

Report on Training of Trainers (TOT) in Tigray Region on Africa RISING Project Validated Technologies/Innovations in the Ethiopian Highland

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Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three regional projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads the program's monitoring, evaluation and impact assessment. <http://africa-rising.net/>



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Abbreviations

| | |
|---------------|--|
| Africa RISING | Research In Sustainable Intensification for the Next Generation |
| ATVET | Agriculture Technical Vocational Education and Training |
| CASCAPE | Capacity building for Scaling up evidence-based practices in Agricultural Production in Ethiopia |
| CIAT | International Center for Tropical Agriculture |
| CIMMYT | International Maize and wheat improvement center |
| CIP | International Potato center |
| GRAD-2 | Graduation with Resilience to Achieve Sustainable Development |
| HH | Household |
| ICARDA | International Center for Agricultural Research in the Dry Areas |
| ICRAF | world Agro forestry center |
| ICRISAT | The International Crops Research Institute for the Semi-Arid Tropics |
| M& E | Monitoring and Evaluation |
| NDF | Neutral Detergent Fiber |
| PVS | Participatory Variety Selection |
| REST | The Relief Society of Tigray |
| TARI | Tigray Agricultural Research Institute |

Summary

Africa RISING project in the Ethiopian highlands together with Maichew Agricultural TVET College organized a three days Training of Trainers (ToT) workshop at Endamehoni, Tigray from 19-21 May 2017. The main objectives of the training were:

- To introduce and familiarize development partners the already validated Africa RISING project technologies/innovations in the Ethiopian Highlands;
- To equip the technical staff of the partners with skills and knowledge of the management of each technology/innovations;
- To jointly plan the implementation process.

59 participants (7 Female and 52 Male) from Government (extension, research, Maichew ATVET College and Mekelle University), NGOs (REST/GRAD-2, CASCAPE) and Private sectors like Raya Brewery factory joined in the training workshop. Scientists and researchers from ILRI/Africa RISING, CIP, ICRAF, CIMMYT, ICRISAT, ICARDA and CIAT lead the training.

The training combined both theoretical and practical sessions. The first two days were covered theoretical training to help participants understand Africa RISING project in the Ethiopian highlands and the various Africa RISING technologies which are ready to be scaled out. Each CGIAR centers made a brief power point presentation on description, management and research results of the technologies /innovations.

The morning of the first day covered an overview of the Africa RISING achievements in phase one and its moves from phase I to Phase II, Gender integration in Africa RISING scaling activities and presentations from four local partners(TARI, REST/GRAD2, Maichew ATVET and CASCAPE). In the afternoon participants divided into three groups; Natural Resource Management (NRM), Crop and Livestock for an in-depth theoretical training.

The morning of the second day started with recap of the first day and followed by two presentations from Southern and South Eastern Tigray Zone offices of Agriculture. After the question and answer session participants split into their respective groups for the final session of the theoretical training. Then, the three separate groups come together in plenary and officially concluded the theoretical session.

The afternoon session were dedicated to joint planning of the implementation process for phase II of the Africa RISING project in the region. The participants were grouped into six groups of implementing partners and developed the implementation process. Each group leaders then shared their draft scaling plan in plenary.

By the end of the second day, Raya Brewery invited all the participants to visit the company. Mr Mola (the factory's Quality manager) gave a very good explanation on the processing units of the factory, initial investment cost, their annual malt barley demand, and their waste treatment units. A very interesting discussion was made during the time of visiting and possible areas where Africa RISING project can work in collaboration with the brewery. One possible area of partnership identified was

malt barley. Malt barley is highly demanded by the brewery which they are currently importing. Africa RISING is engaged farmers to produce improved variety of malt barley. Thus, there is a potential partnership in this regard. The other potential partnership identified was undertaking a joint research on how to convert the factory's byproduct into livestock feeds.

On the third day, which was the final day of the training, participants were able to visit field trials/demonstrations including watershed management, Apple, tree Lucerne, feeding troughs, feed shade, seed and potato storage structures. After the field visit, general discussions were held in Tsibet kebele at Tiamti potato seed multiplication cooperative.

In the afternoon, group discussion was organized with fewer number of partners at Tadele Hotel to discuss future direction on how to tackle apple disease in collaboration with woreda, zonal and regional government officials. Apple disease was a major discussion during the course of the training and was identified as one of the major obstacle in the Woreda for not getting the desired results from apple production. The discussion focused on reviewing the scaling plan based on the resource availability, establishing zonal steering committee, identifying contact person for each woreda Agricultural office and to identify and discuss with potential scaling partners in the region.

First Day

Welcoming remarks

The training workshop kicked off with a brief welcoming remark from the project coordinator, Peter Thorne, and an official opening remark by Gebrezgabher Aregawi, coordinator of the southern zone office of agriculture.

In his welcoming remark, Peter Thorne acknowledged the good coordination, collaboration and commitment of the government extensions and NGO support to go for Africa RISING innovations scaling. He recognized that it would have been impossible to go for scaling without the project partners' involvement and support. Peter mentioned that phase II of the Africa RISING project is mainly about scaling and the responsibility of doing scaling hugely falls on the shoulder of our development partners. Hence, he said, your active participation in this ToT, discussions and joint planning of the implementation process within these three days is very vital.

