ICARDA

Science for resilient livelihoods in dry areas

Report on small-scale mechanization and ICT opportunities for SI-MFS and Sapling initiative in Ethiopia

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Contents

1. Introduction

Small scale mechanization offers large opportunities for small scale farmers in Ethiopia to improve efficiency and effectiveness in different areas of agricultural production. The SI-MFS and SAPLING initiative is particularly interested in the use of small-scale mechanization for livestock production. Improved utilization of feed and forages could reduce wastages, increase production and income of smallholders. It could also serve as a business opportunity for youth and farmer groups.

Besides small-scale mechanization, the use of Information and Communication Technology (ICT) is another area to be explored in the framework of the initiatives. It offers good opportunities for scaling and transfer of knowledge. Technologies like the Interactive Voice Response (IVR) could be used to train lead farmers and extension workers to enlarge their capacities. Ethiopia is known for its advanced use and public support of these technologies.

To investigate and identify opportunities regarding small-scale mechanization and ICT in SI-MFS and SAPLING, a study was carried out from 20. – 30. September 2022 by Udo Rudiger, agricultural innovation specialist at ICARDA – Tunisia and Muluken Zeleke, NRS at ICARDA – Ethiopia. The specific objectives of the study are as follows:

i) Identify role of Minster of Agriculture (MoA), public research institutions and partners in small scale mechanizations and ICT
ii) Identify role of private sector in providing small scale mechanization and ICT solutions
iii) Discuss business opportunities with youth groups and mechanization service providers

2. Small scale mechanization

2.1 Public sector

2.1.1 Ministry of Agriculture(MoA) – Mechanization Department

The MoA disposes a mechanization strategy which has been developed about 10 years ago with the support of GIZ. The strategy mainly focuses on large scale machinery like tractors and combined harvesters used in crop production. According to Mr. Bereket Forisido, the mechanization director, an update of the strategy is mandatory. It should include small-scale mechanization aspects for irrigation equipment (water pumps, etc), post-harvest, local food processing and small-scale animal feed processing technologies, like choppers and grinders. The national strategy states that all agricultural machineries are now tax – free. This applies for imported and locally manufactured machines. There is no public subsidy program for farm machinery, but the local governments give guarantee for farmers to obtain credit.

Although most machines are imported, there is a growing sector of locally produced farm machinery. Small feed pelletizers, maize shellers and choppers are produced locally but do not always fulfill security and environmental standards. This applies not only for locally but also for some imported machines (mainly from China). The ministry disposes testing facilities and certification mechanisms. The standards have been developed in collaboration with a South Korean project.

The MoA runs a vocational training center called ATVET (Agricultural Technic Vocational Education and Training). Here they can train local blacksmiths in developing and manufacturing agricultural machines. They have different modules and different business cases. The vision of MoA is to construct and run

ATVETs in each region. The use of solar powered machinery (e.g. for water pumps) is also growing and should be scaled according to the Director.

2.1.2 ATI (Ex-ATA)

ATI, the Agricultural Transformation Initiative, which used to be called ATA (Agricultural Transformation Agency), is a strategy and delivery-oriented government agency created to help accelerate the growth and transformation of Ethiopia's agriculture sector. The Agency's mandate is focused solely on improving the livelihoods of smallholder farmers across the country.

Dr Yosef Mekasha, general director of ATI and Mr. Gebre Tsadik, the Director of ATI's mechanization department confirms the above-mentioned importance to further develop the small-scale mechanization sector for the national strategy. In particular the development of bailers and choppers to better valorize crop residues like straw is ATI's concern.

ATI's approach is the clustering of farmers who can't afford machines individually and link them to mechanization centers. They are in the process of supporting the establishment of 10 such mechanization centers which are run by private entrepreneurs. ATI provides land and finances building for keeping the machines (shelter). But the purchase and management of the machines are the entrepreneur's responsibility. Those centers will provide mechanization services along the value chain. Until now they concentrate mainly on machines for crop production (ploughing, planting and threshing), but will and should include machines for livestock production (e.g choppers and grinders). Regarding the production of industrial feed, there is Alema Koudijs a leading company in the animal feed industry, focused on the production, sales, and services of animal feed and concentrates. Local feed pellet production using locally available material would be an interesting option to discover according to Mr.Gebre.

