SAFE REGIONAL NETWORKING WORKSHOP ON THE B.SC. PROGRAM FOR MID-CAREER AGRICULTURAL EXTENSION PROFESSIONAL

ADDIS ABABA, ETHIOPIA
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**Background to the workshop**

Having realized that smallholder farmers can enhance their incomes substantially by adding value to their products, SAFE partner universities have, in recent years, come up with value chain-oriented curricula. However, challenges have been observed in the implementation of the curricula.

Firstly, there seems to be very little of practical value that is taught, beyond what smallholder farmers are already doing, that could enhance the value of their crops and crop products – especially from harvesting to marketing.

Secondly, there seems to be very little of practical value that is taught, beyond what farmers are already doing, that could enhance the value of livestock and livestock products at smallholder farmer level. As a result, students avoid livestock when they choose topics for their supervised enterprise projects (SEPs) – and the number of SEPs on livestock remains very low. Farmers must, therefore, be missing opportunities for enhancing their incomes through livestock.

**Purpose of the workshop**

The workshop is designed to share experiences on appropriate value-enhancing technologies and practices that can make a difference at the smallholder farmer level.

**Workshop theme**

Aligning teaching to smallholder farmers’ needs with special focus on value-enhancement technologies and practices.

**Specific objectives**

Employers will share their experiences with value-enhancing technologies and practices for crops and livestock among smallholder farmers.

Universities will present examples of smallholder farmer-specific crops and livestock value-enhancing technologies and practices that they teach.

**Expected outputs**

Documented smallholder farmer-specific value-enhancing technologies and practices on crops and livestock.
Welcome Remarks by Dr Deola Naibakelao, Managing Director, SAFE

Mr. Chairman, Dr. Aberra Debelo
His Excellency, Ato Tesfaye Mengistie, State Minister, Ministry of Agriculture and Natural Resources, Ethiopia
Honorable Professor Ruth Oniang’o, Chair of Boards, Sasakawa Africa Association and Sasakawa Africa Fund for Extension Education
Senior Executive Officer, Sasakawa Africa Association and Sasakawa Africa Fund for Extension Education: Mr. Masaaki Miyamoto, Managing Director, Sasakawa Africa Association, Dr. Juliana Rwelamira,
Representatives of Winrock International: Ms. Andi Thomas, Ms. DeAnn McGrew and Dr. Hendrik Knipscheer.
Deans, Heads of Department, Directors of Agriculture, Ladies and Gentlemen

It is a great pleasure for me to welcome you to this first joint networking workshop. I would like to especially welcome the new programs; some of which have been started solely with local resources. As you know, until last year we used to alternate the networking workshop between East Africa and West Africa. We have been receiving some observations and remarks indicating that a joint workshop should be considered for the future. This will be an ideal occasion for all participating institutions and stakeholders to come together as one body and share their experiences. The decision was therefore reached to organize a joint networking workshop starting this year.

Dear Colleagues

We are going to be together for the next 3 days to share our successes, failures and challenges. We will also use this opportunity to establish new friendships and build on old ones. For more than 20 years of the existence of the SAFE initiative you have put in tremendous efforts to contributeto the transformation of smallholder agriculture in your respective countries. You have donethat through your determination to produce very sound agricultural extension professionals. I would like to commend you for all your efforts and achievements so far.

Mr. Chairman

The theme of the workshop: “Aligning teaching to smallholder farmers’ needs with special focus on value-enhancement technologies and practices” is very relevant and timely. Agricultural extension services have been focused on improving production and productivity. University training also has a strong production orientation. This situation is self-reinforcing in that the extension service’s production focus influences training at universities, and training at universities determines what extension can do. The result is that extension staff are not trained to provide advice beyond production.
To break this cycle, employers need to articulate their changing needs and demands. Universities and colleges need to respond to those changing needs and demands as part of their social mandate.

In the 9 African countries where SAFE/Winrock programs are active, employers have started calling on universities and colleges to embrace the value chain orientation in their training. Likewise, as SAFE/Winrock, we are also investing heavily in this process both financially and in terms of time, not only because we believe it is the right way to go, but because we see huge potential for farmers. Small-scale farmers can substantially increase their incomes by processing and adding value to their produce. But, they can do so if they are advised by extension staff who are properly and adequately trained through value chain oriented curricula.

Mr. Chairman

I must recognize that our initial curricula were production oriented. This was the reflection of the countries’ focus: improving production and productivity. We have agreed that it has become necessary to mainstream the concepts of value chain and value addition into the curricula. Consequently, our curricula were revised and they are now value chain-oriented.

The process of revitalizing the curricula was the following:

- A value chain-oriented extension needs assessment was conducted;
- A curriculum proposal was developed based on the identified needs;
- The proposed curriculum was reviewed by a curriculum design expert;
- The needs assessment report, the proposed curriculum and the reviewer’s report were discussed at a national stakeholder workshop; and
- The curriculum proposal was then finalized based on the comments and inputs from the stakeholder workshop.

We are however observing some challenges in the actual implementation of the value chain-oriented curricula. Our task during this workshop is to have a critical look at those challenges and come up with pertinent ways of making the implementation effective both in teaching and at farm level.

As a practical way of addressing those challenges, we should try to benefit from field experiences of organizations that are engaged in development programs focused on value chain enhancement. In Ethiopia, for example, a series of seminars were especially organized at the participating universities for Sasakawa Africa Association’s staff to share their experiences with teaching staff. These seminars were meant to create awareness of the technologies and best practices that exist.

Mr. Chairman, I would like to re-emphasize here the current thrusts of the SAFE initiative.

- We want to remain competitive despite the challenges
- We want to mainstream value chain in the curriculum and the Supervised Enterprise Projects.
- We want to broaden accessibility into the program.
• We want to diversify mode of curricula delivery and
• We want to see more and more countries scaling up the program.

The Nippon Foundation of Japan continues to be our strong supporter and sole donor so far. We are most grateful.

Winrock International is a wonderful partner. I sincerely appreciate the central role it has been playing in the implementation of the programs.

Once again you are most welcomed. I wish all of us fruitful deliberations.

Thank you.
Opening Remarks: Hon. Prof Ruth Oniang’o, SAA & SAFE Board Chair

- Representative of His Excellency, Ato Tesfaye Mengistie, State Minister, Ministry of Agriculture and Natural Resources, Ethiopia
- Senior Executive Officer, Sasakawa Africa Association and Sasakawa Africa Fund for Extension Education: Mr. Masaaki Miyamoto,
- Managing Director, Sasakawa Africa Association, Dr. Juliana Rwelamira,
- Managing Director, Sasakawa Africa Fund for Extension Education, Dr. Rwelamira,
- Representatives of Winrock International
- Directors of Extension,
- Deans of Faculties of Agriculture from SAFE programs universities and colleges,
- Extension Department Heads,
- Ladies and Gentlemen

I am so happy to be here with you this morning at this opening session of the SAFE regional networking workshop which is designed to share experiences on appropriate value-enhancing technologies and practices that can make a difference at the smallholder farmer level.

This is the first joint workshop after Uganda and Ghana. The topics you are addressing are so relevant: how do we add value? We teach our farmers how to triple yields, leading to market adding value and food safety. It is our responsibility to reach out to them. This is a great opportunity for actualizing the value chain concept in the program for mid-career extension professionals.

As we know, challenges for responding to producers needs have become imminent to foster the pace of sustainable agriculture in the continent, particularly in the context of household food security. Food producers are striving very hard to overcome problems relating to achieving food security. Though they get technical guidance and training by the extension service providers concerning production and productivity of a given value chain enterprise perhaps, currently these are not adequate, also value chain technologies demands more effectiveness to address the problem. The continent has recognized that there is a need to strengthen the agricultural extension system by providing more participatory and demand–driven value chain technologies and hands on training to the farmers for achieving food security. Ranges of opportunities are available to address this problem.

A value chain process or technology includes not only individual firms or organization, but also whole supply chains and distributions networks. Enhancing the linkage in the chain of activities gives products more added value than the sum of added values of all activities. This approach enhances the linkages between agricultural production and industrial processing to create value, not only at the firm level but also at national level, and thereby improve the livelihood of the rural farming community as well as the urban industrial workforce. It is demand-driven and market-led, linking farmers and manufacturers to the consumer closely.
I hope this important workshop will successfully identify the potential opportunities and would be able to shape and refine the emerging and existing value chain technologies and practices for the development of mid career extension as a dependable tool for appropriate delivery of quality extension service to the smallholder farmers by providing the mechanisms for transfer and dissemination of appropriate value chain technologies and approaches for adopting sustainable agricultural practices in Africa.

I am happy that Chris Doswell scholarship is growing and bringing in more women. I see your program which is so packed.

My message is in all our continent there is a lot going and can we find out who is doing what?

I wish you a fruitful discussion.

Thank you.
Official Opening Remarks by Mr. Dejene Habesha, representative of State Minister, MANR, Ethiopia

State Minister, Ministry of Agriculture and Natural Resources

Federal Democratic Republic of Ethiopia

Honorable Professor Ruth Onyango, Board Chair of Sasakawa Africa Association (SAA) and Sasakawa Africa Fund for Extension Education (SAFE);

Mr Masaaki Miyamoto, Executive Director for SAA and SAFE;

Dr Deola, Managing Director for SAFE;

Dr Juliana, Managing Director for SAA;

Winrock/SAFE partners from the US;

Distinguished representatives from nine African Countries;

Representatives of 25 Universities from nine African countries;

Ladies and Gentlemen;

First of all allow me to once again extend my welcoming address to all of you for being here in Addis Ababa to attend this important workshop. I hope you will enjoy to experience the rich diversity of this country during your stay here in Addis Ababa the seat of the African Union Apart from its rich written history, Ethiopia is a land of rich diversity in its people, with over 80 nationalities, dietary diversity and its weather which includes from wet highland areas to some of the hottest places on our planet.

Like most sub-Saharan African Countries, Ethiopia recognizes agriculture as its engine of economic growth. To this end, we recognize the crucial role of our Development Agents as the key drivers of the agricultural modernization. To this end, any weaknesses observed in the extension services and extension agents lead to slow agricultural growth.

It is with this in mind that, I believe, SAFE, in partnership with Winrock, came up with the idea of training extension workers to ensure that they have the requisite knowledge and skills that will enhance their effectiveness in the enormous task of ensuring farmers, pastoralists and agro-pastoralists, have relevant knowledge and skills to grow their businesses.

Distinguished workshop participants

Ladies and Gentlemen
Ethiopia has been among the trailblazers of the B.Sc. program for mid-career extension professionals, second after Ghana. Ethiopia has also the highest number of universities offering the B.Sc. program for mid-career extension professionals. Hence Ethiopian universities are among the most active in embracing the value chain orientation in their agricultural extension curriculum.

I am also glad to know that, through SAFE’s leadership, we now have a specially designed pastoral and agro-pastoral-oriented curriculum which focuses more on pastoral and agro-pastoral issues than the earlier curriculum. This is in line with Ethiopia’s Government plan to pay special attention to the pastoral and agro-pastoral sub-sector of our economy. This has been demonstrated by the establishment of a new Ministry of Livestock and Fisheries which pays special attention to the livestock industry. This also shows the commitment of the Government towards addressing the basic needs of pastoral and agro pastoral regions of the country.

It is evident that my Ministry takes extension seriously. That is why we have the highest number of extension workers in Africa; and one of the densest agricultural extension systems in the world, with over 20 DAs per 10,000 farmers on average, and even more in the high-potential areas.

My Ministry also believes that a key and indispensable precondition to agricultural development is the existence of frontline extension workers with the requisite knowledge and skills to drive the agricultural modernization process. If agricultural development does not take place at the farmer level, it is unlikely to take place at any other level. Extension workers, therefore, drive the agricultural modernization process and it is important that they keep abreast with innovations and practices that can enhance farmers’ performances.

To this extent, I would like to commend the many universities in Ethiopia that have come up with B.Sc. programs in Plant Science, Animal Science and Natural Resources Management to cater for specially designed programmes to upgrade training of our the knowledge & skills of our Development Agents.

I would also encourage the universities to include the specially designed B.Sc. program for mid-career extension professionals to enhance the performance of our agricultural extension staff. We recognize that there are already sufficient technologies ‘on the shelf’ to make a difference at the farmer/pastoralist level, but many of these technologies have not been adopted by farmers. Part of the reason why they have not been adopted can be traced to ineffective extension practitioners.

Ideally, all extension workers should have extension training. However, as this might not be possible for a variety of reasons, we need at least a critical mass with formal training in extension that will provide extension expertise. I therefore call upon all universities to embrace the B.Sc. program for mid-career extension professionals.

On a related topic, I am glad to know that SAFE played an important catalytic role in the formation of the Ethiopian Society of Rural Development and Agricultural Extension, through your support to the Alumni Association of the graduates of the mid-career program at Haramaya, which later joined hands with other extension professionals to form the professional association.
As a Ministry, we do not only recognize the existence of the Society, but we take it as a key partner as we seek ways of taking our agriculture to greater heights. The Ethiopian Society of Rural Development and Agricultural Extension can significantly play a crucial role in enhancing the professionalism of our extension professionals.

The Society is an excellent platform for sharing experiences from across the country and beyond and it is a good platform for learning from each other so that high potential technologies and practices can be scaled up across the country and beyond.

**Distinguished workshop participants**

**Ladies and Gentlemen,**

At this future, I would like to bring to your attention in addressing one issue of concern which is also the major reason why you are all gathered here today.

This is issue of concern is about post-harvest crop losses. While our farmers are making huge efforts in increasing their production, they are still experiencing unacceptably high losses from the time of harvesting to marketing because they still use traditional methods of harvesting, threshing, storage and transport to markets. Having spent so much effort in preparing land, purchasing and using improved inputs, they should jealously guard against any preventable losses – and they need help from all of us on this matter.

We should be ready with the technologies and practices that could reduce these losses and enhance farmers’ incomes. I am confident that you will give due emphasis to this important issues of concern during the next three days of this workshop.

Apart from traditional crops and livestock, many farmers could greatly enhance their incomes through fruits like mangoes, avocados, oranges, bananas, and others. But many of these are harvested prematurely resulting in huge losses as they rot instead of ripening properly. Again, farmers need help from all of us on this matter.

With these few remarks, I have the pleasure to declare that this workshop officially open and wish you successful deliberations.

Thank you for your attention.
Presentations
Session I

1. Presentations from Ministry of Agriculture, Ethiopia

Wheat and Beekeeping, Recommended Value Enhancement Technologies and Practices in Tigray Region, Ethiopia

INTRODUCTION

Beekeeping has a long history in Ethiopia. There is a huge potential for honey production in the country and the subsector is an important livelihood activity in almost all regions owing to the prevailing ecological and floral diversity. It is an environmentally safe venture contributing much to the improvement of the livelihood of beekeepers. It is also an important integral part of the economic activity that created job opportunity.

Like the rests of the country, Tigray region is one of the best honey producing regions in the country. The region’s agricultural resource base, favorable climate and its botanical resource can support large number of bee colonies. Tigray honey is derived almost entirely from wild bees; no chemicals are used in any part of production and processing. The region is known for its white honey, which has low moisture content and distinctive aroma. The compositional content of Tigray honey meets international quality standard. In domestic market, Tigray honey—because of its superior quality—has on average a higher price than honey produced in other parts of Ethiopia.

The success of the honey promotion program; however, is inextricably linked with the success of enclosure areas in re-habilitating vegetation on a large scale. Vast areas of land are now covered in flowering plants such as Tebeb, Gerbia and akacha which provide bee fodder. Moreover, the landless youth have got benefits from these enclosed areas through beekeeping activity. Therefore, transforming enclosure or watershed in to apiary is just one example of a possible “win-win situation” for poverty alleviation.

Recently, the regional government has named beekeeping as one of its priority commodities, targeting both the local and export market. Improved honey production (including beewax, royal jelly and other honey product is a major focus of the food security strategy of the region.

Under the prevailing reality of Tigray region, where the population is sparsely settled and seasonality of honey production and the nature of the product on the one hand and lack of organized marketing system on the other it is likely that the high transport cost and other physical barriers abate access to market. Furthermore, lack of negotiating skills and the absence of collective actions and market information are important impediments to the prevailing honey value chain.

In Tigray region, apiculture is a good source of income for smallholder farmers, as both honey and bee colonies are in high demand. To increase the yield and improve the quality of honey bee resources in the region, the Tigray Regional Government has been introducing framed beehives and accessories. However, because this equipment is relatively expensive to buy, most smallholders could not increase
their income as expected. Some innovative beekeepers started to use alternative equipment and practices to manage their bee resources and to improve the quality of the products.

As production of honey is largely in the hands of smallholders who own only a few beehives, it offers a small amount to the market from which the majority is supplied to local mead brewers. The subsector is also facing a number of challenges such as lack of adequate technology, extension services, beekeeping materials and lack of adequate market.

Nevertheless, to improve honey production and the marketing system in the region, regional government and other non-governmental development organizations have intervened to a great extent in terms of modernizing the beehives and the extraction process, transferring technology through training, upgrading the honey value chains, and supplying credit and other inputs.

Other than areas with extreme climatic conditions, beekeeping is common in most villages and in virtually all smallholder farms in Tigray. The sector is characterized by a large number of smallholder farmers with low average yield per hive. It is estimated that approximately 450 thousand farm households are keeping bees for income generation using traditional and modern beehives.

Above all the backward and forward linkages between the businesses communities are not at Satisfactory level and do not have the forum to share their business knowledge and idea for common development. They are powerless to resolve their common problems and even do not know each other.

**Beekeeping bottlenecks and regional value technology enhancement intervention in Ethiopia**

**Bottlenecks**

- Use of technologies of low productivity, resulting from undeveloped research
- Poor pre-and post-harvesting management
- Limited number of honey processor industry
- Inadequate capacity building, extension service and knowledge of modern apicultural Development
- Lack of market information for honey production

The major causes for honey quality deterioration are backward post-harvest handling practices. The following are beekeeping technology enhancement intervention

- Training of farmers in improved technologies and production of beekeeping.
- Enhancing honey collection centers, processing and packaging equipment suitable for marketing
- Strengthening sector of beekeepers associations, smallholder honey producers and cooperatives.
- Private sector investors and cooperatives strengthened through promoting market linkages.
- Deploying development agents and provide appropriate apiculture extension services.
➢ Provide an apiculture market price information system through public media and FTCs.

**Wheat Value enhancement technology**

**Introduction**

The northern highland of Ethiopia is among the wheat-producing regions of the country. Wheat is a main staple crop, a source of income and employment for millions of farming families in the region. However, wheat production is threatened by a series of production and socio-economic constraints that hamper not only the livelihood of the farming population but also the performance of the whole value chain. Although wheat yield in recent years has shown a promising increment at national level, productivity of the crop varies across locations depending on agro-ecology and inputs used; thus wheat production in Ethiopia is characterized by unbalanced growing gap in wheat supply and rising demand.

The use of improved wheat seed has also been limited and has remained largely dependent on the informal seed system. Wheat production is not just a function of the biophysical factors, but also of the socioeconomic conditions. Among others access to market information; input and output market, wheat price instability, storage structure, and decreasing land size holdings are additional concerns that will preclude many farming households from linking to local millers and processors. Unless appropriate evidence-based models for pro-poor wheat value chains are developed through research, understanding of functioning of markets and how markets can work for the poor as well as linking different stakeholders along the value chain would be difficult.

Wheat value chain actors and supporters’ are different in numbers. The wheat value chain process involves producers, collectors, small traders, wholesalers, processors, institutions and individual consumers. Each of these actors has their own role and characteristics along the value chain development. Specifically the Regional bureau office of agriculture and rural development provide production-related technical advisory services.

Tigray Regional Bureau of Agriculture in collaboration with ATA has implemented the Agricultural Commercialization Cluster (ACC) approach aims to accelerate commercialization of priority agriculture commodity value chains in geographically clustered high-potential areas through market-driven and integrated value chain development.

Wheat value chain has been developed with broad participation of value chain actors to support effective coordination of public, private and development sector stakeholders to address priority bottlenecks in the value chain through key strategic interventions to achieve planned targets for the cluster.

The cluster is one of the largest bread wheat producing areas in the country, with 92,923 hectares of land cultivated and produces 13% of the country’s bread wheat. Farmers in this cluster also produce Barley, Faba bean, honey, as well as livestock products, though the majority of farmers are engaged in bread wheat production.
The primary actors for bread wheat within the cluster include smallholder farmers, primary cooperatives, input suppliers, traders, flour factories and institutional buyers and financial institutions. Only 46% of the total bread wheat production is marketed, the rest is used for subsistence. Primary cooperatives (PCs) and cooperative unions currently play a minor role in output marketing, only handling about 12% - the majority is handled by private aggregators and suppliers. There are thirteen marketing cooperative unions in the cluster (one cooperative union in each woreda). Currently there are around 17 bread wheat flour factories in the region and they have limited linkages with PCs and unions.

A number of general and bread wheat specific initiatives have been implemented in the region, some of the development partners working in the cluster are the Ethiopian Orthodox Church, the Ethiopian Catholic Church, Relief Society of Tigray (REST) and Integrated Seed Sector Development (ISSD). The bread wheat value chain in Tigray ACC1 is dominated by self-consumption, with only 46% of bread wheat sold as marketed surplus. Of this marketed bread wheat, the majority is processed, mainly sold by wholesale traders as flour to rural and urban consumers and large institutional buyers, or as animal feed to animal feed buyers within and outside the cluster. A small amount of unprocessed bread wheat is sold to urban or rural individual consumers, who mill it themselves in local mills.

A value chain alliance was established in the cluster, the alliance is a multi-stakeholder platform of value chain actors to discuss and align on critical issues for the development of a Value Chain in the cluster, to identify, coordinate and ensure accountability on critical interventions needed for the implementation of the cluster and to foster backward and forward linkages. The members of the Value Chain Alliance also appointed three (3) of its members as representatives of the Value Chain Alliance to present activities and progress at the Regional Commodity Platform. Accordingly in 2016/2017 production year a contract agreement was made among 13 cooperative unions and 7 wheat flour factories to purchase 67,000 qts of wheat, to date 6001qts of wheat was aggregated and supplied by primary cooperatives to the respective cooperative unions then it was delivered to 7 wheat flour factories. Along the value chain implementation process so many challenges were observed and the major prioritized bottlenecks are summarized below:

**Challenges**

- Insufficient access to mechanization for wheat production and post-harvest processing as a result of low participation of private sector in mechanization service provision.
- Insufficient supply of improved and rust resistance certified seed to farmers due to limited capacity of research centers and ineffective distribution channel.
- Ineffective demand assessment for provision of seed, fertilizer and bio-fertilizer
- Lack of access to standardized quality agro-chemicals due to limited number of service providers
- Lack access to finance for purchase of full inputs package due to lack of proper lending mechanism
➢ Limited awareness on best agronomic practices (soil, crop, weed, and water management practices) and post-harvest practices due to knowledge and skill gaps of extension service providers

➢ Limited control of wheat rust due to lack of an early warning system and limited awareness of control techniques

➢ Poor cooperative aggregation practices due to limited awareness, lack of adequate storage and skilled personnel

➢ Limited access to output finance for pre-financing, input delivery, product aggregation, transport and marketing by cooperatives

➢ Limited commercialization of wheat due to limited linkage between potential big buyers and producers

Solution

The regional government are identifying the possibility of irrigated wheat production in some parts of the region to attract large scale farming towards commercialization of wheat becomes an indispensable task on the part of the government.

Interventions relevant to addressing wheat processing and marketing related problems in the region include;

➢ Adopted a participatory/community action research approach as a strategy, through creating action platforms for concerned stakeholders to collaborate easily and find appropriate solutions to farmers’ problems along the value chain; and foster innovative farmers to analyze their situation and to develop measures for solving problems they face with their own initiatives.

➢ The regional governments encourage and demonstrate the use of farm mechanization.

➢ Convincing stakeholders to create relevant and suitable market governance to mediate market interaction between growers and manufacturing industries within the wheat value chain.
2. Vegetable value chains in Ethiopia: Opportunities for better nutrition and new market access in Ethiopia.

By Akalu Teshome and Kebede Atsebi, Ministry of agriculture and natural resources, Ethiopia

1. Introduction

Vegetables play a central role towards meeting food and nutrition security in Ethiopia. However, the production levels of vegetables are still far below their potential (Haji, 2007). Vegetables took up about 1.18 % of the area under all crops at national level. Vegetables contribute 2.0% of the total volume crop production (CSA, 2014). Vegetables are the most important source of micronutrients and are essential for a balanced and healthy diet. Diversifying and increasing horticultural production can help to overcome malnutrition and poverty by augmenting household consumption and also create new market opportunities for smallholders. Moreover, vegetable value chains can offer new income and employment opportunities in trading and processing sectors (Ganry et al., 2011; Parrot et al., 2011; Virchow, 2014).

Public research on horticultural technologies is negligible and major public policies and attention of extension agents were mainly focused on staple crop production so far (MoFED, 2010). However, based on growing demand for vegetables especially in the major cities, the horticultural sector is gaining importance in the country and intensification is slowly starting to take place (Wiersinga and de Jager, 2009). To improve the nutritional status of the population and accelerate other positive development impacts, pathways and strategies for sustainable intensification need to be identified for vegetable value chains in Ethiopia. The objectives of this paper are to analyze vegetable value chain and examining the performance of actors in the chain as well as to assess and analyze the challenges and opportunities of vegetable production, marketing and consumption.

2. Material and Methods

2.1. Description of the study area

The study was undertaken in Yayu and Hurumu districts (Woredas). These districts are part of the Yayu biosphere reserve area (Fig.1). The biosphere reserve of Yayu forest is a biodiversity hotspot and is home to a wild gene pool of Coffee Arabica (Tadesse, 2003). The reserve has a total of six Woredas and thirty five kebeles (ECFF, 2015).

2.2. Research approach, data source, and analytical methods

This study uses a nutrition-sensitive value chain approach to analyze vegetables value chain in Yayu biosphere reserve. The data were collected from both primary and secondary sources. The primary data for this study were collected from vegetables value chain actors i.e., four farmer groups, 13 traders, 3 input suppliers, 11 consumers (including restaurants) and 7 experts and 2 development agents using semi-structured questionnaire. Secondary data were collected from both published and unpublished
3. Results and discussion

3.1. Vegetable value chain

The primary actors in vegetable value chain in Yayu and Hurumu woredas are input suppliers, farmers, traders and consumers. Each of these actors adds value in the process of changing product title. Some functions or roles are performed by more than one actor, and some actors perform more than one role. Supporting actors are those who provide supportive services including training and extension, information, financial and research services. According to Martin et al. (2007), access to information or knowledge, technology and finance determines the state of success of value chain actors. Office of agriculture (OoA), primary cooperatives office of irrigation and health extension are main supporting actors who play a central role in the provision of such services.
3.1.1 Input Suppliers

For major vegetables produced in Yayu and Hurumu Woredas, the majority of the producers buy seed from private traders. Private trades supply the seeds of onion, cabbage, carrot, beetroot and tomato. They buy seed from Jimma, Metu and other traders in their vicinity. They sell the seed of vegetable together with other consumable goods. There is no specialized seed supplier in the study area. Due to the seasonal nature of improved seed business, input suppliers do not want to specialize on seed business.

The Office of agriculture and irrigation also provide seeds to farmers. The seed from office of agriculture is cheap and of good quality but not available on time, which is why farmers buy seeds from traders. Seeds from traders are past their expiry date. The cooperatives do not supply the seeds of vegetables but the cooperatives deliver improved seed of maize.

Primary cooperatives are the main supplier of inorganic fertilizers for farmers in the study area. Cooperatives get fertilizer on time from union. Chemicals are not supplied by cooperative.

3.1.2. Producers

Vegetable production in Yayu region is relatively diverse. The major vegetable crops grow in the study area are beetroot, lettuce, carrot, spinach, tomato, ginger, shallot, onion, garlic, E. Kale and Cabbage. All vegetables are produced with rain-fed system except tomato due to disease problem. E. Kale and Cabbage are the first and the second most crops in terms of area coverage during rainy season, respectively. Cabbage, carrot, beetroot and tomato are in order of production in irrigation system. Farmers grow vegetable crops in homestead and irrigation areas. E. Kale is produced in on-farm area intercropped with maize. Species are produced under coffee but it is not possible to produce vegetable. The main source of knowledge and skill to produce vegetable is office of agriculture (development agents). Farmers also learn from each other (visiting model farmer) about vegetable production.

Farmers revealed that the production trend of vegetables is increasing because farmers learned about the benefits of vegetables (food, health and income source). But the productivity of some vegetable is decreasing due to disease.

Farmers use few inputs for vegetable production. Improved seed is one of the major inputs that are used by farmers for vegetable production. But farmers do not get quality seed. In general, farmers do not use organic fertilizer for vegetable production in their backyards. But they use manure and compost for vegetable production. Some farmers are using fertilizer for vegetable production in irrigation and wet land system. But the intensity level of fertilizer use is very low due to high price of fertilizer. Due to unavailability of pesticides, farmers do not use any chemicals for vegetable production. Farmers do not have access to credit for input vegetable production.

Farmers sell their vegetables to urban consumers (mostly), assemblers (collect from home), neighbor (who do not produce e.g. E. Kale), retailers and hotels owners at market place. Market outlet preference of men and women are different men prefer to sell to collectors. This is because it decreases transport cost and time. On other hand, women prefer to sell to consumers to get a good price. Farmers sell
vegetables at village level for assemblers and neighbors (local people), Yayu and Hurumu markets and exchange each other. Farmers know the price of vegetables by visiting market places, asking other friends/ farmers, based on previous day or previous week price, and based on demand and supply. Farmers sell at village level based on last week price.

3.1.3. Traders

Analysis of the collected information identified six main vegetables marketing channels. The channels consist of different market actors such as producers, vegetables buyers at village levels, traders (collectors), brokers, distributors and retailers. The results showed that the shortest marketing channel is channel one (producers to consumers). Female farmers prefer to sell their vegetables through channel 1 and male farmers prefer to sell their product through channel 2. This is because it decreases transport cost and time. On other hand, women prefer to sell to consumers to get a good price.

Channel 1= Produces (Yayu area)=>Consumers (village level)
Channel 2= Produces (Yayu area)=>Collectors (Village level)=>Consumers
Channel 3= Produces (Yayu area)=>Retailors=>Consumers
Channel 4= Producers (other areas)=>Traders(other area)=>Distributors (Yayu area)=>
Retailors=>Consumers
Channel 5= Producers (other areas)=>Traders(other area)=>Brokers (Yayu area)=>Retailors=>
Consumers
Channel 6= Producers (other areas)=>Traders(other area)=> Retailors (Yayu area=>Consumers

3.1.4. Consumers

Consumers are those purchasing the vegetable for consumption. Two types of vegetable consumers are identified in the study area: households/private consumers and restaurants. Consumers buy vegetable directly from traders (retailors) and farmers. Consumers purchase vegetables from local market during market days and from permanent shop on other days (during non-marketing days). Supply of vegetable by farmers is seasonal and very low, so that consumers cannot find the vegetables they would like to consume at all times and thereby consumption patterns are determined by the seasonal availability of vegetables. Hotels/restaurants purchase vegetables from respective market of Hurumu and Yayu. Some hotels from Yayu area also buy vegetable from Metu and Bedele markets. They buy lettuce, spinach and green bean from Bedele, Metu, Jimma and Addis Ababa. They buy vegetables from traders and farmers. Farmers mostly supply vegetable during fasting period. They visit market three days per week to get fresh vegetable product.

3.2 Marketing Margin

Gross marketing margin analyses indicate that 50, 55, 50, 23.1 and 27.3 % of the total marketing margin are added to onion, tomato, cabbage, garlic and ginger prices when they reached to consumers (Table1).
The marketing margin can be decreased by producing vegetable in Yayu area. It can also enhance the consumption of vegetable by decreasing marketing margin and thereby bring nutrition security in yayu area. Of the marketing margin of vegetables, distributors absorb a higher proportion of the total margin.

Table 1: Average price and margins at various levels of chain actors

<table>
<thead>
<tr>
<th>Prices/costs</th>
<th>Onions (from Woreta) in Birr/kg</th>
<th>Tomato (from Mekie) in Birr/kg</th>
<th>Cabbage (from Masha) in Birr/100 units</th>
<th>Garlic (from Naziret) in Birr/kg</th>
<th>Ginger (from Yayu) in Birr/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm gate price</td>
<td>6</td>
<td>8</td>
<td>250</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Trader (collectors)</td>
<td>8</td>
<td>10</td>
<td>270</td>
<td>53</td>
<td>-</td>
</tr>
<tr>
<td>Distributor</td>
<td>10</td>
<td>12.2</td>
<td>325</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Retailer</td>
<td>11</td>
<td>15.5</td>
<td>425</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Consumer</td>
<td>12</td>
<td>18</td>
<td>500</td>
<td>65</td>
<td>55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of marketing margin</th>
<th>Gross marketing margin (%) Onion</th>
<th>Gross marketing margin (%) Tomato</th>
<th>Gross marketing margin (%) Cabbage</th>
<th>Gross marketing margin (%) Garlic</th>
<th>Gross marketing margin (%) Ginger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Gross Marketing Margin</td>
<td>50.0</td>
<td>55.6</td>
<td>50.0</td>
<td>23.1</td>
<td>27.3</td>
</tr>
<tr>
<td>Margin Trader</td>
<td>16.7</td>
<td>11.1</td>
<td>4.0</td>
<td>4.6</td>
<td>-</td>
</tr>
<tr>
<td>Transport costs</td>
<td>16.7</td>
<td>12.2</td>
<td>11.0</td>
<td>3.1</td>
<td>9.1</td>
</tr>
<tr>
<td>Margin Distributor</td>
<td>8.3</td>
<td>18.3</td>
<td>20.0</td>
<td>7.7</td>
<td>9.1</td>
</tr>
<tr>
<td>Margin Retailers</td>
<td>8.3</td>
<td>13.9</td>
<td>15.0</td>
<td>7.7</td>
<td>9.1</td>
</tr>
<tr>
<td>Margin Producers</td>
<td>50.0</td>
<td>44.4</td>
<td>50.0</td>
<td>76.9</td>
<td>72.7</td>
</tr>
</tbody>
</table>

Source: own survey.

3.3 Challenge and Opportunities of vegetables production

3.3.1. Major constraints of production, marketing and consumption of vegetables

The study identified different constraints related to vegetable production. The major constraints are: lack of nutrition-sensitive farming system, animal damage, pest and disease problem, high cost of seed, lack of high quality of seed, unavailability of chemicals, seasonal constrained production systems,
competition with cash crops, lack of research and extension supports, low productivity, low awareness about vegetable crops, low price of output after harvesting and unavailability of improved technology.

Major constraints related to vegetables marketing are: low volume supply, seasonal unavailability of vegetables, fluctuation in price, problems with storage, processing and packaging (lack of post-harvest handling), lack of market place (shade), distance from market places and shortage of capital. Specifically, women also encounter some challenges in vegetable marketing such as shortage of market place and thereby women exposed to sun.

Lack of awareness for nutritional issues, reluctance to consume indigenous vegetables, low purchasing power, high price of vegetable and low supply of vegetable are identified as the major constraints related to vegetable consumption.

3.3.2 Opportunity for production, marketing and consumption

There are ample opportunities to vegetable production at different stages in the value chain Major opportunities include:

Strong political will in the promotion of horticultural crops and irrigation: the government has given emphasis to horticultural crops and irrigation in the second growth transformation plan (G

Conducive agro-ecology: The climatic and edaphic conditions of the study areas are within the range of the requirements of most horticultural crops growing environment

High demand for vegetable in the study area

Potential for intensification of vegetable production

Existence of underutilized different vegetable crops in the study area

As agricultural chemicals are hardly used there is a possibility for niche market exploitation under the brand name of organic produce

4. Conclusions and Outlook

This study identified some of the dynamics, potentials and constraints of vegetable value chain development in Yayu region. We identified that highly demanded vegetables are supplied through imports from other regions of Ethiopia because the local supply is low. Different recommendations are drawn from this study. To start with, dissemination of modern input technologies is essential in increasing the productivity of vegetables. Given that farmers are small-scale and unorganized in the study area, this state of affairs clearly needs strong government intervention. Not only does it require providing input facilities, but also their dissemination to ensure optimal access. Effort should also be made to strengthen farmers’ cooperative and encourage collective action of farmers to lower transaction costs to access inputs.
There is a need to strengthen nutrition-sensitive extension services in the study area to increases vegetable supply to the market. Increasing the production and productivity of vegetables per unit area of land is better alternative to increase marketable supply of vegetables. Introduction of new and improved varieties, modern vegetable technologies, controlling disease and pest practices should be promoted to increase production.

It is very important to increase farmers’ awareness about vegetable production and marketing, postharvest handling, and storage infrastructure. In order to motivate lead farmers and bring more farmers in to the production of vegetables crops, a cluster based vegetable production in which farmers organize themselves under local level organization helps to a very great extent to decrease animal damage. When clusters are formed, member farmers take care of their farms based on their agreed norms. Strengthening the supportive activities such as input supply systems would also boost vegetable supply. In addition, changing traditional production practices and beliefs about vegetable through intensive social behavioral change strategies are of paramount importance.

There is a need to strengthen vertical and horizontal linkage between vegetable value chain actors in the study area. It is also important to use of nutrition-sensitive value chain approach for vegetable crop development.

References


3. Ethiopian Somali Regional State Livestock and Pastoral Development Bureau Organizational Profile and Livestock Intervention Areas

By: Nimaan Abdullahi Hamarrie

Introduction

Ethiopia is endowed with huge livestock resource base and is one of the top countries in the world. Livestock as an integral part of Ethiopian agriculture contributes considerably for sustainable food security and poverty reduction in the country; yet the livestock sector remains underutilized to its optimum economic benefit due to multiplicity of factors. While the demand for meat and other products of animal origin is increasing internationally, the export earnings from livestock commodities in Ethiopia are very low. Existing and projected market demands create opportunities for pastoralists, who own most of the country’s livestock, to supply products of animal origin to meet this increased demand. However, there are constraints which severely hinder the benefits of pastoralists in international livestock trade the majors of which are backward husbandry practices, animal diseases and stringent international standards for trade in livestock and livestock products.

Ethiopian Somali Regional State (ESRS), being home for the country’s largest pastoral community, suffers from low-value and lower productivity of livestock which is otherwise the chief economic pursuit of the majority of the population. Several reasons are ascribed to this low productivity and lower quality of livestock production that rendered the sector less competitive in livestock markets; domestic or international. The state of livestock condition in Somali region is, like in other parts of Ethiopia, backward. It is teetering far behind most other regions in the coverage of extension services, technology adoption and in the access to marketing infrastructure. As much as production itself, marketing is a critical livelihood element in the context of regional livestock as both food and income are accessed through the market. Exposure to climatic shocks and disease outbreaks pose the biggest threat to the production of the sector.