Gebrezgabher Aregawi, coordinator of the Southern Zone office of agriculture, while officially opening the training workshop acknowledged the contributions and initiatives of the Africa RISING project in different technology adaptation and validation in the two kebeles in the last four years. He said that all the government partners from the woreda to the regional levels were well aware of Africa RISING project activities thus reaffirmed the government commitment to work together with Africa RISING and other stakeholders in scaling out the validated technologies. Finally, he requested participants for their active participation and maximize their benefit from the training workshop.

Presentations

The morning of the first day entertained six presentations of which two were from the Africa RISING project in the Ethiopian highlands and the remaining four from development partners. The first presentation was by Kindu Mekonnen, Crop – livestock systems Scientist for the project. His presentation focused on the overall activities of Africa RISING project during the first phase and the move to the second phase of scaling out of proven technologies and innovations particularly focusing on the coming Maher season.

Key areas covered in the presentation included:

- Engagement and partnerships with CGIAR centers, national and regional partners during in phase one,
- Spatial distribution of Africa RISING intervention sites in Ethiopian Highlands,
- The various diagnostic studies conducted for better understanding of the farming system,
- Major constraints and challenges identifies across sites,
- Identification and formulation of the seven key research thematic areas and the implementation of 17 action research protocols in collaboration with the project partners.

Kindu also demonstrated some of the major achievements in the areas of livestock feed and fodder development, field crops, land and water management, small mechanization (mainly the introduction and utilizations of the two wheel tractor), high value fruit trees, water shade management, number of HH beneficiaries, Innovation platforms(IPs), Capacity building, communication and publications.

Finally, he indicated the project moves into the second phase focusing on 70% in backstopping research and 30% in supporting technology adaptation and validation. With this approach, by the end of the second phase, it is estimated to reach 700,000 direct HH beneficiaries and 3,000,000 indirect HH beneficiaries in the coming five years.

Annet Mulema, Gender specialist for the Africa RISING project in the Ethiopian highlands, made the second presentation focusing on how to integrate gender in the scaling activities. She outlined that all the technologies to be scaled needs to consider the disadvantage groups like females, children, elderlies, youngsters, students, etc. Unless we include these disadvantage groups, she noted, the technologies will not reach out to the number of people we envisaged to reach out. The best approach, as to her, are to be follow the accommodative approach (working around existing gender differences and inequalities) or adopt the transformative approach (fosters critical examination of general norms and dynamic, strengthen creates systems that support gender equality, strengthen or create equitable gender norms and dynamics and changes inequitable gender norms and dynamics). In such ways we should be targeting, assessing the technologies and identify where and how to involve the disadvantage groups example by putting quota (e.g. 30% Female), establishing gender balanced group and conducting M& E.

Discussion

- The Malt barley varieties from Africa RISING project are obtaining a promising results. Brewery factories are here in Michew and discussion has already started to partners with them which ultimately benefit the farmers
- Questions: Are equity and equality the same or different?
- Answer: No they are not the same. Equality is in terms of technology or material supply where us equity is in terms of the targeted benefit out of the technology supplied.

Partners Presentations

Tigray Agriculture Research Institute (TARI)

Representing Tigray Agriculture research institute, Tesfay Hagos, presented the institute's research focus area in food and feed crops varietal development, adaptation and seed multiplication, sheep and cattle breeding and poultry productions and demonstration, Natural Resources Management (NRM), soil fertility management and mechanization, and technology. He also covered key responsibilities, achievements, challenges and constants as well as its current engagement with Africa RISING and future collaborations.

Maichew ATVET College

Mr. Moges Assefa from Maichew ATEVT College then presented on the college's key activities and engagement including Specialization and development agent curriculum, informal training for the youth groups, technology transfer, and scaling of technologies in partnership with Africa RISING. He added that Maichew ATVET College is very keen to work closely with Africa RISING especially in demonstration of technologies to use as a teaching aid for development agents and the development agents to popularize the technologies in their working areas.

CASCAPE

CASCAPE stands for Capacity building for scaling up of evidence-based best practices in agricultural production in Ethiopia. According to Haile Kidane, the CASCAPE project is designed to add to activities initiated by Agricultural Growth Program (AGP), especially in verifying best practices in agricultural production and identifying under which circumstances farmers are prepared to take up innovations. In the presentation he highlighted the objectives of CASCAPE2, target and intervention areas, scaling activities, innovation pathway, scaling approaches and other capacity building activities.

GRAD

GRAD is a five year USAID-funded project designed to build on the Government of Ethiopia's Productive Safety Net Program Plus (PSNP) project. PSNP was a previous USAID-funded initiative that demonstrated the potential for safety nets to support extremely vulnerable, food insecure populations. In his presentation Yikuno Amlak focused on GRAD2 project target areas, focused intervention (commodities) and target group, partnership, approaches and scaling plan of technologies in partnership with the Africa RISING project.