Opportunity: We could identify suitable ATI supported service providers and introduce small scale mechanization for feed processing to them

2.1.3 EIAR- (Ethiopian Institute of Agricultural Research) – Melkasa Agricultural Mechanization Research Center

Dr. Laike Kebede, the national director of the mechanization research, states that the Melkasa center was established in 1982. Ethiopian agricultural research institute (EIAR) works in the following research areas: i) crop production, ii) animal production, iii) mechanization, iv) natural resources and v) socioeconomics.

The mechanization center adopts agricultural machines from abroad to better fit Ethiopian conditions, but also develops its own machines. The Research for Development approach includes generating, testing, evaluating, and promoting machines. They have a strong linkage to the private sector. Private manufacturers will pick up the developed technology to take the new machines to the market. They want to address the whole machinery value chain.

Fig 1: Different types of choppers at Melkasa

The mechanization center has three programs: i) farm machinery, ii) post-harvest and iii) energy. They have 20 researchers working on mechanization and give trainings for farmers, development agents and extension staff on handling and maintenance of machines.

Concerning mechanization in the animal husbandry sector they developed the following machines: milk turner, electric and engine driven feed choppers, milking machines, pelletizer (380 V), grinder and feed mixer. Pelletizer and chopper have low production capacity.

Best experiences they made with different threshers for teff. Threshers are given to service providers for a period of two years free of charge. After that the provider returns it, the machine is given to another service provider.

Opportunity: The specialized trainers of the center could be used to train our farmers in use and maintenance of the introduced small machinery like grinders and choppers

2.1.4 Mechanization training center at EIAR Kulumsa research center

The Kulumsa research center is one of 22 EIAR research centers in Ethiopia, with only one on agricultural mechanization research in Melkasa. The Kulumsa research center works on durum wheat, bread wheat, irrigated wheat, barley, pulses, maize and forage crops. Beside crop variety trials, the produce pre-based seeds and send it to seed multipliers to produce basic and certified seeds. They have strong collaboration with CIMMYT and ICARDA.

Fig 2: Large scale machinery at Kulumsa research center

The Kulumsa mechanization training center has been established with the support from GIZ in 2011. It is one of four training centers in Ethiopia. Since 2020 the center is part of EIAR. They had received large scale mechanization implements like tractors, planters, combined harvesters, ploughs and harrows from different donors. They can accommodate up to 20 participants at the same time, but many trainees stay in Kulumsa town. The training fees are to be covered by the participant himself. The objective of the training center is to demonstrate farm machinery and train farmers and service providers. They offer two types of courses: i) A 65-day course for tractor drivers to learn manipulating, calibrating, adjusting and maintenance of tractors, combined harvesters, and planters. Participants will receive an accredited license, ii) an upgrade course of 10 – 14 days after a training needs assessment. Their trainees can be put in four categories: i) Mechanization service providers, ii) farmer cooperative unions, iii) large scale farmers, iv) youth working for tractor owners. Since 2011 the center has trained over 8,000 trainees.

Conclusion: They are not specialized on small-scale mechanization but are interested in the topic. Little scope for collaboration.

2.2 Research and Development partners and projects

2.2.1 CIMMYT

CIMMYT works on large scale and small-scale mechanization as well as on implements for animal traction. They are closely collaborating with the Kulumsa and Melkasa research centers. In large scale mechanization they test different types of tractors and direct seeders to practice conservation agriculture with maize and wheat. They intend to develop or import a smaller direct seeder for Amhara region where plot sizes are smaller.

Concerning small-scale mechanization, they mainly work with two-wheel tractors for threshing, irrigation (water pumps), liming and transport. Soil tillage with the power tiller often faces problems as they are not strong enough for the heavy soils. Therefore, a 4-wheeel tractor is recommended.

Together with GIZ they developed a program to support mechanization service providers. A community selects a suitable, trustful person with a bit of experience in the mechanization sector to become the service provider. He then receives the necessary machinery (2-wheel tractor and implements) by CIMMYT and must participate with 20% at the costs. These costs are usually collected by the community. The service provider also receives technical and management training by GIZ and CIMMYT. GIZ also supports the providers with loans. The system works very well. Some providers have started buying their own additional machinery as there is high demand for mechanization.