Even though livestock is the base of the region’s economy, it fails to meet food and non-food needs of the population. Therefore, the growing recurrence of sudden onset emergencies frequently lead to food, feed, health and water related crises. Crop moisture deficit and feed and water driven stress affecting livestock, low genetic potential, high prevalence of animal diseases, scarcity of feed, backward husbandry practices and lack of modern market infrastructures, are the primary factors for the low productivity in the sector. Poor genetic make-up and environmental factors are also other contributing factors. The sector covers a wide range of areas and activities including livestock production (dairy, meat, poultry, honey and bee wax, silk production, fish, and hide and skin), livestock productivity and genetic improvement, animal feed production and productivity, animal health services, livestock cooperatives and research activities within the sphere of stated areas. Consequently, the government has recently bolstered efforts to make interventions that ultimately enhance production and productivity of livestock following formulation of strategies as well as reformation of institutional framework the livestock sector geared towards achieving the goals set in Growth and Transformation
Plan. This paper presents major value-enhancing intervention areas in order to increase production and productivity of livestock by the ESRS Livestock and Pastoral Development Bureau.

**Ethiopian Somali Regional State in brief**

Somali region state is located in East and South-Eastern part of Ethiopia between 4° to 11°N latitude and 40° to 48°E longitude and it is the second largest regional state by area covering roughly 350,000km². Out of this total area, 80%(24,000,000 ha) is flat land and 20%(6,000,000 ha) is arable land mass while close to 55% (16.4 million hectares) is a rangeland. The region’s population is currently estimated to be 6 million of which 60% are pastoral, 26% agro pastoral and 14% urban dwellers while the entire population is composed of 44% women and 56% males. The average household size is estimated at 6.6; with an average population density of 13 persons per km². As of 2016, the region is administratively organized into 11 zones, 93 woredas and a total of 1234 kebeles (LPDB, 2016). Altitude varies from 1600 meters in the northwest of the region to about 500 meters in the far south, around the Wabi Shebelle River Most of the region lies below 900 m above sea level (a.s.l).

The region is traversed by two rivers, namely Wabi Shebelle and Genale though Wabi Shebelle is the only perennial river but there are major seasonal rivers such as the Fafen, Jerer, Dakata and Erer that flow in a north to south direction. Rainfall is bimodal often low and extremely variable and the average annual rainfall range from less than 200 mm to 700 mm. Nevertheless, the higher altitude areas receive as much as 600mm rainfall per annum (semi-arid) whereas the larger, low-lying areas in the south of the region receive only 300mm rainfall or less (arid) (Andy Catley et al., 1997). Temperature in the region is usually high ranging from 20° to 45°C. Due to its arid and semi-arid climatic conditions, the region is covered with characteristic vegetation cover predominantly acacia species and is home for wild life and plant biodiversity. According to ESRS BoFED, the region’s livestock population is currently estimated to be 26.8 million which comprises cattle (20%), sheep (33%), goat (36%), camel (10%) and equines (1%). The livestock density is 75 animals per km², while the ratio of animals per inhabitant is 6:1.

**ESRS Livestock and pastoral Development Bureau**

The government has given emphasis to the development of livestock sector under more autonomous institutional arrangement. As a consequence, new proclamation has been promulgated by the Ethiopian Somali Regional State parliament in February 2016 and the directive passed by the regional cabinet for the establishment of ESRS Livestock and Pastoral Development Bureau, LPDP assumed legal personality as the regional government’s organ in charge of livestock and pastoral development portfolio. Accordingly, the bureau consists of several sub-divisions or core processes that carry out its legally prescribed missions and mandates of dissemination/promotion of livestock technologies that enhance production and productivity in order to achieve swift socio-economic development in the mainly pastoral setting of the region. The structure of the Bureau comprises 6 core processes and 3 support processes.

The core business processes are:

Animal health Service and regulation
Animal Diseases investigation and Surveillance
Animal production
Livestock and livestock product Marketing
Forage and Rangeland development
Pastoral development coordination

The support processes are units that help core activities of the bureau achieve their goals. These are; Finance, property and procurement process, planning, monitoring and evaluation, ITC and public relations units.

**Strategic directions of the Bureau**

I: Increase of livestock production and productivity

II: Promoting Livestock marketing linkage

**Strategic Objectives of the Bureau**

1: Enhance livestock production and productivity

2: Improve Performance of livestock and livestock products Markets

3: Enhancing implementation capacity and skills

**Examples of Livestock Value Chain Ethiopian Somali Regional State**

**Live Animal Value Chain**

Basically there are producers at the bottom level, who sells their livestock at bush, district level and terminal markets to various buyers including local collectors, small scale traders, brokers, who trades the livestock to the bigger traders, exporters, export abattoirs and traders from Somaliland. The end market of the livestock from the target districts is mainly Gulf and Middle East countries, while small portion has been consumed the local market. The livestock value chain includes a lot of actors, and the trading chain was complicated and very long with different actors.

**Milk Value Chain**

There are virtually no commercial dairy farms in ESRS and milk is produced by pastoral livestock herders who sell the surplus of milk to the nearby market or urban centers to generate cash they often need to buy non-livestock food items. While milk from goats is consumed among pastoral households conspicuously, the milk that is available in local markets in viable proportions is the cow milk and camel milk. Generally, milk produced by pastoralists often ends up in local urban centers. The Milk Value Chain
Actors and linkages involved are; producers, collectors/individual buyers, urban milk retailers, restaurants/kiosk milk vendors, processing plant and urban consumers/local consumers.

**Value Enhancing Interventions**

**Animal Production**

Adoption, popularization and dissemination of the following interventions;

Breed and genotype improvement of local livestock breeds through adoption, popularization and dissemination of various reproductive and breeding technologies in an effort to increase the production and productivity of less productive indigenous livestock breeds among pastoralists of the region.

Adoption, popularization and dissemination of dairy technologies in order to maximize milk yield of dairy animals and enhance sustainable milk production in the dairy sector of the region.

beef and meat technologies in order to maximize carcass yield of meat animals and enhance sustainable meat production and productivity in the meat sector of the region.

poultry technologies in order to enhance sustainable egg and poultry production in suitable areas of the region.

fishery and aquaculture technologies in order to enhance sustainable fish production for ensuring food security and economic benefit in suitable areas of the region.

honeybee technologies in order to enhance sustainable honey production in areas of the region with high potential for apiculture.

dissemination of modern skin and hide technologies, knowledge and skills in order to ensure sustainable and high grade production of competitive skin and hide products for domestic and international markets.

Promotion of urban and peri-urban animal production and farming, and provision of technical assistance for cooperatives, women associations, small-scale enterprises, large-scale enterprises and other legal entities engaged in poultry farming, beef fattening, sheep and goat fattening, dairy farming, honeybee production and aquaculture fishery across the region.

Promotion of draught animal and/or working animal management and welfare techniques that maximize their efficiency both in urban and rural areas of the region by introducing improved harnessing tools and implements.

Promotion of efficient animal feeding and nutrition technologies/practices that maximize livestock production and productivity.

Working and collaboration with NGOs, donors and other stakeholders in various aspects of animal production.
Provision of technical backstopping, trainings and extension service to the pastoralists and agro-pastoralists across the region on matters pertaining livestock production and productivity.

**Animal Health**

Improving the coverage, quality and regulatory aspects of animal health services in the region through;
- Purchase and supply of veterinary drugs, vaccines, equipment and instruments
- Direct diseases prevention, control, identification and treatment

**Facility Creation and Expansion**

**Knowledge and Research Information Generation, Dissemination and Usage**

**Forage and range development**

**Dissemination of improved forage technology**

**Improved animal nutrition and feed supplementation techniques**

**Improved Rangeland management and productivity**

**Conservation and rehabilitation of Range-ecology**

**Livestock and livestock product marketing**

Improve Performance of livestock and livestock products Markets by developing Market Oriented System through;

- Market expansion and facility creation
- Livestock and product Market information dissemination system and linkage
- Strengthening Joint coordination and awareness raising
- Enhancing implementation capacity and skills

Building the capacity of Animal production and health professionals

  a. Animal Health technicians
  b. Development Agents
  c. Field Assistants
  d. Advanced career specialists etc
4. Value Addition practices by Small holder in SNNPR, Ethiopia

By: Germame Garuma, Deputy Head of Bureau of Agriculture and Natural Resource

Background
Agriculture is the major pillars of the Ethiopian economy, and the overall economic growth of the country is highly associated with the agriculture sector performance. The sector is the major source of livelihood for about 85 percent of the population earn a living directly or indirectly from agriculture. It also contributes 42% of GDP in 2014/15 (CSA, 2015) and 90 percent of export earnings in 2014/15 (NBE, 2015). However, the performance of the agricultural sector in terms of production, productivity, value and quality of agricultural product is challenged by biophysical, institutional, trained man power(agribusiness and related) and smallholder farmers’ related constraints and factors. As mentioned earlier the major export item of agricultural product without any value addition except cleaning and grading.

Value addition and marketing is the priority area of the Growth and Transformation Plan (GTP) of Ethiopia. Value addition practice in the country as well as in the region is mainly on a few agro processing light industries for domestic market. For centuries, farmers and government of Ethiopia have been exporting raw agriculture products like coffee, oil crops, pulses, live animal, hide and skin etc.

In line with the above GTP, government has been extending supports for the increase of agricultural productivity and the improvement of basic productive infrastructure. However, the fact is that the improvement of the product quality and value added products developments’ activities are still limited to a certain group of large scale Cooperatives or Unions, and product developments through value added activities initiated by the community level are rarely seen at this moment.

Agriculture in region
In the region we have 3.3 million rural Households those depend on agriculture. In the region annually it covers 2 million ha of land by annual crop in two rain season (belg and meher) and Irrigated agriculture increased over time it estimated 400,000 ha irrigated agriculture. More than 12,000 DA’s Graduated by livestock production, crop production and natural resource conservation serving farmers.

The agricultural products grown such as pulse, cereals, oil crops, vegetables (red chilli cabbage, root crops etc.), fruits (banana, mango, avocado, and pineapple), spice, coffee and legumes are widely known in the country. However, the farmers’ activities mainly focus on the production of primary products (raw materials) and most of the farmers have very few accesses to technology, intellectual resources, information and funds in order for them to undertake value added activities utilizing primary products or raw materials they grow in the field.

While the value addition practice is far from ideal, the value addition sector luck of attention, skilled man power especially at grass root level, financial and institutional constraints that limit its
performance. Due to the prevailing condition in the country, farmers based value addition systems appear to be the most appropriate strategy for improving small holder income in the region. The farmers-based value addition quality has several advantages over rawer agricultural product exchanging for domestic and international market operation. Some of the advantages are value addition quality product improve farmers income, increase shelf life of some products, job create in rural area, and stepping stones of agro processing.

In agriculture sector to support small holder farmers government assigned development agents in each kebele (livestock, crop production and natural resource diploma graduate Das) Beside this coop organizer every two and three kebele and others assigned to provide extension service to farmers. Currently all farmers receive extension service and trainings only on how to produce crop, natural resource conservation and animal husbandry but still a gap with value addition, marketing or market oriented agri, Due to limited practices of value addition at peak harvesting time specially horticultural crops the price became drop and damage the products.

Why value addition necessary in the region?

We have been started in a few agricultural products and some pilot districts since 2012 by the support of some projects, the project that provide technical, marketing and/or financial support to the groups. With the collaboration of projects develop some Guidelines for sustainability of the value addition practices.
In the beginning it cannot apply the value addition activities in the large scale. Hence, it better to commence in small amount in pilot approach. There for to select the area and to draw experience it need some selection criteria.

Selection of the Target Woredas by citing the following criteria:

I. Availability of basic infrastructure  
II. Availability of public services  
III. Existence of potential products for OVOP activities  
IV. Accessibility from major towns  
V. Willingness of people in the areas  
VI. Availability of service providers  
VII. Availability of community-based business organizations and extension services

Hence according to the selection criteria priority was given to five products which are produced by the local farmers in large scale such as Enset (false banana), banana, bamboo, mango, koseret (spice) and barely.
We have established Committees at Regional and Woreda Levels. The Guidelines stipulate the establishment of the Joint Coordinating Committee (JCC)

**Recommendations for the Next Round**

The following recommendations are proposed to be reflected in the Guidelines and other related documents (e.g., application form, score sheets, monitoring sheets, etc.) prior to the commencement of the project.

- Some Structure is important to support small holder farmers’ prospect.
- Involve the Enterprise Development Agency at the regional level, the Trade and Industry Development Office at the woreda level, and cooperative organizers at the kebele level. They are mandated to support business activities at each level.
- Clarify the roles of each stakeholder (committee, officer, etc.). Consider delegating authority and responsibility to the wc in order to ensure sustainable roll-out to the other woredas after the Project.
- Prepare the support menu beforehand as much as possible, in order to be able to start the support provision as soon as possible.
- Set the budget ceiling or indicative amount for group support beforehand.
- Simplify the monitoring system. Weekly monitoring to the groups can be reduced to every two (2) weeks (unless otherwise necessary). Ensure that the WC would meet at least once a month and submit the minutes of meeting (with WC’s monthly monitoring report) to the RC through the official channel. The RC is expected to forward monthly monitoring report from the WC as well as prepare quarterly monitoring report for submission to the RSC the WCs. It is ideal to standardize the format.
- Extension on agri business and marketing.
- Link with financial institute.
- Product standard and food safety clearances

1. Introduction

Tanzania is endowed with abundant natural resources which include land and huge livestock resources base. Available statistics indicate that, there are more than 25 million cattle, 16.7 million goats, 8.0 million sheep. Other livestock kept include 2.4 million pigs, 36 million traditional chicken and 24.5 million exotic chicken, to mention a few. About 90% of cattle reared in Tanzania are indigenous type.

There is substantial potential for improvement of the indigenous cattle through the adoption of improved technologies in production and marketing technology. This can be done through improved husbandry, particularly adequate feeding and provision of water throughout the year, prevention/treatment of common animal diseases followed by introduction of more productive livestock/selection.

Production stage:

The production stage consists of commercial ranchers, pastoralists, agro-pastoralists and smallholder farmers as major contributors to the value chain. At this stage, Livestock keepers are trained on good animal husbandry practices such as:

e. Housing cattle: Cattle are housed in shelter/sheds/byre

If cattle shed/shelter, should be able to protect the animal from direct sun, rain cold wind, well ventilated, with slopping floor and easy to clean. If byre, especially for most of pastoralists and agro-pastoralist, it should be strong enough to protect the animals against thefts and predatory animals, the size should be equivalent to the number of animals kept and different ages, at slopping area not to allow water logging, easy to clean, constructed with non- skin bruising materials

Selection (among the herd) of high quality cattle to rear: this help them to keep profitable cattle in terms of size and weight, fast growing are preferred

Iringa Red breed
Keep the right number of animals: Farmers are trained to keep the number of cattle equivalent to carrying capacity of the pasture land and/or feed resources available

*Cattle kept equivalent to carry capacity*

Calf rearing: Calves should be well managed in order to raise them properly. At time when calves have been calved, iodine tincture is administered to their umbilical cords, feed on nature/artificial colostrum, vaccination, protected (from predators, sunshine, rain, wind), dewormed, weaned at proper time, prevented against ecto-parasites, feeding and watering them adequately etc.

Mature cattle rearing: should be well fed, given sufficient safe and clean water, treated and/or prevented against diseases as well as against endo-parasites and ecto-parasites, given supplement feeds

Fattening: Farmers are trained to fatten their cattle prior to marketing for more profit.

Some cattle eating hay
Pasture production and preservation: Livestock Farmers are trained on production of different pasture species, preservation of hay and silage, use of crop residues, supplement feedstuff

Record keeping: proper recording and keeping different cattle records

Identification Marks: for traceability and identification of the source

Contribute to development of infrastructures: Farmers are advised to contribute to construction of production infrastructures, such as Chaco dams, dip tanks etc.

Marketing of live cattle:

Farmers are advised to fatten their animals prior to marketing and sell them when reached the market weights to avoid extra costs of keeping the animals

Advised to sell on weight basis not on visual of size and/or weight

If market place is far, cattle should be transported by lorries or train

Contribute to construction of marketing infrastructure; such as resting pen, Loading Lumps etc.

Recommendation

Given the existing live cattle value chain in the pastoral and agro-pastoral communities as the most popular one, improvements in the value chains should focus on provision of enabling production infrastructures to improve their management and livestock markets infrastructures that will enable farmers and traders to sell animals by weight rather than visual estimation of their sizes and weight. Participatory feedlot trialling with communities should be conducted to assess the profitability of animal fattening
6. Coffee Value Enhancement in Tanzania

By, Twahir Nzallawahe, Director of Crop Services, Ministry of Agriculture, Livestock and Fisheries (MALF) Tanzania.

Background and Overview

Coffee was firstly introduced in Kilimanjaro by Catholic missionaries in the year 1898. For many years, coffee was a leading foreign exchange earner accounting for about 25% of export earnings. Even now, coffee accounts for 24% of total traditional exports over US $ 160 million per year. The country produces about 50,000 tonnes (70% Arabica and 30% robusta) of coffee, and almost the entire amount is exported. Directly coffee is grown by about 450,000 families with an estimated 2,000,000 additional people employed directly or indirectly in the industry. Coffee is the main source of income for 6% of the country population which is currently estimates to be 48 million. Tanzanian is the 19th largest coffee producer in the World and 4th in Africa.

Coffee production is concentrated in five main geographic areas of Tanzania, in the north (Kilimanjaro, Arusha and Tarime), in the west (Kigoma and Kagera) and south (Mbeya, Iringa and Ruvuma). Northern coffees tend to be pleasant in aroma, rich in acidity and body, sweet taste with balanced flavours due to mineral nutrients from volcanic soils. Southern coffees are characteristically medium body and fine acidity with good fruity and floral aromatic taste.

Smallholders constitute 90% of the total coffee production and the remaining 10% comes from the estates.

Coffee value enhancement along the Value Chain

Coffee Harvesting

Ripe cherries are either harvested by hand, stripped (for robusta coffees) from the tree with both unripe and overripe beans, and all the coffee beans are collected manually. Coffee harvesting in Tanzania is done by selective picking of the ripe berries. This is a labour intensive exercise and involves most of the members of a family and hired labour. To maximize the amount of ripe coffee harvested, it is necessary to selectively pick the ripe coffee beans from the tree by hand and leave behind unripe, green beans to be harvested at a later time. About 12-20 kg of export ready coffee will be produced from every 100 kg of coffee cherries harvested.

Coffee Processing

The cherry is sorted out before pulping. This helps to remove the immature, diseased, insect damaged and dry berries as well as the leaves, twigs and other foreign matter. The sorted out berries are processed by the dry method.

Over ripe coffee cherries, undeveloped coffee cherries, sticks and leaves float in water. Ripe coffee beans and green coffee cherries are dense and sink. Therefore, the first step in coffee production
consists of separating the "floaters" from the "sinkers." The coffee floaters are usually sent directly to the patio to be dried and are often slated for internal consumption. The ripe and green cherries can be sent to the patios to be dried using the natural process of preparing coffee or can be sent to the coffee pulping machines.

Coffee Processing Equipment

The first stage of coffee pulping is used to remove the green coffee cherries from the ripe cherries. In the coffee pulping machinery (hand or central pulper), the internal pressure is monitored to push the coffee against a screen with holes only large enough for a coffee bean (not cherry) to pass through. Since the ripe cherries are soft, they break and the coffee seed is released through the screen.

Pulping Coffee

Pulping is the mechanical removal of the pulp from the cherry to have parchment coffee. After pulping, the coffee is graded into three grades 1,2 and lights. This is done by density and size of the coffee. Parchment 1 is conveyed to the fermentation tanks while grade 2 and lights are further processed again through another smaller pulper called a re-passer.

The green cherries are hard and cannot be pulped. Instead of passing through the screen, the green coffee beans pass to the end of the barrel system and are separated from the ripe coffee beans. The pressure inside the barrel controls how many cherries will be pulped. The pulp and coffee beans are then separated by centrifugal force and a barrel screen system.

Coffee Fermentation: Mucilage removal

i) Biochemical removal: Fermentation

Fermentation allows the mucilage layer on the parchment to be washed off easily. Completion of fermentation is determined by washing a bit of the parchment with clean water and then feeling the coffee with the hand. A gritty feel is an indication of the completion of fermentation. This stage takes 1 to 4 days depending on the prevailing weather conditions, faster on warm days and slow on cold days.

ii) Chemical Removal

Several chemical products are used for removal of the mucilage, mainly lime, which precipitates the pectins in the form of insoluble pectates, which are then easily removed by washing. Alkaline carbonates have also been used. This method is not common in Estates.

Underwater Soaking

Soaking is a complete immersion of the parchment under water. Studies in Tanzania have shown that soaking of coffee parchment after fermentation for about 12 hours improves the coffee quality both in
colour and taste. The parchment is thoroughly washed to remove the degraded mucilage and acids completely before soaking.

**Final Washing and grading**

After fermentation and soaking, the parchment coffee is thoroughly washed with clean water to remove any dirt or remains of mucilage or sugars. Final washing is done in concrete channels by pushing the parchment with wooden paddles against a stream of water. The washing channels are painted like the fermentation tanks with acid resistant black paint. The paint allows heat retention during fermentation and reduces friction between the coffee and the concrete surfaces during washing.

During final washing, the coffee is graded again by weight into different grades.

**Coffee Drying**

11%. This is the ideal level of moisture content required for proper storage, hulling and roasting. In Tanzania, sun drying is predominantly used and mainly by the co-operatives and the coffee is spread on wire mesh tables for several days (normally about 14 days), until fully dry. When it rains, the coffee is covered by a polythene sheets to avoid re-wetting. Some big commercial estates use mechanical drying.

The following are the stages of parchment drying that are observed:

**Skin Drying (55 - 45% mc)**

This stage involves the removal of surface water and that between the parchment and the bean. The parchment is spread on layers not exceeding 0.5 inches on wire mesh tables and turned frequently to encourage rapid evaporation and at the same time it is fully exposed to the sun. This stage is normally completed on the same day of final washing. While stirring the parchment to ensure uniform drying, discoloured and broken beans are sorted.

**White Drying Stage (44-35% mc)**

At this stage, the parchment is white and it is easy to sort out the defective beans. Drying at this stage is made slow and controlled, and during very hot days, the coffee is covered during the hottest part of the day, (from 10.30 a.m. to 3.00 p.m.) in order to avoid cracking of the parchment cover. This stage can be mechanised with well controlled temperatures to avoid cracking of the parchment.

**Soft Black Stage (35 -25 % mc)**

At this stage the parchment attains is final black colour. In Tanzania, it is recommended to only sun dry in this stage, for the coffee is said to be photosensitive and the sun light makes the coffee to acquire some preferred quality characteristics. The coffee is fully exposed to the sunlight for a period of 48 -50 hours. Mechanical drying is discouraged at this stage.

**Hard Black Stage ( 25 -12 % mc)**

At this stage the parchment is hard dark in colour and can be done rapidly without any loss of quality.

**Fully Dry and Conditioning (12 -11 % mc)**
This is done in ventilated stores or bins in order to even out the moisture of the coffee. At this moisture content, the coffee can be stored in well controlled environment without any effect on quality.

**Milling (Secondary processing)**

The purpose of primary coffee processing is to transform cherry to parchment ready for secondary processing. Milling represents the secondary processing when the coffee parchments is delivered into the mill Plant; by either the coffee cooperative societies, estate growers and large scale plantation.

Coffee societies are required to appoints a miller annualy from a list of licensed miller by the Tanzania coffee board. Coffee milling involves two stages, namely the removal of impurities through use of screens, magnetic separation of any metal pieces and pneumatic system to remove light materials. This is followed by hulling of the parchment or buni to remove husk and polishing to remove silver skin from the clean bean surface. The other second stage is mechanical grading which separate the clean coffee beans into different grade based on size, shape and weight of the clean bean.

**Coffee Marketing**

There are three types of coffee markets in Tanzania;

Farm gate market – this is the first level market where the farmers are selling their parchment or dry cherries to the licenced buyers (private coffee buyers).

Auction market – this is the second level market where the Private Buyers and Cooperatives sell their coffee to the auction. At the auction, the exporters will compete for coffee whereby the highest bidder will take the coffee.

Direct Export – the market where growers can export directly outside the country without passing through the auction.

**Conclusion and Way-forward**

- The industry recognizes the opportunity of increasing fully-washed coffees, which are processed through central pulpery units (CPU) so as to utilize the opportunity that Tanzanian Arabica coffee receives a premium to the New York Board of Trade.

- The process of achieving fully-washed coffees should be to ensure farmers benefit on the additional income accrued from premiums for Colombian Milds.

- Thirty percent of all Tanzanian coffee is sold through direct export giving buyers access to specific un-bulked coffee with specific flavour characteristics, thereby establishing long-term relationships between growers and roasters.

- Given recent developments towards washed Robusta coffee and the emergency of a niche market segment, there are signs that there is a chance of emerging specialty market for this type of coffee.
However, farmers will gain more when there are parallel support from the services industry and good marketing systems from both policy and regulatory environment.

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INTRODUCTION

Agriculture in Nigeria has evolved greatly over time in the past few years because of the advent of technology and other infrastructure. However, most of the farmers merely engage in subsistence farming to provide food for their families while very little is made available to the market.

Nigeria government in her bid to achieve food security and boost export earning started prioritizing on certain crops and livestock like maize, rice, wheat, sorghum, cattle, sheep and goat, poultry, bee farming etc.

Government is focusing its policy among others on enterprise development across successive stages of the commodity value chains for the development of crops, livestock and fisheries sub-sectors, namely input supply, production, harvesting, storage, processing, marketing and consumption. It is believed that building complex linkages between value chain stages will be an important part of the eco-system that will drive sustainable prosperity for all Nigerians.

The Nigerian Agricultural Development and value-enhancement technology practices and activities tend to support the scaling up of Agricultural investment to improve the competition in maize, rice and livestock value chains, reduce drudgery in the processes and improve on the quality of the produce by smallholder farmers. This is value addition on farm produce from post-harvest through marketing in a particular value chain. Farmers are linked to markets, finance, inputs, equipment and information through government institutions, and commercial farmers who have the capacity and incentive to invest in smallholder production.

OBJECTIVES

The main objective of this paper is to share the experiences of the federal ministry of agriculture and rural development on its value-enhancement technologies, practices and activities in maize and rice for crops sector, sheep/goat and poultry for livestock.

TOP TWO VALUE CROP CHAINS: MAIZE AND RICE

Maize and Rice value chains are among the priority crops of the Nigerian Government. They are among the staple foods in Nigeria.

MAIZE VALUE CHAIN

It is the most important staple food in Nigeria among all cereals and most areas are devoted to its cultivation. Production continues to expand due to technological breakthrough. It’s used by both human and livestock and cultivated twice in a year during rainy and dry seasons. An irrigated crop and used as coping strategy against the ever worsening climatic anomalies in Nigeria. Over 50 million farmers grow maize every year and 90 million are employed in its processing and daily usage.
Nigeria developed arable market and Development Company, strategic grain reserve scheme was activated and many silo-complexes built to store grains. Some of them are still operational today and some new ones are under construction to boost food security.

**RICE VALUE CHAIN**

Rice is a food grain that contains a number of vitamins and minerals, grown in more than 100 countries, and one of the world’s staple food. Domestic consumption of Rice is estimated at 6million metric tons per year. Nigeria is rated 2nd largest rice importer in the world spending $2.5bn per year. Meanwhile, she has all it takes to produce for domestic use export. Presently, Nigeria produces 32m MT but gearing to produce up to 100m MT per year. It is produced by all the regions in Nigeria. Different varieties are available such as long, medium and short grains.

Both maize and rice grains go through some stages to make them consumable from production through marketing and each chain, value is added. To ensure an appreciable value addition on these farm produce in order to enhance the income and economic wellbeing of the smallholder farmer, some innovative technologies, practices and activities are introduced from the harvest through to marketing as shown below.

**HARVEST: MAIZE AND RICE VALUE CHAIN.**

Postharvest losses remain major challenges to food security and income growth to smallholder farmer in Nigeria. Harvesting is the first step to a successful post-harvest operation and must be done properly to ensure the crops are matured and are not contaminated. Poor post-harvest practices carry double risk of a quantitative loss of produce and exposure to dangerous toxins leading to illness and death among producers (farmers) and consumers of the produce. Also nutritive and market value of maize and rice grains depend on their quality. Common practices in harvesting include, drying, shelling, threshing, cleaning, parboiling, milling. Most smallholder farmers harvest their cereal by hand, plucking maize cobs and cutting paddy rice panicles.

**THRESHING/SHELLING**

This is a process of separating the grain from the seed heads, cob or panicles. Traditionally done by beating with sticks or trampling by cattle and many grains are damaged exposing them to insects and fungal attack. To overcome these, some technologies are being introduced like threshing Machine, to reduce the drudgery, reduce loss of grains, faster and improve the value. Could be hand, pedal or engine operated, engine operated multi-crop thresher. Farmers are clustered into groups or cooperative associations for ease in purchase and use. Youths are trained and empowered to operate and maintain these machines as enterprise.

**DRYING**

Drying is done to prevent germination, growth of bacteria, fungal, mites, and insects and improve on the quality of the grain. The use of clean mats, tarpauline (or plastic sheets), wire mesh, concrete floors or slabs, improved natural well ventilated structures like cribs, batch or bin dryers, column dryers, rotary dryers, tray dryers were introduced to smallholder farmers. This replaced the old method of drying.
grains along high ways, ground which gets the grains contaminated and much wasted. These drying instruments are not too expensive and could be constructed from local materials.

**PARBOILING/CLEANING**

Parboiling is a process whereby the rice grains are steamed to soften it for the removal of husks and bran. Cleaning is an agro-process of removing foreign bodies to improve the quality of grains produce of maize and rice. For effective and qualitative cleaning, these technologies were introduced, milling machines, haulers, blowing/destoning machine for blowing off husks or dust from rice grain instead of blowing and winnowing.

**GRADING/WEIGHING/BAGGING**

Grading is a process of sorting grains into grades. Smallholder farmers were introduced into grading their products to attract more income through quality. Nigeria’s standard for both maize and rice is determined by the market demand. A grading instrument constructed from local materials mainly for the smallholder farmer. Weighing is to determine quantities to be put in bags depending on the sizes. Different bags are used like jute, acetic bags.

**STORAGE**

Storing the harvested grains to preserve the quality, quantity, reduce fungal, insects and rodents’ infestation and contamination. Grains could be stored for short term (less than 3months), medium long term (3-12months) before they are taken to the market, household consumption or when prices are better. Traditional ways of storage at fire place and calabash has been improved upon by the introduction of new techniques for storage. Such as Hematic plastic bags (PICs), PVC thanks, metal silos, cribs and treated storage bags.

**MARKETING**

This is the process of disposing the grains to those doing business or for consumption, to government and to companies as up-takers. Good agronomic practices are communicated to the smallholder farmers through ICT medium like phones. Farmers are connected to companies that use their grain for them to produce according to specifications of the company. Market information is provided to the smallholder farmers on where to sell through ICT. Government also buys off the grains to store in the Silos for storage to be released in time of scarcity or during emergency to achieve food security. Aggregation centers and value chain development were introduced. Standard certification and assurance are being practiced.

**LIVESTOCK VALUE CHAIN**

The livestock sub-sector is an important and integral component of Nigeria agriculture and is a major source of house hold wealth and food security. IT has contributed immensely to the socio-economic development of Nigeria to about 9-10% of Agricultural GDP. Sheep, goat and poultry are raised throughout the country. Poultry, sheep, and goats are raised virtually by every rural household which is
an integral part of the farming system. This guarantees minimal availability of livestock products nationwide. Nigeria is one of the four leading livestock producers in Sub-Saharan Africa.

SHEEP AND GOAT VALUE CHAIN

Sheep and goat are very widely distributed in Nigeria, and part of well-known farming systems. They are basically classified into extensive (pastoral), semi-intensive (crop/livestock system) and intensive (Urban and Peri-urban) systems. The semi-intensive system constitutes over 70% followed by the extensive and intensive systems. This sub-sector is dominated by small-scale peasant farmers who are mainly involved in crop production but who keep livestock to supplement their incomes.

Sheep and goat supply animal protein for humans as nutrients, hides and skin to earn foreign exchange, domestic milk production and employment to over 1 million people. Nigeria is ranked 5th among the top 10 sheep and goat producers in the world as recorded by FAO in 2008. The present government aims at transforming the sector from subsistence level production to a viable and profitable commercial enterprise through the following.

➢ Sheep/goat farmers were registered and validated into cooperatives groups and associations for easy access to all the farmers. Professionalized sheep and goat farmers for better productivity from free range rearing to intensified farming. Animals reared in shades to maximize feed utilization, reduce waste, disease infections, increase offsprings and more milk from goat.

➢ Introduction of crushing machines for crushing crop residue after harvest to produce animal food.

➢ Baling system for packing their feeds into bales to preserve the feed after harvesting and reduces the cost of feeding for the farmer.

➢ Crush and spray race for treatment of animals are set up in some clustered by government but the farmers pay for the services, reduces mortality and improve the quality of skin and meat.
  - In some places where commercial farmers invested on hay, silage and pelleted forage, the smallholder farmers utilize the services though they pay.
  - Research institutes and federal universities of agriculture supplies grade bucks and rams to the registered cooperative farmers for the upgrading the national flocks to attain their optimum potentials.

➢ Provision of animal health care services and input delivery to rural-based farmers to increase the population and production. The sheep and goats are vaccinated to avoid diseases, worms and pox to enable the animals breed and fatten well.

➢ Sheep and goat farmers’ cooperative societies are linked to financial institutions to enhance their ability to obtain funds such as BOA, BOI, NIRSAL and commercial banks

➢ Development of mini-abattoir and standard retail shops for supply of wholesome meat.
- Collaboration with leather industry to ensure coordinated and systematic collection and handling of skin, and capacity building in flaying for operations and goat slaughter houses were initiated.

- Advocacy and sensitization especially the rural populace on the importance of goat milk.

- Value chain development that has created more job along the chain

**POULTRY VALUE CHAIN**

The livestock sector is vital to the socio-economic development of Nigeria and the poultry sub-sector is the most commercialized of that sector. It contributes about 9-10% of agricultural GDP by FAO 2006 records. Nigeria’s chicken population is over 150,682 million, of which commercially farmed is about 25%, semi-commercially 15% and backyard rearing 60%, and these constitute mainly of smallholder farmers. Poultry are raised for meat and eggs. Poultry meat containing phosphorus and other minerals of B-complex and contains less fat than meat cut from beef and pork.

Three types of chickens are reared namely: layers for egg production, broilers for meat product ready for market from 8 weeks, cockerels also for meat production and takes about 24 weeks to mature, more resilient and can stand shock thereby survive more. The indigenous breeds or strains of chicken/fowl survives under harsh conditions and they have to fend for themselves but at the expense of high levels of productivity and that is why government introduced the breeds with a greater generic potential for egg production and feed conversion.

Many techniques to enhance the value of poultry products for the farmer include the following:

- Registration of smallholder poultry farmers and clustering them into groups.
- Certification of hatcheries for day old chicks by government and introduction of these to farmers.
- Farm demonstrations to farmer on the management of their poultry farms for optimum productivity,
- Formulating feed using locally harvested crops from farms using feed mills services around their cluster to reduce the cost of feed.
- Introduction of mini-incubators that could hatch 20-25 day old birds from 30 eggs set from hatchery.
- The use of local pens constructed with local materials
- Disease control, vaccination schedules and provision of drugs by veterinarians to mortality.
- Debeaking of birds at minimal cost to avoid killing themselves.
- Introduction of plastic drinkers and feeders to reduce waste of food and littering water to avoid contamination by fungal organisms.
➢ The use of locally made laying nests that farmers could afford instead of battery cages for layers. Introduction of poultry feather plucking machine for plucking out feathers from birds with ease.

➢ Presently the federal government is building poultry processing plants in some states in the federation where poultry will be processed into usable products.

RECOMMENDATIONS

Hides and skin from sheep/goat are of high quality and are exported raw and imported back after processing hence depriving our farmers and youth employment. Efforts should be geared towards establishment of processing industry to create jobs and increase income to farmers and nation at large. Research on our local breed of animals for better performance should be encouraged.

CONCLUSION

Value chain development and classification of farmers has made them compete more favorably with others and improved their economic-wellbeing. Agriculture is now a business hence farmers produce to sell to improve their income and foreign exchange to the nation.

By: Richard Kow Annobil, Deputy Director, Hrdmd, MOFA, Ghana

FUNCTIONS OF THE HRDMD

➢ Initiate and formulate policies in human resource development and management and planning programs
➢ Co-ordinate human resource development and management issues
➢ Recruit and train qualified staff for the agricultural sector.
➢ Provide in-service training of MOFA staff
➢ Facilitate the review of education and training program
➢ Provide Pre-service training in Agricultural Colleges
➢ Creation of Enabling Environment for Teaching and Learning in the agricultural institutions

The HRDMD has the overall responsibility for the management of the Agricultural Institutions of the Ministry of Food and Agriculture

➢ 5 Agricultural colleges
➢ 3 Farm institutes

DEFINITION – VALUE CHAIN

➢ Value Chain is a business-oriented approach, which aims at capturing the best value at all stages of production, processing and trading, from farmers through traders, processors and retailers up to the final consumer.
➢ All business opportunities along the chain are identified for employment creation
➢ Employment opportunities created for young graduates

IMPORTANT VALUE CHAINS

➢ CROPS
   1. Maize    2. Cashew

➢ LIVESTOCK
   1. Sheep    2. Goats
MAIZE VALUE CHAIN
➢ Maize is an important grain crop in Ghana
➢ Is important for both human consumption and as animal feed
➢ Over 318,514 tonnes of maize is lost annually to post harvest losses
➢ This figure represents 18% of the country’s annual maize production
➢ Harvest maize as soon as it is dry – when stalks are straw coloured
➢ Dehusk harvested maize
➢ Transport harvested maize to the crib
➢ Clean all materials used in harvesting and store properly
➢ Dry harvested maize in the crib, on tarpaulins or concrete floors
➢ Avoid drying maize on the ground
➢ Shell maize after it has dried to an appreciable moisture level-12-13%

MAIZE STORAGE
➢ Use recommended chemicals for long term storage of maize
   i. Pirimiphos-methyl+Thiamethoxan
      (Actellic Gold Dust)
   ii. Pirimphos-methyl (Ateco Super 25EC)
   iii. Pirimiphos-methyl +Permethrin
      (Betallic Super)

CASHEW
➢ It was introduced in Ghana in the early 1960’s
➢ It is becoming increasing important as non-traditional export crop in Ghana.
➢ Cultivation has gained more interest in Cashew Development Project areas
➢ The growth in Cashew cultivation has tremendously improved among small scale farmers in Ghana.