Question and Answer

| Question | Answer |
|---|--|
| TARI did feeding trough pre-scaling work. Can you update your progress? How many technology demonstrated and validated by TARI? | TARI demonstrated feeding trough in four woredas with 50 households using farmer research groups (FRG) approach. TARI also released 14 crop and 5 livestock feed varieties. |
| Africa RISING supported row planter demonstration under Maichew ATVET. What is the progress? | The work was successful and the Ministry of science and technology gave patent right for the inventor. |
| What is the progress of your trial on cactus wilting micro-organism? (MATVET) | The initiative of the gov't and others to control cochlea infestation on cactus is weak. But, we have been trying all our best to tackle this problem and our work is in a good progress. |
| What is the commitment of Raya brewery factory to work in collaboration with Africa RISING project? | Raya brewery is committed to engage in scaling out of malt barley because the factory needs quality malt barley. |
| Farmers may lose some benefits because of producing malt barley since its productivity is lower than other crops. How the factory is planning to compensate farmers in this regard? | The best approach that the factory prefer to collect the malt barley is through farmers' cooperative unions not from individuals. Regarding the yield gap, the factory planned to either help them to enhance its productivity or set price that could fill their gaps. |
| How the factory could solve the working capital problem of the farmers? | This is not a problem and it is a must for the factory to do this. |
| What is the linkage between GRAD-2 and Maichew ATVET? | GRAD-2 will work with Maichew ATVET collage and in the near future we planned to organize a workshop to decide on how to start our collaborative work. |
| To what extent GRAD-2 is flexible to collaborate with Africa RISING outside your target woredas? | We are flexible and we can collaborate with Africa RISING on other sites as well. |
| There are similar works that Africa RISING and CASCAPE are working on. Africa RISING developed one innovation document together with our partners. How you planned to review and align your activities with us so as to reduce duplication of effort? | CASCAPE-II mainly focus on capacity building. Best fit manuals will be prepared. CASCAPE and Africa RISING have been engaged almost on similar work. We have to reduce duplication of effort in the future. We need to discuss and develop joint plan with Africa RISING phase II project. |

Second day

Partners Presentations

Southern and South Eastern Tigray Zones

Gebrezgabher Aregawi (Zone Agriculture and rural development office coordinator) made an overview presentation on Southern Tigray zone agricultural production; the natural resource and management, soil and water conservation, livestock production, cereal, legume, tuber, fruit and vegetable production. He also highlighted the investment activities and investment opportunities in the zone. Mamo Gebremariam from south east Tigray, Tenben woreda on the other hand made a brief presentation on his woreda Agricultural activities; crop and livestock production, NRM and scaling plan of technologies in partnership with Africa RISING.

Question and Answer

| Questions | Answers |
|--|---|
| What is planned by the Southern Zone to scale out Africa RISING innovations? | We have planned to scale out into 2 zones and 5 Woredas. |
| One of the apple nursery established by the fund obtained from FAO severely affected by apple disease. What is the plan of the Zone to rehabilitate the nursery? | Another apple nursery site is under construction with support from AGP so as to control disease and develop disease free seedlings. |
| Animal feed aspect is not mentioned in the presentation. What is the potential available here in southern zone? | There is huge potential in livestock feed production. 10% of land is allocated by the zone for feed production by irrigation. |
| Raya valley has abundant potential not utilized yet. It has good water resource which is not utilized. What is your future plan as a zone to utilize these resource? | Yes, Raya valley has big potential. I hope we are on a right track to start utilization of resources from Raya valley. But, we need to do much in the future. |

Group training

On the afternoon of the first day participants were divided up into three groups (Livestock, Natural Resources Management and crops) for the training. Below is a short summary of the groups training.

Natural Resources Management (NRM)

Natural resource management experts from the 5 selected woredas office of agriculture, Maichew ATVET College, Wukro Saint Mary, Mekelle University, Alamata Agricultural research center (ARC) and Mehoni ARC attended the training. The main aim of the training was to capacitate experts with knowledge and skill to scale out Africa RISING innovations in the areas of natural resource management.

ILRI, Mekelle University and ICRAF made presentations focusing on the technologies they introduced and their plan for scaling out with partner.



The NRM experts on training (Photo credit: ILRI/Simret Yasabu)

Kindu Mekonnen from ILRI presented Africa RISING experience on biophysical measures as a means to manage watersheds. The presentation covered definitions of watershed, why watershed approach is used, components of watershed management and why Africa RISING is interested to operate at watershed scale.

Kifle Woldearegay from Mekelle university then made a presentation on water harvesting, irrigation development; enhancing productivity under rainfall variability. In his presentation he outlined that to develop water resources there should be upper catchment treatment of the watershed and for the development of water resources there should be physical and biological conservations in the upper catchment of the watershed. Thus, it is generally believed that to have water sources and develop irrigation activities the watershed management approach is the most appropriate to implement.

Aster Gebrekirstos from ICRAF finally presented the various high value trees the center introduced in the first phase of the project and the plan to scale out high value multipurpose trees and their management practices from homestead to landscape. She talked about how the implementation were done through the integration of trees with crops and livestock. In ensuring planted trees to have multipurpose benefit, considerations should be made about livestock feed, human food etc.