When comparing animal traction with mechanized ploughing it is much more labor and time intensive as the land must be ploughed four to five times before a proper seed bed is established. Nevertheless, the introduction of 2-wheel tractors were not easy, as a previous public project Metals and Engineering Corporation (METEC) used to simply distribute 2-wheel tractors without training, and no access to spare parts. Farmers were disappointed from the technology. The improved CIMMYT approach whereby collaboration with private sector for spare part delivery and repair (often Tuk- Tuk bajaj garages) and research centers for training and coaching is assured, took some time but is now well established and successful. Up to now 180 service providers are established, partly in the SI-MFS intervention area North Shewa and in Jimma.

CIMMYT also worked on seed cleaning units with the GIZ green innovation center. Eight units were bought from a manufacturer in Adama (Techno Nejat Engineering). The seed cleaning units were delivered to cooperatives and small seed companies.

Opportunity: As CIMMYT has already trained small mechanization service providers in the SI-MFS region (Debre Berhan, North Shewa), we could collaborate with one of these providers in the field of spare part delivery and repair of introduced grinders and choppers or even attribute a chopper to one of them to provide services. They can support the youth groups.

2.2.2 GIZ

The GIZ green innovation center program works on three value chains: wheat, legumes, and honey. In collaboration with ICARDA they are presently executing legume seed project, whereby different varieties of different leguminous species are tested in a participatory way and multiplied by farmer organizations. In this context GIZ is working with small machinery as they are importing a set of seed cleaning machines from Germany to be distributed to those seed producing organizations which later on will be reproduced by local manufacturers.

Opportunity: ICARDA and GIZ green innovation center intend to continue the collaboration around the legume seed VC and intensify the scaling of these new varieties in a second phase of the project to the SI-MFS intervention area in North Showa. (A constraint can be the budget situation of GIZ as the green innovation program on its whole is phasing out between 2014 and 2016. Staff is already being reduced).

2.3 Private sector

2.3.1 Introduction

There are a number of local enterprises in Addis Ababa which are engaged in the designing, development and production of small-scale machinery. The survey team visited four of them which were recommended by CGIAR and national partners. The objective was to exchange about the different types of machinery they are producing, their technical characteristics and prices (see details in annex 2). This helps to find the most suitable machine for a potential feed processing farmer group.

2.3.2 Mecce engineering

The company is specialized in manufacturing feed processing machines. Their manger Ephraim Hailu Tamerat has over 20 years' experience with the company. They collaborate with ILRI to develop a complete feed chain composed of a hammer mill (grinder), a conveyor (transporter) and a feed mixer and delivered already such a chain to ICARDA and its partner, EIAR in Debre Birhan. Mecce collaborates with Melkassa research center but is not convinced of the quality of small machinery. Their main customers are NGOs like Oxfam and USAID; they export their machines also to Somaliland.

Besides the feed chain, they also manufacture choppers and could produce combined chopper / grinders but haven't done it yet. Mecce engineering delivers and installs their materiel and trains the farmers. All is included in the machine price of. They give one year guarantee and spare parts are usually available in the region. They even have a prototype of a pelletizer with a low capacity of 50 kg /h. The company sold only two of them (unit price 180,000 Birr) as there is little demand.

Fig 3: Chopper

Fig 4: Feed producing chain

Fig 5: Feed pelletizer

2.3.3 Amio – machine manufacturer

The company manufactures all types of industrial machinery, about 70% agricultural machines. In addition to the grinders and choppers and combined feeding plant, they also produce mobile seed cleaners with a capacity of 3 – 5 t / day and different sized sieves to clean a variety of crop seeds. In their agricultural machinery portfolio, we find also solar water pumps and solar driers, threshers and imported 2-wheel tractors with different implements (thresher, disc plough, trailer). There is a high demand for combined 2-wheel tractor machines. Their main partners are CIMMYT and NGOs. The company developed a pelletizer, but there is no demand.

2.3.4 Hayle Engineering

Hayle engineering is a company which mainly produces industrial machines and occasionally some agricultural machines. They are relatively modern and design all types of machines virtually with a specific 3-D program. They collaborate with CIMMYT and the Melkasa research center. The types of agricultural machines they have designed and / or produced so far are peanut roaster and peeler, row planter, disc ploughs seed cleaning units, composed hammer mill / transporter / mixer, potato planter, lime spreader and solar power pumps. No experience with chopper nor pelletizer but the manager confirms their capacity to manufacture such implements.