APPLE HARVESTING
➢ Handpick matured fruits gently from the tree to prevent bruising of the apple when targeting the fresh/market or aiming at juice production
➢ For alcohol production, fruits may be allowed to drop before picking.
➢ Detach nuts from apples, using a sharp knife or nylon tread.
➢ Wash the harvested fruits with clean water and pack gently in perforated plastic crates or cardboard boxes.
➢ Transport packed apples within 24 hours to the processing plant or marketing centre to prevent deterioration in quality of the apples.

NUTS HARVESTING

➢ Allow fruits to drop to the ground before picking
➢ Collect fruits daily on very hot days otherwise collect fruits every three days
➢ Detach the apple completely from the nut using a sharp knife or nylon thread.
➢ Air-dry nuts under shade on concrete floors, drying mats or tarpaulins for three (3) to four (4) days
➢ Turn frequently to ensure uniform drying
➢ Do not dry nuts on metallic surfaces or under extremely high temperatures.
➢ Well-dried nuts produce rattling noise when turned on the drying floor.

STORAGE OF NUTS

➢ Store well-dried nuts in jute sacks
➢ Do not use fertilizer bags, poly-bags, boxes, buckets for storage
➢ Place the bags on wooden pallets in a dry, well-ventilated room with leakage-proof roof.
➢ Leave a clearance of at least 1.5m between the top of the packed sacks and the roof as well as the walls of the storage building
➢ Sell nuts within the same year of harvest to prevent loss in quality

Adding value and Processing

➢ Increase the worth of the raw cashew nuts and apples in terms of money
➢ Changing the original form of the nuts and apples to roasted nuts and jam
➢ Kernels can be used in the food industry, apples which can be processed into alcoholic and non-alcoholic beverages
➢ Animal feed
➢ Vinegar cashew nut shell liquid which have industrial use.

SHEEP AND GOATS

Introduction

In Ghana, sheep and goats play an important role in the food production systems. Sheep (mutton) and goat (chevon) are highly patronized by revelers in all the regions across the nation. This indicates the fact that a big market exist for the meat. The main issue has to do with how the meat is prepared for consumption.

Production of Mutton and Chevon

➢ Sheep and goat handling and slaughter for human consumption usually follow a traditional or ritualistic norms, some of which may be at variance with acceptable practices,
➢ Resulting in cruelty to animals, quality losses in meat, challenges to public health and little or no aesthetic values.

SLAUGHTERING

➢ Slaughter healthy animals – veterinary officers should undertake antemortem examination of the animals
➢ Slaughter in a clean environment
   f. Makeshift premises
   g. Slaughter slab
   h. Modern abattoir
➢ Use humane methods to restrain and slaughter animals

SLAUGHTERING TOOLS

Few tools are required for the slaughter of small ruminants. These include:

1. Sticking knife: this has with, a six-inch blade (15.2 cm) blade and a V-shaped ends used for severing the blood vessel on the neck to bleed the animals.
2. Skinning knife: used for skinning of the animal’s skin. This also has a six-inch blade characteristically curved backwards to allow for ease of operation.
3. **Meat Saw**: A replaceable blade handsaw which is used in sawing through bones.

4. **Meat Chop**: A heavy axe used for separating heavy structures eg the head from the neck or the shanks from leg.

5. **Spreader**: A metal device for suspending the animals body and spreading out the legs for dressing and inspection

**CUTTING CARCASS**

- Cut the carcass into desired sizes
- Package meat nicely before transporting to the market centres
- Use of cold vans is desirable
- Store meat in a freezer
- In the market, house fly proof net should be used to screen off houseflies

**CHALLENGES**

- Weak capacity to undertake value chain analysis
- Inadequate information on actors and functions along the value chains
- Inadequate funding
- Addressing the Challenges
- Capacity building for staff and extension officers
- Seek donor support

By: Mr. Mr Kasigwa Moses Ag Asst Commissioner, Primary Processing a and Value Addition

Introduction

Currently, MAAIF is implementing commodity value chain approach for priority/strategic commodities which include; maize, rice, cassava, beans, citrus/mango, banana, coffee, tea, fish, beef, dairy, oil seed crops, cocoa, etc.

Understanding and developing value chains is receiving more attention as a systems based approach for accelerating and scaling-up development processes. By their nature, value chains involve and connect multiple actors; producer, input dealer, buyer/processor.

Crops with a developed value chains

A) Vegetable oilseed sub-sector

➢ This comprises sunflower, groundnuts, and sesame. These are among the seven strategic commodities selected by the Ugandan government within the policy framework. The sub-sector directly influences livelihoods of over 12 million Ugandans (all actors along the entire vegetable oil chain mainly in north-eastern, south-western and central parts of Uganda.

➢ Sunflower is the leading domestic raw material for vegetable oil. Sunflower is produced from both hybrid and open pollinated variety (OPV) seeds. Since Uganda is not able to produce hybrid seeds, they are currently imported from South Africa by a large private sector company, Mukwano Industries Uganda Ltd.

Fig. 2: Smallholder farmers learning sunflower production practices
Sunflower production is exclusively done by smallholder farmers, while processing is carried out by a range of small, medium and large scale processors with varying capacities. The domestic demand continues to increase because of higher local per capita oil consumption. In addition, regional demand in the Democratic Republic of Congo (DRC), southern Sudan, Rwanda, Kenya, Tanzania and Burundi have further opened up markets for the Uganda vegetable oils (Ton and Opeero, 2009).

In addition, seedcake from milling could be used for animal feed and in the production of bio-fuels. Other possibilities included the potential to serve Uganda’s domestic, regional and export markets, and to add value to oilseed value-chain activities by establishing links with the education sector for vocational training of producers and processors.

As a result of bulking, this market coordination and government has provided for the warehouse receipt system which guarantees farmers for agricultural loans through the existing commercial financial institutions.

![Farmers bulking produce](image)

**Figures 1: Farmers bulking produce at the collection facility**

The bulking practices helped to eliminate middle men, reduced post-harvest losses and increased the prices received at the farm gate. In addition the producer organizations have been empowered to negotiate for much better deals with the processors. This has helped farmers to earn higher prices: This price increase has attracted more farmers to adopt sunflower production.

The increased production has also attracted an influx of investments in the value chain. Recently, for example, a US$30 million processing plant was commissioned by Mt. Meru Millers Ltd in Lira. This drive to enter into the sub-sector is an indication of the oilseed value chain growth, business attractiveness and likely profitability.

**Constraints along the value chain**

- Use of rudimentary tools and equipment (e.g. hand hoe); some areas are affected by soil exhaustion; most of these lands were previously occupied and over cultivated.
➢ Weather is also a crucial issue, with rainfall patterns becoming more and more unpredictable for farmers.

➢ Farmers in most cases market their crops without any primary processing.

**Recommendations**

1. Increase farm productivity and production
   ➢ Develop climate change mitigation strategies (e.g. water harvesting technologies)

2. Improve postharvest handling and value addition
   ➢ Train farmers on value addition and strengthen postharvest handling
   ➢ Support farmers to procure small postharvest handling and processing equipment

3. Support the development of a sustainable value chain financing
   ➢ Build partnerships with financial institutions
   ➢ Promote warehouse receipt system
   ➢ Strengthen VSLAs

**B) Maize value chains**

Maize production takes place in all regions of Uganda. Maize has been traditionally cultivated in Uganda by small-scale farmers both as a source of food and for income generation. It is now one of the 15 priority commodities which have been prioritized in the Agricultural Sector Strategic Plan (ASSP) of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF, 2015/16).

Although maize has been grown for a long time in Uganda, its per capita consumption is still low compared to Kenya owing to the presence of various staple foods, such as *matooke*, millet, sorghum, cassava, sweet potato. However, domestic consumption of maize is rising due to an increase in urbanization, number of institutions, and prices of traditional staple food, such as *matooke*. Surplus maize is sold to regional markets, especially Kenya and South Sudan.

**Maize Value Chain Actors**

**Producers**

The farmers in Uganda opt for the most common maize seed, “Longe 5” and “Longe 4”. Open Pollinated Varieties (OPVs) which are grown all over the country. However, in most cases farmers use home saved seeds instead of buying them, this negatively affects the yield.

After the harvest, organized farmers bulk the maize in local stores that have been provided by development Partners like WFP and later sell it to local traders or WFP if their produce meets the
required standard. A big proportion of maize producers sell individually at the farm gate to local traders and sometimes to wholesalers. As a bad practice, some farmers sell maize in the garden.

**Local traders**

These local traders go around the remote rural areas that are usually difficult to access and buy the maize from farmers; they either go to the local storage facilities or directly to the farmers’ gates. These traders move from collection point to another and bulk up the maize until they accumulate a sufficient amount. Once the maize is collected, local traders bring the maize to the millers for it to be processed or sell it as grain to wholesalers.

**Small/medium scale millers**

Small millers can be found at a local level near trading centres and rural markets whereas medium scale millers are usually found in big towns. They receive the maize grain and process it into flour for direct consumption. The processing of maize is an important stage in the chain because it adds a significant amount of value to the maize.

**Wholesalers**

Wholesalers buy and sell maize grain destined to Kampala and regional markets (Kampala, South Sudan and Kenya) where the maize will be eventually milled for final consumption. Wholesalers either go directly to collecting points such as trading centres and storage facilities or else they pass through local traders that bring the maize directly to them in the local towns. Once the merchandise is bulked in large quantities, they transport it straight to the main market in big towns where they mill and sell flour or sell grain to WFP or export it within the region (South Sudan and Kenya).

**Constraints along the value chain**

Farmers face great difficulty accessing seed in terms of quantity and quality due to high prices and limited availability. Seed used is usually home saved seeds.

Production is also limited by a lack of capital and access to rural credit; the majority of farmers lack access to formal financial services.

Other factors affecting yields include: use of rudimentary tools and equipment (e.g. hand hoe); farmers’ inadequate agronomic knowledge; incidence of pests, weeds, vermin and diseases. Some areas are affected by soil exhaustion; most of these lands were previously occupied and over cultivated.

Weather is also a crucial issue, with rainfall patterns becoming more and more unpredictable for farmers.

Farmers in most cases market their crops without processing it (e.g. unmilled maize) and sell it with minimal added value. Farmers lack simple processing equipment (e.g. maize shellers) or good quality milling facilities.
The relationship between farmers and local traders tends to be characterized by a general mistrust due to farmers’ lack of market information.

Farmers lack appropriate storage facilities and where they have, there is mistrust among members and inadequate knowledge for managing the facility.

Apart from sunflower, the marketing channels for most commodities are inexistent. For maize, because of its great potential it is well adapted to the local environment.

A significant proportion of farmers remain unorganized and act individually in the value chain, so cannot attract big buyers

Recommendations

1. Increase farm productivity and production
   Encourage farmers to select and adopt improved crop varieties and animal breeds
   Train farmers on better and good crop and animal management practices
   Develop climate change mitigation strategies (e.g. water harvesting technologies and pasture preservation)

2. Improve postharvest handling and value addition
   Train farmers on value addition and strengthen postharvest handling of crop produce and animal products
   Support farmers to procure small postharvest handling and processing equipment
   Support farmers to acquire bulking stores and train them on their management

3. Strengthen market linkages
   Provide market information
   Promote collective marketing: encouraging farmers to organize themselves as a group/associations/cooperative
   Improve relationships between farmers and traders

4. Support the development of a sustainable value chain financing
   Build partnerships with financial institutions
   Promote warehouse receipt system for grains
   Strengthen VSLAs

C) Dairy value chain
Dairy production

It is now one of the 15 priority commodities which have been prioritized in the Agricultural Sector Strategic Plan (ASSP) of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF, 2015/16). The dairy industry has had a number of improvements across the value chain.

Through various initiatives, there has been an effort to improve the breeding stock by supporting farmers to acquire bulls of good pedigree or artificial insemination of local cows. Farmers have been trained on proper management of these hybrid animals. There are also interventions to improve feeding through introduction, production high production pastures and preservation mechanisms.

Handling of milk
Milk being a highly perishable product, farmers have been trained on proper milking methods and handling of milk and supported to acquire milk cans for transporting milk to the market.

Marketing of milk
Most farmers particularly in western Uganda are organized into groups/associations/cooperatives through which the bulk and market their milk. After bulking, the milk is cooled and transported in refrigerated containers to the Dairy cooperation where the milk is processed into various products.

Constraints along the value chain
- Production is also limited by a lack of capital and access to rural credit; the majority of farmers lack access to formal financial services.
- Incidences of parasites and diseases e.g Ticks, Foot and mouth disease
- Weather is also a crucial issue, with rainfall patterns becoming more and more unpredictable for farmers.
- Farmers apart from those of Western Uganda remain unorganized and act individually in the value chain, so cannot attract better prices

Recommendations

1. Increase farm productivity and production
   - Encourage farmers to adopt improved animal breeds
   - Train farmers on good animal management practices
   - Develop climate change mitigation strategies (e.g. water harvesting technologies and pasture preservation)

2. Improve postharvest handling and value addition
   - Train farmers on value addition and strengthen postharvest handling of milk and products
   - Support farmers to acquire milk collection and transporting facilities
3. Strengthen market linkages
   ➢ Provide market information
   ➢ Promote collective marketing: encouraging farmers to organize themselves as a group/associations/cooperative
   ➢ Improve relationships between farmers and traders

4. Support the development of a sustainable value chain financing
   ➢ Build partnerships with financial institutions
   ➢ Strengthen VSLAs

Conclusion

Whereas the Universities and Colleges were attempting to train on Value chain, extension focus was on production. With the government reforms, there is need for strong linkage between academia and the Ministries (MAAIF and MTIC).

D) Beef value chains

Beef is another priority enterprise support within the ASSP framework 2015/16-2020/21. The main beef products include fresh meat and processed products such as sausages, meat balls. This involves high investment in slaughter houses, specialized equipment and development of skills in processing. Some of the byproducts of beef value are manure, milk, bones, blood, hooves and horns, skins.

Some of the post-harvest value enhancement accessible to small holder farmers include; holding pens, Slaughter Hall, Cutting and deboning, Meat processing, chillers and cold rooms, Offal Processing Unit and meat packaging.

Marketing

Most of the beef produced in the Uganda is for domestic consumption. However, there are significant exports to the regional markets especially Rwanda and South Susan, COMESA (Democratic republic of Congo, Mauritius, Madagascar, etc) and United Arab Emirates.

Constraints to the beef value chain.

   ➢ Absence of adequate capacity for disease control and clinical services,
   ➢ Gaps in public awareness on disease and pest confirmation,
   ➢ Inadequate inspectorate and quality assurance,
➢ High financial investment for beef processing to small holder farmers
➢ Inadequate capacity to enhance performance of the Department of Veterinary Services.
➢ Poorly integrated markets and highly seasonal sales practices by producers.

Recommendations

➢ The engagement of the private sector is a clear requirement for encouraging transactions and boosting offtake. It can provide advances in provision of animal health services, credit (working capital and investment capital), and in export development and promotion.

➢ The private sector can provide the impetus for, and practical applications of, standardization so as to achieve uniformity of product lines.

➢ The communication of market requirements by actors at various stages of the beef value chain.

➢ An integrated set of activities may be identified whereby value chain actors can be provided with incentives to buy at designated times and places, using specific desirable methods to investment capital

➢ A major branding initiative will be required that on government competence in establishing standards, and compliance behavior among value chain actors.
10. Promoting Value-Enhancing Technologies for Smallholder Farmers in Africa

By: Leonides Halos-Kim, Thematic Director, Postharvest and Agro-processing, SASAKAWA AFRICA ASSOCIATION (SAA)

Introduction

Many government programs in Africa have been putting emphasis on enhancing agricultural productivity; however, the use of appropriate technologies is still wanting. One constraint to adoption and use of improved technologies is the inability of the farmers and processors to invest on machinery. The machines introduced earlier are usually expensive and complicated. Many technologies, developed and proven to work in developing countries can be adapted for African conditions. However, they are not known to the users.

Promoting appropriate technologies to use under African conditions present a challenge in terms of investments, operational requirements and accessibility. The of supply of machines, spareparts and related services in the rural areas where the machines are to operate are still unreliable.

Africa also needs qualified extension specialists to advice on proper selection, use and management of these technologies. Specialists on post-production technologies are still very few and need to be aware on technologies available for smallholder farmers.

This paper presents SAA’s experiences, challenges and lessons learnt in promoting value-enhancing technologies.

Characteristics of Smallholder Farming in Africa

Africa’s agricultural economy is largely subsistence. Efforts to build capacity for innovation that increases productivity are yet to achieve significant results. Producers still use traditional methods of cultivation, crop care and management, using hand-held hoe and cutlasses. Smallholder farms are also planted to multiple food crops (grains, cereals, legumes, etc.) mostly for consumption. This is a concern in mechanizing the system.

Harvesting, and the subsequent processes of postharvest handling, storage and processing operations are done by women and children using traditional methods which are cumbersome and can result in considerable losses both in quantity and quality due to delays in gathering the crops for safe storage, processing, or market.

Labor requirement for harvesting alone was estimated at ±217 labor-hrs/ha (Halos-Kim. 2007); 60% are provided by women. An on-farm postharvest loss assessment from harvesting to drying gave an average cumulative loss of 18.82% for maize, 16.43% for beans and 15.30% for rice (Unpublished Report, SG2000-Uganda, 2015).

The postharvest system is also constrained by limited utilization of crops, lack of storage structures, and poor management. There is a serious lack of appropriate tools and equipment.
Postharvest and processing sub-sector of the value chain, if done properly, will reduce losses and add value to the farm produce.

**Desirable Features of Value-enhancing Technologies for Smallholder Farmers**

Developing technologies that can add value to farm produce entails a careful analysis of the farming system and the accessibility of technical services in the rural areas. The development criteria should include the analysis of the pattern of crop production, type and nature of food processing and consumption, the availability of resources, technical and economic capability of producers, and the marketing opportunities they present. Gender issues should also be factored into the design of the technologies.

Some desired features of technologies that work for smallholder farmers are: simple, easy to operate and maintain even by women, lightweight yet sturdy that allows for in-field mobility, and can be used for different crops.

A challenge posed to research and development institutions is to develop technologies that require minimum investment so that it can be built and purchased locally by individuals or small groups. Many types of postharvest technologies are available and proven to work elsewhere but may need some adaptations when used in different environments. The role of extension agents is vital in this regard.

**Strategies in Promoting Value-enhancing Technologies**

SAA collaborates with research and development institutions, training centers, local manufacturers, and other relevant service providers to identify and adapt identified technologies. Training and demonstrations form part of the capacity building for extension agents and producers. Strategies are put in place to improve the delivery and use of improved postharvest handling, storage and processing technologies by smallholder farmers so that they benefit from them.

**Conducting Postharvest Needs’ Assessment**

Assessment of the constraints and opportunities within the post-production sub-sector of the selected crop value chain to get information on the required interventions to improve the system. In many cases, the first intervention to improve postharvest handling is awareness training on the importance of good postharvest management to prevent losses occurring in the food chain as a result of poor handling. Technological options are recommended thereafter to enable the producers further improve the efficiency of the process.

**Establishing Postharvest Extension and Learning Platform**

SAA establishes the postharvest extension and learning platform (PHELP) to facilitate the promotion and adoption of value-enhancing technologies. The PHELP showcases improved technologies, their operational requirements and their associated benefits.

The platform also serves as a venue for training extension staff and producers while providing more information on their utilization potentials and constraints which are useful in fine-tuning technologies, or in developing and adopting technology dissemination strategies.
Using the facilities in the PHELP, extension agents are trained as frontline postharvest extension staff. They in-turn train the producers (farmers and processors) in the proper use and management of the technologies. In the long-run, the PHELP, facilitated by the extension agents, is expected to develop into a profitable enterprise that can generate income to pay for its operating costs.

The PHELPs in Mali and Ethiopia had resulted in increasing use of the technologies by farmers. Sustained operation of the PHELP however requires good group and enterprise management, access to new technologies and services, and linkage to market. Institutionalizing the PHELP under government programs will make it an effective extension and learning platform, to facilitate the adoption of postharvest technologies.

Involving the Private Sector

Involving the private sector and individual entrepreneurs, especially unemployed rural youth, as service providers, proved to be effective. The 'service-provision model' is being adopted to scale-up the adoption of other technologies in the four SAA focus countries: Ethiopia, Mali, Nigeria and Uganda.

SAA identifies and sensitizes enterprising individuals who had been motivated by field demonstrations and by experiences in the PHELP. They are trained on agro-processing enterprise management, the operation and maintenance of selected technologies, linked to agro-machinery manufacturers and spareparts dealers and small machine shops to assist in their machine' repair and maintenance requirements. Individuals and/or groups who wish to be a service provider but lacks capital to buy the machinery, are linked to finance institutions for proper assistance.

SAA recorded successful cases where private individuals purchased and used machines to provide postharvest and processing services to producers. For example, the portable grating machine introduced in Nigeria were bought by private entrepreneurs who go around the villages with their machine and provide grating services for a fee. The threshing service provider for teff farmers is also working well in Ethiopia. Over 300 units of the thresher are already reportedly purchased by farmers and private entrepreneurs in a span of 5 years.

Experiences, Challenges and Lessons Learnt

The SAA postharvest and agro-processing program provided important lessons on the strategies in the packaging and promotion of value-enhancing (postharvest handling, storage and processing technologies). These are related to issues of suitability of technologies, technical skills of operators, quality control and marketing.

Suitability of Technologies

This happens when the technologies were selected on a 'piece-meal' basis. Many technologies proven to work in other countries were adopted and introduced to farming communities in Africa without consideration of the production capacity, and the capacity of the farmers to feed a growing agro-processing enterprise. There was a 'blanket' recommendation for specific operations per crop. This resulted in technologies either too small in areas where there is bumper production, or too big in areas
where production is still low. Within the system, some operations are mechanized and others are still using traditional methods—there is a mismatch of capacities.

When the mechanized cassava grater with a capacity of 1-ton per hour was introduced, the processors were quick to adopt but were not able to utilize it fully because the capacity for peeling was 20 times slower than the grating capacity. Mechanizing peeling however is still constrained by the efficiency of existing peelers because of the physical characteristics (variable size and shape) of the crop. On the other hand, grating must be done as quickly as possible after peeling before deterioration sets in. Increased processing capacity also triggered a problem on lack of cassava to process (Ganye Women Group Processing, Ibrahim, 2012).

**SAA promoted new cassava varieties to encourage farmers grow more cassava in the area.**

SAA introduced a wet-type grinder to a village in Benin for sheanut processing. However efficient, the wet-type grinder did not appeal much to the processors. This highlighted the need for a system-approach to technology development, and packaging technologies for specific production objective. Collaborating manufacturer (COBEMAG- Coopérative Béninoise de Matériel Agricole (Benin)) adapted a sheanut crusher and coupled it with the wet-type grinder. This facilitated the adoption of the wet-type grinder. Furthermore, the kneading operation has been improved to reduce the drudgery of the process and enable processors to carry out their operations more efficiently.

SAA strategized to address the crop value chain through analysis of unit operations in the system identifying constraints and opportunities including markets and relevant stakeholders. through needs' assessment surveys. Interventions are based on the results of this exercise.

**Poor technical skills for operation, repair and maintenance of technologies**

Postharvest technologies are new to most operators in the rural areas. There are no technicians to assist the farmers or the owners to maintain and manage their machines. There is also a serious lack of spareparts in the rural areas where the technologies are being used; if there are, the supply cannot be sustained. In many cases, technical experts and spareparts’ suppliers are located in the urban areas and are not known to producers. This disrupts the operations, and the agro-processing enterprise cannot be sustained.

A particular example is the lack of spareparts for rubber roll-type rice mills. The rubber roll type rice mill was introduced in Tigray Region (Ethiopia) and in rice-processing areas in Nigeria to improve the quality of milled rice. The rubber rollers and belts wear off fast because of extensive use but these spareparts are not readily available. Since there are only few units of the machine, the demand for a constant supply of parts is still not recognized by importers as a good investment.

SAA started working with local fabricators and technicians in the rural areas where the technologies are introduced so that technology-users had access to their services. Other types of technologies with similar performance characteristics are being identified and demonstrated. The government still have a big role to encourage investors to support the technology promotion and the private sector.

**Quality Control and Marketing**
The existence of informal markets in the rural areas which are easily accessible to producers, and the lack of market information on products required by consumers limit producers' options to improve their capacities and access to better markets. There is no price incentive for good quality products.

The introduction of improved processing technologies had certainly increased capacities and improved quality of the products but processors are unable to supply to markets. Issues of certification, distance of markets, price incentives are to be addressed.

In Ethiopia, women who used to process butter from 1 liter of milk in 3 hrs, were trained and provided with a butter churner. They now process butter in less than 30 minutes from 6 li of milk. Besides the savings in time, the quality of the butter had also improved. After satisfying their families' (and that of the community) needs, there is still excess butter ready to sell- but where is the market? The same case was experienced by peanut butter processors. Supermarkets in nearby cities recognized the good quality of the product but could not buy from the group due to lack of VAT-registered receipts.

SAA now works with relevant government agencies to facilitate the groups to conform to market requirements, and linking the processors to reliable markets.

**Recommendations**

Improving the post-production system which directly contributes to value-enhancement of farmers’ produce is receiving attention from related research and development organizations, but serious investments are few. Many technologies to improve postharvest handling, storage and processing had been developed and being used elsewhere but are not know to producers. Linkage between suppliers and users must be established.

Investment in machinery is a critical economic decision for smallholder farmers with very limited economic resource, therefore, any machines considered must be low-cost yet versatile so that returns to investment are realized in a short time. The technologies should be simple, portable, easy to fabricate and repair by village artisans using local materials.

Differentiation in product price due to quality, a reliable supply of machines, spareparts and associated services, infrastructure development are also to be instituted to encourage and sustain the adoption of value-enhancing technologies.

Equally importantly, the sector needs professionally trained human resource to pursue this development. This will require increased investments on specialized training for development and extension staff. The establishment of the PHELP can be an immediate solution but needs to be institutionalized in order to address the growing need of producers for information and training on improved technologies and practices.
References


Annex: Some value-enhancing technologies promoted by SAA

• For Grain and Legumes
  • Harvesters
  • Maize Sheller; Multi-crop Thresher
  • Rice Mill
  • On-farm Storage Facilities

• For Root & Tuber Crops
  • Grating Machine
  • Chipping Machine

• For Grain and Legumes
  • Harvesters
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• For Root & Tuber Crops
  • Grating Machine
  • Chipping Machine
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Agricultural production is to meet the challenge of maintaining long-term adequacy of food, fiber, feed, and biofuels. Agriculture is still means of livelihood especially in the developing countries since large share of the population is still directly dependent on it. Farmers in these countries exercise subsistence farming methods consequently limited products are taken to the market without information about the market demand. Later on agriculture was forced by various factors to be transformed from subsistence to business oriented enterprise..Globalization and expanding international markets as well as the fast-growing middle and high income classes in many developing countries offer opportunities for developing country producers to operate in emerging national and international markets, which were initially practiced with the intention of producing food for the family. These trends produced prospects to the farming communities, to shift their system from subsistence to commercial agriculture. Consequently the traditional agriculture is to be transformed into a business that could enhance income and improve livelihood and alleviate poverty among the rural community. It is therefore necessary to promote agriculture from small family farms to big and sustainable business enterprises.

Value enhancement
Crop value enhancement could be achieved through enhancing productivity and/or innovative value addition. Crop productivity per unit area, time and input is the result of exercising appropriate preharvest management practices from land preparation to harvesting of the economic yield.

Harvesting
Small-scale horticultural crop producers have the option to harvest earlier, before they become more delicate; harvest later, when fruits are ripened and become more flavorful stage; or harvest more often (taking advantage of multiple harvests to gather produce at its optimum stage of maturity). Thus based on their maturity characteristics fruits are classified in two major categories.

1. Climacteric fruits (Ethylene producing): they are usually harvested before full maturity and continue ripening after being picked by produce larger quantity of ethylene. Such fruits consist of; apples, pears, peach, mango, avocado, banana, tomato and passion fruit. Ethylene treatment also enhances faster & uniform ripening and simplifies the risk in transport and storage.
2. **Non-climacteric fruits (non ethylene producing):** Fruits that have to be harvested only after ripening on the mother plant so that no further ripening and flavor development occurs after harvest. They produce very small amount of ethylene or don't even respond to ethylene treatment except for degreening and thus they have shorter shelf life. This category includes; cherry, blackberry, strawberry, eggplant, cucumber, pepper, lemon, orange, mandarin, watermelon and grape.

One of the most common mistakes growers make is to harvest fruit crops too early, when they are under-ripe and have not yet developed their full flavor. If allowed to grow large, some vegetables will be too fibrous or full of seeds for good eating quality. Mechanical damage during harvest can also become a serious problem, as injuries predispose produce to decay, increased water loss and increased respiratory and ethylene production rates leading to quick deterioration. In general, harvesting by machine will cause more damage than harvesting by hand, despite some root crops can be severely damaged by careless hand digging. The containers used by pickers in the field should be clean, have smooth inside surfaces and be free of rough edges.

Manual harvesters should be well trained in the proper way to harvest the crop to minimize damage and waste, and should be able to recognize the proper maturity stage for the produce they are handling. Pickers should harvest with care, by snapping, cutting or pulling the fruit or vegetable from the plant in the least damaging manner. Exposure to the sun should be avoided as much as possible during and after harvest, as produce left out in the sun will gain heat and may become sun-burned.

**Post-harvest management**

The main objectives of applying postharvest technology to harvested fruits and vegetables are to maintain quality, protect food safety and reduce losses between harvest and consumption. Postharvest management is mainly associated with suppressing the biological activity of respiration of the product. Respiration breaks down glucose to use the energy that was in the carbon-carbon bond to make metabolic energy. Thus energy, CO$_2$ and water vapor are given off by the process of respiration:

$$6\text{CH}_2\text{O} + 6\text{O}_2 + 6\text{H}_2\text{O} \rightarrow 6\text{CO}_2 + 12\text{H}_2\text{O} + \text{Energy}$$

Generally, lowering temperature to certain level suppresses respiration and maintains quality as well as increases shelf life. However the method of reducing respiration depends on the type of crop product.

**Grain Drying**

The main postharvest handling in grains is associated with dry and storage. Intensive respiration especially grains causes increased; temperature and relative humidity that could create conducive environment for fungal development and reduce grain content and quality. Thus suppressing rate of respiration in harvested grains is mainly associated with moisture reduction. Consequently, drying is the easiest strategy of reducing water content of the grain for safe storage. The drying process has to focus on both moisture content of the product itself and the surrounding air. The rate of grain drying is the function of; moisture content and temperature of the grain itself, ambient air temperature, atmospheric
relative humidity and velocity of the air in contact with the grain. Incorrect drying conditions and equipments can affect grain quality such as; cracking due to excessive heat or hot air, rapid cooling, decline in grain constituents resulting in lower food/ feeding value, loss of seed viability, changes in colour and appearance. The desired moisture content depends on: type of grain, duration of storage and available storage condition; while the rate of grain drying is the function of grain moisture content, temperature of the grain, ambient air temperature, atmospheric relative humidity and velocity of the air in contact with the grain.

**Grain Storing**

Safe storage of agricultural products often depends on; storage facility, moisture content of the product and relative humidity of the surrounding air. Grains are hygroscopic and they can lose moisture until equilibrium is achieved with the surrounding air, since equilibrium is dependent on relative atmospheric humidity and air temperature. Thus it is not possible to dry grains to moisture content lower than the equilibrium moisture content (EMC) under a given temperature and atmosphere humidity. The storage of grains thus should be properly managed based on harvesting condition and storage period.

**Scenarios of harvesting conditions and methods of storage:**

1. Dry harvesting and dry storage period there will not be problems with storage as long as other conditions have to be fulfilled.
2. Dry harvesting and wet storage period; the dried product will take up moisture from the humid air during storage, thus it has to be stored in airtight and waterproof conditions, despite this makes storage more expensive.
3. Wet harvesting and dry storage period; the store should be well ventilated and the grain loosely packed since the still moist product has to be dried.
4. Wet harvesting and wet storage period; the product should be well dried artificially before threshing, and then be stored in an airtight and waterproof container.

Agricultural Products are often handled by many different people, transported and stored repeatedly between harvest and consumption. While particular practices and the sequence of operations will vary for each crop, there is a general series of steps in postharvest handling systems that will be followed. The main objectives of applying postharvest technology to harvested fruits and vegetables are:

- maintain quality (appearance, texture, flavor and nutritive value)
- protect food safety
- reduce losses between harvest and consumption

Effective management during the postharvest period is the key in reaching the desired objectives. Although large scale operations may benefit from investing in costly handling machinery and high-tech postharvest treatments, often these options are not practical for small scale handlers. Instead, simple, low cost technologies often can be more appropriate for small volume, limited resource commercial
operations, farmers involved in direct marketing, as well as for suppliers to exporters in developing countries.

**Value addition**
Although agricultural commodities have essential value in their original state, adding value is the process of changing or transforming a product from its original state to a more valuable state at different phases based on the consumer’s demand. For instance production of quality wheat grain has got essential value; however, processing & transforming wheat grain into flour, even further changing it into bread, spaghetti in agro-industries is value addition. Maize is often fed to livestock on the farm has its original value; however feeding of maize to animal in fattening program transforms the maize into meat with better market value. Crop value could be enhanced at different stages throughout the value chain and may be related to: quality, cost, packaging, delivery time and flexibility and innovativeness. In addition, the growing demand for organically produced fruits and vegetables offers new opportunities for small-scale producers and marketers. Value-added products can open new markets, enhance the public’s appreciation for the farm, and extend the marketing season. Consumers buy more "ready-to-eat" or "ready-to-cook" food while farmers generally produce and market raw agricultural commodities. Value adding especially in food production often focuses particularly on safety and quality of the product. The necessary conditions to add the right value are associated with; market information about the value added product, value addition process requirements, availability of resources, knowledge of chain actors, infrastructure to bring the products to a market, comparative advantage in that market and willingness of the end user to pay premium.

**Processing**
Value-added processing offers farmers the potential to capture a larger share of the international financial transaction. Although processing practices of fresh-cut horticultural products differ for various species; the most common practices include: curing, degreening, pre-cooling, washing, sorting and grading, disinfection and waxing, packing for delivery.

**Packaging**
It could be used as a method of controlling respiration rate of produces in order to increase storage life and quality.

**Preserving of processed Products**
Agricultural produces always have lower price during the harvest season it would be thus necessary to process and preserve until premium price by; pasteurization, boiling, freezing, drying, treating with antimicrobial agents, ionizing (UV) radiation, submersion (in strongly saline, sugary solution, organic acid or base environment.

**Major causes of postharvest losses and poor quality**
The most common causes of postharvest losses in developing countries continue to be rough handling and inadequate cooling and temperature maintenance. The lack of sorting to eliminate defects before storage and the use of inadequate packaging materials further add to the problem. In general, minimizing rough handling, sorting to remove damaged and diseased produce and effective
temperature management will help considerably toward maintaining a quality product and reducing storage losses. Storage life will be enhanced if the temperature during the postharvest period is kept as close to the optimum as feasible for a given commodity. Questions to be answered in developing a sustainable marketing plan:

1. What crops should I grow?
2. How much of these crops should I produce?
3. To whom or where shall I sell the produce that I will grow?
4. How much real demand is there for the crops I am considering?
5. How much will it cost me to produce and market these crops?
6. What if any are the sizes of the market windows for these crops?
7. What are the ecological, social, economic and cultural risks associated with the production of these crops?

Market Prospects
The main factors creating better prospect to agricultural products and emerging trends in social and lifestyle changes, such as:

- Rapid global population growth
- Increase in urban centres
- Increase in single person households
- Increase in middle-income populations
- Less time for meal preparation
- Increased demand for convenience food items
- Increased purchase of ready-to-eat meals
- Increase in restaurant and fast food services as a result of:
  - lack of time for meal preparation
  - income growth

Even the traditional food supply chains and food habits are being changed to keep up with these changing trends and developed countries are looking at innovative food products. In this regard they consider tropical fruits and vegetables as good potential to fill a gap. To fetch better price the produce should be: creatively packaged, with new colours, flavours and textures, attractive to the busy consumer, with convenient package, in ready-to-eat format consumer demand

Opportunities for Export
Generally the need especially for fresh-cut fruits and vegetables is growing in developed countries as well as urban centres of developing countries. There are export opportunities of especially tropical fruits mainly due to:

- Increasing the demand for sources of food worldwide
- Need for supermarkets to keep their shelves filled with year round
- Interest of consumers in developed countries for safe produces from developing countries
- These trends open up production possibilities especially in the tropics
Summary

Value addition is the enhancement of a product by the producer or associated enterprises before it is offered to the consumer. Thus enhancement in agriculture converts agricultural outputs into products of greater value and increases the economic value of the commodity that would improve the livelihood of the farming community. Moreover value adding increases the consumer appeal of an agricultural commodity. Enhancing agricultural productivity and value addition to products should be indispensable duty of agricultural professionals.
2. Bahir Dar University, and College of Agriculture, Ethiopia

Tailoring of Teaching Process for Agriculture Extension Mid-Career Students; to Small Farmers Value Enhancement Needs Using Practical Examples in Crop and Livestock Production

By Assefa Abelieneh, Head of Department, Bahir Dar University

1. Introduction

How Bahir Dar university Tailoring Mid Career Agricultural Extension program Teaching Process to Small Farmers Value Enhancement Needs

The purpose of the ‘BScAgricultural value chain-oriented extension training for mid-career extension professional’ with degree nomenclature Bachelor of Science in Agricultural extension is;

➢ To support and strengthening the effort of the country
➢ To facilitating market-led and knowledge-based transformation of smallholder agriculture
➢ To enable the graduates more capable in meeting the challenges in the rural sector of the country
➢ To meet the human resource requirements of several stakeholder organizations

Value Addition Oriented Mid-Career Agricultural Extension Curricula Module Organization

The module classified in to ten different modules that includes; Foundation courses(language, computer and statistics) , Value chain in farm animal enterprises, Value chain in crop enterprises, Agricultural Extension and Communication, Rural Development, Value Chain and Quality Standards, Agricultural Economics & Agri-business , Food Science & Human Nutrition, Natural Recourse Management, Extension Research

In the teaching and learning process the value addition technology package enactment considers the following main issue:- Applicability of the technology package at farmers level; Practical value addition nature which includes change in form, change in place, change in time; Focus on local potential context ; simple to implement the technology. The framers; Need, Demand, Market, Feasible, Resource requirement Further it considers agreement on such performing activities and Identify the weak point and link where shall act.