Discussion on scaling out

- Enhancing productivity under rainfall variability is the approaches to scale out the biophysical measures as a means to manage watersheds and water harvesting and irrigation development.
- The approaches discussed here are good approaches to use, however, the woreda natural resource management experts are mostly engaged in convincing people to take fertilizers, which is not in line with their profession. Hence it was suggested Africa RISING to meet and convince the influential political leaders/ decision makers to implement approaches that can bring a difference in the livelihood of the rural people.
- To scale out high value multipurpose trees there should be availability of quality planting materials or through strengthens existing nurseries or facilitating establishment of demand driven community based multiplication & distribution centers.
- Experts from Ofla woreda said that there is enough space to plant avocado if its full package is provided. They also add that, before its implementation, agro ecological fitness should be checked and there should be capacity building. In Ofla woreda, the youth are given a nursery site which they are producing other seedlings (other than high value trees) like Hops. If the youth get capacity building and seedlings they can bring a change. When the technology is introduced capacity building should also be given to all the woreda DAs. Besides, while introducing the technology, there also needs to be awareness creation programs on the nutrition values of the high value multipurpose trees.
- Alamata experts also said if the youth capacity is enhanced they can bring change from this technology.
- Participants also agreed that there should be a guideline before applying the high value multipurpose trees.

Field Crop group

Nineteen (19) field crop experts from the four selected woredas office of agriculture, Maichew ATEVET College, GRAD, CASCAPE, Alamata ARC, and Mehoni ARC attended the training. The main aim of the training was to equip the crop experts with knowledge and skill of the management and utilization/application/ of field crop technologies (management and varieties) and to cascade the training to the other staffs and development agents.



Crop experts on training (Photo credit: ILRI/Simret Yasabu)

ICARDA, CIP and ICRISAT made presentations focusing on the technologies and new approaches they tested during got first phase of the project life and their plan for scaling out with partner.

Yetsedaw from ICARDA presented the gaps and problems of Cereals and legume production, joint planning and implementation of R4D interventions, new varieties and decentralized seed system, approaches and achievements of the on farm research interventions. He noted that the on farm research interventions includes faba bean and disease management, participatory variety selection (PVS) of bread and durum wheat, lentil, field pea, food and malt barley, community seed multiplications of bread wheat, barley and faba bean.

Meresei from CIP then presented potato related technologies mainly on potato productions gaps and problems, approaches and methods of potatoes R4D, achievements and results of potato demonstration, PVS and community seed multiplication, and ware and seed potato storages. She also presented the importance and the status of potato seed producer cooperatives both at Tsibet and Emba Hasti kebeles.

Representing ICRISAT, Yidenkachew made a brief presentation on the findings of Yield Gaps of wheat production system in Ethiopia through Soil Test-based Nutrient Amendments. The presentation covered approach, Applications and Policies, target research approach and portrayed outputs, preliminary findings and suggested approaches, economic analysis on specific fertilizer recommendation and scaling the innovations and next Steps. He also pointed that the technologies (information) can be packaged with other Africa RISING technologies (wheat) planned to be scaled-out to improve crop productivity and soil health which will later help farmers to get a certificate for their land.

Finally, Walter from CIMMYT presented the farm Mechanization technologies mainly focusing on the importance of Mechanization and the target beneficiaries, what technologies to be scale out, farm mechanization Service Provider scheme, lesson learnt from phase one trials and training approaches. CIMMYT recommend to scale out two wheel tractor with its trailer for its multi-purpose benefits (seeding, irrigation and transportation).

Discussion

- In bread wheat the variety recommended for the area is only Hidase, why not Mekelle 4, which sometimes outsmart Hidase in terms of yield?
- Some of the recommended agronomic practices, for example, fertilizer rate is based on the national level, but we have regional recommended packages that considers regional contexts such as amount of rainfall and the like. So how can we proceed and which rate shall we use?
- The demonstration plan of the project seems to concentrate on adjacent plots, but it would have been good to plan these demonstration plots in all kebeles so that many farmers will have access to these demonstrations? How do you arrive at the plot size for demonstration?
- Currently the Quality Declared seed (QDS) support seems to be non-functional, how can we support this?
- One of the main gap with farmers are supply of chemicals, so how can the project support in this regard?
- There is a huge opportunity for linking malt barley marketing with the Raya brewery. But this needs further discussion with the factory and other partners. So how is the project planning to facilitate this? Can we also develop appropriate agronomic practices for malt barley that meets the requirement?
- The variety you recommend for chick pea is white color and big size. But farmers in our woreda prefer tegegnech for its earliness, size and color. So how can we link farmers to market for a big size and white colored chick pea?
- Faba bean Gal and orobache are the main pests. So how can we manage these pests?
- Did selection criteria and preference varied among male and female participants?
- Research recommendations on the use of PICS for seed storage of faba bean?
- Lack of availability of inputs such as seed, fertilizer, chemicals, PICS, bio-fertilizer in the market were some of the issues raised from participant side.
- Financial feasibility for tractor should have been conducted to compare with the existing practices of using ox.
- What available technology does ICRISAT has to scale?

