries:

The learners of agriculture subject in the lower secondary starting February 2020

Outcome:

Upgrading the lower secondary agriculture syllabus curriculum

Reasons for his success:

The lessons learnt in the FTF ITT International training program on "Agricultural Credit for Sustainable Livelihood at BIRD", Technical back hand support by MANAGE and also for being in the position of curriculum specialist agriculture at the National Curriculum Development Center. It helped him in execution of upgradation in the curriculum.

Reward:

End of year award for outstanding performance for leading the design and development of the agriculture teaching syllabus for the Lower Secondary School [Senior 1 to 4] in Uganda.


NATIONAL NEWS

Cabinet clears new curriculum

UCU demands justice over attacked worke

Coverage of story in leading news media of Uganda

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Inputs to ministry for policy making on agriculture produce market management in Nepal

Mr. Sirish Pun, Senior Agriculture Economist, Nepal had participated in the 41st Feed The Future India Triangular Training program on 'Agricultural Policy Formulation, Review and Analysis' during 21st January - 4th February, 2020 at National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana, India.

During the training program, Mr. Sirish Pun learnt many innovative and farmer friendly marketing strategies by the government of India. The training program also gave him an opportunity to get insights on several other important topics like optimum land use planning, agri exports, national e-governance, agricultural insurance, agricultural marketing etc. which are critical to the agricultural policy making process in Nepal.

Mr. Sirish Pun, after getting exposure to the good policies and practices from Indian agriculture policy scenario, identified the scope for implementing few proven innovation in some provinces of Nepal. Accordingly Mr. Sirish Pun chose to work on his BAWP on suggesting the restructuring of policies on agriculture produce market management. Since he is key person in the ministry on the policy formulation in agriculture, this FTFITT training and his BAWP in the program gave him right opportunity to share his knowledge obtained in the FTF ITT program.

Mr. Sirish Pun discussing with the honorable minister of his province

In order to achieve his objective of BAWP on restructuring of agricultural market management, he had a meeting with honorable minister. Mr. Sirish presented all the policy structures and models which he had learnt during training program. Mr. Sirish discussed with the minister about the need for some changes in the existing policies of agricultural produce market in Nepal.

In addition, Mr, Sirish also suggested the ministry to establish “Chobhar Agriculture Produce Market’ in Farmer’s Market model/Rythu Bazar model.

Major outcome:

Efforts initiated to restructure agriculture policy in Nepal and to establish the ‘Chobhar Agriculture Produce Market’ in Farmer’s Market model

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Annexure - I

List of Partner Institutes in implementing FTF ITT

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Annexure – II

Back At Work Plan Questionnaire

Sl. No.	Question type	Response type
1	Personal info. Name and Email address	Your personal details
2	PROBLEM identified in your service AREA/PROVINCE/ REGION: (Title)	A short and convincing title
3	Nature of the problem (Be specific)	Multiple choice question with one or many possible answers
4	Description of the problem	Long answer text
5	Approximate number of PEOPLE AFFECTED by the problem identified in your REGION/PROVINCE Approximate number of PEOPLE AFFECTED by the problem identified in your COUNTRY Extent of AREA AFFECTED in PROVINCE/REGION in which you are working (Approx. in %) Extent of AREA AFFECTED by similar problem in your COUNTRY (Approx. in %)	Multiple choice questions with single answer
6	Indian experience learned from the training that offer solution to the problem identified by you (Back at work Plan):	Short answer
7	What is the important objective of your Back at work Plan?	Short and action oriented answer
8	What is first action you have planned that can help you to achieve your objective?	Short answer related to your objective
9	What is/are the follow up action/s you wish to take after first action?	Short answer
10	What kind of support /assistance do you expect from your supervisors?	Short answer
11	What strategy /plan you want to adopt to motivate your subordinates?	Short answer
12	What is the scope of duration to work on the problem identified?	Multiple choice question with single answer
13	What do you expect with your interventions/solution?	Short answer
14	What challenges do you foresee in working with your BAWP?	Short answer
15	What is your BIGGEST motivation to achieve results in your back at work plan?	Multiple choice question with one or many possible answers

Annexure-III

Proforma for FTF-ITT Trainees to Report the Progress on their BAWP

Sl. No.	Question		Response
1.	Name of the Executive		
2.	Country		
3.	Mobile Number		
4.	Email		
5.	Title of the FTF ITT program Attended		
6.	Place of FTF ITT Organized		
7.	Title of Back at Work Plan (BAWP)		
8.	Objective of Back At Work Plan		
9.	Place where implemented the BAWP		
10.	Activities of BAWP		
11.	a.		
12.	b.		
13.	c.		
14.	Beneficiaries of BAWP		
	Results of BAWP (Brief) (Attach separate document for addition-al details)		
	Important appreciation/Rewards Won for your BAWP activities		
	Reasons for your success in BAWP		

Date: Signature of the executive

Country:

National Institute of Agricultural Extension Management (MANAGE)(An autonomous organization of Ministry of Agriculture and farmer's welfare, Government of India)
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