Reflection on Current Mid-career Agricultural Extension

Better achievement
By nature the program considers value addition issues in each plant and animal science origin courses. It also encompasses new course which is valuable to our context such as; quality assurance, apiculture & human nutrition and supervised extension project can be more structured & sequenced (I, II, III & IV)

**Challenges**

In the process of teaching and learning it faces the following main challenge which includes;

- Limitation in address all these value addition & chain component in each course,
- Less alternative in supplying of value addition technology,
- Vague on nomenclature of the degree & curriculum, its credit hour is less than other formal curriculum,
- teaching tailoring lacks about partner management, linkage and net work building, and

1. **Examples of Value Enhancement Technologies and Practices Taught at Bahir-Dar University**

   **1.1. Two crop Production Practical Examples of Harvesting and Post Harvesting Value Enhancement Technologies and Practices**

There are a number of technology that we teach for our mid-career agriculture extension students; to mention some of them selling primary products in the form of bread, Potato *enjera*, Tomato paste, tomato juice, carrot juice. etc. For this purpose let us see two practical examples on this regard

**2.1.1 Preparation of Tomato Juice**

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selecting raw materials</td>
<td>Select healthy good, well-ripened, but not overripe tomatoes</td>
</tr>
<tr>
<td>Washing</td>
<td>Wash tomatoes in clean and running water</td>
</tr>
<tr>
<td>Peeling</td>
<td>Dip tomatoes in boiling water for about 1 minute or until skins split and then in cold water to slip off skins, and remove stem scars and discolored portion and cut into pieces</td>
</tr>
<tr>
<td>Heating</td>
<td>Cook peeled and cut tomato pieces until soft and stain juices</td>
</tr>
<tr>
<td>Sieving</td>
<td>Press heated tomatoes through a sieve or food mill to remove skins and seeds and immediately heat the juice to simmering</td>
</tr>
<tr>
<td>Preparing jars</td>
<td>Wash the glass jars in hot water with soap and then rinse and heat the jars in water bath</td>
</tr>
<tr>
<td>Jar filling</td>
<td>Add commercially bottled lemon juice or citric acid and salt if desired to each hot jar and pack hot tomatoes into hot jars, leave 1 cm headspace; wipe jar rims and place the clean, prepared lid on the rim of the jar and firmly screw on the ring band. Do not over-tighten, since it may cause glass breakage during processing.</td>
</tr>
<tr>
<td>Pasteurization</td>
<td>Heat filled jars in boiling water bath for about 40 to 50 minutes depending on the altitude of the area and the quantity prepared.</td>
</tr>
</tbody>
</table>
Cooling and storing

Cool the jars for 12 to 24 hours, then check seals and store in cool area

1.1.2 Potato and Onion Storage Construction

Since these two products have large volume nature and they are perishable. This needs balanced storage system. It is based on constant temperature. It can be construct by using wood. The wood shall be straight enough. Its height shall be 80-100 centimetre
**potato storage roof**

- It is constructed by using wood like bed
- The cover sheet shall be grass for the cooling effect

The **potato storage wall** can be constructed by using mud box. The length of box have rectangle shape can be 3 cm x 1.5cm. It has cooling effect. The procedure for mud box construction starts by moisten mud and the moisten mud mix with straw and strike with hand and woody instrument. Wait the mix of it for 6-10 days and again strike on it by adding water and straw. Finally the shaped mud can be dried by sun for 10-15 days.
The mud box shall be dried by sun for 10 - 15 days.

Wind direction
Air entry point
Air outlet window

Completed improver potato storage

1.2 Two Livestock Production Practical Examples of Harvesting and Post Harvesting Value Enhancement Technologies and Practices
1.2.1 Value Addition on Honey Production

The apiculture sector is likely a priority in Ethiopia. It is supported by government, international development partners and NGOs. Currently there is focus on expensive frame hives with high cost. By closely planning in collaboration with Bureau of Agriculture, poorer households can produce honey using modified local style frame hives. It can be made by using locally available materials. It plays a great role in answering the demand of honey in the country. Youth in rural areas will utilize protected watersheds for beekeeping. They will benefit by earning income and expending less for initial investment. This can also easily be done by women.

Modified local-style frame hives

Making Candle from Bees Wax

Procedures

It starts by milting the crude wax (direct heating) but water should be under the base., Wax extraction completed in this process. After extraction cooling the extracted pure wax for 12 hours, then again milt the pure wax (through in direct heating) example contact the boiled water on pure wax containing material. Finally drop the milted pure wax in to the mold contains tread in middle. The candle type can be rolled, pressed, dipped based on the mould material shape
2.2.2 Transformation of Traditional Poultry Production System to Improved System through Addition

Introduction and value addition of improved poultry production packages can be implemented by supplying 25 pullets (3 month old chicken) of improved breeds. Prepare husbandry equipments like; feeders, drinkers and hay box brooders prepare the required feed based on the trainings. Vaccines and medications will be provided to birds according to the standards. Technical support will be provided to Participant farmers
3. Conclusion and Recommendation

3.1 Conclusion

Generally the overall tailoring of our teaching activity is so good and comprehensive; however, still it needs some improvements in order to update some current issues with the process; specially how to include the cross cutting issues (environment, climate and population). Still scholars and development practitioners request supervised Extension project shall consider natural resource technology promotion in the program. There are also no course for partnership management and network building challenge for value chine activities. Regarding to value addition technology much effort has been done specially in crop value addition. at a standstill efforts continue to strength the teaching process.

3.2 Recommendations for Future Improvement

Based on the experience gain in the teaching and learning process the department wants to forward the following recommendations:

- Full filling Practical active learning instruments
- Developing practical demonstration sites in and around the university
- Capacity building on our instructors about practical value addition considerations and process
- Involvement of different partner in tailoring our teaching process (co-owner ship on this regard)
- Awareness creation and consensuses building among concerned partners about the program nature and program development
- Effort shall be made in generating value addition technologies
- Further scaling up value enhancing technologies and lessons learnt in the process
3. Haramaya University, Ethiopia

Experiences with Teaching Appropriate Value-Enhancement Technologies and Practices for Smallholder Farmers through the In-Service BSc Program for Mid-Career Extension Professionals at Haramaya University, Ethiopia.

By: Muluken Gezahegn Wordofa

1. Introduction

The Mid-career BSc program at Haramaya University, since its establishment in 1997, largely focused on upgrading the technical and professional skills of Mid-career frontline extension workers. It was meant to produce qualified and competent agricultural extension workers to raise production and productivity in the country. However, due to recent developments in the country, particularly the increased move towards agricultural commercialization and the increased realization that small-scale farmers are not benefiting much from their farm produce (due to lack of knowledge and skills on postharvest handling), the Mid-career program was redesigned to embrace aspects of postharvest, value addition and marketing. In doing so, it was reoriented to developed extension professionals who could deal with not only production, but also harvesting, storing, processing, marketing and other value additions along the product value chain.

he implementation of this revised Mid-career curriculum is going on at Haramaya with a strengthened pace and a renewed commitment. It can be said that the teaching-learning activity is smoothly running. However, there are some concerns on SEPs design and implementation when viewed through the revised curriculum. This short paper discusses some challenges faced and the how-to-do aspects of some technologies and management practices promoted through the SEPs of our students.

2. Some Challenges in Implementing Value-Chain Oriented SEPs

There are several challenges on the proper implementation of the value chain oriented SEPs at Haramaya University. First, due to limited or no funding for SEPs (in some regions/zones), students are facing difficulty to go beyond the production and intervention objectives that are the traditional components of SEPs. In some cases, this was circumvented by some support from NGOs and external projects in some regions (e.g., Integrated Seed Systems Development Project at Haramaya and Hawassa). However, not all students are beneficiaries from this because of the location-specific nature of these projects.

Second, the lack of adequate remuneration for our staff members and staffs from other Schools in the College of Agriculture and Environmental Sciences involved in advising Mid-career students had a lot of consequences on the quality and depth of the SEPs. Moreover, it became practically difficult to send a team comprising professionals from different Schools for field supervision. Staff members who are already overburdened by teaching and advising regular students have less time to advise Mid-career students. Even if they have the time, they may have less morale to do so. Hence, it is not uncommon to see redundancies in topics chosen, less focus to value addition and marketing objectives, poor
powerpoint slides, and improper SEPs data recording and analysis (e.g., before-after income, knowledge, skills and attitude measurements; documentation of participants of field days and reporting, etc).

Finally, although the withdrawal of SAFE from HU gave us the opportunity to run the program ourselves, the lack of support from SAFE on some critical periods, such as orientation on SEPs project design, implementation and evaluation; SEPs supervision; and SEPs workshop created some vacuum. For example, we could not invite stakeholders from different universities, NGOs, community representatives, members of the bureaux of agriculture, health, etc to participate in our SEPs workshops. Specifically, since this workshop is a forum for stakeholders to come together and provide comments and suggestions for those students presenting their project proposals, it is an important platform to orient students’ research to be aligned with the needs of the community without compromising scientific rigor.

3. SEPs Proposals and Reports (2016/17)

The implementation of SEPs proposal and report is guided by the module ‘Extension Research’ where students take various courses to gain clear understanding and skills on the basic concepts of action research methods from developing a sound SEPs proposal to writing research reports based on findings in extension research. Some of the courses and practical exposures in this category include: Research Methods in Agricultural Extension; Statistics for Social Sciences; Introduction to SEPs (SEP-I); Need Assessment and Project Proposal Preparation and Presentation (SEP-II); Off-Campus SEP (Project Implementation) (SEP-III); and, Off-Campus SEP Evaluation (SEP-IV).

3.1 SEPs report (graduating class students):

Some of the action-research reports of the current graduating class Mid-career students include:

Promotion of improved crop varieties (Bako/BH661/Gossa/BH660/Bongo/BH540/Shone/Melkasa 4 maize; Werer 962 groundnut; Mexican 142 Haricot Bean; DZ-387 Teff; Gambella 1107 sorghum)

Promotion of improved crop varieties and row sowing/planting (Alidoro/Shorma/Denfa/ Huluka wheat; Dende/Digalu HR 3116 wheat; BH661 maize; row transplanting Teff (quncho))

Promotion of cattle feed/forage (Rhodes grass; Panicum)

Promotion of small-scale sheep/goat fattening

Introduction of energy saving mirt stove technology

Introduction of rice (Nerica 4 var.)

Promotion of row intercropping of groundnut with maize

3.2 SEPs proposal (second year students): 33

➢ Some of the action-research proposal topics of students ready to go to the field include:
➢ Promotion of (row planting/sowing of) improved crop varieties (Gambella 1107 sorghum; Kakaba/Shorma/Ogolcho/Dendea wheat; Gossa/Limu/8H540/8H661/Melkasa 1/Melkasa 4/MH138 maize; Werer 961 groundnut; Chick pea;

➢ Promotion of improved forage production

➢ Adoption of double cropping on vest soil by using BBM

➢ Promotion of intercropping maize and haricot bean

➢ Promotion of biomass energy saving stove (mirt)

In both SEPs projects and proposals, comparative approaches to introducing/promoting new varieties and agronomic practices were followed. For example, in most crop-related cases, students had separate blocks of improved and traditional varieties with similar agronomic practices, so as to document the yield advantage of the improved varieties over the local ones. This approach also made it easy for participants of method/result demonstration to witness/assess the performance of the improved varieties over the local ones. In addition, the short-term training students gave on land preparation, sowing/planting, fertilizer application, weeding, etc were also demonstrated on both plots in order to impart necessary skills to the farmers on how to manage the crop varieties.

4. Selected Technologies/Management Practices: the how-to-do aspect

The ten modules in the BSc program for Mid-career agricultural extension professionals are designed in such a way that they will help students obtain the necessary knowledge and skills to deal with the multifaceted practical challenges facing rural dwellers. Students are exposed to the latest knowledge and approaches, management practices, and postharvest handling of crops, livestock, natural resource management, food science and human nutrition, to mention but a few. In what follows, four examples are provided from classroom based teaching and SEPs to highlight on some of the courses in selected modules.

Introduction/promotion of biomass saving improved stove (mirt)

In view of the alarming pressure on fuel wood throughout the country, this has been an encouraging project by some students in order to aware the community on how to use fuel wood efficiently. It also has an added health advantage by protecting the maids and housewives from enormous amount of smoke. In most cases, the students give orientation training on how to use these stoves. Then, they link the users with potential producers of the stoves – in most cases, these are youth groups organized into small and medium enterprises or private producers. Recently, however, some students have embarked up on not only imparting the necessary knowledge, but also imparting the required skills to produce the

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1Foundation Courses; Value Chain in Farm Animal Enterprises; Value Chain in Crop Enterprises; Agricultural Extension and Communication; Rural Development; Value Chain and Quality Standards; Agricultural Economics and Agribusiness; Food Science and Human Nutrition; Natural Resource Management; and, Extension Research.
stoves. In a case study in one village (Wesha), a student linked his target people with women’s group producing the stoves. In doing so, all his target groups were able to grasp the required knowledge and skills – starting from the molding machine to the proper mixing of various sand, cement and other adhesives – to produce the stoves themselves.

4.2 Small-scale animal fattening

Having attended various courses and practical sessions in value chain in animal enterprises, some students had the audacity to embark on promoting small-scale animal fattening by convincing their target groups on the choice of appropriate breed; advising them on how to prepare proper feed from locally available sources or growing improved forage crops; and, teaching them feeding and watering as well as healthcare practices.

Introduction/promotion of improved crop varieties and agronomic practices

Informed by the different courses and practical sessions in value chain in crop enterprises, some of the students went into the introduction/promotion of improved crop varieties and agronomic practices. In most cases, the students opted for the use of row planting/sowing in combination with improved varieties, proper spacing, fertilizer application, weeding, etc.

Postharvest handling

Realizing that much of the crops produced is lost due to improper postharvest handling practices, some students went as far as advising farmers on how to minimize this. They had specific plans on imparting knowledge on proper ways of storing, processing as well as linking the producers with cooperatives and potential markets. This is especially evident on students’ projects aimed at promotion of potato and groundnut varieties. With groundnut, for example, a student in Babile was demonstrating effective ways of drying the groundnut before storing in order to reduce the aflatoxin levels.

5. Conclusion

From this short paper, it is evident that the Mid-career BSc program at Haramaya University is going on as designed in the delivery of courses. However, the implementation of value chain oriented SEPs has a lot to be desired – from diversity of topics chosen to a strong focus on postharvest handling of products. This calls for a renewed commitment from our staffs, regional/zonal bureaux, and SAFE. We hope that this partnership will flourish in order to realize the full implementation of the revised curriculum.
Experience in Mid-career Agricultural Extension program at Wollo University

By Rahmet Yimer and Dr. Fikru Mekonnen, Wollo university, College of Agriculture, Department of Rural Development and Agricultural Extension

Introduction

Wollo University is established in 2007 in the highland of north Ethiopia Dessie town, which is located 400 km from the capital Addis Ababa to the northern part. The university has 7 colleges, 2 schools, and one institute. The mid-career Agricultural extension program is hosted under college of Agriculture in Rural Development and Agricultural Extension program. The program is launched in 2012 by the request of the Regional Bureau of Agriculture in order to cover the gap of extension professionals at Woreda and PA level. According to the agreement between the Bureau of Agriculture and the university there is a consensus to send students by the Bureau every year not more than 30 during the regular program. The program is value chain oriented agricultural extension curriculum to make the approach focused on value addition i.e, creating market linkage and quality product aspects. The program so far accepted 129 students in five batches 28.7% of which are female. A total of 87 students were graduated from the successive three batches successfully.

Students’ enrolment of each year

<table>
<thead>
<tr>
<th>Year</th>
<th>Students enrolment</th>
<th>Graduated</th>
<th>Status After Graduation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
</tr>
<tr>
<td>2012/2013</td>
<td>19</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>2013/2014</td>
<td>18</td>
<td>10</td>
<td>28</td>
</tr>
<tr>
<td>2014/2015</td>
<td>20</td>
<td>12</td>
<td>32</td>
</tr>
<tr>
<td>2015/2016</td>
<td>16</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>2016/2017</td>
<td>19</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>37</td>
<td>129</td>
</tr>
</tbody>
</table>

When running the program it requires resources such as human, financial and other materials. Sasakawa Africa fund for Extension Education (SAFE) is our main supporter by providing us with financial and other materials like field vehicle and office materials such as LCD projectors, Laptops and printers to run the program effectively. Impact that SAFE created is so enormous and appreciated for both region and the university.
The first and second intake of the program is already graduated and re-absorbed (employed) by their employers and the third batch will be back to their work place on March 2017 to be re-absorbed by their employers. During their learning time they did their projects on different cereals and animal production, natural resource such as rain water harvesting to increase production and income of farmers by applying action research. When doing their action research they started by identifying extension need assessment of farmers on specific technologies. This process of action research helped them to analyze the gap of the farmers and to fill their gaps based on their extension need. This identification of farmers extension need is the key for the success of agricultural extension works and it also increased the practical application of action research by the students to be more proficient on their career. Still now 87 effective action research works were implemented on the farmer’s field.

Types of enterprises implemented by students

<table>
<thead>
<tr>
<th>S/N</th>
<th>Batch of students</th>
<th>Type of enterprise</th>
<th>Quantity of projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1st Batch</td>
<td>Teff</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maize</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Faba bean</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sorghum</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wheat</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mungbean</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Malt barley</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improved transitional beehive</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2nd Batch</td>
<td>Malt Barley</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wheat</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teff</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sorghum</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Onion</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cattle fattening</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>3rd Batch</td>
<td>Sorghum</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potato</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wheat</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teff</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tomato</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rain water harvesting</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improved beehive</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sorghum enter cropping with mung bean</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improved forage production</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compost preparation and utilization</td>
<td>1</td>
</tr>
</tbody>
</table>

The implementation of SEP by the students is diversified from year to year by giving emphasis on other types of enterprises rather than crops.
Challenges facing the program

Shortage of staff

- The department of rural development and agricultural extension has a great shortage of staffs and this creates highly load to the instructors in advising and during supervision of off campus SEP.

Credit load of the program

- Even though the total credit load of the program is revised from 90 to 98 credit hours there is still a question by the students of the program to raise it 105 credit hour.

Lack of transport

- Off campus SEP requires supervision at field level by the staffs of the college to evaluate the students work. Since the students work area is very scattered in different zones of the regions it is highly demanding of transport access to reach at each area.

Field Visit

Field visit was organized by the department of Rural Development and Agricultural Extension of Wollo University to create awareness for the staff members of the university on supervised enterprise project which was implemented by students on their work place on selected enterprises. The visit was held in South Wollo zone Worebabo district by participating different bodies from the college of Agriculture participating all department heads, higher officials and the research office.
5. Samara University, Ethiopia

A Report on Experiences of Mid career program

By: kedir Ebrahim and Habtamu Admas (PhD), Samara University, college of dry and agriculture, department of rural development and agricultural extension

Background and Rationale

Samara University is the only higher education institute in Afar National Regional State (the pastoral and agro-pastoral area). It established in the year 2008. The university has 7 colleges and College of Dry Land Agriculture is among the early established college of the institute. Its mission is to graduate high skilled and knowledgable graduates who will help in solving the community's problem and the university has a vision to be one of the leading higher institutions from the pastoral area by the year 2030.

Though the college has five departments (department of horticulture, animal science, natural resource management, plant science and agribusiness and value chain management) till 2016, it was impossible upgrading the technical and professional skills of mid-career who are frontline extension workers in the region. Considering this in mind, Samara University with the support of Sasakawa Africa Fund for Extension Education (SAFE), a program of the Sasakawa Africa Association (SAA) after wide consultation with local stakeholders on its desirability, feasibility and content launched this mid-career program in 2016.

The program has two basic objectives: supporting and strengthening the effort of the regional government in facilitating market-led and knowledge-based transformation of pastoral and agro-pastoral sector of the country and producing competent and adaptable mid-career extension professionals who will facilitate the transformation of pastoral and agro-pastoral production systems in the region along sustainable commercialization paths.

The program is running as a partnership between the Ministry of Agriculture (MoA) and Samara University where the employer agrees to send staff for training on paid leave and to support the students during training and reabsorb them after training. The university agrees to: develop tailor made programs based on the needs of the employer; select candidates from those nominated by employers which we consider they geographically represent the region; and provide competent staff for teaching on the program. Most of the courses in the program are concerned with attitudinal change outcomes. In addition, there are courses with practical knowledge and skill orientations. Most importantly, the face-to-face course delivery dominates practical oriented and participatory approaches so as to satisfy the demand of student center learning methods.

Since the establishment of the program, there is a high demand and need from the regional agriculture office sending the mid-career agriculture professionals to the institute. So far, the department registered two batches of students, 32 students in the first batch and 45 students in the second batch.

1.2 Smallholder farmer-specific crops and livestock value-enhancing technologies and practices in Afar region
Through the midcareer program, Samara University has been taught different small holder farmer-specific value enhancing technologies and practices. As most farmers in the region are pastoral and agro-pastoral, need specific curriculum is designed and delivering to these front liner midscale extension workers. The theoretical knowledge and practical skills provided by our lectures are considered with local need and focus on crops and livestock available in the region.

**Smallholder farmer-specific crops harvest and postharvest value enhancing technologies and practices in Afar region**

Students equip with different knowledge and skills on crop production, harvesting, postharvest harvest handling and processing of crops with the approach of dry land farming. To expose and grasp experience of different areas, our students do have field visits of three to four times during their academic career. Field crops production and postharvest value addition; horticultural crops production and value addition; and value chain approach in agriculture are some of the courses which are delivering to our students to enrich them with knowledge and skills on crops farming.

**Harvesting, postharvest handling and value addition of maize**

Students equip with different knowledge and skill on maize proper time of harvest; harvesting material; storage materials and conditions; and maize value addition during class teaching and field visit.

**Maize harvesting:** The most suitable time to harvest is after the plants attain physiological maturity. The time of physiological maturity can be accurately determined by the development of the black layer at the point of attachment of the grain to the cob. From this stage onward, ripening consists of moisture loss, which may be quite rapid if the weather is dry.

**Maize postharvest activities:**

Threshing: it refers to separating the grain from the straw. This activity follows soon after farmers finish all harvesting activities. During threshing, considerations like time of threshing; items needed for threshing; place to be used for threshing; items to be used for storage after threshing are very important.

Cleaning (winnowing): This refers to removing everything from the maize grain after threshing.

**Maize Storage material/container:** maize can be stored inside mobile storages (sacks or bags) or inside mobile storage materials (usually bins). These storage materials should be free from storage pests and clean.

**Maize storage:** maize grain can be stored for a longer period of time. This is generally done by drying the grain to desirable moisture content (11-14%). The storage of grain calls for protection against damage by insects, mites, mold, bacteria and heating brought on by the action of bacteria.

**Harvesting, postharvest handling and value addition of tomatoes**
Students equip with different knowledge and skills on tomatoes proper time of harvest/harvesting index; harvesting and transport materials/containers; storage materials and conditions; and fruit value addition during class teaching and field visit.

**Harvesting of tomatoes**: Tomatoes should be harvested at proper ripening stages when they are full mature considering the market destinations. If we deliver our product to the local near market, they should be harvested when they are at red ripe stage. When we deliver tomatoes to far market, they should be harvested when they are at green mature stage.

**Harvesting materials/containers**: Harvesting containers must be easy to handle for workers picking fruits in the field. These containers are made from a variety of materials such as paper, polyethylene film, sisal, hessian or woven polyethylene and are relatively cheap but give little protection to the crop against handling and transport damage. Harvest containers include baskets, buckets, carts, and plastic crates.

**Packaging**: The packing of produce directly into marketing packages in the field at harvest reduces the damage caused by multiple handling and is used increasingly by commercial growers. It is not a common practice in rural areas, where produce is sent to nearby markets and elaborate packaging cannot be justified, but commercial growers can view it as cost-effective if the packaging takes produce in better condition to market, where it can command a higher price.

**Tomatoes value addition**: Packaging with cartoon, processing of the fruit to different products like tomatoes ketchup, sauces, storage inside cold storage structure and selling during offseason, looking for alternative market during selling are some of value addition strategies students learn.

**Smallholder farmer-specific animal value enhancing technologies and practices in Afar region**

Different courses are delivering to equip our students with different knowledge and skills on technologies which enhance smallholder farmer’s animal production. On these courses, different animal production, processing and value addition technologies helpful for smallholder farmers discuss in detail. Livestock Production and Product Value Addition; Poultry Production and Product Value Addition; and Entrepreneurship and agribusiness are some of courses given by the department both theoretically and in practice which help on improving animal production technologies and practices in the region. Wide range of topics and technologies on; Milk Quality and Processing; Meat Quality and Processing; Hides and Skins Quality and Processing; Live Animal Marketing; and Slaughter Wastes and Manure Management discuss during class room teaching and field practices.

**Smallholder farmer-specific dairy cows value enhancing technologies and practices**

Afar region is known for its cattle production. Ayssaita, Afambo and Chifra districts are known for their large production of dairy cows. As it has a significant role for the community, knowledge and skill on the production, processing and marketing of the dairy cows is very important.

**Milk Preservation**
Milk should be cooled immediately after milking, and be kept as cold as possible before processing. The best temperature to keep the milk is 4 degrees Celsius (or below)

**Cooling methods**

1. Keep the milk in the shade not in the sun;
2. Keep the milk in a well-ventilated place;
3. Use cold water to cool the milk (for example put the milk in a water bath or in a stream);
4. Use evaporative coolers to cool the milk

**Technologies for Small-scale Processing of Milk**

**Pasteurization**

Heating of milk at 63°C for 30 minutes in batch pasteurizers or 72°C for 15 seconds

**Cream Separation**

Butterfat is one of the most valued components of milk. It gives milk its special creamy taste and color.

Shallow pan method: is designed to make the path (distance) the fat globules have to travel as short as possible. A cream layer forms in 24–36 hours. Because the cream separation takes place at ambient temperature, both the cream and skim milk become sour and cannot be pasteurized.

- Deep setting method: The deep setting method was designed to maximize fat cluster formation under low temperature and slow down acidification of the milk. The separation vessel is 8–20" deep. The vessel is placed in cool running water at 10ºC. A cream layer of about 20 per cent butterfat is formed in 24 hours.

**Smallholder farmer-specific Sheep and goat value enhancing technologies and practices**

The small ruminants (both goats and sheep) production is high in Afar region. The community mostly use this produces for meat and recently is using the hide and skin. The following are some of technologies which we teach in classroom and practical lesson help production of small holder farmers.

**Slaughtering and meat management of small ruminants**

**Pre-Slaughter Management**

There are a variety of environmental conditions which can cause stress in animals before slaughter. The following are some of the major pre-slaughter factors resulting in stress and subsequent poor meat quality.

**Distance and conditions of travel to the abattoir:** Traveling long distances exerts substantial stress on animals which could lead to greatly reduced glycogen levels.

**Nutrition and fasting:** The rate of glycogen repletion is particularly slow in animals that have been on poor quality diets and/or that have been fasted long periods prior to slaughter.
Mixing strange animals prior to transportation or slaughter: This can lead to fighting while establishing a new social order.

Physical activity: Too much physical exertion prior to transport or slaughter can increase stress.

Factors Affecting Meat Quality On-farm

Genetic factors: Many physical properties of meat are greatly influenced by genetic factors. Tenderness is reasonably inheritable. Sheep and goat producers can make improvements to the end-quality of meat by careful selection of breeds, and strains within a particular breed.

Age and weight: Meat quality changes markedly with the animal’s age or weight at slaughter. Hence, appropriate slaughter weights should be identified for various breeds to get better dressing percentage, meatiness and quality. Postponing the slaughter age permits a better exploitation of growth potential, but the parallel increase of the carcass fat content and the subsequent worsening of the feed conversion index reduces potential economic returns.

Feed factors: Efforts are needed to help producers provide optimum nutrition to marketable animals to improve live weight at slaughter, the proportion of carcass contents and total edible meat produced.

Sex: Meat quality differences between sexes of animals is not fully understood, but is believed to be caused by differing levels of sex hormones circulating in the blood. Young rams have meat that tends to be relatively darker and tougher than that of female animals of similar age. Moreover, at similar age, ewe lambs are fatter than ram lambs.

Preservation of hide and skin

Air Drying: Drying of hides and skins can be done in different ways. The techniques include drying on the ground, using suspension/frame drying, drying by suspension over cords or wires, and tent and parasol drying.

Suspension frame drying: It is best to frame-dry under a shed. While frame-drying in the open is cheaper, it is better to use a shed where suitable cross-ventilation occurs. Shed drying also allows for close supervision as well as protection from theft and control of damage from vermin.

Suspension drying over cords or wire: This technique is employed where wood is scarce. Skins are suspended symmetrically along the backbone with the hair or wool hanging down over a wire not thicker than one’s little finger. The overhanging sides of the belly and flanks must be prevented from touching each other and the shanks from folding inwards.

Salting: Salt can for preserving the skins and hides.
a. **Wet salting:** The skin is spread on the floor or a wooden pallet and common salt is uniformly applied on the flesh side equal to 30–40% of the green hide weight. A second skin is now spread on the first one with the flesh side up and salt applied in the same manner.

b. **Dry salting:** This technique is very similar to wet salting but hides/skins are dried after the initial salting. This method gives the advantage of both drying and salting. The initial steps are the same as in wet salting; however, salting has to be done without any delay after flaying.
6. Jigjiga University, Ethiopia

Value-enhancement technologies practiced in the Mid-Career program of Jigjiga, University, Ethiopia

By: Dr. Mussa Mohammed (Dean), Abraham Mulu (Deputy Dean) and Muhyadin Mohammed (Lecturer)

Background

The pastoral value chain oriented program taught at Jigjiga University (JJU) consists of practical, problem-focused courses and field-based practical. The teaching, therefore, covers pre-production, production and post-production processes for each main product of cattle’s, camels, small ruminant, vegetables, cereals and legume crops. To support the teaching learning, SAFE granted two enterprises established in 2016 namely; poultry and home garden vegetables production enterprise. Both enterprises have been integrated to mid career courses such as; poultry and vegetable crop production, value addition, marketing, irrigation agronomy. Additionally, we are practiced field visit method to various small holders farms in eastern Ethiopia to teach value enhancement technologies gaps practiced by farmers.

Home garden enterprises technologies and practices:

Recently, the rainy season in the semi-arid region of Ethiopia has been experiencing a decline in its annual rainfall amounts and distribution nature. As a result, smallholders farming community in drylands, struggled to maintain home gardens vegetable production using hand-watering and/or surface water application to cultivate vegetables for their families. Hand-watering of vegetable gardens is tedious and inefficient especially where water is scarce. It requires many trips back and forth to the water source (which is often some distance away), and it does not deliver water down to the root zone. Surface application of water faces huge evaporation losses and infiltration at drylands before reaching the root zone.

Objective:

➢ To establish a home garden enterprise demonstration center for vegetable crop production, value addition and marketing

Advantage

➢ **Water saving:** reduction in the amount of water needed for growing vegetables
➢ **Labour saving:** plots can be irrigated quickly, simply by filling the bucket/tanker
➢ **Fewer disease problems:** such a mould and powdery mildew (fungal), caused by soil splashing onto plant leaves
➢ **Low-cost:** the system is priced to fit poor farmers’ budgets
➢ **Simple to install, operate and maintain:** Easy to adapt to meet farmers’ particular needs
➢ **Profitable for small-scale farmers:** Enabling them to produce enough vegetables for their families and for sale
A model home garden enterprise integrated to low-head irrigation technologies in the form of bucket drip kits to deliver water to the root zone of the crops effectively were established in Jigjiga University campus for the purpose of demonstrating the possibility of producing vegetables such as onion, lettuce and cabbage in semi arid areas. The students will also learn the production process, product value chain and marketing of the vegetables through involvement from input preparation up to selling the produced commodities to University community. The students were learn the potential to utilize small amount of pond water found in semi arid areas using small scale drip irrigation schemes limited during the poor rainfall season to allow families to grow their own vegetables, thus increasing their food supply and annual income, improving their diets and reducing the need to buy expensive vegetables at the market.

**Table1: Home garden vegetable value enhancement technologies and practices taught at Jigjiga University**

<table>
<thead>
<tr>
<th>S/N</th>
<th>Pre-production</th>
<th>Production</th>
<th>harvesting</th>
<th>Post harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drip kits cover an area of 500m²</td>
<td>Seed bed preparation</td>
<td>Harvesting cabbage and lettuce</td>
<td>Keeping leafy vegetables fresh</td>
</tr>
<tr>
<td>2</td>
<td>Preparation of main lines -lateral lines based on crop spacing</td>
<td>Drilling seeds in row</td>
<td>Drying onion</td>
<td>delivering for market</td>
</tr>
<tr>
<td>2</td>
<td>Installation of drip kits</td>
<td>Transplanting within 45-50 days</td>
<td></td>
<td>Storage practice for onion</td>
</tr>
<tr>
<td>3</td>
<td>Land leveling</td>
<td>Water application through drip lines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Farm input purchase (improved seeds of lettuce, cabbage and onion ), Collection of farm yard manure and poultry wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Picture of home garden enterprise while student conducting practical
Key elements and relevance of home garden enterprises for mid-career program described here under. It is important to teach the concept of vegetable crop value chain in practice.

**Gardening Input:** Access to the necessary inputs for gardening from a local and sustainable source is an important element for successful gardening. Such inputs include improved seeds, a regular water supply, environmentally friendly soil improvement techniques. Drip irrigation designed for smallholder and easily managed by mid-career students. It should be prepared from locally available and affordable equipment.

**Mid-career student capacity development:** Mid-career students were involved and participated in designing, practical demonstration and evaluate the outcome of the enterprises. It is a learning stage for the mid-career students to establish it at Farmers Training Center (FTC) and conduct practical oriented training for agro-pastoral communities.

Post product value enhancement and marketing: The garden was utilized as a practical point of product grading after harvesting, how to deliver fresh leafy vegetables for market, and teaching standardization of leafy vegetables such as lettuce and cabbage as well as onion. Garden product marketing and consumer feedback will be collected to develop a product demanded on the market.

Follow up and evaluation: Strict students follow up is used as a tool for ensuring all garden activities are carried out as planned and to improve the challenges. It facilitates the identification of problems and the development of solutions. Continued integration of lessons learned from implementation and evaluation efforts is one of the key aspects to the successful scale up of this enterprise by mid-career students. Evaluation and planning was conducted at the key intervals during the program period to improve the enterprises.

**Small scale poultry enterprise establishment**

Small scale poultry is established in the JU to provide the training for mid career students on egg production which help them to understand modern way of job creation, income generation. The students have also learned livelihood diversification into alternative enterprises which appears to be gaining popularity and economic importance as one way to boost family income.

**Table 2: Poultry production value enhancement technologies and practices taught at Jigjiga University**

<table>
<thead>
<tr>
<th>S/N</th>
<th>Pre-production</th>
<th>Value enhancement technologies practiced</th>
<th>Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Layer preparation- exotic breeds</td>
<td>Watering- time</td>
<td>Collection to egg tray</td>
</tr>
<tr>
<td>2</td>
<td>Locally prepared house</td>
<td>Feeding- amount and time</td>
<td>Transportation to market</td>
</tr>
<tr>
<td>3</td>
<td>Feed preparation</td>
<td>veterinary service Vaccination-time</td>
<td>egg packaging- for easy handling</td>
</tr>
<tr>
<td>4</td>
<td>Vitamins</td>
<td>Rear chickens-daily monitoring</td>
<td>Egg selling-daily activity</td>
</tr>
<tr>
<td>5</td>
<td>Vaccine</td>
<td></td>
<td>Product promotion</td>
</tr>
</tbody>
</table>
Deep litter
Poultry cage
Egg tray
Feeders
Waterier
Perches
Laying nests
Sanitary equipment

Fig Demonstration of local gauge system

Demonstration of deep litter system

Demonstration of egg storage
I. Teff production with the value addition

1. Introduction

Teff, *Eragrostis Teff* (Zucc.) Trotter is a staple food crop of Ethiopia. It has existed in Ethiopia since recorded history of the country and some authorities believed that the pre-Semitic inhabitants might have domesticated it in BC. Ethiopia is the center of origin and diversity for Teff. Ethiopian farmers grew it for centuries because of its various merits. Otherwise it would not have existed after the introduction of other cereals such as maize, wheat, barley and others. The crop is highly adapted to diverse agro ecological zones including conditions marginal to the production of most other crops. It tolerates reasonable levels of both drought and water logging better than most other cereals. Teff grows on various soil types ranging from very light sandy to very heavy clay soils, and under mildly acidic to slightly alkaline pH conditions. The cultivation of Teff in Ethiopia has partly been motivated by its relative merits over other cereals in the use of both the grain and straw.

**Importance:** Teff is primarily grown in Ethiopia for human consumption of its grains. Its grain flour is mainly used for preparing *injera*, which is the favorite national dish of most Ethiopians. Injera produced from Teff flour is of good odor, flavor, texture, and keeping quality. Teff is the major staple cereal of Ethiopia. According to a six year (1992/93-1997/98) average data of the Central Statistical Authority, Teff is annually cultivated on about 1.8 million hectares of land (Table 3), there by covering about 29.4 percent (largest) of the total acreage of cereals. Its area is expanding from time to time and showed a respective increase of 2.8 percent, 33.3 percent, 13.9 percent and 3.5 percent, from 1993/94 up to 1996/97 in comparison to each preceding year.

**Economic and marketing value**

*Price and contribution to the GDP:* Using national grain prices published by the Central Statistical Authority in 1998 for the harvesting time of all zones of the country, Teff grain contributes 2.3 billion Birr.

*Export status:* Official figures on the export status of Teff have appeared during the past two years (Table 5). Almost equal amounts (18 thousand quintals) of Teff grain were exported in 1997/98 and 1998/99, but the value obtained differs remarkably.
**Yield potential:** Over six years (1992/93 - 1997/98), average national yield of Teff was estimated to be 8.9 q/ha. However, farmers who use improved varieties and management practices can easily get 17 - 25 q/ha (Table 6), which is a little more than two fold.

Secondary & Derived Products: Teff is predominantly grown in Ethiopia as a cereal crop and not as forage crop. However, the straw after the grain is threshed is used as fodder. Farmers highly value the straw of Teff and it is stored and used as a very important source of animal feed, especially during the dry season. Teff straw is called *Ch'ed*. Farmers feed Teff straw preferentially to milking cows and working oxen. Cattle prefer Teff straw than the straw of any other cereals and its price is also higher than that of other cereals.