Responses

- The newly released varieties will be included in participatory variety selection testing sites for 2017 including Hashenge variety of Faba bean with its management as it is tolerant to orobanche which is a problematic parasitic weed in the zone and other parts the country.
- It is important to have continuous follow-up and discussion to bring the Raya brewery on board in the evaluation/PVS of malt barley, and create market linkage. The factory can be member of the innovative platform.
- Disease and pest are major constraints in sustaining crop productivity, therefore, attention should be given in the management of diseases and pests.
- Demonstration should be conducted in cluster areas so that apart from serving as a learning ground, it will also become good sources of seed. This could be a starting point for community based seed multiplication.
- Input availability such as seed, chemicals, sprayers and other farm tools and spare parts are very important in the scaling of technologies. Therefore, there is a need to support private agro-dealers and build their capacity.

- The use of multipurpose tractor may be feasible in the course of transformation, however, there are availability, affordability, spare parts supply and maintenance issues that need attention. Therefore, this kind of technology requires donors like ATA and AGP.

Livestock group

Aberra Adie with Melkamu Bezabih facilitated this group as it was exclusively dealing with livestock related technologies and innovations that the project has introduced.

Teklu Kidane and Kindu Mekonnen from ILRI presented the feeds and forages technologies tested in Africa RISING and options for establishing local seeds system. 17 participants from extension, research, NGOs, and colleges



The Livestock experts on training (Photo credit: ILRI/Simret Yasabu)

were part of this livestock group. At the end of the presentation participating local partners were given the chance to briefly explain the ongoing feeds and forage interventions in their respective areas. Accordingly, the following activities have been mentioned:

- Raya brewery residue/by-product can be used as source of livestock feed supplementation, but the brewery residue is moist and exposed to air which can create mould, so to avoid this problem it should be closed to avoid air contamination
- Demonstrations on urea treatment of straws
- Cactus-Urea-Molasses block formulation
- Limited scale introduction of improved forage varieties – Sesbania, Tree Lucerne, Alfalfa Cowpea, Napier grass. About the forage development at farmers level it is still difficult due to the farmer's resistance and land shortage especially at the highland area. The investors are relatively better on forage seed production at farm land
- Business oriented farmers assign 2-5 ha of land for forage production and seed multiplications
- Forage seed multiplication can be possible in Forage sites found At Endamekoni, Raya Alamata and Raya Azebo wored's.

Discussion

The following discussion points (Questions/Answers) emerged following the presentations:

| Issues / comments / Question | Responses |
|---|---|
| Rate of mixing tree Lucerne with local feed stuff | <i>A detailed user manual has been prepared in English for each technology and distributed to participants. However, these manuals need to be translated into local languages and local measurement units so that farmers can easily understand the mixing proportions. As a general guide the extension should promote mixing of 30% tree Lucerne leaf with 70% crop residues to meet the requirements of animals for protein and energy and improve productivity.</i> |
| Feeding fresh and dry tree Lucerne leaves – NDF content vs rate of supplementation and preference by different classes of animals | <i>Tree Lucerne has generally low NDF content (36-42%) and high readily digestible organic matter (app. 70%). In terms of feeding value, the fresh or wilted tree Lucerne has a comparative advantage, as the green biomass is rich in vitamins and minerals and is low in fiber content. During the drying process, there is some degree of loss of nutrients, especially vitamins, and intense solar exposure may create association between the NDF and protein content, making it less digestible. To avoid or minimize nutrient loss during drying, the leaves should preferably be dried under shed and continuously turned upside down to uniformly dry the leaf and avoid excessive solar exposure. In that way it is possible to prepare dried leaves and hay which is greenish in color and has similar nutritive value as the fresh biomass. Drying is the common method of feed preservation and should be performed regularly to harvest forages at their optimal stage of growth. But it is important to follow proper procedures as mentioned above.</i> |
| It is good to include action research on indigenous forage collections in addition to the exotic species? | <i>The action research continues as a backstopping to the scaling</i> |
| We are measuring with units of scientific known measuring what are the best measurements of the forage | we have to show farmers to use locally available measurements for sustainability. |

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| supplementation at farmer's level with farmer's equipment? | |
| What is the attention given for the indigenous grass species? | we focus on exogenous forage species- moreover TARI is also working on the indigenous forage species identification, screening and releasing as well |
| There is low experience with Desho grass in the area – Desho grass is one of indigenous forage grass, it can be harvested 3-5 times per year if it is in good condition. So desho grass is well promoted splitting. | <i>further validation and demonstration work to be done in Tigray for wider scaling</i> |
| Free grazing is an outstanding challenge for improved forage development | <i>Promote intensification and identify niches for the various forages. Ex: annual forages like oats-vetch and lupine can be planted during the main crop season and harvested when food crops are harvested so that they are not affected by free grazing. Perennial forages can be planted in a controlled area at the backyards or fenced plots.</i> |
| Livestock product market is very short – Milk is sold for Birr 12.00/lit in Maichew during non-fasting times and lower during fasting times. Farmers face problems to sell their fattened animals | <i>Input supply and product market linkages needs to be addressed at the platforms and government extension system (there is an existing IP at woreda level and there should be one at zonal level to facilitate the linkages)</i> |
| Less fat content of exotic dairy cows Vs holding less number of improved dairy breeds than large number of local cows especially for areas where selling fluid milk is a problem | <i>a trade-off analysis has to be done considering the feed intake and product values</i> |
| Rehabilitating pasture land around Lake Ashange and control runoffs silting up the lake: It has been presented that there is about 628 ha of pasture land (with a grazing capacity of 10,000 heads of cattle) out of which 50 ha closed. Ashange Lake is one of the endangered lakes in | <i>This is beyond the capacity of the project, but can be raised as an issue in the platforms and seek the attention of government support.</i> |

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| Ethiopia due to uncontrolled sedimentation from the runoffs | |
| Local Seed Supply System | <p><i>from the various options presented by Teklu it has been discussed and agreed to start with the informal seed supply system whereby few capable and interested farmers are selected from Kebeles with a niche for livestock production potential to ensure demand for seed and forage biomass. The need to provide practical training in forage seed production, processing and storage and basic marketing skills to farmers and/or their educated children was emphasized. Followed by the training and access to foundation seed it was mentioned the need to also provide on-site advisory services to farmers by the extension system. The first step is to help farmers produce seed and planting material for self-use and transfer to their neighbors the excess material thereafter. It has also been presented from the local partners that there are some farmers in some villages who produced forage seeds but could not sell it due no market information/linkage. So, the prior activity in establishing local seed system has been agreed to be taking inventory of existing forage seed sources, verify their quality and link to the demand side. In this case it was indicated that there is a need to undertake a quick survey of the regional demand for seed and planting material, mainly that of the government and NGOs operating in the region. TARI takes responsibility of quality check and multiplying some forage seeds for this season for future scaling. In the long-run, the informal (local) seed producers are expected to become part of a formal forage seed system. The need to link farmers with the existing ILRI FeedSeed project clients was also recommended. The possibility of engaging ATVET graduates and cooperatives in the business of forage seed marketing/distribution was also sought as a means to increasing the supply of good quality material within the region and beyond.</i></p> |
| Irrigated forages | <p><i>There are three woredas (Ambalage, Endamahoni and Ofla) with irrigation capacity and experience where forages can be planted on at least 400m2 of land with irrigation for improved dairying.</i></p> |

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| <p>The small scale farmers have no enough awareness on forage seed production, but they have high seed demand. Alfalfa seed production is not easy they need bee pollination for good seed production. The problem is no market for forage seed produced by farmers at this time.</p> | |
| <p>Original alfalfa seed have kidney shape the forged alfalfa seed have O shape or egg shape, so it need carefully identification. ATA is now demanding certified alfalfa seed for farmers, So Africa RISING project is interested to work on the forage seed production coordinating wit ATA, TARI, Board, Universities, and ATVETE for such type of forage seed production. And they have to establish task force at the regional level and research have big responsibility. The forage demand of the region and the smalls scale is not well known so why we give to investors to multiply the different forage seed , so we have to know the actual demand and work for fulfil the demand. The current reality is Different GOs and governmental institutions are working on purchasing and distributing of different forage seed but farmers are not willing to purchase forage seed by their own cost. As Alamata ARC experience farmers were show on Alfalfa forage production at 20x 20 m2 area at the highland woreda. Alamata is now multiplying Alfalfa forage seed for providing starter seed for farmers and we can also able</p> | |

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| to supply the oat forage seed as starter seed for beneficiaries of our mandate areas. | |
| Palatability of tree Lucerne is lower than that of Sesbania | <i>This may be the case at the initial stage, but the feed has to be treated with salt or other local laxatives, and mixed with other feed stuff to enhance fast intake. Once the animals are exposed to the feed, they will start to consume it readily like any other feed. It is therefore important to train the animals for few days by mixing it with feeds already known to the animal and adding salts</i> |
| Spacing of tree Lucerne planting | <i>This is dependent on the purpose of planting: If for hedge or wind-brake, it can be planted at 50cm interval between plants and the normal spacing for planting for forage is 1m by 1m between plants/rows.</i> |
| Tree Lucerne leaves harbor birds and suffocate other crops when planted in association with other crops | <i>This depends on the density and the cutting height and frequency. If planted for forage, it has to be cut at 1m - 1.5m height every 4-6 months depending on the vegetative cover. If planted in association with other crops, an appropriate plant density has to be maintained to avoid shading effect. Otherwise, tree Lucerne is friendly with other crops as it is a leguminous tree.</i> |
| Household size Vs Tree Lucerne establishment | <i>In the study it was found out that households with more number of family members established the tree Lucerne better than those with less number of members – this implies that the households with more family size had enough labor to manage the trees.</i> |
| Anti-nutritional factors in tree Lucerne | <i>Tree Lucerne has less level of tannin as compared to Sesbania and other trees and even that level is positive in terms of suppressing the green-house gas emission from ruminants and enhancing the animals' immunity against gastro-intestinal parasites.</i> |
| Can tree Lucerne be an invasive plant in the long-run as it is the case for Prosopis in Afar region? | <i>Tree Lucerne is not an invasive plant. It best establishes from seedlings as opposed to Prosopis which is spread by animals with their dung. Moreover, tree Lucerne is not thorny like Prosopis and as such not harmful. In any case farmers have to manage the trees as recommended</i> |