2. Main activities from harvesting to marketing and value adding intervention

**HARVESTING**
- Most farmers use sickle for harvesting
- Many crops left in farm
- Value adding intervention:
  - harvest the crop at the proper dry state and avoid from rains

**IN-FARM STORING**
- Store at the farm without great care on soil
- Affected by different pest and rodents (termite, rat etc.)
- Value adding intervention:
  - Store on the farm appropriate place using storing bed
  - Store for short time as much as possible.

**TRANSPORTING THE BUNDLES TO THE THRESHING FIELD**
- Majority of farmers transport to home side to store again or for threshing
- They use human labor particularly women’s back or sometimes men’s head
- lose of grain while transporting to threshing place
- consume labor and time
- Value adding intervention:
  - Using plastic to threshing rather than threshing on the ground
  - Using thresher machines to thresh Teff.
THRESHING

- Traditionally threshing is done by animal trampling and preparation of threshing field is a tiresome activity especially for women.
- During threshing it is not possible to get all the grains out of the straw.
- Significant amount of grain left in the threshing place.
- Different foreign materials mixed with teff (soil, sands, dung, etc.).
- The quality of grain affected (smell like urine of ox, dung, soil, etc.).
- The powder will have sand and will be discomfort able for eating.
- Value adding intervention:
  - Using plastic to threshing rather than threshing on the ground.
  - Using thresher machines to thresh Teff.
  - Could avoid or minimize threshing losses and keep quality of grain.
  - Making the Teff free of any foreign materials and make it ready directly to be grained.
  - This can be done at the field level either using threshing machine or manually.

WINNOWING FOR CLEANING

- Winnowing is traditional and energy and time consuming.
- Different foreign materials mixed with teff (soil, sands, dung, etc.).
- Local winnowing methods cannot purify the grain.
- Value adding intervention:
  - Using thresher machines to thresh Teff.
  - Making the Teff free of any foreign materials and make it ready directly to be grained.
  - This can be done at the field level either using threshing machine or manually.

TRANSPORT AFTER THRESHING: FIELD TO HOMESTEAD

- They use human labor particularly women’s back or sometimes men’s head.
- Sometime farmers use donkey and local container (silicha or Kalikalo).
- The quality of grain affected (smell like material contained teff for transportation, etc.).
- Use labor and time.
o Value adding intervention:
  o Using plastic container and power of donkey

**STORAGE**

- Farmers keep their grains in traditional storages namely gotera, gota, unigulo
- Color of teff changed
- Affected by rodents and storage pests

  **Value adding intervention:**
  Communal or cooperative storage facilities.

**SELLING TIME AND PLACE**

- Farmers sell almost their entire product within two or three months after harvesting

  **Value adding intervention: Time and place utility**
  - Farmers should store the Teff product and the Ch’ed (byproduct) up until they get good price for their product.
  - Hence, they extension advise where to sell and when to sell their product in order to get good price.

**II. Value enhancement technology**

Different practices and technologies taught for maize is almost similar with Teff. But there are differences since this crop has its different nature than teff. Some necessary areas of adding value in post-harvest are listed here below.

**Harvesting**

- Optimum dry stage

**Shellering**

- After few weeks stored in farm
- Use improved maize Sheller

**Storage**

- Independent storage
- Construct communal storage by group
- Use appropriate recommended chemical for postharvest pests

**Marketing**

- Appropriate plan when and where
III. Bee keeping and value enhancing technologies

Introduction

Bee keeping in Ethiopia has been practiced since time immemorial. Most bee keepers in Ethiopia base their practice on indigenous knowledge which has been passed from one generation to the next. Various factors identified as key determinants in honey quality are harvesting methods, processing procedures and storage.

B. Honey production value addition

1. Using Transitional or Better Beehive
   Farmers use Local beehive which are not suitable to harvest and cannot keep/retain the bees for the future.

   Value enhancing technology
   Advising farmers to use the following bee hive technologies that could enhance value addition.
   Made with local material

   Top bar
   Langstroth Bee beehive

2. Harvesting Time
   The use of unpleasant smelling chemicals to drive bees away is a technique preferred by many beekeepers because it is quick and easy. Approach the hive quietly and blow smoke around the hive and later through the entrance holes using a smoker. The smoke makes the bees to start eating honey thus becoming heavy and inactive.

   Value enhancing activities
   - Lift the hive lid and puff smoke into to the surface of the top bars
   - Using the smoker appropriately
   - Using a hive tool, gently knock upper surface of the top bars to find out where the building of the combs ends. Lift off the last build comb and inspect for ripe honey.
   - It is used to emit smoke when opening a hive to inspect or harvest honey.
   - Cut the combs from each top bar three centimeters from the surface and put them in a clean container rubbing off the bees using a twig/brush.
   - The 3 cm of the comb left is for attachment of new combs.
   - Place back the bars and do not disturb the brood.

3. Local Extraction Processes
During local extraction process farmers do net pay attention for the purity of honey. This less attention cannot make them conscious to protect from different foreign materials. There is a chance to be mixed with foreign material. Because of this the purity of the honey is very less.

**Value adding processes**

➢ **Using heat to melt.**
  - Heat some water in a dish.
  - Put honey combs in an enamel basin or any other container which is not made of iron.
  - Put the container with honey combs on the boiling water.
  - Heat until most of the honey melts.
  - Separate the melted honey from the combs by straining through a muslin cloth.
  - Keep honey in a container to cool down.
  - Remove the wax layer that may form on the surface of the honey.

➢ **Crushing and Straining**

This method produces the highest quality honey. The following should be done: Honey combs are crushed and strained using a muslin cloth into the enamel basin. The scum formed is removed with a wooden spoon. The pure honey is put in a suitable container (plastic or glass jars) that is tightly closed.

➢ **minimize a chance of foreign materials**

➢ **extract using relatively better extractor**

4. Marketing

The local market for honey is significant and demand in urban areas outstrips supply. Trade opportunities for other bee products are also growing. However, inefficiencies in the supply chain and the low capacity of producers to negotiate markets, limits capacity to exploit the country’s full potential. The beekeeper sells the honey either directly to the user (retail trade) or in large volumes to a trader (wholesaler). The domestic honey market starts at the smallholder beekeepers level, who majorly sell crude honey to collectors in the nearest town/village markets. Therefore, the producers are price takers. The collectors mainly pass the honey to the whole sellers in big cities and towns, though significant amount of honey they collect also goes to local tej brewers, processors and other consumers (Abebe 2009; Belie 2009; Assefa 2011).

**Value enhancing activity**

Organize the cooperatives to collect crude honey from their members and sell the semi-processed honey to processing companies and other intermediaries who buy in bulk and retail.

Cooperatives, individuals and self helps groups are needed to be established and strengthen in order to involved in marketing of the honey.

Places and time to Sell
III. Value enhancement technologies and practices in small holder poultry production

Genetic improvement:

Indigenous or local breeds are generally raised in small holder production systems. These birds are exposed to natural selection from the environment for hardiness, running and flight skills, but not for egg production. Hens are thus poor layers, but good mothers (except for guinea hens). When farmers contemplate the adoption of a more intensive poultry production system, they are eager to purchase more productive birds. There is a need to find the best method to provide them with such birds, and the options are:

- to supply hybrid strains, which requires the presence of well-managed hatchery facilities and (grand) parent stock, or
- to supply pure-bred breeds, which allows the farmer to renew his flock and to remain independent from external suppliers.

Unfortunately, pure-bred breeds are becoming more difficult and more expensive to purchase, and produce fewer eggs than hybrids. (Branckaert et al., 2000).

Genetic improvement has been considered a high priority in poultry development projects. Usually vaccination programs are carried out during genetic upgrading programs, but feed supply to the improved birds has not received sufficient attention. Thus it has not been possible to exploit the superior genetic potential of the improved birds.

The indigenous birds need genetic improvement while exotic breeds used in small scale and commercial system showed lower productivity both require genetic and feeding improvement.

The use of hay box brooder:

- Chick brooding refers to the early periods of growth (0-8 weeks), when young chicks are unable to maintain their normal body temperature without the aid of supplementary heat. Unlike most other small animals, baby chicks are unable to live for any length of time without an additional source of heat other than their own bodies. Different artificial chick brooders exist of every conceivable type and size, heated by oil, coal, wood, water, gas and electricity. With the exception of the electric brooders, all other methods are difficult to operate with local skills in rural areas. They do not maintain constant brooding temperature, require foreign currency for importation and are expensive in size of less than 1000 chick capacity. On the contrary electric brooders are economically feasible, could safely and easily be constructed and maintain the desired constant brooding temperature. Unfortunately however, it is difficult to adopt electric brooders by the African rural household poultry producers owing to the unavailability of electric power, numbers of chicks to be raised and remote locations of the farm sites (Solomon, 2007).

The hay box chick brooding technology utilizes simple and locally available materials. The major principles of this simple technique are brooding chicks by conserving the metabolic heat produced by the chicks and thus keeping them warm. It was assumed that the use of the hay box brooder could alleviate the burden of the breeding and multiplication centers of the
Ethiopian Ministry of Agriculture and develop the capacity and success of the national poultry extension services. Under village conditions using the hay box brooder also has the advantage of providing protection to chicks against predator attack and reducing the risk of exposure to disease through confinement. Another potential benefit of this technique is that it could enable farmers to isolate chicks from their mother at a very early age and raise them separately so that the hens could resume egg laying in short period of time (Nigussie et al., 2003). The hay box brooder is a low-input technology that releases the mother hen from brooding so that it may return to laying early. This would increase small scale poultry production in general and egg productivity in particular. The brooder is easy to construct, use and modify with the use of locally available skills and materials.

The advantages and significance of the hay- box chick brooding technology are that:

It is as productive as the electric brooder in any size of < 70 chicks.

No artificial heat is employed in the hay-box and hence brooding costs are saved.

It is portable and exposes the chicks to natural vegetation. It is simple and could successfully be operated and managed without high level specialized training.

It can be modified by local skills to the local situation of climate and available type of construction materials.

It is applicable to different agro-ecological conditions and a wide range of changing circumstances.

**Poultry Market Planning**

Forming a marketing plan so as to identifying where and when birds and eggs will be sold to receive the best possible prices.

Putting large numbers of birds up for sale in a small community may depress the price.

Even the sale of small numbers of intensively managed layers needs advance planning.

The plans of other farmers must also be considered. If they all expand their flocks and have well years, prices will almost inevitably fall.

Seasonal considerations enter into market plans as well.

**Challenges faced**

Teachers of different departments have less experience on post-harvest value enhancement technologies

Tendency of teachers to follow production oriented teaching methods.

The absence of technologies in the University for practical teaching
8. Mekele University, Ethiopia

Experience with teaching and appropriate value chain enhancement technologies and practices for small holder farmers, Mekele University College of Dryland Agriculture and Natural Resources, Department of Rural Development and Agricultural Extension

By: Letebrihan H/s (Lecturer) and Baynachew B. (Asst. Lecturer)

Introduction

Agricultural change can function effectively only if the national system of education as a whole is geared effectively to the needs of development. Agricultural education and training can succeed in their objectives only when integrated into an overall development program. The training programs must be shaped to meet the needs of the farmers. Ethiopian agricultural production system is constrained by multitude of factors. Among others, lack of sufficient trained agricultural professionals in the area of Agricultural extension and rural development at the grass root level is the critical one. To this effect, SG 2000 SAFE in collaboration with Haramaya, Mekelle, Hawassa and Bahirdar University has developed new curriculum of mid-career program which is unique in its kinds in considering value chain, post-harvest and processing aspects of agriculture which was a missing agenda in so far.

Accordingly, Mekelle University has been delivering Value Chain Oriented training in BSc Agricultural Extension program since 2012 to Tigray Bureau of Agriculture and Rural Development extension workers. The first batch of admission was in October 2012. Still now, Mekelle University admitted six batches (Male 127, Female 66 a total of 173 students). Out of them, three batches has been graduated a total of 102 students (Male 85 and Female 17) from 2014-2016 and now 20 students are expected to graduate.

SEPs differ substantially from the regular research projects in that SEPs involve both ‘action’ and ‘extension research’ – ‘action’ to improve farmers’ welfare and ‘extension research’ to increase knowledge in extension.

In planning SEPs together with farmers, students identify extension needs from their work areas. After identifying extension needs, students discuss the needs with employers from whom they receive further guidance and approval. Employers assess the projects on the basis of relevance and importance of the problems being addressed. As the students think of what they could do to solve farmers’ problems, they also identify opportunities for learning for themselves – learning that should help in improving the situation that they are dealing with, and learning that should help them grow as extension professionals by sharpening their understanding of extension science. Each project, therefore, has two objectives – a production (or development) objective and a learning (or research) objective.

2. Smallholder Farmers and value-enhancement needs in Tigray, Northern Ethiopia

What is value enhancement?
Value enhancement is a short term change that creates a long term benefit to equity (ownership) holders.

**Tailoring value enhancement technologies to smallholder farmers**

Mekelle University (RDAE department) has been delivering Value Chain Oriented training for BSc in Agricultural Extension professional since 2012 to The Development Agents from different districts of Tigray regional state.

The program adopted a value chain approach where smallholder farmers were linked to markets, finance, inputs, equipment, and information.

The program is built upon grading up the knowledge and skills of development agent so that they work with smallholder farmers to increase the efficiency of their farm businesses with improved production and post-harvest handling practices. The practices included improved seed varieties, access to quality inputs, mechanization, and market access.

A total of around 1200 target farmers benefitted directly from students action research that included training on agricultural productivity and production, linkages to input suppliers, land preparation and sources of credit. They were mostly smallholder farmer producers of maize, wheat, and sesame. Around Forty percent of the farmers were women who received new skills and knowledge in production technologies as well as management practices to operate in a more professional manner.

**It is important to differentiate Value chain from Value addition**

A **value chain** is a set of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market. The concept comes through business management and was first described by Michael Porter in his 1985 best-seller, *Competitive Advantage: Creating and Sustaining Superior Performance*.

Outside of economics, **value added** refers to "extra" feature(s) of an item of interest (product, service, person etc.) that go beyond the standard expectations and provide something "more", even if the cost is higher to the client or purchaser. Value-added features give competitive edges to companies with otherwise more expensive products.

**3. Harvesting and Postharvest Value enhancement technologies and practices**

Post-harvest and marketing system is a chain of interconnected activities from the time of harvest to the delivery of the food to the consumers. Agricultural commodities produced on the farm have to undergo several procedures like harvesting, drying, threshing, winnowing, processing, bagging, storage, transportation, and exchange before reaching the final consumer. The primary role of an effective post-harvest system is to ensure that the harvested food reaches the consumer, while fulfilling customer
satisfaction in terms of quality, volume and safety. Post-harvest losses in the developed countries are lower than in the developing countries because of more efficient farming systems, better transport infrastructure, better farm management, and effective storage and processing facilities that ensure a larger proportion of the harvested foods is delivered to the market in the most desired quality and safety. For the low income countries, pre-harvesting management, processing, storage infrastructure and market facilities are either not available or are inadequate (World Bank et al., 2011).

As indicated in the above, Midcareer students take courses in relation to value chain, postharvest technologies and practices. In addition to that, the department instructors are initiating them that to teach the farmers more about harvesting and postharvest value enhancement technologies and practices while doing their action research. As a result, some students are doing as they recommended by passing different challenges. But most of them are focusing still on the following issues and it is well done.

Training and follow-up on:

Land preparation (3 and above time)

Row planting/sowing method (space between plant to plant and row to row)

Weeding (2 and above time)

Early growth, middle, development and harvesting stage.

Harvesting product at a right time

The same is true for animal production

They teach target farmers very well about modern feeding systems, housing method and treatment, but marketing and value addition issue has gained less attention.

4. Sample Photo evidences from two batch graduated students’ research

Some of the students were given organized training for their target farmers about wheat value addition. As a result, most of them are practicing it in household consumption. A few number of target farmers are started selling small-breads, Dabo-kolo and Grisli to local markets, since September 2009 E.C.

Cattle fattening practice
5. **Recommendations:**

In both case (Animal production and Crop production) value enhancement issue has given less attention. Therefore, all respected bodies (project coordinator, Collage dean, Department head, Program coordinator, instructors and students) should give initiation to bring an effective result in value improvement.

In Ethiopia, above fertilizer, there is no more value enhancement technology that is available across the country; hence there is strong need for other value enhancement technologies.

The traditional crop/livestock value enhancement practices shall be transformed in to modern one
9. Polytechnic Rural Institute of Training and Applied Research of Katibougou, Mali

Overview on Katibougou’s IPR / IFRA and its SAFE program

The Polytechnic Rural Institute of Training and Applied Research of Katibougou, Republic of Mali, is a Higher Educational Institution under the supervision of the Ministry of Higher Education and Scientific Research. Established in 1897, it is one of the oldest Institutions in West Africa for training and research in Agriculture. Its missions are:

- Basic, professional and continuing education of professionals in the following fields: agronomy, soil sciences, agro-economics, zoology, veterinary medicine, forestry, fisheries, agroforestry, rural engineering, agricultural extension;
- Postgraduate training;
- Short courses for retooling;
- Scientific and technological research;
- Development and dissemination of knowledge and know-how;
- The utilization of expertise for production activities.

The various courses (Higher level Technicians, Masters, Engineers, Bachelors) are carried out within 5 teaching and research departments: Fundamental and Basic Sciences, Agricultural Sciences and Techniques, Livestock Sciences and Techniques, Forestry and Rural Engineering, Economic and Social Sciences.

The IPR / IFRA SAFE program in Katibougou started in October 2002 as part of a partnership between SAFE, the Ministry of Rural Development represented by the National Directorate of Rural Support and the Ministry of Rural Development. National Education represented by IPR.

Admitted into the program are professional technicians (with 13 years of initial schooling) with specialties in Agriculture, Livestock, Water Management and Forestry, Rural Engineering and Agricultural Extension.

The training Programme is domiciled in the Department of Economics and Social Sciences with duration of 4 years and leads to the BSc degree in Agricultural Extension.

Situation of SAFE/IPR/IFRA as of March 2017

Following the recommendations of various SAFE workshops and value chain trainings organized for lecturers at the Institute, a 30-hour course on the Value Chain Approach was introduced into the curriculum in 2011.

At the same time, curriculum review was conducted which considered various aspects value chain. These include the courses such as "Introduction to SEPs", "Plant Productions", "Animal Productions", "Forestry and Fisheries Productions", "Food Technology", "Rural Economy", "Marketing of Agricultural Products", "Management of Agricultural Products" and Agricultural Enterprises ".

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Supervised practical field activities and educational outings taking into account approaches to improve the income and living conditions of small producers are implemented.

SEPs are increasingly oriented towards the value chain approach. As examples, the SEPs presented below fall within the scope of the theme of this workshop. It should be noted that all these SEPs topics come from the participatory diagnosis with farmers and that the SEPs are carried out in a very participatory way.

1. **Introduction of winter onion cultivation to diversify the income sources of women's association of the village of Siramana.**

This project was executed in 2016 by the student Ibrahima Dembele in the village of Siramana, rural community of Tiakadougou-Dialakoro, Kati.

In this commune, onion production is 15 to 30 tons for an estimated demand of more than 130 tons. In Mali, onions are mostly produced during the cool dry season but the local women decided to produce this during the winter period and it is during this period that demand is stronger and prices are fairly profitable.

Thus, during the execution of the SEP:

- 24 people including 16 women and 8 men were trained on techniques for producing quality compost and certain gardening practices in general and the technical itinerary of winter onion cultivation in particular, conservation and marketing techniques for market garden products;
- 629.9 kg of onion was produced in an area of 339.76 m², a yield of 18,540 kg/ha. The production was sold at 500 F per kilogram for a profit of 157,650 F CFA.

In addition to the profit, all the income was reinvested in market gardening equipment and seeds of PREMA, adapted variety, to motivate the participants to ensure the sustainability of the activity, ie 314,950 F CFA.

2. **Characterization of the value chain of parboiled rice in Niéna.**

This study was conducted by student Soumahila Koné in 2016 in Niéna, capital of one of the rural communes of southern Mali (Sikasso) where rice farming is one of the income generating activities for women thanks to the low land prepared by the Malian Textile Development Company. Despite the availability of land and rice production activity in Mali, it is found that imported rice competes with local production. To have better understand the situation, the study on value chain of parboiled rice was initiated. Its objective was to identify ways to improve the competitiveness of parboiled rice produced in Niéna.

To do this, a survey was conducted among 20 rice farmers, 1 group of steamers, 20 rice traders, 30 consumers, 10 restaurants and 20 households.

The results showed that the main actors in the parboiled rice value chain are rice farmers, parboilers, traders and consumers. The average cost of rice production in lowland NIENA is 335,670 F CFA/ha. The
rice farmers have an average profit of 69,630 F CFA/ha. The co-op's steamers generated a profit of 705 900 CFA from January to June.

Despite the fairly satisfactory economic results, many constraints were noted by the study at the level of linkage in the chain, specifically linking production with marketing. It is particularly a question of the delay in the supply and the high cost of the inputs, insufficiency of agricultural equipments, the difficulties of access to agricultural credit and poor organization of the traders.

The recommendations for developing the value chain for parboiled rice are as follows:

➢ Strengthen rice production capacities in the low land (training in the Rice Intensive System, for example);
➢ Build capacity in modern parboiling techniques;
➢ Facilitate the use and access to organic inputs in order to reduce production costs;
➢ Facilitate access to credit to improve the acquisition of agricultural equipment;
➢ Develop a good marketing strategy to popularize the qualities of parboiled rice and develop the marketing circuit.

3. Improvement of the income of Badiongo’s women through beef and sheep fattening

This project was carried out by another student by name Moussa Coulibaly in 2008 in the village of Badiongo circle of Mopti in Central Mali.

The fattening of 40 cattle on natural pasture was practiced by 12 women. The total cost of the operation was 2,138,950 F CFA and the women registered a profit of 1,141,050 F CFA.

Sheep and goat fattening was carried out on a plot of land by 22 women and it involved 50 animals. These women made a total profit of 263,486 CFA and also learnt to produce fodder crops.

4. Improvement of poultry farming through the introduction of "wassachie" in the Mafeya farmyard

This theme was executed by Fatoumata Dembele in 2015 in the village of Mafeya, rural commune of Meguetan.

Poultry farming is considered as an activity needed for income diversification and fight against poverty in rural areas. Despite this realization, its production weak and productivity very low. The "wassachie" is an improved strain developed by the Institute of Rural Economy of Mali by crossing local and exotic breeds.

The introduction of 5 wassachie improved cockerels in the village, together with the improved 5 breeding henhouses, resulted in 145 eggs laid which generated a certain enthusiasm among poultry farmers in the village. The activity generated a real monetary result of 495,000 CFA francs, with an economic profitability of 268.39 %, from the sale of 165 table birds in a relatively short time.
These examples provide ample evidence that agricultural extension students are able to positively influence the improvement of smallholder incomes, mainly through the proper implementation of SEPs.

For this, it is necessary to:

➢ prepare students from the beginning of the curriculum for the value chain approach;
➢ strengthen the value chain aspects in the different courses;
➢ ensure the correct supervision of SEPs;
➢ strengthen partnership in SEP implementation and training;
➢ work towards fund raising for SEPs projects and the program itself.

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Current Student Statistics

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1. **OVERVIEW OF SAMANKO CAA**

The Agricultural Learning Center (CAA) trains students to obtain the Certificate of Professional Agricultural Aptitude (CAPA) for Agricultural Technical Agents (ATA), the Brevet de Technicien Agricultura (BTA) for Senior Technicians of Agriculture and the Agricultural Extension Technician Certificate (BTVA) for Specialized Agricultural Extension Technicians. It is precisely this last sector, the BTVA, which was created in 2006 by the Government of Mali through the Ministry of Agriculture, with the financial and technical support of SAFE.

Supervised Internships apply to this sector specialized in agricultural extension, whose students benefit from training modules jointly designed by the Professors of the Polytechnic Rural Institute / Institute of Training and Applied Research of Katibougou (IPR / IFRA), in collaboration with the Coordinator of the Sasakawa Fund for Education and Extension in Africa (SAFE) and the National Directorate of Support to the Rural World (DNAMR), now National Directorate of Agriculture (DNA).

All agricultural extension students complete 45-day vacation courses for the first year and 120 days for the finalists. Since the basis of these courses is necessarily focused on participatory village diagnosis, all the themes selected take into account the constraints of the farms, in order to help the producers to raise them.

It should be noted that these constraints, as reflected in the various reports of holidays and end-of-cycle internships, mainly concern:

- Agronomic aspects: lower yields of cereals and vegetable crops, soil degradation, etc.
- Livestock aspects: epizooties, lack of information on fattening practices, etc.
- The difficulties of evacuation and / or processing of agricultural products, particularly market gardeners, etc.

The solutions provided are long-lasting, because they are obtained in a collegiate way, taking into account the producers’ practices and experiences.

The trainees receive the joint supervision missions composed of the executives of the structures referred to above, as well as the technical support structures, in order to provide them with the technical and methodological support essential to the success of their traineeships.

At the end of the internship period, a series of defenses organized for the first years (internship) and for the finalists (end of cycle internship), will sanction the work.

2. **ADAPTATION OF THE PROGRAM:**
The program taught at the Center is adapted to the needs of small farmers in terms of valorization because it takes into account almost all areas of the rural sector.

Some modules of this program are: crop production, animal production, forestry production, methods and principles of agricultural extension, tools of rural sociology, environmental studies, organization of the rural world, gender and leadership in agricultural development, processing and conservation of products, product marketing, farm management, microproject development.

We believe that with this range of modules, students are well equipped to deal with the concerns of small farmers.

3. TECHNOLOGIES AND ENHANCED IMPROVEMENT PRACTICES:
The examples below relate to end-of-cycle internship activities for some trainees, with the aim of removing major constraints identified during diagnosis in the localities. These examples among many others in the fields of crop and livestock production are evidence of a willingness to support producers in finding durable solutions to problems that hinder their development.

3.1. Field of vegetable productions

Example 1:
End of cycle report of a student in Kounè (rural commune of Sakoïba, Segou district).

In order to respond to the constraints related to women's nutrition and income, the theme entitled "Contribute to the improvement of the income of the women and the living conditions of the population of Kounè, by the production of tomato of wintering", have been selected.

In terms of results obtained, the student, the author of this report has proceeded to the equipment of 54 out of the 126 women of the village (42.85%), in small material market gardener (watering cans, shovels, hoes, sprays, magnifying glass, 30-meter tape measure, mosquito net) and agricultural inputs (seeds, mineral and organic fertilizers and phytosanitary products) and provided training on wintering tomato production techniques.

Thus, the production carried out on the perimeter of 2,500 m² of tomato, amounted to 6,250 tons, for a gross income of 1,722,415 F CFA.

To all this add the benefits of improving the nutritional quality of household because tomatoes are rich in vitamins A, C and E.

It should be noted that these women had never conducted previously, gardening activities.

The total cost of funding is: Eight Hundred Fifty Two Thousand Two Hundred Fifty Francs CFA (852,250 F CFA) of which 10% is, 85,225 F CFA for the personal contribution of the beneficiaries.
Example 2:

End of cycle report of a student in Boron (Boron rural district, Banamba district, Koulikoro region).

As a result of the village participatory diagnosis, posed by this student, the main constraint was the low sesame production inherent in the degeneration of plant material and the lack of training of producers in agricultural production techniques. The solution advocated by the village assembly focused on the following theme: "Improving the income of the population by increasing the production of sesame in the rural district of Boron".

In terms of the results obtained, the trainee focused on strengthening the capacities of sesame producers, the provision of seeds of high-yielding varieties, mineral and organic fertilizers, and the technical support required to improve practices.

Thus, the average yield achieved was 875 kg/ha with the variety VS42, against an average yield of 212.5 kg/ha with the rustic variety. The five (05) farms covered by the theme saw their yield increased from simple to more than triple.

The total cost of financing is: 858,000 F CFA, of which 85,800 F CFA, or 10% as contribution of the beneficiaries and an amount requested from: 772,200 F CFA.

3.2. Field of animal productions:

Example 1:

End of cycle internship report for a trainee in the village of Dagambé (N'Dodjiga commune, Youwarou cercle, Mopti region).

The major constraint resulting from the participatory village diagnosis, focused on the insufficient income-generating activities of women in Dagambé and as an alternative solution, the choice was oriented towards the project of cattle fattening, with the theme: "Improved income of members of the Waldekaldekawrali Association through training in cattle fattening techniques".

The activities that contributed to the realization of the project focused on the mobilization of financial resources, the training of 20 women of the Association "Waldekaldekawrali" in cattle fattening techniques (concept and advantages, fattening site selection criteria, types of fattening, criteria for choosing a feeding cow, measurement techniques, health and medical prophylaxis program, control of food ration), building sheds, animal health monitoring.

The overall cost of purchasing 20 oxen was 1,375,000 F CFA, an average price of CFAF 68,750/head and current maintenance costs were evaluated at CFAF 437,875. The finished products were sold to 3,360,000 F CFA, an average price of 168,000 F CFA/head. The 20 women realized for this purpose, a profit of 1,547,125 F CFA on the sale of stuffed oxen after 90 days.
Example 2:

*End of cycle report of a trainee at Dièn (rural commune of Guéniéka, Dioilacercle, Koulikororegion).*

Difficulties in the acquisition of cattle feed were mentioned by the women of the Jekafo de Dièn Association, in terms of the constraints inherent particularly in the breeding of small ruminants. The solution proposed to overcome this constraint was the production and sale of fodder cowpea, formulated under the theme "*Production and sale of fodder cowpeas in the village of Dien (as rural of Guenieka, circle of Dioila, region Koulikoro)*".

As part of the cowpea production activities, the trainee and the beneficiaries together reflected on how to mobilize the financial resources of the project. Then, the provisions for the realization of the project have been taken. These are: selection of the ten members (10) and their training in techniques of cowpea production and storage, choice of plots, purchase of inputs (seeds, fertilizer, phytosanitary treatment products).

Fodder cowpeas were grown on 2 ha 50, at a rate of 0 ha 25 per person. The cost of production is 285,000 F CFA. The total production was 2,200 tons, sold at a price of 200 CFA francs / kg, for a total amount of 440,000 CFA francs. The profit realized on the sale of the products amounted to 155,000 F CFA. Thus, every woman in the Association ended up with a net profit of 15,500 F CFA.

The overall cost of the project is: 285,000 F CFA, of which 14,250 F CFA, or 5% as contribution from the Association and a desired amount of 270,750 F CFA.

4. Conclusion:

In the light of the examples mentioned and highlighting the efforts made by the trainees to arouse the interest of producers in identifying, prioritizing constraints and arriving at the choice of a solution, it appears that the option, as taught at the Center, takes more account of the desires of the producers through the process of participatory diagnosis.

The results arrived at by producers and trainees, testify to the fact that the improvement of the living conditions in the village was achieved, and this helped in the establishment of a fruitful partnership between the actors (producers, trainees and other financial partners) and sustainability of actions.
Teaching at the service of small producers through the valorization of technologies and practices at University of Bobo Dioulasso

I. Introduction

Smallholder farmers could substantially improve their incomes by adding value to their products if the research faculty made new accessible and sustainable technologies available to them. It is in this perspective that SAFE universities partners have developed in recent years curriculum focused on the value chain. However, challenges were identified in the implementation of these programs on the basis of value chain approach.

First, there seems to be very little taught practical values, beyond what are already small farmers in order to increase the value of agricultural products and their derivatives from harvesting to marketing.

Second, animal production as it seems to be very little taught practical values, beyond what breeders and producers already do in order to improve the value of livestock and animal products. From this fact, students avoid topics on animal production when choosing subjects for their supervised business projects (SEPs). In general the number of SEPs on animal production is very low.

In view of all these considerations, it appears appropriate to make available to small producers of new technologies available for rural people to enable them to add more value to their harvest products marketing.

II. Some technologies taught in agricultural extension department at UPB.

Agricultural Production Technologies

1. Canned whole peeled tomatoes

To make whole peeled canned tomatoes, whole tomatoes must be peeled, a liquid medium (seasoned tomato puree or not or plain water) prepared and acidification.

2. Soybeans Processing Milk

   ➢ First day

   o Weigh the amount of grains necessary and sort the grains.
   o Soak the beans in water for 12-24 hours. Renewed water from time to time while washing the grains.
➢ Second day

- Rub grain with hand
- Wash the beans and make sure they are stripped of their testa.
- Grind the seeds (the "Moulinex") to obtain a paste.
- Boil the required quantity of water.
- Pour butter into boiling water still on the gas or on the hot plate and stir to make the homogeneous slurry.
- Wait until the mixture begins to boil.
- Boil gently for 20 minutes then turn off the heat.
- Filter by pressing the preparation obtained in a muslin fabric very clean (previously washed with soap and dried).
- The juice is soy milk.
- The residue obtained after the filtrate is okara, used in various food preparations.
- Sweeten milk depending on the desired taste.
- Allow to cool and consume.
- The resulting milk can be refrigerated 1-4 days without being altered

B) Animal Production Technology

1) The production of Fulani cheese

1.1. Filtration of milk

The collected milk must be immediately filtered into a plastic container previously sterilized with hot water and dried. For the filtration, use a plastic funnel with a filter cloth (muslin, percale, etc.) white and clean.

The filtered milk should be stored in plastic or aluminum containers pending their use.

1.2. Milk coagulation

➢ Coagulant Preparation

There are several traditional coagulation techniques (Calotropisprocera) generally used by producers. The most recommended technique is to wash the leaves or the stem, and then crush them in a mortar or grind them on a clean stone grinding wheel. The ground material is then mixed with a small amount of cool or warm milk. The resulting mixture is filtered with a sieve and then added to the milk on the fire. This method of extraction is easy and fast; it avoids the green color as the leaves give the cheese.

➢ Coagulant Incorporation

After heating milk at low heat for about ten minutes, the coagulant is added. The amount of Calotropisprocera used is determined by quantity and varies from 7 to 12g per kg of milk. The coagulation is carried out after 20 to 25 minutes with appearance surface of the cream as oily foam. At
this time, it activated by putting on fire to allow the curd formed and to cook until the whey is light yellow and transparent; coagulum tends to fall back on itself. It is divided into small pieces and floats whey.

1.3. Dewatering and shaping the coagulum

After coagulation, the curd formed is transferred to a ladle in sieves plastic or wicker, placed on small bowls for separating whey. The coagulum is shaped according to the desired mold type. The resulting cheese is a soft, humid (65-75% water) and fragile. It can be re-tempered in whey for a short shelf life.

1.4. Conservation and use of Fulani cheese

When the white cheese is not yet sold, it can be kept in whey (whey) where it keeps its moisture. One can perform a hot staining. At the consumer level, bought white cheese can be red heated with salt water and dried in the sun. After these treatments, the dried cheese can be stored for 45 days without significant change organoleptically.

1.5. Cooking and cheese coloring

These operations are to tint the cheese in red by using sorghum panicle (Sorghum vulgaris) or young leaves of teak (Tectonagrandis L.) to make it more attractive. This technique also allows for good preservation.

The staining technique

About 15g sorghum panicles previously washed are immersed in a liter of water in an aluminum pot heated on fire. White Cheese is soaked in the pot; Salt is added (10g / l) and potassium hydroxide (3-4g / l). All is cooked on a low heat for ten minutes at about 95 ° C. The color of the dye (red), leaves of Sorghum vulgaris, binds the cheese together. After coloring, the cheese is exposed to a colander to drip. Drained and dried in the open air, the cheeses are cooled, harden and lose up to 30% of their weight.

In the absence of sorghum panicles, shea bark is used for the same functions.

As for sorghum panicle, 55g of young teak leaves are crushed in a liter of water. And the same process is performed for the color.

White Cheeses packed in polyethylene black bags are cooked with these bags. The packaging gives cooking cheese firmness, consistency and resistance to crumbling when coloring and handling of the product.

1.6. Cheese Conservation White

For storage, the cheese is being exposed to the sun on the roofs of houses or smoky fire of wood or cut into pieces and fried in oil. However, this latter treatment causes rancidity earlier than others.

2) Salting and drying of the meat

The methods of salting meat are always made with fresh meat.
First removing defects in the meat by cutting scuffed areas colored or attacked by parasites or other pathogens. Then, detaching (the knife), the bones of the carcass, avoiding damaging the meat. Then we choose the good pieces to keep. For drying, for example, lean meat of a middle-aged animals is preferably selected. Large pieces are cut into smaller pieces, following the anatomical lines. Then the pieces of meat are cut into strips. For this, there are two methods: Either the meat is placed on a board or it is hung on a hook or a string. In both cases, the meat is cut according to the muscle fiber. The strips of the length may vary from 20 to 70 cm. The long strips require a shorter suspension period but may break during drying due to their weight. The drying time depends much on the thickness of the meat. All strips of the same batch should be the same thickness to obtain a uniform drying.

**Drying salted meat**

This method is used for meat that is dried again after salting.

We must have:

- Fresh raw meat cut into long pieces about 1 cm thick, weighing 1.5 to 2 kg.
- Salt: 30 35 kg of salt per 100 kg of meat.
- Boards or plates own perforated plastics.
- Big stones

**Method work**

1. Working in good conditions of hygiene; for example, washing hands well at every stage of work to avoid the risk of cross contamination.
2. Washing the meat cut in clean running water and to drain the slices in the shade for a moment.
3. Put the meat for 1 hour in a saturated saline solution (brine). Make this brine at least 360 grams of salt per liter of water. Well dissolve the salt before adding to the meat.
4. Suspend the meat above the brine so that it drips.
5. Rub the meat well with salt; must be a total of 30 35 kg of salt per 100 kg of meat.
6. Enlarge a thick layer of salt 1 to 2 cm on a board or a perforated plastic plate or, if possible, on a concrete or stone plate with diagonal grooves.
7. Place the meat on a bed of salt. Place this layer of meat a new thick layer of salt 1 to 2 cm. alternating a layer of meat and a layer of salt until 1 to 1.5 meter in height.
8. Cover the pile with a board or a plastic plate and lay over the large clean stones. The liquid that comes out of the meat must be able to flow.
9. Alternate the next layers by placing those above below and vice versa. Add salt. If after 2 days there is no more water coming out of the meat, the operation is complete. If this is not the case, continue to alternate layers of meat until all the water is out. The drying process can finally begin and can last for several weeks or months (3 months).
Background and rationale for the SAFE program in Benin

Benin has several centers and agricultural technical schools that train thousands of young people in various agricultural specialties such as: crop production, animal production, forestry, fishing, agricultural products processing, development and rural infrastructure. Once out of these training schools, they are recruited in their majority by the public service for the Ministry of Agriculture, Livestock and Fisheries (MAEP) or Non-Governmental Organizations (NGOs) to play the role of agricultural extension agent or advisor; role for which they were not prepared for their basic training.