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| <p>Pests on tree Lucerne – Partners fear that if there is any chemical recommendation for the pests that may affect their other crops, bees, etc. The example the infestation of the cactus plant by the chemical by a researcher.</p> | <p><i>It has been explained that tree Lucerne seedlings may mildly be affected by insects/worms at a younger stage, but at a later stage they are not susceptible to any pest.</i></p> |
| <p>There is also thinking of the methane emission when the animal consume tree Lucerne tree leaf, so what is your opinion on this regard- The existing of Tannin in browse trees is becoming important to minimize methane extraction from the animal body, so presence of ant nutritional factors in browse trees becoming the revers from the previous literatures information .</p> | |
| <p>The Teee called Shewaka (in Tigringa)/Shebha(In Amaharic) is also good source of animal feed that can be found in our region and this should be get good attention on its management and expansion through its planting method</p> | |

Next steps – *Participants anonymously agreed to include the presented feed technologies in their extension program and implement the scaling starting with the implementation plan to be drafted at the end of this ToT.*

Third day

Field Visit at Emba Hasti and Tsibet kebeles



Hftu Aregaw briefing on feed trough (Photo credit: ILRI\Simret Yasabu)



Potato seed storage visited at Tsibet kebele (Photo credit: ILRI\Simret Yasabu)



Trainees visiting the improved feed trough (Photo credit: ILRI\Simret Yasabu)



Particpatis visiting the Apple tree field experiment (Photo credit: ILRI\Simret Yasabu)



Amakelech telling her story to the trainees (Photo credit: ILRI\Simret Yasabu)

The theoretical training were complemented by a field visit arranged for participants to visit watershed management, Apple, feed trough and tree Lucerne at Emba Hasti kebele and potato seed storages at Tsibet kebele. The visit started at Emba Hasti watershed which was constructed by SLM and provided for the landless youth groups. Kifle Woldearegay and Kindu Mekonnen shared their experience on how to manage and use watershed areas with appropriate soil and water conservation practices. After having discussion on the watershed participants were split in to three groups to visit Apple, feed trough and shed. Each technology promoter took the responsibility and explained to each group about Apple production and management, feed trough & shed respectively. Then the groups visited feed trough which one the farmer, Hftu Aregaw, with his own initiative which he learnt from a neighboring farmer who is involved in Africa RISING research demonstrations. Though he took the technology he didn't copy everything and he made some revisions based on his context to construct the trough in better way using the green feeds, straw and concentrates for cross breeds. Haftu explained the costs and importance of the trough in saving feeds, feeding concentrates and fattening. The effectiveness both in terms of costs and saving of the feed, flexibilities in size and construction materials makes the feed through more preferable and attract the visitors' interest to scale up wider.

The participant also visited Tree Lucerne at Amakelech Meresa farm. Amakelech is one of Africa RISING model farmers who actively participated in testing wheat, faba bean and potato technologies during the farm research trials. Amakelech explained that in 2015 she participated on potato seed multiplication and harvested more than 20 quintals and receive Birr 12,000 (twelve thousand) from the sale of potato. This money has helped her to pay her credit and purchase three sheep. Currently, she is well managing the Tree Lucerne plants and feeds for the sheep. Amakelech shared her practical experience of managing, growing and use of Tree Lucerne.

Finally, participants visited the Potato seed and storages at Tuemti seed producer cooperatives of Tsibet kebele. The cooperatives was established in 2014 and currently used to produce, collect and supply improved potato seeds to the community. The participant visited both the seed and ware storages. Gebrehiwot (CIP), Ykunoamlak(GRAD2), and Kes Haftu Gebresilassie, Tsibet Kebele, Tuemtimay Potato seed producer cooperative chairman gave briefing on the storage and responded to questions.

General discussion

Before concluding the field visit there was a general discussion to hear questions as well as reflections on the training in general and the field visits in particular.

| Questions/comments | Answers |
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| What will be the contributions of Africa RISING in finding solutions to apple disease? | The problem of the apple disease is about conflict between the bee owners and apple owners. It is known that using the herbicide for healing the apple disease is harmless for bees. Because of this conflict the disease has not yet been addressed. Thus, What is needed is to meet |

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| | the higher officials at the Zonal level and discuss the way forward. Another possible solution to have a continuous follow up and management. |
| There is no enough potential land for malt barley production in the high land. He asked whether there is a way to adopt this technology in the low land that have enough potential land to cultivate malt barley | Production of malt Barley needs suitable climate in order to have the required quality of malt barley. If we adopt malt barley in the low land it might reduce its required quality. It could be better to know the potential highland for malt barley production. This could be found in the BoARD. |
| Is the cooperative present in Tsibet kebele certified? Certification is important for selling the seed potato everywhere. | The cooperative has certificate. Even the cooperative is a member of the cooperative union of the south zone |
| To scale out the validated crop technologies seeds need to be available. Is Africa RISING ready to provide all these? | CIP (Potato) AR provide a validated technology for scaling out. It may not provide potato seed for scaling out. |
| The gully in some places is getting wider. If the upstream is not well managed we are going back to the previous problems. We need to be cautious about the management of the land. If the gully continues to increase our springs will get dry and the land will changed in to bare land. | |
| With the feed trough it could be more productive when we identify farmers with livestock market arrangement. | |
| During scaling up we have to consider participation of women | |
| experts from Tembien woreda indicated that the feed troughs and storage sheds are new to their | |

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| woreda and they are keen take up the technology for scaling | |
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Before the end of the field day, Kindu mekonnen and Mohammed Ebrahim expressed their heartfelt thanks to all the participants, the trainers and especially farmers who were willing to take up Africa RISING technology testing. They and encourage all the trainees to put the three days theoretical as well as practical trainings to a wider scale. They also appreciated the partnership Africa RISING have with development partners in the region and asked a stronger partnership to scale out the technologies and reach out more beneficiaries.