Also, once in employment, these extension workers often do not have the chance to build their capacity and have a university degree. This then created a gap at the middle level between Rural Development engineers and Rural Development controllers.

Training in extension and advisory service started at the Faculty of Agricultural Sciences (FSA) of the University of Abomey in 2003 with the support of the Sasakawa Africa Fund for Extension Education (SAFE) meets these needs. It came out of the desire to professionalize the practice of agricultural advisory extension function by improving the response capacity of extension agents but also to allow agents to access a university degree for the improvement of administrative status and remuneration.

Achievements of the program in Benin

The SAFE program in Benin started in 2003 and so far trained hundreds of professionals (233 mid-careers - 51 women and 182 men) who are now in various spheres of the country's rural development sector. Their contributions to the professional development of agriculture by the quality of their interventions and actions by their association are recognized today by all stakeholders.

Compulsory class agricultural extension advice

The first promotions trained are one hundred sixty (160) alumni including thirty (30) women and one hundred and thirty (130) men. The low representation of women is due to their low numbers in the system but also by the constraints associated with full time training programme.

The SAFE program in Benin has trained graduates from general education colleges, rural development controllers directly from agricultural secondary schools and practitioners in search of qualification though initially, it was designed to receive mainly extension agents sent for training by the Ministry of Agriculture, Livestock and Fisheries (MAEP). Indeed the opening of the SAFE program Benin to mixed targets groups is justified by the fact that the APRM did not release extension staff for the program. Having been prohibited, the extension workers/staff cannot leave their workstation.

The training of these mixed groups with different level of experiences posed some difficulties that were overcome by organizing practical refresher courses regular students.
Distance course "follow up program" in Agricultural Extension

The desire created by the better competence, professionalism and on the job improvement of the beneficiaries of the SAFE program, serving in various structures, increased the clear desire of many people to attend the training but with some flexibility to them by way of having the possibility of combining training and employment. This target group consists mainly of men and women in employment that cannot spend three years in a row at the university led to the establishment of Vocational training Distance (ADF) diploma in agricultural extension and advisory services that can bring together periodically mid-career students. This experience was supported by the adoption at the Faculty of Agricultural Sciences (FSA) of the LMD system with training curricula specially developed for this purpose with review from year to year. The training is for four years with alternating consolidation phases on sites identified in advance and individual work (study of monographs with the supervision of pre-identified guardians).

So, for four years distance learning courses started and already had four promotions with a total of sixty-three (73) agricultural extension professionals out of which were twenty one (21) women and fifty-two (52) men.

Today over a thousand extension workers manifest the desire to benefit from the SAFE program to improve their professional situation. But they are hindered in this determination by the administrative authorization training requirements without which the degree will not be valued.

Program Impacts

➢ Integration into working life of the recipients of the program

In spite of the fact that unemployment rate is increasing in the country, it is good to note that the students who were not in employment prior to training in agricultural extension have successfully integrated into professional life. We find many of these graduates in the state structures of rural development, the technical bodies of industrial organizations, non-governmental organizations, research projects / programs of agricultural development. A study conducted on the first promotions showed that 100% of the graduates have successfully integrated into professional life (55% in the structures of the Ministry of Agriculture, Livestock and Fisheries and 45% in non-state structures).

➢ Well defined positioning frames after training

Once in service in villages as agricultural adviser, lowest position in the hierarchical structure of support to farmers, graduates of training in agricultural extension could climb to important leadership positions today. Their new status of graduates gave them license to gradually influence the design of the country's agricultural policy documents. Many of them occupy important positions (chief of training department, national trainer etc.) in the public system of support to producers. The two largest professional organizations in the country namely the National Platform of Agricultural Producers and Producers Organizations (PNOPPA) and the Platform of Actors of Civil Society in Benin (PASCiB) have appointed graduates of the programme as permanent secretary.

➢ SAFE Alumni: Beninese Association of Extension-Agricultural Council
To capitalize on the learning outcomes and lasting impact on the agricultural sector, the alumni (The Beninese Association for Professionals in-Extension Agricultural Council (ABPVCA)) was established in December 2009. It is an initiative of professionals and agricultural extension graduates of FSA and is strongly supported by SAFE program.

The association has over one hundred members based in all departments of Benin and is rapidly expanding its base. They combine their effort to conduct in-depth reflections on the evolution of agricultural extension service, help to provide the stakeholders of agriculture technology productive and quality information, help researchers exploit the results of their research and provide technical support for rural stakeholders.

The ABPVCA now brings its contribution at all levels of decision-making bodies related to agricultural policy in Benin through the positioning of these members and actions directly on the ground.

**Activities of the Association**

- Organizing workshops for exchange and reflection on extension and farm advisory whose results are published and distributed thousands of copies;
- Making available to farmers and agricultural advisors technical data documents on agricultural production. These data sheets elaborate and sometimes in local languages are distributed free of charge to compensate for the lack of reliable technical information for the players;
- Organizational capacity and management of cooperatives.
  - Through this program, several organizations (cooperatives vegetable and pineapple municipalities of Abomey, Zè, AlladaToffo, KpomassèAdjohoun, Dangbo and AdjaOuèrè) were supported for their compliance with the act OHADA uniform law relating to Cooperative Societies, facilitating access to the market through the creation of innovation platforms and establish development project.
- Participation in the implementation of the ease of access to agricultural inputs project for the production of healthy vegetables in Ouémé and Mono. Over hundred growers (change leader) were trained on the production of natural fertilizers and the use of aqueous extracts to produce healthy vegetables.
- Assembly training videos to accompany the actions of farm advisory service. These videos are for more twenty-five thousand agricultural workers engaged in the production of pineapple in Benin, but can also be used in all countries of the West African producing pineapple.

**Challenges**

The SAFE program in Benin faced some challenges which could only be resolved through the synergistic action of the actors of the program. These challenges include:

- the low participation of women in training;
- lecturers’ lack of training how to develop monographs according to selected template;
➢ the reluctance of lecturers due to lack of resources to finance the drafting of monographs (100,000 FCFA per monograph);

➢ the acquisition of didactic materials: computers, video projectors, various types of tables, etc.;

➢ the establishment of a reliable internet, regular and high speed: subscription, maintenance and access for learners in remote areas;

The Way forward

➢ Increase involvement of the Ministry of Agriculture, Livestock and Fisheries;

➢ Development the alumni Association activities;

➢ Intensification of awareness creation campaign on the program.

The current thinking for sustainability and a better development of the program are:

1. looking for additional funding,

2. partial or total funding of the participation of women (training grants);

3. youth empowerment as part of the course development to be developed into monographs;

4. production of monographs in downloadable digital form on computer (more protection / security).
Experience with the Mid-Career B. Sc in Agricultural Extension and Community Development at Usmanu Danfodiyo University, Sokoto,

By: Abubakar, B. Z., Ango, A. K. and Usman, T.

Introduction

In this paper, an attempt is made to briefly present the historical development of the mid-career Agricultural Extension Programme at Usmanu Danfodiyo University, Sokoto, Nigeria. Its current status and efforts made in line with the theme of this year, i.e “Aligning teaching to small holder farmers’ needs with special focus on value-enhancement technologies and practices.

Implementation of Value-Chain Oriented Curriculum

In line with the philosophy of the programme, the focus of the training was on producing qualified human resources that can contribute towards the agricultural development efforts in making the country self-sufficient and reliance in food through raising agricultural production and productivity, in tandem with the policy direction of the country i.e diversification of the economy through Value-Chain Oriented Agriculture.

The food increase policy emphasis on Value-Chain necessitated the strengthening of the existing curriculum to embrace aspects of agricultural Value-Chain analysis and management. To facilitate and fast-track this development, the curriculum was designed and developed through participatory process and involvement of different stakeholders. Similarly, a stakeholder meeting was held in Abuja, organized by the National University Commission (NUC) purposely to come up with a uniform and formidable Value-Chain oriented and all-encompassing and embracing curriculum.

Historical Development of the Mid-Career Agricultural Extension Programme at Usmanu Danfodiyo University Sokoto

Like in all other sister University in Nigeria and in the Country that provide training for mid-career agricultural extension professionals, the programme was initiated under an agreement between the SAFE, Federal Ministry of Agriculture and Rural Development (FMARD) and the Usmanu Danfodiyo University, Sokoto (UDUS) in the year 2014.

In the first year (2014/2015 session), 20 students were admitted and with only one female student among them, who is also being sponsored by SAFE. Similarly, in the second year (2015/2016 session), 27 students were admitted by the programme. In the current year (2016/2017 session), 18 students were admitted and with three female students among them. The admission into the programme is the same as in other sister universities but highly on competitive basis. Candidate who have a two years diploma (HND) and minimum of two years’ service in agriculture and related fields can apply to join the programme. The selection process is based on service year, grade point average (GPA) at diploma level and O’level requirements.
Challenges and Opportunities of the Programme

As in other Universities, there are some problems on the running of the mid-career programmes as follows:

Challenges

➢ Lack of finance to supervise students on SEPs project
➢ No budget allocation for the students to the action research i.e. results oriented SEPs project
➢ Less commitment and timely support by the employers of the SAFE students

Opportunities

➢ Award of contract for the construction of Supervise Enterprise Center by the University Management
➢ Holistic address of pending difficulties for enhanced efficiency of the programme. For example, online sale of admission form, registration issues, inclusion of SAFE-Supported degree programme courses on the University Website
➢ Proposed draft curriculum for B. Sc Degree programme organized by the National University Commission (NUC)

Supervise Enterprise Projects (SEPs)

The final year students are now undertaking their research in line with the objective of the programme i.e. Result oriented. For instance, the current SEPs topics presented by students who are now about to present their proposal are as follows:

<table>
<thead>
<tr>
<th>S/N</th>
<th>Name of Student</th>
<th>Admission Number</th>
<th>Project title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kabiru Namadi</td>
<td>1420609002</td>
<td>Introduction of Improved Okra (NHAE47-4) Variety as a means of Economic Enhancement among farmers in Bakura Local Government Area of Zamfara State</td>
</tr>
<tr>
<td>2</td>
<td>Rabiu shehu gwadabawa</td>
<td>1420609004</td>
<td>Production and Marketing of Fish Kilishi in Sokoto State</td>
</tr>
<tr>
<td>3</td>
<td>Tukur Umar Barmu</td>
<td>1420609007</td>
<td>Introduction of Modified Feeds and Housing of Local Chickens in Dalijan, Gwandu Local Government of Kebbi State</td>
</tr>
<tr>
<td>4</td>
<td>Lubabatu Muazu</td>
<td>1420609008</td>
<td>Introduction of Local Feed formulation among Women in Aliero Local Government Area, Kebbi State</td>
</tr>
<tr>
<td>5</td>
<td>Sanusi Aliyu</td>
<td>1420609011</td>
<td>Adaptation of Locally Available Materials for Gully Erosion in Wurno Local Government Area of Sokoto</td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Student ID</td>
<td>Project Title</td>
</tr>
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<tr>
<td>6</td>
<td>Aminu Bello Gwadabawa</td>
<td>1420609012</td>
<td>Production of Floating Fish Feed using Water Hythinch as a Floating agent in Dundaye Bakin Gulbi of Wamakko Local Government Area of Sokoto State</td>
</tr>
<tr>
<td>7</td>
<td>Muhammad lawal maidoki</td>
<td>1420609024</td>
<td>Value addition in Processing and Marketing of Rice among Women in Bakolori of Mafara Local Government, Zamfara State</td>
</tr>
<tr>
<td>8</td>
<td>Bala balarabe</td>
<td>1420609030</td>
<td>Introduction of Poultry (Broiler) Management for Socio-economic Improvement in Balle of Gudu Local Government, Sokoto State</td>
</tr>
<tr>
<td>9</td>
<td>Salihu Jibrin Imama</td>
<td>1420609033</td>
<td>Introduction of De Galmi Onion Variety to Minimize Storage Loss among Onion farmers in Wurno, Sokoto State</td>
</tr>
<tr>
<td>10</td>
<td>Muhammad Lihidda</td>
<td>1420609036</td>
<td>Handling and Application of Agricultural Chemicals among Farmers in Kagara Rima of Goronyo Local Government, Sokoto State</td>
</tr>
<tr>
<td>11</td>
<td>Abdullahi Umar</td>
<td>1420609038</td>
<td>Introduction of Improved Local Battery Cage among Poultry Producers Association in Talata- Mafara, Zamfara State</td>
</tr>
</tbody>
</table>
Steps Studies on Aligning Teaching to Smallholder Farmers’ Needs with Special Focus on Value-Enhancement Technologies and Practices in Abu Zaria Nigeria.

By Y. Dodo and M.O. Akinola, Department of Agricultural Economics and Rural Sociology, Institute for Agricultural Research/ Faculty of Agriculture Ahmadu Bello University Zaria, Nigeria

INTRODUCTION

The SEPs is a key component in the BSc. Agricultural extension programme of the Ahmadu Bello University (ABU), Zaria. It involves the use of participatory problem solving to enterprise development and management with stakeholders (beneficiary groups or individual farmers). It includes: Identification and assessment of problems of rural communities and farmers and providing solutions through the SEPs and facilitating linkages with input suppliers, market outlets, and other relevant organizations and agencies. The implementation of SEPs covers a wide spectrum of agricultural enterprises; with a multi-disciplinary curriculum from core courses in agricultural extension, animal science, agronomy (crop production and protection), soil science, agricultural economics and rural sociology and some shared courses in irrigation and drainage, post harvest loses and food technology. The curricula used for SEPs in the Ahmadu Bello University BSc Extension programme to meet the need of smallholder farmers with special focus on value chain enhancement technologies involve the training of students on how to apply the theoretical training obtained in the classroom to be able to organize and conduct practical enterprise projects with stakeholders.

Training towards Value-enhanced Needs

Training of students on planning of SEPs Report and proposal Writing is provided through AGEX 307. This course enables the student to understand the concepts of supervised enterprise projects, how to help the student in assessment of local problems of agricultural and rural development activities, participatory selection and assessment of projects areas. The projects selected are such that they are relevant to the students’ work environment as well as contributing to advancement of the rural economy.

During the training period the student is expected to embark on study excursion for problem identification and topic selection to enable him/her go about the SEPs together with their community. In order to achieve that a student is expected to have suitable identified problem topic that must address farmers felt needs. After selecting the topic, supervisors are assigned to the student from the specialized areas in the Faculty of Agriculture, Institute for Agricultural Research, National Animal Production Research institute and National Agricultural Extension Research and Liaison Service, all in collaboration with the Ahmadu Bello University, the host of the SAFE programme. The supervisors may be, two or more as the case may be depending on the topic and area of specialty of the study.

Value addition on Livestock products is embedded in ANSC 208 (Animal Production and Management). This course teaches the students on how to prepare for slaughter, evisceration and dressing of animal;
care of carcass and its cuts; processing and care of hides, skin and wool; processing and storage of meat; milk processing and its microbiology and milk hygiene; milk by-products (butter, cheese, and yoghurt); Preparation and storage of beef products; bacon, sausage and ham; food additives: flavors and aroma and marketing and distribution of animal products. The Department of Agricultural Engineering together with the Institute for Agricultural Research of the Ahmadu Bello University develops appropriate prototype post-harvest and agro processing equipments that will improve post harvest handling and processing of farmers crops in order to benefit fully from the gains brought about by improved production technologies. Value addition on crop products is also embedded in Post harvest and Food technology (AGRC 305): This course exposes the student on the major constituents of cereals, fruits and vegetables; Cereals, fruits and vegetables biochemistry and physiology; handling of fresh fruits and vegetables; canning operation; processing of cereals, fruit drinks, juice, jam and preservatives; tomato paste products and prickles; package and packaging of crop products.

Shea Butter Processing

The processing of Shea butter oil in Nigeria involves traditional approach.

- Oils removed from the nut through wet extraction procedure. The application of mechanical devices such as hydraulic or screw press for removal of oil is rarely carried out. The outer pulp of the berries, the Shea fruit is eaten at harvest time or parboiled to remove the pulp.

- The nut is removed by pounding and later roasted in a large frying pot. The fried nuts are later pounded and ground in wooden mortars to a paste or milled using an attrition mill. The milled Sheanut is now thoroughly stirred or mixed with water vigorously to break the emulsion and separate the fat. By cooking the mixed paste the oil floats to the surface and is then decanted.

Traditional mixing takes place in a large pot, strong enough to withstand the applied force through trampling that causes mixing or stirring of the milled Sheanut. According to Olaoye (1994), mixing of milled Sheanut with water causes the colour of the milled Sheanut to change from brownish to grayish colour and the resulting dilution enhances easy separation of oil and precipitation of the impurity and fibres during cooking. There are mechanical devices for drying and size reduction operations, but mixing of milled Sheanut is yet to be mechanized.

The steps in the Nigeria traditional Shea butter processing are:

- Gathering of Shea fruits from wild by women and children.
- De-pulping involving the removal of the fleshy pericarp.
- Boiling for 4 hours in cast aluminum or clay pots to terminate the germination process.
- Sun drying after boiling of the nuts for 5 10 days to reduce the moisture content 5 and easy shelling
- De-husking and winnowing.
- Sun drying to reduce moisture.
Roasting to dehydrate the nuts for release of butter.
Crushing of roasted nuts with mortar and pestle or grinding stone usually with mortar and pestle or grinding stone.
Milling of nuts into a fine paste.
Kneading to break up oil cells for easy butter extraction.
Mixing and churning with cold water to obtain floating grey mass.
Boiling to separate the oil from other impurities in the scooped floating grey mass.

Decanting: the oil is left to float overnight so as to ensure proper separation of the oil from the residue. Olaoye (1994) found that the quantity of oil obtained through the traditional method is low, the procedure is time consuming and the mixing operation is a difficult task. Mainly, women carry out the processing of Shea butter with the assistance of children. Attempt at mechanizing the arduous mixing operation will ensure improvement in the oil recovery rate and make oil extraction more attractive.

The local method of extraction of Shea butter oil is time consuming and labour intensive only to extract the oil without further processing. Material handling during processing procedure was identified as the major cause of poor oil quality; while poor oil recovery is due to poor clarification techniques. Another value addition to the production of the butter is the production of the body cream.

Apart from Shea butter which is the principal ingredient of this cream, other materials needed for this production include; coconut oil, olive oil, fragrance, filtered water, other essentials. Others are: Industrial Stirrer (Stainless Steel), Portable stirrer for Lab, Hot plate, Bucket, Gloves and Packaging containers.

**Popcorn of Corn**

Popcorn is one of the varieties of maize which is cultivated mainly for its commercial purpose. The market value of popcorn is more than that of other maize varieties. However, after spending huge amount of money on production, the farmer is faced with no option than selling it at a give-away price. Products obtained after popping of popcorn are high in demand, usually consumed as snack by students, shared in festive ceremonies and a source of income generation. Sakadadi is a community around the University that produces popcorn in large quantity, but is not connected to rural electricity which results to the use of generators and cooking gas which increases the average cost of production. The introduction of the use of manual popcorn fabricated by the Institute for Agricultural Research (IAR), farmers are now engaging in popping their popcorn for more income generation. Inputs needed for popping of popcorn include Popping machine, Sealing Machine, Polythene bags, flavor, butter and oil.

**Training on Techniques of Milk Processing and Packaging for Income Generation among Pastoralist Women**

In Nigeria, Yoghurt is a fermented milk product, consumed as thirst quenching beverage as well as complete meal when mixed with mashed ‘Fura’ (corn/millet balls) or with cornflakes. Dairy cooperative
society has been perceived as a small insignificant venture however, if harnessed to modern method of processing; it can play a very significant role in the overall development of a community.

The problem of low return in the traditional method of processing and marketing of milk products necessitates the development of technologies that could give high returns. Milk is produce in almost all production system of Nigeria but only a minor portion of milk enters the commercial sector owing to the marketing constraints and processing techniques suitable for small holder dairying and mostly consumed at home either fresh or fermented. These problems make it difficult for local production to meet up with demand. Output of milk from the national herd for the period between 2001 and 2003 was 515,291; 535,911 and 557,347 thousand litters; this by far is below the nutritional requirements of Nigerians (Yahuza, 2001). It is difficult to estimate level of consumption of dairy products especially in the rural areas where proper records are not kept or market channels are not followed. The project addressed the problem of traditional method of processing which generally give low yields to final product per unit of milk. The problem of ailing economic condition of the community could be revitalized through the use of improved processing techniques and marketing.

The group was trained on modern milk processing techniques as follows:

**Standardization**: Trained farmers on the use of filter cloth to remove sediments and reduce microbial load and also use of ladle to scoop out floating cream in the milk.

**Pasteurization**: Pastoralist were trained on how to heat milk and sugar in a covered pot 75°C without allowing the milk to boil, Immerse heated milk in a tank of cold water to rapidly cool the milk, Check the temperature of milk, by dropping few drops at the back of the palm. When the milk does not hurt on the hands, then it could be adjudged to be at correct temperature that is about 45°C.

**Inoculation**: This is the mixing and proper stirring of pasteurized milk with yoghurt obtained from a reliable source or the mixing of milk with culture which contains *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. Inoculums should not be more then 2%.

**Incubation**: The aim is to sterilize the warmer or basin to be used for milk preservation before transferring the inoculated at temperature of 45°C.

**Packaging**: Farmers were trained on how to hygienically package *fura* (paste) with milk using sterile containers and sealing machines ready for market.

**References**


Value – Enhancing Technologies and Practices among Beekeepers, Small Ruminant, Onion and Potato Farmers in SAFE Programme at Adamawa State University, Mubi, Nigeria

By: Umar Adamu Madu, Ph.D. & Andrew Oziel Donye, Ph.D; Department of Agricultural Economics and Extension, Adamawa State University, Mubi, Nigeria

Introduction

Adamawa State University (ADSU) is located in the North Eastern part of Nigeria, West Africa. The establishment of SAFE Programme in the University was conceived in 2010 when a Memorandum of Understanding (MoU) was signed between Adamawa State Government and SAFE. However, it could not take-off fully until 2012. SAFE was established in ADSU to serve the entire North East sub-region. The Programme has so far graduated first and second sets of its students and is about to see the graduation of the third set.

Having realized the tremendous benefits of value addition in agriculture, SAFE has in recent times emphasized the need for value-chain oriented curricula to help smallholder farmers achieve full benefit (value) of their activities. The overall importance of value enhancing technologies cannot be overemphasized. It can reduce wastage, enhance food security, improve livelihoods for low-income groups and empower farmers (Madu, 2013). It is particularly important as it has the potentials to increase the market value of produce which in turn translate into higher price and subsequently higher income.

How Farmers Benefits from Value Enhancing Technologies and Practices in ADSU

SAFE Programme in Adamawa State University, operates differently from other participating institutions, as four options, namely crop production, animal production, postharvest and irrigation agronomy are offered. This is necessitated by needs assessment conducted across the region. This means that those options were suggested as priority areas by stakeholders and farmers in the North East region of Nigeria.

Students admitted into those options partake in SEPs, which is the backbone of the SAFE programme. SEPs are carried out to address the immediate problems of the farmers in their various communities and in this way, various technologies are transferred to farmers, including value enhancing technologies and practices.

The University has established Technology Village, in which four technologies (fishery, beekeeping, vegetables & tree crop) are taught to students and the farmers surrounding communities. The technology village has consistently remained as one of the sources of technology transfer to the farmer in the area.
SAFE Studio in ADSU, has also been playing a significant role in reaching out to the farmers. The studio has been one of the media for interactions with the smallholder farmers. During such interactions, myriads of information and practices are acquired by the farmers.

Some Examples of Value Enhancing Technologies Taught the Smallholder Farmers.

1. Harvesting and Processing of honey

When harvesting honey from the top-bar hives, first remove the bars and brush off the bees. Cut the comb into almost equal half, then cut the comb first from one side of the bar to the middle, turn the other upside down, and cut the remaining half. Leave about 1cm of the comb on the top bar to guide further comb building.

Harvesting is best done around 6.00 pm in the evening to avoid nuisance. Do not harvest all combs, leave some for the bees to utilize during rest or scarcity period. Apply smoke moderately, as too much will taint the honey making it to loss value.

Honey Processing (Pressing method) Using Presser or by Kneading

➢ After harvesting and sorting, Combs are broken into small pieces and packed into the presser
➢ Run the threading to press out the honey
➢ Alternatively tie the broken combs in clean cheese cloth to press out the honey

Rendering Beeswax

Rendering is the process by which wax from comb is converted into blocks of clean beeswax by melting. Use only wax from capping or light colored new combs which are as clean as possible. Old dark combs should be separated because it will taint the wax and has low quality. Melt the wax and strain through fine mesh and allow it to cool in another container of convenient shape and size to form block. Old combs normally form dross at the bottom of wax blocks, scrap the dross and re-melt again to obtain clean clear wax.

Do not heat beeswax over an open flame, as it may cause fire outbreak. Containers used for beeswax processing should be of stainless steel, alluminium, galvanized or tinned iron to avoid discolouring of processed wax.

2. Use of Mahogany Seed Oil (Khaya senegalensis) as a Dewormer in Small Ruminants

First of all, collect dry seeds of mahogany (Khaya senegalensis) from where available. Remove the seeds from the pods and roast in wide sauce pan. Pound the roasted seeds into a paste and mix with cold water and heat to the temperature of between 60 – 70°C until pure oil floats on the surface of the water, then allow it to stand for three (3) hours. Sieve the mixture using cheese cloth to obtain the
filtrate which is brown in liquid extract, heat the filtrate again, until it evaporates completely leaving pure oil, then collect the oil and keep at room temperature until use.

Administer the oil at the dosage of 10 to 25ml depending on the weight of the animal (1 mg/kg of body weight). After four weeks, observe the animal for possible changes. The will help upgrade the animals by adding weight and subsequently increased market value.


Construct a ventilated structure using local materials like woods and grasses, and the floor of the structure cemented to avoid dampness. In the structure, a platform stack of tiers of 2” x 2” x 12ft woods be constructed leaving a gap of 3 cm in between the woods to create bottom ventilation to the stored product. A platform stack tiers should measure 0.62m width and the length and height measure 5.49m and 5m, respectively. Create a central walking alley of 1.7m width and the space between the structure and the platform stacks of 0.62m width to allow for easy inspection.

After curing, sort out the onion bulbs to remove damaged ones and then arrange and spread evenly on the platform. Inspect regularly to sort out the spoiled bulbs. The storage of the onion bulbs using this technology, can last for three to four months after harvest.

4. Processing of Sweet – Potato into Bread and Noodles

Processing of Sweet – Potato into Bread
Wash fresh sweet-potato with water and slice into chips of about 3 – 6 mm size and allow to sun dry for about six to eight hours (6 – 8 hrs.) to ensure high quality chips. During drying, cover with netting material to keep away flies. Grind into flour using a hammer mill machine. After sieving the flour twice,
add butter, milk, yeast, salt and water in mixing bowl and mix to stiff dough. Place the dough on the table and knead for 10 minutes, then place in the baking container which is lightly buttered. Cover with polythene bag until the dough knock back and shape, and leave to double in size. Heat the dough in local oven for 45 minutes to fully and properly bake. The baked bread is then package in polythene bags, ready for marketing.

**Potato Bread**

**Processing of Sweet potato into noodles**

Sweet-potato tubers are washed with water and then milled using a milling machine to provide a fine shred. The grounded raw sweet-potatoes are then placed into a cheese cloth and squeeze properly until the starch content is completely extracted from the pulp. The liquid is then allowed to cool for 3 hours so that the starch can settle to the bottom of the container. This is done to slow down the activities of bacteria. Add more clean water to the starch to rinse it, allow for another one hour to settle at the bottom of the container again, after which the water is removed completely leaving only the starch.

Add hot water to the starch content and passed through a locally made perforated bottom container, then into another bowl with cool water which then solidifies into noodles. This is later hanged on a clean rope to dry properly. After 4 hours, the noodles are ready for packaging.

**Potato Noodles**
INTRODUCTION

In recent time, ensuring food security to meet the need of the world growing population whilst ensuring long-term sustainable development remains a major global challenge. According to the FAO, food production will need to grow by 70% in order to feed the world population which will reach 9 billion by 2050. Certain factors like climate change, poor rural infrastructure, increasing urban population and massive depletion of natural habitat at the expense of modern infrastructural facilities in urban areas put a huge pressure on the limiting ecological resources and biodiversity, loss of fertile land and depletion of the ecosystem. The direct effect is a drastic shortfall in food production. Consequently, there is a need for an integrated and innovative approach to the global effort of ensuring sustainable food production and consumption (Nellemann et al., 2009).

In spite of the fact that the number of food insecure population remains unacceptably high (FAO, 2010; FAO, 2012), globally, massive quantities of food are lost due to spoilage and disease infestations annually. (FAO, 2011; Stuart, 2009; FAO, 2002). In some African, Caribbean and Pacific ACP countries, food wastage can be as high as 40-50% due to poor weather, and poorly developed infrastructure (SPORE, 2011). It is therefore evident that one of the major ways of strengthening food security is by reducing these losses. The term “postharvest loss” - PHL refers to measurable quantitative and qualitative food loss in the postharvest system which comprises interconnected activities from the time of harvest through crop processing, marketing and food preparation, to the final decision by the consumer to eat or discard the food.

Postharvest loss can be defined as the degradation in both quantity and quality of food production from harvest to consumption. Quality losses include those that affect the nutrient/caloric composition, the acceptability, and the edibility of a given product. Quantity losses refer to those that result in the loss of the amount of a product. These losses are more common in developing countries (Kader, 2002; Kitinoja et.al., 2010). Worldwide, there is an increasing interest in effective intervention for Post-Harvest Losses (PHL) reduction. Postharvest handling has been recognized as one of the important areas requiring attention in order to realize agriculture’s full potential to meet the world’s increasing food needs, combat hunger, raise income and improve livelihoods. Improving productivity on existing farmland coupled with reducing PHL is critical to facing the challenge of feeding an increased world population. It is therefore evident that PHL reduction through value enhancement are integral components of
strategies to improve agricultural productivity and linkages between farmers and markets which will help contribute to food security and economic development of the world’s teeming population.

The most challenging issue faced by small holder farmers is appropriate technologies that add value to their produce. These in turn facilitates the market value and access of their products by consumers. However, the perishable nature of most agricultural food crops, the lack of capacity to enhance technologies caused by low income and poor knowledge on value enhancement technological use by small farmers are some of the impeding factors. Value enhancement technologies are paramount to add value to agricultural products, increase its shelf life and improve its accessibility to a wider population. This constitutes a multidimensional scientific approach applied to agricultural commodities after harvest with the intention of improving preservation, conservation, quality control/enhancement, processing, packaging, storage, distribution and marketing to meet the food and nutritional requirements of consumers. Value enhancement technology stimulates agricultural production, prevents post-harvest losses, and adds value to agricultural products thereby opening new marketing opportunities and generating job opportunities while stimulating growth of other related economic sectors. Over the years, agricultural research and development organizations have made significant progress on increasing agricultural productivity and promoting sustainable intensification of major food crops and livestock for small-scale farmers. Growing evidence and experience indicates that sustaining success in productivity-based agricultural growth critically depends on expansion of market opportunities (Diao and Hezel 2004; Gabre-Madhin and Haggblade, 2004) and requires thinking beyond productivity to incorporate profitability and competitiveness. Although, enhancing the ability of smallholder, resource-poor farmers to access market opportunities, and diversifying their links with markets is one of the most pressing development challenges facing both governments and nongovernmental organizations (IFPRI, 2002; Kindness and Gordon, 2002), we have tried to address this challenge through some of our previous and present activities which will be discussed in this write up.

Firstly, we conduct various appraisals in order to know the challenges faced by the farmers and device the best approach to solve those challenges. Through research, we identify practices that can improve and enhance the productivity of small holder farmers. These practices are then developed into technologies that will be transferred to the farmers gradually using the various approaches as highlighted below:

**One on one personal contact/teaching:** this is done to address peculiar challenges faced by individual farmer which may not be a general or common issue among the farmers.

**The use of group dynamic:** in which case, farmers are formed into groups along the value chain. Subsequently, trainings are organized to transfer technologies and also address challenges of the farmers on group basis.

**Demonstration** has also been used to teach and transfer useful technologies to small holder farmers. In this case, the technology to be transferred is demonstrated to farmers during meetings or community gatherings.

**Technology review meetings:** Monthly and forth night training meetings are conducted to further address farmers needs and devise appropriate measures to solve their problems.
Establishment of farmers’ schools: this has also been very helpful in meeting the training needs of resource poor farmers.

VALUE ENHANCEMENT OF SWEET POTATOES

There is a great potential for sweet potato production in Nigeria because it can be grown all year round both under rain fed and irrigation systems. Over the last decade, its production has spread to nearly all ecological zones in Nigeria (Tewe et al., 2001). Globally, Nigeria is the third largest producer with an average annual production of 3.45 million metric ton (FAO, 2013). This can open up a good source of foreign exchange especially to countries where its production is not possible during the winter periods. However, the highly perishable nature of sweet potato due to its susceptibility to pest and disease attack may be a major challenge. There are high PHL of about 60% which occur at farm level due to weevil infestation, rotting, thin delicate skin, respiratory losses and sprouting (Jenkins, 1982). According to Ray and Ravi (2007), PHL vary between 15 and 65% if sweet potatoes are stored for a period of one to four months. Other losses occur during transportation and storage which vary between 20-25%. During peak harvest periods, (October - November), prices drop to as low as 1,500 naira per 50kg bag but can hike to as high as 4,000 naira during scarcity (January-June). The low prices discourage farmers from harvesting and selling their crop, thus causing heavy losses. These losses could be reduced if farmers had appropriate processing and storage technologies. Research has shown a number of ways to prevent and reduce these losses and also improve the market value of sweet potatoes through processing into storable products and value addition.

In the course of our interaction with potato farmers, the following post harvest technologies have been passed to them and they are being practiced by the farmers.

1. Storage of fresh potatoes inside the soil: Farmers have been taught how to store matured potato tubers in the soil by ensuring that cracks in the soil around the tubers are closed up while the soil is still moist. This is to ensure that the tubers are prevented from direct light which causes the tuber to turn green. Greenish discolouration of tuber is as a result of formation of toxins and when such tubers are consumed, they cause serious gastro intestinal illness.

Another method of fresh potato storage is to harvest the tubers. The harvesting requires very careful handling so as to prevent damage. Harvesting is best done when the soil is slightly moist to prevent abrasion and the tubers lifted carefully to avoid damage. Ideally they should be left to dry for few hours in the field after which they are placed in a cool, shady place. Tubers to be stored need to be sorted. Potatoes showing greening, any decay or damage should be rejected for storage. As with other root crops, potatoes to be stored need to be cured to repair any skin injuries and to promote the formation of a stronger epidermis to enhance wound healing which reduces water loss and disease incidence, sets the skin which reduces skinning and increases sweetness which enhances culinary characteristics. The optimum conditions for curing potatoes are temperature of 30-32°C, relative humidity of 85-90% for duration of 5-10 days. Afterwards, the cured potatoes are stored at an optimum temperature of 13°C and relative humidity of 85-90%. Potatoes preserved this way can store for 4-6 months provided all the
conditions are carefully followed. Stores can be constructed using locally available materials like mud blocks, bamboo or wood poles, wooden shutters and other locally available carpentry items.

2. **Production of dehydrated potato chips:** Just like the production of dried chips or flakes from other tubers like yam and cassava, farmers have been taught how to process sweet potatoes into flakes by natural drying. Although, unlike cassava and yam, discolouring may occur in sweet potato due to enzymatic darkening, after cooking darkening or browning during drying and storage. Enzymatic darkening is caused by the oxidation of phenolic compounds resulting in a brown to blue-black discoloration which affects the quality and appearance of the final product. Immediately after slicing, immersing the chips in salty water helps to slow down the enzymatic reaction. When the freshly cut chips have to be kept for prolonged period a preferred treatment is dipping for five minutes in a 0.1-0.2% sodium bisulphite solution, or 10 minutes in a 0.5% sodium metabisulphite solution. When drying the sliced potatoes, it is important to keep the drying temperature as low as possible. Drying normally takes one to two days.

3. **Production of sweet potato flour:** The production of sweet potato flour by milling and sieving well dried potato chips is another value enhancement practice that we have passed to small holder farmers. This can then be packed in attractive packages that are moisture and air tight to prevent spoilage and for further supplies and or sale in the market.

4. **The inclusion of sweet potato (puree) into wheat flour for making confectionaries:** We have also taught farmers how to use sweet potato flour for baking on its own or as a supplement to cereal flour, as well as a stabilizer for ice-cream. The two varieties introduced to small holder farmers are the King J variety and Mothers delight.

5. **Introduction of orange flesh potatoes:** This has been found very helpful in the management of hypertension and diabetes.

**VALUE ENHANCEMENT TECHNOLOGIES IN RICE HARVESTING AND POST HARVEST**

1. The introduction of mechanical thresher and destoner instead of manual threshing with rods which makes the rice to mix with stone. This makes threshing faster, less laborious and the quality of the product is improved.
2. Another alternative if mechanical thresher is not available is the practice of laying trampoline on the floor, and then placing a drum at the center to form a platform on which the rice panicle would be beaten by rods. This has been found helpful in preventing the rice from mixing with debris.
3. During harvesting, rice farmers were encouraged to use the system of cutting from the base of the panicle and keep in sacks or bags as they cut after which the harvested crop is transferred to where it would be kept prior threshing. This method prevents stones and other debris from mixing with the harvested rice.
4. Farmers were taught the practice of accomplishing parboiling and drying of rice within a day. This could be achieved by commencing parboiling very early in the morning so that the parboiled rice would have the opportunity to dry properly before the sun goes down. This method has been found effective
in preventing moulds from growing on the processed rice thereby resulting in blackening of the rice seeds.

VALUE ENHANCEMENT PRACTICES IN GOAT AND SHEEP PRODUCTION

1. Treatment of skin disease: Farmers were introduced to the use of Alvomech for the treatment of skin disease in goat and sheep. An alternative of using local concoction made up of 7 part salt, 1 part black soap and 2 parts potash. The concoction is used to bathe the animal for a week and it has been found to effectively cure the skin disease and this has been found to improve the marketability of the animals.

2. Upgrading of the local variety: Exotic varieties of sheep were acquired and distributed to farmers so that they could cross with the local breed. This has resulted in the production of offspring with improved traits such as height, colour and carcass weight.

3. Improved nutrition: Farmers have been taught how to prepare silage and hay which would be used to feed the animals rather than allow them to live exclusively on grazing or unbalanced diet.

VALUE ENHANCEMENT TECHNOLOGY IN FISH PROCESSING

1. Introduction of smoking chokor for fish processing.
2. The use of locally fabricated ovens for roasting fish instead of using firewood and drum which makes the fish burnt and black in colour. Roasting in oven produces fishes with very low moisture content which gives it a longer shelf life while the golden colour is maintained. Also, it has a better aroma compared to the firewood roasted fishes.
3. Another technology taught to farmers was the process of degutting fishes before roasting. This is done in order to prevent bitter taste as a result of contamination by the gut content. Also, the growth of mould is prevented when fishes are degutted.
4. Packaging: Farmers have been taught various methods of packaging roasted fishes in attractive packages to improve the face value of the product.

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17. Bayero University, Nigeria

Teaching and Research in Crops and Livestock Value Enhancement Technologies and Practices: The Case of Bayero University, Kano, Nigeria

By: Aminu A and A.B. Muhammad, Department of Agricultural Economics and Extensio, Faculty of Agriculture

1.1 Background

The Faculty of Agriculture Bayero University, Kano-Nigeria was established in the year 2002 and currently has the following units;

➢ 8 academic departments (Fisheries and Aquaculture, Forestry and Agro Forestry, Food Science and Technology, Agronomy, Soil Science, Agric Econs and Ext, Animal Science and Crop Protection)
➢ A Centre for Dry Land Agriculture (One of the World Bank Funded African Centre of Excellence)
➢ 4 undergraduate program including the SAFE program
➢ 5 of the departments are running various PG programs( M.Sc and Ph.D) and also host the PGD, M.Sc and Ph.D Programs in Dry Land Agriculture funded by the CDA-BUK

1.2 Overall teaching and research Strategies

➢ Teaching and research are aligned with local and global development goals and contexts.
➢ Priority Value chains of the APP(Extension of ATA) as the main focus
➢ Value chain approach as a common approach used in teaching and research
➢ Participatory problem identifications/definitions for research and teaching programming (using adopted Village, N2-Africa, etc)

1.3 Overview of the Main Undergraduate Programs in the Faculty

Bachlor Agriculture Programme

➢ The Bachlor Agriculture program is research and development oriented
➢ The use of conventional and ICT based teaching methodologies
➢ Focus mainly on priority value chains and technologies in line with the national agriculture policy
➢ Research approach is conventional academic research (exploratory in nature)
➢ But, oriented to solve the problems faced by smallholder farmers
B.Sc Agricultural Extension (SAFE Program)

➢ The SAFE curriculum is practical oriented and demand driven.
➢ Use of participatory and experiential learning methods
➢ The use of value chain approach in teaching and especially in the choice of SEPS
➢ Participatory and technologies diffusion oriented research (SEPs) to solve problems of smallholder farmers

2.0 The main menu of Teaching and Research

2.1 Crops Technologies taught

Production level technologies such as;

➢ Yield enhancement technologies (use of inputs, spacing, Seed quality improvement etc)
➢ Soil fertility improvement technologies
➢ Nutrient management practices (Improve fertilizer use efficiency and reduce nutrient waste) etc
➢ Processing technologies

Harvest and Post-harvest Practices/technology;

➢ Food safety practices especially for the small-holders farmers
➢ Improved harvesting and Threshing technologies/practices
➢ Preservation and Storage technologies/practices
➢ Improved processing techniques

Socio-economic practices

➢ Financial and policy contexts for improving crop productivity and post-harvest
➢ Value chain and Market Analysis
➢ Value chain and climate-resilient agribusiness investment
➢ Food Security and Nutrition assessments

2.1.1 Rice Post-harvest and processing Technologies and practices Taught

Specific rice post-harvest/processing Technologies

➢ Mechanical Vs Manual harvesting and Threshing methods
➢ Improved parboiling methods and processes
➢ Improved packaging methods

Activities
➢ Establishment of modern rice processing unit for practical and commercial purpose
➢ SEPs in areas of rice post-harvest and processing conducted in various communities to test and transfer rice post-harvest and processing technologies
➢ Various under-graduate and post-graduate studies on rice post-harvest and processing.
➢ Dissemination of rice post-harvest technologies to rice farmers through the WAPP adopted village model

2.2 Livestock technologies taught

Production level technologies and practices
➢ Improved Milk and carcass Yield especially in Cattle, poultry and Small ruminants
➢ Using locally available materials to improve feeds quality

Post-harvest practices/technologies
➢ Improved post-harvest and processing efficiencies and options
➢ Improved processing and storage efficiency for Safety, Quality and standards of livestock products

Socio-economic aspects of livestock
➢ Value chain and market analysis of livestock products
➢ Profitability and productivity analysis of livestock and related enterprises
➢ Socio-economic assessments of hazards and vulnerabilities in livestock (effects of AI, and others shocks)

2.2.1 Specific Livestock Technologies Taught

Specific Dairy production/processing Technologies
➢ Improved milk production technologies
➢ Milk processing and preservation technologies (Yoghurt, Cheese etc)
➢ Pasture establishment and management

Activities
➢ SEPs in areas of rice post-harvest and processing conducted in various communities to test and transfer the technologies to farmers
➢ Various undergraduate and post graduate studies in dairy production, post-harvest and processing technologies

➢ Dissemination of dairy technologies to farmers through the WAPP adopted village model

3.0 Major Partners of the Faculty in its Teaching and Research activities

➢ Agricultural Research Institutions (NARIS)

➢ Agricultural Research Council of Nigeria (ARCN)

➢ Other Universities

➢ Federal Ministry of Agriculture and Rural Development (FMARD)

➢ World Bank Funded Projects such as FADAMAIII, CADP, IFAD-CASP

➢ CILSS/ARYMENT

➢ State Agricultural Development Projects (ADPs)

➢ NIPPON Foundation/SAFE

➢ AGRA

➢ NGOs and INGOs

➢ World Bank ,

➢ Marc Author Foundation and other Donors

➢ Farmers and other value actors

➢ Local communities

4.0 Conclusion

Research and teaching of the Faculty is oriented towards technologies and practices that are consistent with smallholders needs in the various areas of agriculture including post-harvest and processing technologies of priority crops and livestock. There is however little investment in terms of acquiring the necessary prototype for effective teaching and research.
Experiences with teaching value-enhancement technologies and practices for small holder farmers: A case of mid-career Extension program at Sokoine University of Agriculture, Tanzania

By: Suzan Nchimbi – Msolla and Catherine, P. Msuya

Introduction

Extension system has a great role to play in improving the agricultural sector in Tanzania. A number of efforts have been taken by the government in order to improve the performance of extension system. This include establishment of training institutions like Sokoine University of Agriculture (SUA), which is the only agricultural university in the country. Among others the university is mandated to impart knowledge, skills and attitudes to extension staff with diploma qualifications. To achieve this government through its Ministry of Agriculture Livestock and fisheries formally known as the Ministry of Agriculture and Cooperatives (MAC) directed SUA through the department of Agricultural Extension and Community Development (DAECD) to develop an in-service BSc. Programme for mid-career extension professionals, the then BSc. Agricultural Education and Extension. The program was launched in 1998 and in 2011 it was reviewed and implemented as Bachelor of Science in Applied Agricultural extension.

Students enrolled and graduated from the programme

Since its inception in 1998, the programme has been attracting both male and female students and a number of them have been enrolled and graduated from the programme as summarized in Table 1.

Table 1: Number of students enrolled and graduated from the programme by sex

<table>
<thead>
<tr>
<th>Batch Number</th>
<th>Intake</th>
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<td>7</td>
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<td>3</td>
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<td>2003</td>
<td>36</td>
<td>6</td>
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<tr>
<td>4</td>
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<td>2013/14</td>
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<tr>
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<td></td>
<td></td>
<td>662</td>
<td>218</td>
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According to Table 1 a total of 882 students graduated from the program and among them 662 (75%) were males and the rest 220 (25%) were females. Among others the graduates serve as extension officers, administrators and policy makers at ward, district, regional and national levels. A number of female extension staff graduating from the programme supports the government mission of training female extension staff expected to serve the community including female farmers who are highly involved in agricultural production and agricultural products value addition but in most cases face multiple constraints beyond those of men farmers. These include invisible to policy makers, deprived of access to markets, key assets, and inputs, and are frequently excluded from decision-making. Also women are even disproportionately impacted by poverty and hunger - including having less access to education and health care facilities. Therefore female graduates from the programme, among others are expected to solve these challenges.

The programme continue to attract students including females and the current students who are enrolled in the programme (first to third year students) are 185 and among them 125 (67.6%) are males and 60 (48%) are females as shown in Table 2.

Table 2 Current number of students enrolled in the mid - career program

<table>
<thead>
<tr>
<th>SN</th>
<th>Academic year</th>
<th>Intake by sex</th>
<th>Total</th>
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<td>2015/2014</td>
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<td>42</td>
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<tr>
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<td>Total</td>
<td>125</td>
<td>60</td>
<td>185</td>
</tr>
</tbody>
</table>

Staffing Position in the Department of Agricultural Extension and Community development

The Department has a total of twenty-two (22) academic members of staff ranging from professors to assistant lecturers as indicated in Table 3.

Table 3: Current Staffing positions and their status

<table>
<thead>
<tr>
<th>Category</th>
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<th>F</th>
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<th>Status</th>
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<td>Professors</td>
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<tr>
<td>Associate professors</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>Available</td>
</tr>
<tr>
<td>Senior lecturers</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>Available</td>
</tr>
</tbody>
</table>
Among these 13 have doctor of Philosophy (PhD), eight staff are on PhD study leave and one is on station with Master qualification. The staff members teach various courses in undergraduate and postgraduate curricula within the department and across the university. They are also involved in supervision of students’ research. In addition are engaged in doing research, outreach activities, offer extension as well as consultancy services to farmers and other community members.

**Curriculum for Mid carrier Programme**

The curriculum of any training programme plays great role in portraying the effectiveness of the programme. It determines the type and quality of knowledge, skills and attitudes to impart the students or trainers. This implies that curriculum translates the quality of graduates to be produced. Since the trainers are expected to serve the community members in one way or another any curriculum developed has a great role to play in the development of any community and national at large. This means that other factors remaining constant, the curriculum of any training institution can have a positive or negative effect to the community development depending on its quality and the way it was implemented.

The experiences show that curricula for mid carrier extension programme including the curriculum of BSc. Applied Agricultural Extension as for the case of other mid - carrier agricultural extension training programs elsewhere (eg in Hawassa-Ethiopia, Bunda College - Malawi, Makerere -Uganda, Cape Cost - Ghana, just to mention few) were production based, focusing on imparting knowledge, skills and attitudes on production aspects. The curricula partly covered the tenets of value chain in content and sequence (SAFE Workshop communiqué, 2010). The communiqué further adds that the aspects covered of value chain such as post-harvest handling, food storage and handling, marketing were not organized sequentially along the value chain aspects. Due to this fact it is definitely that the graduates of mid-career who were trained by production oriented curriculum are technically competent to offer advisory services largely on production agriculture. They are comparatively less competent on value chain aspects related to post harvest handling, processing, value addition and marketing. This in turn results to farmers receiving advice on production aspects that assist them to increase production without having enough knowledge and skills on value addition and marketing aspects. This situation has led to loss of agricultural produce due to poor post-harvest handling, processing and value addition that make farmers to receive low market prices that do not off sets production costs and fail to meet food security and compete in the local and global market at large.

This condition created a need to review mid carrier curricula implemented in various universities in Africa including mid carrier extension programme implemented at Sokoine University of Agriculture. The review process focused on organizing various courses sequentially along the value chain aspects. That is starting with courses that cover production aspects followed by harvesting, post-harvest handling, food

<table>
<thead>
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storage and handling, value addition, marketing and consumption. Also the review process focused on developing courses that were not existed in the curriculum before which address the aspects of value chain. Suitable modes of delivering the courses were also taken in to consideration like lecture, practical, seminars, field visits to enable students to acquire knowledge and hands on skills.


Examples of crops harvesting and post-harvest value enhancement technologies and practices taught

Example 1: Tomato

Tomato is one of the highly perishable horticultural vegetable crops grown in Tanzania. Lack of proper post harvesting handling, storage and processing knowledge and skills can result to a substantial loss to the producers. Most of farmers in Tanzania lack these and force farmers to sell their tomatoes immediately after harvesting which lead to glut in the market and resulting to lower return to the produced tomato. To overcome this problem among Mid carrier BSc. students are taught various technologies and principles related to tomato production, harvesting, grading, packaging, transportation, marketing and consumption.

Tomato Baobab jam is one of the processed product from tomato to enhance its value. Tomato baobab jam is a unique product prepared from fresh ripe tomato and natural organic pectin from baobab fruit. Practices involved in making Baobab jam are as follows: Ripe tomatoes are well cleaned and sliced into pieces of about 1cm thickness using a sharp stainless steel knife. It is then cooked in a thick base stainless steel cooking pan until a thin pulp is obtained. The mixture is then strained through a stainless steel sieves to remove skins and seeds. The obtained clean tomato pulp is weighed and its total soluble solids (TSS) is measured. Based on TSS value, the amount of white sugar is added to achieve 69 -70% TSS in the final product. The amount of baobab powder (pectin) is added based on the combined weight of tomato pulp and sugar. The obtained hot jam is cooled to about 80°C before filling in sterilized jars and capped ready for consumption.

Example 2: Maize
Maize is the main staple food in Tanzania produced in all regions of the country. Over the years to the large extent farmers have been receiving extension services on maize production. Less attention has been put on post-harvest handling including controlling maize loss and processing for value addition. Based on this understanding mid carrier students are trained on types of maize deterioration, agents of losses, prevention through control of biological agents. Preparation of maize grains for long-term storage like drying, cleaning, sorting and grading. They are also trained on storage practices and structures. These include traditional, improved and modern storage structures. They are also trained on Pesticide formulation, abuse and safety in use, handling of maize including selection of packaging materials, types and function after treatment. In order to add value to the students are trained on processing procedures like de hulling, milling, packaging and marketing.

**Examples of crops harvesting and post - harvest value enhancement technologies and practices taught**

**Example 1: Milk and Milk products:**

Students are taught milking hygienic procedures like hygiene of the person who is milking, cow’s udder and milking containers. Also are taught on record keeping of collected raw milk, preservation, transportation and marketing. Students are also taught about milk preservation by pasteurization, extended shelf life (ESL) pasteurized milk; production of long life milk by in-bottle milk sterilization, Ultra High Temperature (UHT) heat treatment. In order to add value to the collected milk students are taught on how to prepare various milk products like Cream, Butter, Ghee and Butter oil, Cheese making, Ice cream and other frozen dairy products. Others include evaporated, condensed and dried milk products and by-products. To enhance understanding, students do practicals related to milk testing and quality control tests, making of different milk products including cream, butter, ghee and butter oil; different types of fermented milk products; different types of cheese; Ice cream and other frozen dairy products. Also they do excursions to visit dairy processing plants to observe milk processing techniques including milk pasteurization, homogenization, and cream separation, modern techniques for milk solids concentration (membrane filtration, ultra-filtration and reverse osmosis.

**Example 2: Fish and fish products**

Students are taught on fish post-harvest handling for fresh fish including chilling, freezing. Also are taught on different methods of fish preservations like salting, smoking, frying. Students are also taught on fish filleting and canning, handling and processing of fish by products like fish skin which is processed to leather and fish bone processed to bone meals.

**Conclusion**

BSc. Mid carrier students are taught various courses that not only lead to impart knowledge and skills on agricultural production but also value addition aspects to enable them advice farmers the same after their gradation. Since the previous curriculum was production based and covered less tents of value chain and hence produce graduates who were less competent to advice on the same there is a need of looking for a mechanism to organize short term training to this group of extension staff to fill the
identified gaps. Since value chain was not the aspects taught there is also a need of refreshers courses for instructors that will assist them to enhance their effective teaching.
Aligning teaching to smallholder farmers’ needs with special focus on value-enhancement technologies and practices in Uganda

By: Kyazze, B.F; & J.Agea, Department of Extension and Innovation Studies, Makerere University

Introduction

The magnitude of postharvest losses in perishable foods is over alarming in developing countries where the losses are estimated to be between 20 – 50% depending on the commodity in question. With high losses, it is therefore not economically to increase food production without catering for postharvest losses. Agricultural professionals who work on a daily basis with rural communities for agricultural advisory services should have some knowledge on postharvest handling and small-scale processing of food of plant and animal origin to add value to food for enhanced income and safety.

While this is true, the magnitude of the food losses (in both quality and quantity) are accelerated if the small holders and their advisors do not have knowledge on factors that cause these losses and the required technologies and practices to prevent further losses. Therefore, the major goal or importance of postharvest technology and or practices is to minimize and or prevent food losses in order to; (i) maintain quality and safety of harvested produce; (ii) increases food security through availability; (iii) increases shelf life of perishables foods; and (iv) increases the economic value of foods. Incorporation of harvest and post-harvest technologies within the mid-career curricula is therefore a key step towards extending the shelf life of perishable products for enhanced food and nutrition security.

Factors Causing Harvest and Post-Harvest in products of Crop and Animal Origin

There many factors that causes harvesting and post-harvest losses for crop and animal products. Among these are;

➢ Physical and mechanical damage.
  o Physical/mechanical damage causes wounding of produce. Types of physical damage include bruising, abrasion and breakages. Physical or mechanical damage; (i) induces discoloration of products; (ii) accelerates water loss; (iii) affects flavor of produce and, (iv) creates avenues for microbial infection thus accelerated decay

➢ Pathological breakdown.
  o This is due to microbial (fungal, bacterial or viral infection).

➢ Changes in flavor (microbes produce off-flavors/off-odours following decay/rotting of produce or fermentation)
 Decay symptoms like lesions are not desirable and change appearance like color (meat products)

➢ Reduction of nutrients as they are consumed or broken down

➢ Food poisoning (Some microbes like Staphylococcus produce toxins while some like Salmonella directly affect consumers).

➢ Vermin contamination:
  o Vermin refers to infestation of produce by macro organisms e.g. insects, rodents, birds, and monkeys/baboons among others.

➢ Temperature and its effects.
  o Temperature is the most important environmental factor affecting deterioration of plant and animal products. Losses may occur through chilling; High temperature injury; enzymatic/biochemical reactions; microbial growth thus accelerated decay of produce and direct influence on insect infestation.

➢ Relative humidity.
  o RH causes postharvest through its (i) direct effect of water loss from produce; (ii) decay development for micro-organisms; (iii) direct effect on texture and appearance of produce

➢ Atmospheric composition.
  o The atmosphere is made up of gases and these influence the biochemical reactions of various products and lead undesirable effects such as fermentation. Light. Light increases post-harvest losses because it enhances process that produce off-flavor, destroys product nutrients e.g vitamins, promotes microbial growth and also enhances sprouting of grain which leads to deterioration

Status of the Mid-Career Curriculum in Makerere University

The Mid-career curriculum is well endowed with courses running through production, post-harvest handling to methodological courses and other cross-cuttings. Table 1 shows the bulk of courses that are taught in an effort to prepare an innovative mid-career professional charged with working with different farmer categories on a day to day basis.

Table 1: Thematic Mid-Career Curriculum in Makerere University

<table>
<thead>
<tr>
<th>Cluster theme</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>Farm Power &amp; Machinery, Integrated Soil Fertility Management, Crop Production and Management, Livestock Production and Management, Food Security and Nutrition, Land use Planning</td>
</tr>
</tbody>
</table>
While a value-oriented curriculum requires that both livestock and crop production courses incorporate aspects of practices and technologies from harvesting to post-harvesting, this has not happened in Makerere University. The livestock and crop production courses are more generic and largely focus on the technical aspects of livestock and crop production. No clear focus or attempt has been made under these courses to teach beyond the production aspects of specific commodity value chain. This paper attempts to provide ingredients for harvesting and post-harvesting practices and technologies for two major crops (rice and maize) and two major animal products (milk and honey) that are important to promote rural livelihoods in Uganda.

The Rice and Maize Commodity Based Value Chain

Rice and Maize are among the most important food and cash crop in Uganda. While many aspects have been addressed in the university curriculum to increased yield through use of improved varieties, proper and timely agronomic practices, little or no attempt by the curriculum to address what happens to the bumper harvest during the harvesting and post-harvest period to ensure quality and quantity of rice and maize. Table 2 shows the harvesting and post-harvesting technologies/practices that can be adapted to reduce the losses and maintain the quality of the grain as well.

Table 2: Harvesting and Post-Harvesting Practices and Technologies for the Rice and Maize Value-Chain

<table>
<thead>
<tr>
<th>Practices</th>
<th>Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>The practices and technology reduces physical loss of grain through spillage, shattering and exposure to unpredictable weather</td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td>Carry out timely harvesting (when panicle heads turn the color of the straw for rice or when the top ear dries for maize)</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Heaping</td>
<td>The practice ensures that the maize and rice grain does not get discoloured during heaping. It also reduces on the incidences of shattering and spillage which contribute to physical losses</td>
</tr>
<tr>
<td>Threshing</td>
<td>The thresher technologies are to reduce on the drudgery for separating the grain from the straw or cob. The technology controls the physical loss through spillage. However, very few farmers can use it due to the cost. So farmers should form farmer groups to purchase and or hire a thresher.</td>
</tr>
<tr>
<td>Drying</td>
<td>The technologies and practices ensure that the grain is dried to the lowest moisture content and that the drying is uniform. It is recommended that the grain is dried for not more than 3 hours a day to ensure that it is not discoloured. Farmers should also use tarpaulin to reduce spillage and also contamination with foreign bodies. The moisture meter is recommended for stakeholders along the value chain who do bulking but small holder farmers can use the tooth bite technique to see if the grain is dry.</td>
</tr>
<tr>
<td>Winnowing</td>
<td>The technologies ensure that the grain and chaff are separated. This ensures that the grain is clean and not contaminated by other foreign bodies</td>
</tr>
<tr>
<td></td>
<td>The technologies and practices ensure that the grain is stored in secure place where it is free from moisture, vermin and pest infestation. The technologies and practices increase the shelf life of the grain for better market price or for</td>
</tr>
</tbody>
</table>
food and nutrition security.

<table>
<thead>
<tr>
<th>Storage</th>
<th>Raise the storage facilities on wooden pellets</th>
<th>Ensure that the store is cool and dry</th>
<th>Use of hermetic storage conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hermetic bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sealed drums</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sealed pot</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use of rat traps</td>
</tr>
</tbody>
</table>

| Marketing | The practices ensure that the rice and maize grain marketed meets the quality standards and is suitable for human consumption. Packaging, grading and labelling further add value to the product and increase its visibility to other consumers |
|           | Observe quality standard for rice as per UNBS |
|           | Proper packaging materials                    |
|           | Proper grading of rice                        |
|           | Branding and Labelling                        |

**The Milk Based Value Chain**

Milk is a highly perishable product and therefore has a very short value chain compared to other agricultural products. Milk leaves the animal udder when it is free of bacteria but gets highly contaminated once it leaves the udder since bacteria to infest it are with the surrounding environment. So milk has to be protected so that it does lose the characteristics that determine its quality. The determinants of quality include; color, viscosity, ph, freezing point and milk composition. So any harvesting or post-harvesting technologies should be geared towards maintain the status of the characteristics. Table 3 shows the practices and technologies that can be used to maintain the milk characteristics at the different nodes of the value chain.

**Table 3: Harvest and Post-Harvest Practices/Technologies for the Milk Value Chain**

<table>
<thead>
<tr>
<th>Practices</th>
<th>Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>The practices prevention the contamination of milk with external agents including the animal itself, the milking equipment and the milker.</td>
<td></td>
</tr>
</tbody>
</table>
| **Milking** | Observation of person and animal hygiene  
Avoid contact with animal’s skin or udder, the animal should not be on treatment, wash the teats before and after milking  
Observe hygiene of milking equipment  
Buckets, cup, funnel | Traditional milking using the hand  
Use of motorized milk equipment |
|---|---|---|
| **Preservation** | The technologies ensure the long shelf life of milk in its fresh form | Use the boiling technology  
Use the cooling technology |
| **Processing** | The processing practices and technologies ensure that value is added to milk and also elongates the shelf life of the products. The value of milk in terms of economic returns is also increased with the value addition  
Value addition to other products such as, ghee, yoghurt, ice cream, butter & cheese | Use of home cottage industry  
Traditional technology of churning |
| **Storage** | The storage practices and technologies are to ensure that the quality of milk is maintained and that the idea temperature is kept to ensure that microbial activities are not catalysed. Usually the milk is stored at bulking centers  
Observe the hygiene of the storage place and equipment | Use of cooler systems including refrigerators, coolers, gourds  
Use a lactometer |
| **Transportation** | The practices ensure that milk is transported under proper hygienic conditions and all ensures that the ideal temperature are maintained to ensure quality of the milk  
Clean the containers used for transportation of milk  
Ensure the containers are filled to the brim  
Transport milk in the morning or late afternoon | |
| **Marketing** | Label and brand the products  
Search for market information | |
The Honey Based Value Chain

The role and contribution of bees to rural development and as an important source of livelihoods cannot be overemphasized. Today beekeeping is being promoted as one of the most important economic enterprises in rural households by governments, non-governmental organization. Table 4 shows the harvesting and post-harvest technologies/ practices to incorporated in the Mid-career curriculum

Table 4: Harvest and Post-Harvest Practices/Technologies for the Milk Value Chain

<table>
<thead>
<tr>
<th>Practices</th>
<th>Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvesting of Honey</td>
<td>The modern bee hives ensure that the bees and their nests are not destroyed during harvesting since modern bee hive have frames that are movable during honey harvesting and are durable. The modern bee hives are expensive and therefore bee hive can also be made from locally available materials to reduce cost though the quality of honey is compromised. The harvesting equipment are used to scrap the honey combs and melt the wax as a techniques to access the honey</td>
</tr>
<tr>
<td></td>
<td>Use of modern bee hives</td>
</tr>
<tr>
<td></td>
<td>Langstroth; Top bar hive.</td>
</tr>
<tr>
<td></td>
<td>Use of traditional bee hive made from locally available materials (basket hives, grass hives, gourd hives, clay pot hives)</td>
</tr>
<tr>
<td></td>
<td>Use of appropriate honey harvesting equipment</td>
</tr>
<tr>
<td></td>
<td>honey extract, uncapping knife and smoker</td>
</tr>
<tr>
<td>Processing of Honey</td>
<td>The processing, packaging and storage practices and technology aim to ensure the honey products maintain its quality and all the desirable characteristics in terms of colour, density, temperature and crystallization as it is prepared to meet market standards</td>
</tr>
<tr>
<td></td>
<td>Use of bucket, nylon fabric and plastic bottles</td>
</tr>
<tr>
<td>Packaging of Honey</td>
<td>Use of a honey tanker</td>
</tr>
<tr>
<td></td>
<td>Use of an air-tight bucket</td>
</tr>
<tr>
<td></td>
<td>Use airtight sealed container</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td><strong>Storage of Honey</strong></td>
<td>Store the honey in a cool and dry place</td>
</tr>
<tr>
<td><strong>Marketing</strong></td>
<td>Observe quality Standard for the Honey and other Products</td>
</tr>
</tbody>
</table>

### 6.0 Conclusion

The sections above describe simple and applicable harvesting and post-harvest technologies that small-holder farmers should use to enhance food, nutrition and income security. It is obvious that some of the harvesting and post-harvest technologies are part of the mid-career though they are taught in very fragment pieces. This makes it very difficult for a student to pick up the different pieces and build an advisory message to advice “correctly” on an entire commodity based value chain. In addition, the technologies and practices taught are so generic and do not follow particular crop and livestock commodity value chain. If a value oriented curriculum is to implemented, course instructor for particular crop and animal based courses have a mind re-orientation to focus on particular post-harvest technologies with a commodity specific lens.
Experiences with Appropriate Value - Enhancement Technologies and Practices For Smallholder Farmers

By: Albert Appiah Amoakoh, SAFE Coordinator; and Ebenezer Tawiah – Principal, Kwadaso Agric. College, Ghana

BACKGROUND

KAC (Kwadaso Agricultural College) training has been focusing on enhancing value addition technologies and practices for smallholder farmers by the mid-carrier students in our college required to move production to consumers. Ultimate goal is to create a strong linkages in value addition including small-scale processing, safety and quality assurance, packaging, storage and distribution, marketing transportation etc.

One of the most important decision in value chain promotion project is the selection of a small scale product market with a pro-poor growth potential that offers a prospect for further economic growth and allows to benefit groups of poor people at the same time.

OPERATORS IN THE VALUE CHAIN SEGMENTS

Micro level” operators are those directly involved in production, processing and marketing functions and become owners of the product at some stage. Others who just perform services (eg transporters or banks) operate at the micro level as well, but within the core sequence of the value chain.

Meso level” organizations (business associations, technology institutes etc) supporting the operators constitute meso level and are called “chain supporters”

IMPORTANT VALUE CHAINS

➢ CROPS
  1. Soya bean   2. Maize

➢ LIVESTOCK
  1. Rabbits   2. Grass cutter

SOYA selected for promotion

Soya processing

  1. Measure the soya
  2. Remove all the unwanted particles
  3. Re-measure and get the quantity needed
4. Wash and soak for 18 hours
5. Drain and wash with cold water whiles rubbing to dehull
6. Grind the dehulled beans
7. Measure the water and add into the paste immediately and mixed thoroughly
8. Strain the mixture through a muslin cloth / clean cloth and squeeze to extract the milk into a container
9. Boil the milk for 20-25 minutes while stirring
10. Allow to cool
11. Add sugar, salt and flavour to taste

**Recipe for soya weanimix**

1. Measure and sort out all foreign particles from the maize, soya bean and groundnut separately
2. Re – measure to get the needed quantity.
3. Blanch soya bean for 20 minutes and dehull
4. Sundry for 48 hours
5. Roast maize, groundnut and soya beans separately

NB: it can be used in porridge and rice water.

**PROCESSING METHOD**
➢ Measure and sort out all foreign particles from the maize, soya bean and groundnut separately
➢ Re – measure to get the needed quantity.
➢ Blanch soya bean for 20 minutes and dehull
➢ Sundry for 48 hours
➢ Roast maize, groundnut and soyabean separately
➢ Cool all and mix thoroughly
➢ Mill to soya weanimix
➢ Bag and label
➢ Store or sell

■ NB : In roasting the ingredients, be careful not to burn them and remove any over brown ones.

PROCESSING OF SOYA KHEBAB
➢ Sort out all unwanted materials from the raw soya bean
➢ Measure to get the quantity needed
➢ Wash the soya bean
➢ Soak the soya bean 3 – 4 hours
➢ Drain the beans and rinse with clean water
➢ Mill the soya to a clean paste
➢ Add the water, mix thoroughly and sieve in a fine net by squeezing to drain all the liquid into a container
➢ Add ⅔ of the bucket full of another water to the and sieve again
➢ 9. Boil for 45 minutes and while still boiling, dissolve sachets of Epson salts in water and pour into it.
➢ NB : It will begin to curdle

MAIZE VALUE CHAIN
➢ Maize is an important grain crop in Ghana
➢ Is important for both human consumption and as animal feed
➢ Over 318,514 tonnes of maize is lost annually to post harvest losses
➢ This figure represents 18% of the country’s annual maize production
➢ Harvest maize as soon as it is dry – when stalks are straw coloured
➢ Dehusk harvested maize on
➢ Transport harvested maize to the crib
➢ Clean all materials used in harvesting and store properly
➢ Dry harvested maize in the crib, on tarpaulins or concrete floors
➢ Avoid drying maize on the ground
➢ Shell maize after it has dried to an appreciable moisture level-12-13%
➢ Harvest maize as soon as it is dry – when stalks are straw coloured
➢ Dehusk harvested maize on
➢ Transport harvested maize to the crib
➢ Clean all materials used in harvesting and store properly
➢ Dry harvested maize in the crib, on tarpaulins or concrete floors
➢ Avoid drying maize on the ground
➢ Shell maize after it has dried to an appreciable moisture level-12-13%
➢ Maize shellers are preferred to beating cobs with sticks
➢ Shelled maize should be further dried to moisture level of 10-11%
➢ Clean grain by removing husks, stones, plant material
➢ Treat grains that will be stored for more than 3 months with insecticides
➢ Grains storing for less than 3 months are put in sacks and closed by stitching

**STORAGE**

➢ Use recommended chemicals for long term storage of maize
  
  i. Pirimiphos-methyl+Thiamethoxan

  (Actellic Gold Dust)

  ii. Pirimiphos-methyl (Ateco Super 25EC)
iii. Pirimiphos-methyl + Permethrin
(Betallic Super)

RABBITS

➢ Rabbit’s production is one of the means by which the nutrition and the incomes of most urban and rural dwellers with limited access to agricultural lands can be improved.

➢ Rabbits are easy to handle, feed and manage. When properly fed they can provide a high protein low fat meat for healthy eating.

Rabbit’s production is a possible solution to the perennial meat deficit problem in the country. Both young and old as well as the physically challenge can undertake rabbit keeping as part time or full time ventures.

GRASS CUTTER

➢ Grass cutter rearing has a number of economic, health, ecological and social advantages. The meat is rich in protein and is therefore a heathy food of choice.

➢ Rearing of grasscutter also helps to protect the environment through the prevention of man-made bush fires.

➢ The meat is a delicacy for many Ghanaians and many people in West African Sub region. The demand for it is significant and stable.
Aligning teaching to smallholder farmers’ needs with special focus on value-enhancement technologies and practices at Lilongwe University of Agriculture and Natural Resources.

1.0 Introduction

In many developing countries, smallholder farmers account for a large proportion of rural poor people and engage in the production of most of the countries’ food. Because of this, smallholder farmers are an important target group if countries aim to increase the socio-economic welfare of the majority of people, improve food security, and steer economic development. In the light of this, special emphasis need to be placed on models or strategies that promote full participation of smallholders in value chains (IFPRI, nd.). Likewise, the economy and livelihoods of the majority of rural people in Malawi remains dependent on agriculture. The agriculture sector generates over 80% of foreign exchange earnings and is the main source of livelihood for more than 75% of rural household. However, agricultural productivity remains low and poverty persist in Malawi (GoM, 2012).

Amongst strategies aimed at poverty reduction, CGIAR reports that one key question is whether emphasis put into research on staple food crops should be redirected to more emphasis on research that seeks to “enhance value” of agricultural produce. According to CGAIR, “value-enhancing” research include reduction of post-harvest crop losses, coming up with new products to increase market utilisation of agricultural produce, and promoting adoption of higher-valued commodities (Walker and Fuglie, 2006). In Malawi, World Bank (2003) estimates that close to 84% of agriculture value-addition is from 1.8 to 2 million smallholder farmers who on average own only 1 ha of customary land.

A value chain covers all processes and linkages that are needed to move a product or service from its production source to the ultimate consumer. Value chains are characterized by multiple actors that perform different functions along the chain, and these actors include producers and consumers (CIP, 2011). Low benefits from value chains is one of the major challenges that smallholder farmers face. In order to maximise smallholder farmers’ benefit from value-chains, extension can play several roles including: mobilizing farmers into groups / cooperatives to engage in collective activities such as processing and marketing, training farmers in value-enhancing technologies and practices, and provision of information on market requirements, e.g., quality standards. This highlights the importance of equipping students with requisite knowledge and skills to enable effectively perform their extension roles in value-chains and support smallholder farmers.

2.0 Value enhancement technologies at LUANAR

The importance of value enhancement in value-chains include: improving profitability of agricultural commodities, provision of better quality and safe produces to consumers, and reduction of post-harvest losses. Through different Departments – for instance, Food Science and Technology, Animal Science, and Agricultural Engineering- undergraduate students at LUANAR learn various value enhancement technologies
and practices that seek to address some of the problems that farmers face in the value-chains of agricultural commodities they produce. These technologies range from production, storage, packaging, processing, and marketing. Amongst others, these technologies seek to improve productivity, reduce post-harvest losses, conserve food nutrition value, and maximize profit margins. Guided by the different problems and challenges that smallholder farmers face in crop and livestock production, departments focus on developing and promoting simple and easy to follow value-enhancement technologies and practices. Use of local knowledge and resources is amongst the features that guides the development of some of the technologies and practices that students learn and encourage farmers to follow.

From Animal Science Department students learn value-enhancement technologies and practices in livestock focusing of beef and dairy production. Under dairy, students acquire knowledge and skills in processing of fresh milk products such as ice cream, ghee, butter, buttermilk, food safety and hygiene, and packaging and labelling dairy products. From Food Science and Technology Department students learn post-harvest fruit and vegetable technologies, and food products development for commercialization. Students have developed local food menus from crops and livestock products. The menus have also taken on utilization of neglected crops and livestock, thereby adding value to them. In Engineering Department students learn post-harvest technologies focusing on storage and procession of different crops such as maize, groundnuts, pineapples, vegetables, and sunflower.

Among the several value-enhancing technologies and practices that students learn at LUANAR, this paper presents technologies and practices, for livestock and crop enterprises. While the presentation requires identification of two technologies under each enterprise, a demarcation has been a challenge when looking at livestock as the technologies are being promoted as a package with several technologies within them.

2.1 Value-enhancing technologies in livestock

In livestock, technologies and practices relate to beef and dairy production. Smallholder dairy farmers, from communities surrounding LUANAR and beyond, work in milk-bulking groups or cooperatives that usually own cooling facilities to store their milk before it is sold to a milk processor. Cooling centers are located in sites with access to electricity and some smallholder farmers have to travel long distances to deliver their milk to the centers. Farmers milk their animals twice a day – in the morning and afternoon. Because of the long distances to cooling centers, some farmers prefer to keep the milk at home overnight and deliver it on the next day. Given this situation, Animal Science Department promotes technologies that enable farmers to ensure milk quality and prevent spoilage. Learning from local knowledge, farmers are encouraged to keep their milk in cool place using clay pots covered with a wet hessian cloth. Further to this, farmers are taught a simple milk testing technology to check for milk sourness before it is bought at the cooling center. These technologies have reduced problems of milk rejection by processors. Further to this, the Department in collaboration with Department of Food Science and Technology worked with two milk bulking groups in Linthipe and Bvumbwe, which owned milk cooling and packaging equipment, but lacked technical know-how on processing and packaging. Farmers were taught packaging, milk handling and hygiene, and food safety.
In terms of beef production, the focus is on meat packaging to meet different customer needs, and working with slaughter houses/places in areas surrounding the University to assist butchers adopt these practices: meat testing, humane-handling of animals, and hygiene and food safety.

### 2.2 Value enhancing technologies in crops

**Solar-drier** – Developed by Agricultural Engineering Department, the dryer is made from wood planks, transparent and black plastic sheets, and it is used for drying vegetables. It was developed to hasten the drying process of vegetables. This technology is being promoted in collaboration with Food Science and Technology Department. The motivation to develop the sun-drier stemmed from two fronts. First, the observation that vegetables (especially indigenous vegetables) tend to be in abundance during the rainy season which is characterized by limited sunlight that prevents drying of reasonable volumes of vegetables. Second, the observation that limited control on the drying intensity using conventional sun-drying tends to compromise nutrient content in vegetables.