Next steps

After the field visit the Africa RISING team discussed in a smaller group on the next steps mainly on refining the scaling plan (identifying technologies which can be easily scaled, Identify technologies which needs Africa RISING support, discussing with potential scaling partners) and establishing scaling steering committee and focal person as well as establishing a task force to follow up the actions to be taken with regard to apple discuses management. Mohammed Ebrahim, Gebrehiwot Hailemariam and Tesfay Hagos were assigned to follow up action points.

List of Participants

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Agenda of the meeting

Day One

| Schedule | Activities | Responsible person/s | Facilitator |
|---------------------------------|---|---|---------------|
| 8:30 | Registration | Organizers | |
| 9:00 | Welcoming and opening remarks | Peter Thorne Maichew ATVET representative | Simret Yasabu |
| 9:10 | Ice Breaker and process introduction | Simret Yasabu /Aberra Adie | |
| 9:30 | Updates on Africa RISING moves from Phase I to Phase II | Kindu Mekonnen | Simret Yasabu |
| 9:45 | Gender integration in Africa RISING innovations scaling | Annet Mulema | |
| 10:00 | Q&A | Simret Yasabu | |
| 10:15 | Break and Group photo | Organizers | |
| 10:30 | Presentation on development partners engagement | <ul style="list-style-type: none"> • Maichew ATVET college • TARI | Simret Yasabu |
| 11:00 | Q&A | Simret Y. | |
| 11:10 | Presentation on development partners engagement cont. | <ul style="list-style-type: none"> • REST/GRAD 2 • CASCAPE | |
| 12:00 | Q&A | Simret Yasabu | |
| 12:15 | Guidance on the afternoon session | Simret Yasabu & Aberra Adie | |
| Lunch Break (12:30-1:30) | | | |
| 1:30 | Training in Group (Livestock , NRM and Crops) | Technology promoters <ul style="list-style-type: none"> • Livestock (ILRI) • Crops (ICARDA,CIP) • NRM(CIAT, ICRAF) | |
| 4:30 | Reflection of the day – Guided plenary | Simret Yasabu | |
| 5:00 | Reception | TADELE hotel | |
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Day Two

| Schedule | Activities | Responsible person/s | Facilitator |
|----------------------------------|---|--|----------------------------|
| 8:30 | Process introduction | Simret Yasabu | |
| 8:40 | Presentation on development partners | South Tigray Zone and Tenben woreda | |
| 9:30 | Training in Groups Continues (Livestock , NRM and Crops) | Technology promoters <ul style="list-style-type: none"> • Livestock (ILRI) • Crops (CIMMYT, ICRISAT) • NRM(CIAT,ICRAF) | |
| 10:30 | Break | Organizers | |
| 12:30 | Training in Groups Continues (Livestock , NRM and Crops) | Technology promoters <ul style="list-style-type: none"> • Livestock (ILRI) • Crops(CIMMYT,ICRISAT) • NRM(CIAT,ICRAF) | |
| Lunch Break (12:30-13:30) | | | |
| 1:30 | Training in Groups Continues (Livestock , NRM and Crops) | Technology promoters <ul style="list-style-type: none"> • Livestock (ILRI) • Crops(CIMMYT,ICRISAT) +ICARDA ,CIP • NRM(CIAT,ICRAF) | Simret Yasabu &Aberra Adie |
| 3:00 | Break | Organizers | |
| 3:30 | Planning the implementation process : Group discussion | Lead by Development partners | |
| 3:30 | Reflection of the day- Guided plenary | Simret Yasabu | |
| 4:00 | Discussions on field day arrangements | Mohammed Ebrahim and Gebrehiwot | |

Day three

| Time | Farmer/ field to be visited | Technologies to be visited | Facilitator /Village guide | Technology promoter |
|-------|--------------------------------|----------------------------|---------------------------------|-----------------------------------|
| 8:00 | | | Mohammed Ebrahim and Gebrehiwot | |
| 8:10 | Woldeseliasie | Apple | | Dr Aster/Hadiya |
| | Eyasu Melese | Apple | | |
| | Ftale Eyasu | Apple | | |
| 9:00 | Kesh Birhanu Aregawi | Feed trough and shed | | Dr Melkamu Bezabih and Abera Adie |
| 9: 30 | Haftu Aregaw | Feed trough | | Dr Kindu Mekonnen and |
| 11:00 | Berhe Adhana | Tree Lucerne | | Dr Melkamu. |
| 11:30 | Kesh Birhanu Aregawi and other | Potato storage (DLS) | | Mereciet |
| 12:00 | Embahasti watershed area | Watershed | | Dr Kifle |
| 6:30 | General discussion | | | All |
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