The advantage of this technology is that drying time is fast and the end product is clean as opposed to uncontrolled sun drying. The product is clean as it is protected from foreign matter, which usually contaminates the product when it is dried in direct sun on mats placed on the ground.

**Thresher** – Developed by Agricultural Engineering, this equipment is used for threshing legumes such as beans, pigeon peas and cowpeas. It can either be hand or bicycle operated. The technology seeks to minimize grain losses associated with hand beating using a stick, which is a common practice among smallholder farmers. The benefits of this technology are that kernel breakage is reduced, the kernels are separated from the chaff, and it is very efficient as less kernels remain in the pods. The technology is being used by farmers; however, the challenge is availability of bicycles for the bicycle operated mode, which is deemed expensive.

### 3.0 Experience in implementing value enhancement technologies

Development of the courses in value enhancement technologies and practices has largely be guided by the problems or challenges that farmers face in crops and livestock enterprise, and the policy drive to increase smallholder farmers’ income by making farming as business and responding to market demands.

To ensure promotion of these technologies, one of the strategies used by the University is the emphasis on use of simple technologies and local knowledge. Another practical way of ensuring that farmers’ needs are addressed, is the approach whereby the University outreaches farmers surrounding and away from the University to offer them technical advice on the problems they are facing. The support offered to dairy farmers in Linthipe and Bvumbwe is an example of this approach.

Collaboration between departments has shown some promise on how technologies developed in one department can be used by another department and easily extended to the relevant target farmers. The use of solar drier by Food Science and Technology department illustrates this case.
One notable gap is that what extension students learn from the other departments is limited to crop and livestock production, and does not extend to cover elaborate value-enhancement. This raises a question on how can extension workers competently disseminate information on various value-enhancement technologies and practices to the smallholder farmers they serve. Partly, the current gap can be addressed by revisiting the current curriculum in the next curriculum review process.

Another weakness is lack of follow-ups or participatory evaluation on the various technologies and practices being promoted. Such follow-ups or evaluations would be key in getting farmers’ feedback on the appropriateness of these technologies and promoting co-learning to determine how the technologies can be improved.

4.0 Conclusion

This paper has presented background information in the introduction section, and selected examples of value enhancement technologies and practices in livestock and crops being taught to undergraduate students at LUANAR. It has highlighted the experiences with value-enhancement technologies and practices, and explained the benefits and challenges of some of the technologies.

References


Session III

Farewale dinner and presentation by Dr. Jeff Mutimba

SOME PERSPECTIVES ON AGRICULTURAL EXTENSION², by Jeff Mutimba

jeffmutimba@gmail.com

Introduction

This lecture has two parts:

• The first part is to thank you for the good work that we did together;

• The second part is to verbalize my frustration about the extension profession.

We built a successful extension training program

It is with a heavy heart that I say ‘farewell’ to the program that had become part of my blood system for the past 20 years. During this time, I met so many great people; made many friends; watched people’s lives improve and achieved tremendous personal professional growth. Above all, I felt privileged to be involved in a program with such a noble cause – extension human resource development.

A key and indispensable precondition to agricultural development in smallholder agriculture is the existence of frontline extension workers with the requisite knowledge and skills to drive the agricultural modernization process. If agricultural development does not take place at the farmer level, it is unlikely to take place at any other level. To this extent, it is no surprise that, when no perceptible improvement takes place at the farmer level, the blame lies squarely on the shoulders of extension. Extension workers drive the agricultural modernization process and, like a colleague at Mekelle University (Tekleyohannes Hailekiros) once said, ‘the rest of us are support staff’. When you come to think about it, this is so true. Whether you are a lecturer, a professor, a dean, a researcher, an extension director, a head of a non-government organization – if your mission is to develop smallholder agriculture at farmer level, you are supporting the field extension worker to achieve your/farmers’ goal. There are already sufficient technologies on the shelf to make a difference at the smallholder farmer level. However, the extension workers are poorly trained to perform their pivotal roles in full. This calls for universities to come up with custom-made programs that address the specific needs of this vital group of agricultural change drivers. The role of universities is to ensure that the wheels of the agricultural modernization process are well oiled with the necessary knowledge and skills to ensure continuous and sustainable development (Mutimba et al. 2010).

I am delighted to be associated with some of the modest successes we achieved as a Winrock/SAFE program. For example:

² A farewell lecture delivered at the 2017 Sasakawa Africa Fund for Extension Education (SAFE) networking workshop, Getfam Hotel, Addis Ababa, 13-15 March, 2017
1. We brought employers and universities closer like never before.

2. We demystified the ‘ivory tower’ phenomenon which traditionally characterized institutions of higher learning by proving that universities can actually respond to well-articulated needs. Through this program, employers demanded, and continue to demand, extension training and universities have respond, and continue to respond, with need-based B.Sc. programs in agricultural extension.

3. In the process, we opened a whole new world for a cadre of extension workers whose potential was neither fully realized nor utilized. I will never forget what one graduate told me when I visited her in her office. She was vice-dean of an agricultural college. When I walked in her big office with a bell to call messengers, I asked “Kasech, is this you?”...she retorted “Yes, this is a liberating degree Dr Jeff”. In a way, I could identify myself directly with what she said because I also started with a diploma. During my time, the only option for a diploma holder to go to university was through the ‘mature entry’ provision which was limited to a few who had either a first-class diploma, or a distinction in one of the three majors: animal husbandry; crop husbandry; or agricultural engineering. Even then, you would have to choose from existing degree programs – there were no extension degree programs.

4. Through this program, we have raised the profile of agricultural extension as a distinct agricultural discipline at least in those countries where we have had a presence. The universities that we work with now have full-fledged departments of agricultural extension each offering a range of extension degree programs.

5. Based on our experiences with the student’s supervised enterprise projects (SEPs), we have realized the inadequacies of the standard research methods. They tend to be so academic that sometimes it becomes difficult to extract anything useful in real life. In his book on writing and publishing scientific papers, Day (1988) observed that the dustiest corner of a university library is where the PhD theses are kept. They are written in ways that only the advisor and other students of the same topic will understand. The methods are not suitable for action-oriented extension research. Hence, two colleagues (Dr Charles Masangano and Dr Margaret Mangheni) and I are writing a book on guidelines for extension research.

6. SAFE and its partner, Winrock International, have developed a model for capacity strengthening the agricultural extension delivery system that we believe now awaits scaling up across Africa. This model can be used for a range of upgrading trainings – from certificate to diploma; from diploma to degree; from degree to post graduate diploma or degree.

However, the lack of accreditation of diploma programs by universities pauses a serious threat to the sustainability of the program as originally envisioned. This is a program that takes diploma holders. Therefore, they cannot, and should not, be treated as high school graduates. Some universities have recognized this and came up with programs that are shorter than regular programs. However, this understanding is not mainstreamed into the agricultural education system. Hence, each time there is a change in university management, questions are asked why this program has less credit hours – and in several cases the programs have been changed to conform with regular programs. I recommend that
universities work toward officially accrediting diploma programs so that the students can transfer credits from diploma to degree to maintain a truly mid-career program.

**Agricultural extension: An abused profession**

Agricultural extension is the most misunderstood, and abused, of all agricultural disciplines – and the lack of understanding reveals itself in several ways.

**There is no single definition of extension**

The problem with extension starts with its definition. As Mutimba (2014) points out, extension definition is a moving target – there has been so many definitions, and more are still coming. There is confusion about what agricultural extension is and what it is supposed to achieve. I am not aware of any other agricultural discipline that is mired in so much confusion and so many definitions – with some of them tending to broaden its mandate (see Sulaiman and Davis 2012; Worth 2008). Apart from changing definitions of extension, there is even debate on the use of the term ‘extension’ because it is believed to have top-down (whatever that means) connotations. Some are arguing for the abolition of the term – but have not yet found a suitable and enduring substitute.

About fifteen years ago we founded a pan-Africa platform for which we had challenges coming up with an appropriate name because we did not want the word ‘extension’ in it – and we called it African Forum for Agricultural Advisory Services (AFAAS). However, the major highlight of AFAAS since has been a pan-Africa ‘Extension Week’ which we organize every two years. We could not run away from the word ‘extension’ on this one.

At about the same time we founded AFAAS, a global platform was formed and was called Global Forum for Rural Advisory Services (GFRAS) – again the founders made effort to avoid the word ‘extension’. Since its establishment, one of GFRAS’s main achievements has been the publication of a booklet entitled ‘The New Extensionist’. Again, they could not run away from the word – because that is what it is.

Makerere University in Uganda changed their Bachelor of Agricultural Extension and Education (BAEE) program to Bachelor of Agricultural and Rural Innovation (BARI) – a change which was spearheaded by a colleague who had just returned with a PhD from Wageningen University.

Haramaya University changed its Department of Agricultural Extension to Department of Rural Development and Agricultural Extension – a change which was spearheaded by a colleague who had just returned with a PhD from University of Pretoria. Several universities in Ethiopia have adopted the Haramaya naming.

My definition of extension is in terms of its roles – of which there are only two. The role of extension is to ensure that farmers have knowledge; and, to ensure that farmers have skills – knowledge and skills to farm successfully. This could be knowledge and skills to manage a maize crop, an irrigation scheme, a dairy unit, a farmers’ organization, markets – anything they are engaged in.

*Extension used as a punch bag*
When no perceptible improvement takes place at the farmer level, the blame lies squarely on the shoulders of extension. Criticisms abound of the failures and ineffectiveness of extension in sub-Saharan Africa. Literature is replete with reasons for extension failures ranging from inappropriate training, top-down approaches (and there seems to be an obsession against public extension services on this point), to marginalization of women, youth and the limited resource farmers (Christoplos, Sandison & Chipeta, 2012). In fact, when you go through literature, you hardly find anywhere where extension has done it right. If it happens that a country produces more than its food needs, credit goes to some government initiative, or the weather - and rarely attributed to extension.

Some of the same literature marginalize women even more by viewing as food providers who need help to produce more food. Women not only want to make money, but they need to make money, just like men, to meet a whole range of financial needs. Besides, many women are single parents who must provide everything for their families.

*Extension is usually not even recognized as an agricultural discipline*

Most universities do not teach extension and, if they do, it is in the form of an elective or introductory service course given to students pursuing degrees in other agricultural disciplines. Because of this lack of understanding, these universities do not even have departments of extension – and the people who teach the odd extension course are usually placed in departments of agricultural economics. I have never understood the rationale behind this structuring. What is the relationship between agricultural extension and agricultural economics?

At Egerton university, extension is under the Faculty of Education. At Lilongwe, it is under that Faculty of Development Studies. At Ambo University extension is under the Institute of Cooperatives and Development Studies.

I believe ‘agricultural extension’ should be firmly under the ‘faculties of agriculture’. It is an agricultural discipline.

*There is a (mistaken) belief that anybody can do extension*

That is why there is no extension training at most universities; that is why people with no extension training are employed to do extension; that is why extension is being decentralized to district local governments in some countries; that is why, in some ministries of agriculture, there are no directorates of extension; that is why, in some countries, people with neither extension nor agricultural training are appointed to manage extension. In Uganda and Rwanda even the military is engaged to carry out some extension functions.

The bottom line is that all doing extension should have extension training. Of course, you can do extension without extension training, just like you can be a school teacher without training in teaching. But, in many countries, you will be employed as a temporary teacher until you get a teaching certificate – otherwise you will be replaced when a qualified teacher becomes available. Meanwhile, your students may be passing exams and even going to university. But your employer knows that you would do a better job if you were trained in teaching. Likewise, you could do extension and assist farmers in improving their business without extension training – but you would do a better job with extension
training. If you send a poorly trained army to battle, you cannot expect it to win. In football, they fire the coach if the team in not winning.

Some countries are experimenting with forms of extension arrangements which are not conducive to extension efficiency

For example, in several countries, Ministries of Agriculture, usually against their expert advice, have been made to transfer their extension function to district local governments in the name of ‘decentralization’. Under this arrangement, extension is managed by non-extension professionals with all the consequences that this entails. The district officials may not have full appreciation of extension in which case they may not prioritize extension in the allocation of resources; they may give extension personnel non-extension duties; they may not consider capacity development as important – all of which leads to low morale as they feel like ‘orphans’ as neither the Ministry of Agriculture nor the Ministry of Local Government, under which they are employed, pay attention to their professional development needs. Regarding decentralization, countries do not seem to learn from each other. Zimbabwe had a similar arrangement but abandoned it having realized that it was cumbersome and inefficient. Uganda is reconstituting its Ministry of Agriculture after it had been disorganized in the name of decentralization for ten years.

Ethiopia has decentralized extension to regional governments – but in a way that agricultural extension professionals are in charge of the extension function at the lower levels – similar to what Swanson (2008) recommends – and the Federal Ministry of Agriculture still has strong policy influence on extension in the country. Agricultural human resource development remains a central issue of the Ministry and the Federal Government in general. Over the past 15 years the number of universities has risen from 3 to 33 – with most of them offering agricultural training programs. The number of agricultural diploma holders has risen from about 3000 to 72000 – and most of these are employed as frontline extension workers.

There is also mistaken belief that extension is only about softs skills.

Agricultural extension curriculum is quite broad and produce generalists enabling graduates to advice farmers on a wide range of issues. In fact, during needs assessment, farmers told us they wanted generalists, ‘one-stop advisors’, not to spend time looking for specialists for different types of advice.

Extension expected to link farmers to non-existent markets

Since the removal of markets in many African countries, markets have become informal and unpredictable. Extension can neither create markets nor link farmers to unknown markets. Governments have a role to play in creating efficient marketing systems for smallholder farmers.

Failure of employers to articulate their extension training needs

For many employers, especially Ministries of Agriculture, things are usually OK as they are – and they do not see any need for changing them. They take whatever they are given by universities with the belief that universities know what is good for them. Thus, universities see no need for extension training. As Sutz (2005) points out, universities are not isolated institutions. They are socially embedded, and their guiding visions are influenced by local history and traditions. This status quo is therefore self-reinforcing – see Figure 1 below.
To break this cycle, employers need to articulate their needs to universities. The Department of Agricultural Technical and Extension Services (Agritex) in Zimbabwe has a Training Branch offering a whole range of in-service training courses to extension staff including extension soft skills having seen that graduates come out of universities are inadequately qualified for extension work. But the Department has not been successful in engaging universities to ensure that universities embrace extension training in the curricula.

The concepts (or slogans?)

There is a proliferation of extension concepts and approaches which leave no traceable evidence of success. Concepts like: demand-driven extension; farmer first; client-oriented extension; farmer-led extension; decentralized extension; accountability; farmer field schools; training and visit; participatory rural appraisal; agricultural knowledge systems; agricultural innovation systems; farmers plant wise clinics, farmer to farmer extension; market-oriented extension; value chain-oriented extension; will not, in themselves, bring food to the table. Their power to transform rural people's lives tends to be exaggerated at times. We can debate these forever without ever seeing whether we have achieved these on the ground or not. It will be difficult to arrive at a point where we can say 'extension is doing it right' based on these concepts as the goals can keep changing depending on who is elaborating the concepts. Discussions of the concepts can be quite academic – and more of slogans. For example, there are people who make a living out of articulating the value chain concept – it is an industry.

We need to avoid labouring and romanticizing these concepts and focus on seeking for practical ways of enabling farmers to prosper in agriculture.
Concluding remark

A lot of education is needed across the board for all to know that: getting the science right is one thing; but getting the science to work for farmers is quite another. That is why there are a lot of technologies on the shelf that could make a difference at farmer level but they are still lying there unused.

REFERENCES:


This is special time for Winrock, being able to attend this event longest standing projects, SAFE.

I want to draw your attention to this photograph shown below (Jeff Mutimba Friend of the Farmer article on Winrock.org)

![Jeff Mutimba: Friend of the Farmer](image)

- Passion, commitment, dedication
- Take it to the farmer
- Fambai Zvakanaka – go well but don't go far.

**WINROCK**

Winrock's mission is to empower the disadvantaged, increase economic opportunity and sustain natural resources across the globe.

We work in 45 countries with more than 200 projects focusing on agriculture, energy and the environment, technology and innovation,

**SAFE Legacy**

This is a special time for SAFE, we just marked 30 years of success at the World Food Prize this past October, in Des Moines, Iowa.

Nobel Prize for Agriculture, global award that recognizes extraordinary achievement in agriculture. The World Food Prize celebrated 30 years this year.

At the same event, the Sasakawa Foundation for Africa, also celebrated 30 years, from which Winrock’s own SAFE project which has been made possible by the generosity of the Nippon Foundation.
25 years ago, Nobel Laureate and Winrock Board Member Norman Borlaug, Japanese philanthropist Ryoichi Sasakawa and former President Jimmy Carter tapped Winrock to lead an innovative agriculture education pilot in Ghana.

Story about Jimmy Carter.

We are building on a tremendous legacy of the SAFE project, the past many years of implementation, and I want to emphasize that now more than ever we need to focus on agriculture as the foundation for the long term economic success of the African continent.

Why? We have just implemented 30 successful years, and we need to look forward to the next 30 years. Let me outline some of the challenges and trendlines.

Challenges: changes in climate, agricultural disease outbreaks, environmental degradation, including soil degradation, illegal fishing and overfishing, intensifying urbanization, and rising food demand, poverty and malnutrition will all have major impacts on progress against agriculture in Africa.

So we have challenges on both sides of the equation: production and post harvest. On the production side, the world needs to feed 9 billion people by 2050.

Nigeria itself has the 9th largest urban population in the world. Urban growth rates in Africa are around 4% on average while the world rate is 1.2. This growing population will include new consumers and will need to be fed!

Arable land is not going to increase so we have to find ways to increase productivity while protecting natural resources.

At the same time, on the post harvest end, a third of all the food produced in the world is never consumed, and the total cost of that food waste could be as high as $400 billion a year. Reducing food waste by just 20 percent globally could save $120 billion to $300 billion a year by 2030.

On the positive side: Africa is endowed with fertile soils, favorable climates, vast water basins and rivers that can mitigate the impacts of climate change and increase potential in agriculture and food security.

The pessimist sees difficulty in every opportunity. The optimist sees the opportunity in every difficulty. I am more optimistic about this than at anytime before.

There are other reasons I am optimistic: against the backdrop of these challenges, that SAA and SAFE will witness over the next 30 years, we have exponential growth in science, technology and engineering is expanding the range of technical knowledge available for agricultural transformation.

The efforts by African leaders to create regional trade bodies will create new opportunities for agricultural trade.

The commitment to CAADP is a key reason to be optimistic.

A new generation of leaders in the public and private sectors across the continent will use science and technology, entrepreneurship and innovation to take things forward.
Bringing it back to SAFE:

The theme of this meeting and the examples given over the last 3 days demonstrate that potential now more than ever before, and represent solutions to these challenges I have mentioned.

I have been impressed with the VAST amount of technologies for value addition in the presentations throughout these last 3 days.

You know, much of our education system (and that includes the United States), encourages youth to seek employment in urban areas. Away from agriculture. You are part of the way we can seek to discover ENHANCING competence within the agricultural value chain, with emphasis on the role of women and youth as agriculturalists and stewards of the environment. Just like Ruth, I am bothered as she says by this “gender thing” – we have to find more ways to incorporate women both in finding the technologies, in the education systems, and to be part of the solution in farming systems.

To be specific – these examples are impressive from the past 3 days:

Jigiga University and the efforts toward irrigation

Samara University and the post harvest handling in maize

Coffee and dried naturals in Ethiopia: Arabica 3x more value for farmers in export markets

The efforts of the Government of Nigeria in the area of post harvest handling and aflatoxin reduction

The creation of agricultural enterprises represents one of the most effective ways to stimulate rural development. This is where I want to bring in the private sector into the equation. A lot of these technologies represent business opportunities for farmers --- for SME’s. I think of agriculture through a different paradigm – not as a development program but as a business opportunity that can enrich farming communities in Africa.

As Africa continues along its growth trajectory in agriculture, the private sector and particularly SME’s will be critical. Agro-processing as urban areas ---- and the middle class grows --- will allow agribusiness to flourish. Africa can make it’s own food. The World Bank estimates that agribusiness will be valued at $1 trillion by 2030.

Value added food processing enterprises could help African farmers retain a higher portion of the profit from the crops they produce.

Seed, fertilizer, processing, milling, post harvest technologies are all part of this growth. But there are new technologies that will allow Africa to “jump” over existing technologies – these include sensor technology, the use of biopolymers that will allow, for example, fertilizer to be on a “timed release” schedule to deliver the right amounts and reduce waste, ICT and mobile technology.

So I see the next 30 years of implementation as building on the legacy of solving these critical challenges for farmers in the education and extension system.
I have two things to put onto the table as Food for Thought. Sharing, Scaling

**Sharing** – there is a need to create an inventory of all the technologies. For example: irrigation, soy, post harvest handling. These are the issues and crops that are present in multiple countries. What can we learn from each other? What farmers are adopting? Why? How should we adjust curriculum to account for the realities farmers are facing and needing in the area of extension?

**Scaling** – If we had that inventory, and we were looking into adoption rates with partners for example, we could have the power to scale the best technologies that are working, drop the ones that are not working so well, and focus our efforts more strategically in the context of the challenges I have mentioned. How can we elevate our important work to the next level? Winrock has ideas we would like to discuss with Deola to bring more to the table to address Sharing and Scaling.

Finally, I would like to issue a challenge in terms of the legacy of Jeff Mutimba. Last night, Jeff talked about his frustrations in extension education – how it is not at the forefront, how universities retitle extension curriculum, it is not a priority. I would like to posit that in light of the trendlines I discussed earlier it will become much more of a priority in the coming years – bringing science and technology to the farmer through extension. The future of agriculture and food security in Africa will depend on it. I encourage all of you from SAFE and SAA to view it in this light, take this opportunity forward, and change it from frustration to opportunity in honor of Jeff’s legacy with SAFE.
Conclusion and Recommendations

There are some challenges observed in mainstreaming value chain and value addition concept into the curricula such as;

- Finance and capacity
- Limited technology availability
- Inadequate information
- Lack of commitment of the employer

At the same time, there are many opportunities that will help to up-scale the program if utilized properly. For example, the expansion of agro-processing industries in many countries, high demand of the program, government giving priority to value chain, etc.

Value chain is now part of the university curricula but it seems courses are fragmented in different departments. They should be taught in a way that they can capture the whole VC process.

As we continue to work and strength the activities on value chain activities, the role of private sectors should be clearly stated. The studies on the role of private sectors in Uganda and Benin can help to identify the roles of private sectors.

The key link between the employer and the university is SEP and there should be continuous learning by both the employer and the university. The implementation of SEPs is so far successful in all universities and colleges. We should encourage universities to scale up (instituionalize) the SEP (mid-career) approach in other faculties.

In addition to MOA and university partners, we need to involve other key stakeholders (research centers, private sector, SEP students, farmers) in SAFE networking workshop to address emerging issues.

The existing linkages and partnerships with key stakeholders should be improved. SAFE should organize a stakeholder’s workshop to strengthen such linkages. In countries where SG2000/SAA exists, the collaboration between SAA and universities/colleges should be strengthened. SAA also need to establish demonstrations at Universities/colleges to demonstrate new technologies.

Most reports from universities at times focus on the processing aspect and in other times on marketing and lack a complete picture of value chain process. However, it is also observed an improvement of awareness in value chain among university lecturers after SAFE’s intervention through different short term trainings for lecturers that involves the revision of curriculum along the value chain.

➢ The following additional comments were forwarded from participants:-

- The content of the curriculum is based on need-assessment, but it is also noted that courses are taught in fragmented piece.
- Some reports lacked specific examples and recommendations on value chain process.
There is a concern that food safety is generally neglected in university’s report. It is therefore advised that lecturers have to be sure that all valuechain components are addresses with ample examples while teaching students.

- SEP is a partnership between MoA and the University.
  - There should be continuous coordination/discussion between employers and universities
  - Need to have a clear recommendation from employers so that universities can modify SEPs to fit with employers’ interest
  - SEP should be implemented in a way that can influence the employers recommended technologies and practices
  - Need to compile any learning by universities as a result of changing demand
  - We need to incorporate indigenous knowledge in SEP development

- Course load of SEP students: as we add value chain in the new curricula, course load becomes a problem for students.
  - Always we should start with need assessment and based on that content and curricula can be formulated.

- Gender balance: tough there is variation of female proportion from country to country, there should be incentives to increase the number of women students.
- A partnership with stakeholders (input dealers, agro-processors, MFIs) is a key to strengthen the program.
- Extension should foster the linkages training institutions with source of technologies (eg., ITK, private sector, research)
- We need to have friendly value chain technology and practice manuals and compile inventory of these technologies and practices.
- We need to have a strategy on how to engage with private sectors
- We should have a mechanism in place on how to scale up our successful approach
Program of the 2017 SAFE Networking Workshop

13-15 March, 2017
Getfam Hotel, Addis Ababa, Ethiopia

Workshop theme
Aligning teaching to smallholder farmers’ needs with special focus on value-enhancement technologies and practices.

Background to the workshop
Having realized that smallholder farmers can enhance their incomes substantially by adding value to their products, SAFE partner universities have, in recent years, came up with value chain-oriented curricula. However, challenges have been observed in the implementation of the curricula.

Firstly, there seems to be very little of practical value that is taught, beyond what smallholder farmers are already doing, that could enhance the value of their crops and crop products – especially from harvesting to marketing.

Secondly, there seems to be very little of practical value that is taught, beyond what farmers are already doing, that could enhance the value of livestock and livestock products at smallholder farmer level. As a result, students avoid livestock when they choose topics for their supervised enterprise projects (SEPs) – and the number of SEPs on livestock remains very low. Farmers must, therefore, be missing opportunities for enhancing their incomes through livestock.

Purpose of the workshop
The workshop is designed to share experiences on appropriate value-enhancing technologies and practices that can make a difference at the smallholder farmer level.

Specific objectives
Employers will share their experiences with value-enhancing technologies and practices for crops and livestock among smallholder farmers.

Universities will present examples of smallholder farmer-specific crops and livestock value-enhancing technologies and practices that they teach.

Expected outputs
Documented smallholder farmer-specific value-enhancing technologies and practices on crops and livestock.
## Program of the Workshop

### Sunday, March 12, 2017 – Arrival of international participants at Getfam Hotel

### Monday, March 13, 2017

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<td>1210 – 1225</td>
<td>Examples of value enhancement technologies and practices taught at Bobo Dioulasso</td>
<td>Bobo Dioulasso</td>
</tr>
<tr>
<td>1225 – 1300</td>
<td>General discussion</td>
<td>Participants</td>
</tr>
<tr>
<td>1300 – 1400</td>
<td>LUNCH BREAK</td>
<td>Getfam Hotel</td>
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</tbody>
</table>

### OPENING SESSION

Chairperson: **Dr Aberra Debelo, Country Director, Sasakawa Global 2000, Ethiopia**

<table>
<thead>
<tr>
<th>Time</th>
<th>Agenda Item</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0830 – 0900</td>
<td>Introductions of workshop participants + Workshop objectives</td>
<td>Dr. Jeff Mutimba, Winrock-SAFE Coordinator for East &amp; Southern Africa</td>
</tr>
<tr>
<td>0900 - 0915</td>
<td>SAFE’s perspectives</td>
<td>Dr. Deola Naibakelao, Managing Director, SAFE</td>
</tr>
<tr>
<td>0915 – 0930</td>
<td>Opening Remarks</td>
<td>Hon. Prof Ruth Oniang’o, SAA &amp; SAFE Board Chair</td>
</tr>
<tr>
<td>0930 – 0950</td>
<td>Official opening: State Minister, Ministry of Agriculture and Natural</td>
<td>H.E. Tesfaye Mengistie, State Minster, Ministry of Agriculture and Natural</td>
</tr>
<tr>
<td>0950 – 1030</td>
<td>Group photograph</td>
<td>Resource, Ethiopia</td>
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</table>

### SESSION I – PRESENTATIONS

Chairperson: **Dr Assa Kante, Winrock-SAFE Program Coordinator, Mali & Burkina Faso**

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<tr>
<th>Time</th>
<th>Agenda Item</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>1030 – 1050</td>
<td>Examples of recommended value enhancement technologies and practices in Mali</td>
<td>MoA-Mali</td>
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<tr>
<td>1050 – 1105</td>
<td>Examples of recommended value enhancement technologies and practices in Mali</td>
<td>DNA-Mali</td>
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<tr>
<td>1105 – 1120</td>
<td>Examples of value enhancement technologies and practices taught at Samanko</td>
<td>Samanko Agricultural College</td>
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<tr>
<td>1120 – 1135</td>
<td>Examples of value enhancement technologies and practices taught at IPR/IFRA</td>
<td>IPR/IFRA</td>
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<tr>
<td>1135 – 1150</td>
<td>Examples of value enhancement technologies and practices taught at Segou</td>
<td>University of Segou</td>
</tr>
<tr>
<td>1150 – 1210</td>
<td>Examples of recommended value enhancement technologies and practices in Burkina Faso</td>
<td>MOA-Burkina Faso</td>
</tr>
<tr>
<td>1210 – 1225</td>
<td>Examples of value enhancement technologies and practices taught at Bobo Dioulasso</td>
<td>Bobo Dioulasso</td>
</tr>
<tr>
<td>1225 – 1300</td>
<td>General discussion</td>
<td>Participants</td>
</tr>
<tr>
<td>1300 – 1400</td>
<td>LUNCH BREAK</td>
<td>Getfam Hotel</td>
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### SESSION II – PRESENTATIONS

Chairperson: **Dr Roselline Nyamutale, Country Director, Sasakawa Global 2000, Uganda**

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<tr>
<th>Time</th>
<th>Agenda Item</th>
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<tbody>
<tr>
<td>1400 – 1420</td>
<td>Examples of recommended value enhancement technologies and practices in Uganda</td>
<td>MOA-Uganda</td>
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<tr>
<td>1420 – 1435</td>
<td>Examples of value enhancement technologies</td>
<td>Makerere University</td>
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and practices taught at Makerere

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<thead>
<tr>
<th>Time</th>
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</thead>
<tbody>
<tr>
<td>1435 – 1455</td>
<td>Examples of recommended value enhancement technologies and practices in Tanzania</td>
<td>MoA/MoLG-Tanzania</td>
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<tr>
<td>1455 – 1510</td>
<td>Examples of value enhancement technologies and practices taught at Sokoine University</td>
<td>Sokoine University</td>
</tr>
<tr>
<td>1510 – 1525</td>
<td>Examples of value enhancement technologies and practices taught at Lilongwe University</td>
<td>Lilongwe University</td>
</tr>
<tr>
<td>1525 – 1600</td>
<td>General discussion</td>
<td>Participants</td>
</tr>
<tr>
<td>1600 – 1630</td>
<td>COFFEE/TEA BREAK</td>
<td>Getfam Hotel</td>
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</table>

**Tuesday, March 14, 2017**

**SESSION III – PRESENTATIONS**

*Chairperson – Mrs Aberash Tsehay, SG2000-Ethiopia*

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>0830 – 0845</td>
<td>Examples of recommended value enhancement technologies and practices in Ethiopia</td>
<td>MoA-Ethiopia</td>
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<tr>
<td>0845 – 0900</td>
<td>Examples of recommended value enhancement technologies and practices in Ethiopia</td>
<td>MoLF-Ethiopia</td>
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<tr>
<td>0900 – 0915</td>
<td>Examples of recommended value enhancement technologies and practices in Gambella Region</td>
<td>Gambella</td>
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<tr>
<td>0915 – 0930</td>
<td>Examples of recommended value enhancement technologies and practices in Tigray Region</td>
<td>Tigray</td>
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<tr>
<td>0930 – 0945</td>
<td>Examples of recommended value enhancement technologies and practices in SNNPR</td>
<td>SNNPR</td>
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<tr>
<td>0945 – 1000</td>
<td>Examples of recommended value enhancement technologies and practices in Benshangul</td>
<td>Benshangul</td>
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<tr>
<td>1000 – 1030</td>
<td>Examples of recommended value enhancement technologies and practices in Somali Region</td>
<td>Somali: -Crops -Livestock &amp; Pastoralist Development</td>
</tr>
<tr>
<td>1030 – 1050</td>
<td>COFFEE/TEA BREAK</td>
<td>Getfam Hotel</td>
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**SESSION IV – PRESENTATIONS**

*Chairperson - Dr Mercy Akeredolu, Winrock-SAFE Program Coordinator, West Africa*

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>1050 – 1105</td>
<td>Examples of value enhancement technologies and practices taught at Haramaya University</td>
<td>Haramaya University</td>
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<tr>
<td>1105 – 1120</td>
<td>Examples of value enhancement technologies and practices taught at Hawassa University</td>
<td>Hawassa University</td>
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<tr>
<td>1120 – 1135</td>
<td>Examples of value enhancement technologies and practices taught at Bahir Dar</td>
<td>Bahir Dar University</td>
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<tr>
<td>1135 – 1150</td>
<td>Examples of value enhancement technologies and practices taught at Mekelle University</td>
<td>Mekelle University</td>
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<tr>
<td>1150 – 1205</td>
<td>Examples of value enhancement technologies and practices taught at Wollo University</td>
<td>Wollo University</td>
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<tr>
<td>1205 – 1235</td>
<td>Examples of value enhancement technologies and practices taught at Jimma University</td>
<td>Jimma University</td>
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<tr>
<td>Time</td>
<td>Event</td>
<td>Location</td>
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<tr>
<td>1235 – 1250</td>
<td>Examples of value enhancement technologies and practices taught at Jigjiga University</td>
<td>Jigjiga University</td>
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<tr>
<td>1250– 1400</td>
<td>LUNCH</td>
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**SESSION V - PRESENTATIONS**  
Chairperson - Dr Mercy Akeredolu, Winrock-SAFE Program Coordinator, West Africa

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<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>1400 – 1415</td>
<td>Examples of value enhancement technologies and practices taught at Samara University</td>
<td>Samara University</td>
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<td>1415– 1430</td>
<td>Examples of value enhancement technologies and practices taught at Arba Minch University</td>
<td>Arba Minch University</td>
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<tr>
<td>1430 – 1500</td>
<td>General discussion</td>
<td>Participants</td>
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<td>1500 – 1530</td>
<td>COFFEE/TEA BREAK</td>
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**SESSION VI - PRESENTATIONS**  
Chairperson - Dr Dessalegn Molla, Dean, Bahir Dar University

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<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>1530 – 1550</td>
<td>Examples of recommended value enhancement technologies and practices in Ghana</td>
<td>MoA-Ghana</td>
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<tr>
<td>1550 - 1605</td>
<td>Examples of value enhancement technologies and practices taught at Kwadaso College</td>
<td>Kwadaso Agricultural College</td>
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<tr>
<td>1605 - 1620</td>
<td>Examples of value enhancement technologies and practices taught at University of Cape Coast</td>
<td>University of Cape Coast</td>
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<tr>
<td>1620 - 1650</td>
<td>General discussion</td>
<td>Participants</td>
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**Networking**

**SESSION VII – Farewell Dinner and Lecture starting at 1830 hours**

**Wednesday, March 15, 2017**

**SESSION VIII – PRESENTATIONS**  
Chairperson - Dr Muluken, Extension Head, Haramaya University

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<th>Time</th>
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<tbody>
<tr>
<td>0830 – 0840</td>
<td>Observations so far</td>
<td>Dr Habtu Assefa, SG2000-Ethiopia</td>
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<tr>
<td>0840 – 0900</td>
<td>Examples of recommended value enhancement technologies and practices in Benin</td>
<td>MoA Benin</td>
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<tr>
<td>0900 – 0915</td>
<td>Examples of value enhancement technologies and practices taught at Abomey University</td>
<td>University of Abomey Calavi</td>
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<tr>
<td>0915 - 0930</td>
<td>General discussion</td>
<td>Participants</td>
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**SESSION IX – PRESENTATIONS**  
Chairperson - Dr Sani Miko, Country Director, Sasakawa Global 2000, Nigeria

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<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>0930 - 0950</td>
<td>Examples of recommended value enhancement technologies and practices in Nigeria</td>
<td>MoA-Nigeria + Prof Tunji Arokoyo</td>
</tr>
<tr>
<td>0950 - 1005</td>
<td>Examples of value enhancement technologies and practices taught at ABU</td>
<td>Ahmadu Bello University</td>
</tr>
<tr>
<td>Time</td>
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<td>Location</td>
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<tr>
<td>1005 – 1030</td>
<td>COFFEE/TEA BREAK</td>
<td>Getfam Hotel</td>
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<tr>
<td>1030 – 1045</td>
<td>Examples of value enhancement technologies and practices taught at BUK</td>
<td>Bayero University</td>
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<tr>
<td>1045 – 1100</td>
<td>Examples of value enhancement technologies and practices taught at Ilorin University</td>
<td>University of Ilorin</td>
</tr>
<tr>
<td>1100 – 1115</td>
<td>Examples of value enhancement technologies and practices taught at Adamawa University</td>
<td>Adamawa State University</td>
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<tr>
<td>1115 – 1130</td>
<td>Examples of value enhancement technologies and practices taught at Usmanu Dan Fodio</td>
<td>Usmanu Dan Fodio University</td>
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<tr>
<td>1130 – 1200</td>
<td>General discussion</td>
<td>Participants</td>
</tr>
<tr>
<td>1200 – 1230</td>
<td>SAA’s experiences with value enhancement technologies and practices</td>
<td>Engr. Leony Halos-Kim</td>
</tr>
<tr>
<td>1230 – 1245</td>
<td>General discussion</td>
<td>Participants</td>
</tr>
<tr>
<td>1245 – 1300</td>
<td>Split into groups and assignment</td>
<td>Dr Habtu Assefa &amp; Dr Jeff Mutimba</td>
</tr>
<tr>
<td>1300 – 1400</td>
<td>LUNCH</td>
<td>Getfam Hotel</td>
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<tr>
<td>1400 – 1500</td>
<td>Group discussion on way forward</td>
<td>Groups</td>
</tr>
<tr>
<td>1500 – 1530</td>
<td>Groups report back &amp; Summary of observations</td>
<td>Plenary &amp; Dr Habtu Assefa</td>
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**SESSION X – CLOSING SESSION**  
*Chairperson – Prof. Tunji Arokoyo FAESON*

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<tbody>
<tr>
<td>1530 – 1550</td>
<td>Remarks</td>
<td>Winrock</td>
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<td>1550 – 1600</td>
<td>Closing Remarks</td>
<td>Hon. Prof Ruth Oniang'o, SAA &amp; SAFE Board Chair</td>
</tr>
<tr>
<td>1600</td>
<td>End of the Workshop + COFFEE/TEA</td>
<td>Getfam Hotel</td>
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