2.3.5 Tsehay Roschli Industrial and Agricultural Engineering

This is part of the non-governmental organization "Selma's children village", which supports two nearby children's villages. The benefit generated by Tsehay finances the children's villages. They produce in different areas like metal work, transport equipment and boats, carts, playgrounds, pumps, building equipment and agricultural equipment. Their agro-machinery equipment includes baler, beehives production, wax press, rice polisher, crushers, seed cleaner, hammer mill, shellers, and animal feed mixer.

Selma has also branches in rural areas like Hawasa, called Hawasa Selma. They have long year of experience with GIZ, ATI and NGOs and collaborate closely with the Melkasa center.

Opportunity: All four of them can manufacture the machines SI-MFS is looking for like grinders, choppers and feed-processing compound units. We should therefore request a detailed invoice pro forma with technical details of the requested machines and order the most suitable one. As Mecce is specialized in feed producing machinery and ICARDA has already good experience with the company, collaboration with them is most preferable.

2.4 Farmer groups and service provider

2.4.1 Melik Silties Farmers Cooperative Union in Worobe

The farmer union is composed of 90 cooperatives with almost 100,000 farmers and has about 50 employees. They supply inputs like fertilizer, seeds, pesticides, and animal feed to their member cooperatives. They have their own feed factory in Worobe, where they produce different compound feed for cattle, sheep fattening and poultry. The production unit has a capacity of 10 t / day with a grinder and a mixer, but no pelleting. They also collect production from cooperatives and link to markets like grinded tef for university and school feeding programs.

In collaboration with ATI they are constructing a huge farm machinery training center in Worobe with 70% ATI and 30% union financing. The center will be achieved in 2024 and has as objectives: i) give training to the tractor and combined harvester drivers, ii) maintain and repair tractors and combined harvesters, iii) supply spare parts to all agricultural machinery, iv) service provision for farmers (ploughing, harvesting, etc).

Fig 6 : Machinery training center

Opportunity: There are three areas of collaboration they seem to be interested: i) Introduction of ICT for improved communication with members (access to markets, short trainings, etc) ii) revise feed ratio for

sheep fattening, iii) introduce feed pelleting. Collaborating with union will significantly increase the number of our beneficiaries as they work with almost 100,000 farmers.

2.4.2 Dogoyena farmer youth groups

ICARDA collaborates since 2018 with 5 youth groups in Dogoyena concerning sheep fattening. They have received several trainings on technical aspects like feeding system, disease control and selection of animals, but also on business aspects like marketing, collective action, and benefit calculation. Three of the five groups have already reached the cooperative status.

The youth groups do purchase of inputs and marketing of sheep together to obtain better prices. The members also exchange knowledge and help solving problems. Members have on average 7 – 10 sheep and 2 cows.

Fig 7: Showing mechanization video (chopper) to farmers

The idea of chopping and grinding feed with a motorized machine is highly appreciated by the farmers as they observe that a lot of feed is wasted. Using the machine they could chop maize stalks, cereal straw, different shrubs, and tree leaves and grind faba beans, barley and maize to reduce wastage and improve feed.

Fig 8: Discussing with youth group

As the village disposes access to 220 Volt, an electric engine driven machine would be preferable to a diesel engine driven as running costs will be lower. The farmer groups would be ready to build a small shelter in a central place of the village where members of the three cooperatives could easily reach. They live all nearby. The land can be given by the local government. Their idea of managing the machine would be first through an establishment of a committee, composed of representatives of the three cooperatives. At present they see two management options: i) a farmer brings its feed for processing, pays a fee to the committee, and returns to his/her farm with the feed, ii) a union of three cooperatives will produce their own feed, pack it and sell it to farmers.

Opportunity: ICARDA could supply the union of three cooperatives with one electric 220 V chopper (ideally combined with a grinder) to help improving feed production and use. This can reduce wastage and shorten the fattening period. The financial contribution of the union could be the construction of the shelter. The union should initiate the request for the land.

2.4.3 CIMMYT mechanization service provider in North Shew

Mr. Getanat Margas is a mechanization service provider to local farmers who was selected by the local community, trained and equipped with different machines by Africa Rising and CIMMYT. He started six years ago with a two-wheel tractor and a trailer. Three years later he added a water pump, a thresher for wheat and barley and a disc plough. All implements are powered by the 2-wheel tractor.

Fig 11: Service provider

The threshing business is highly demanded, and the business has been developed very well. He started with less than 10 clients and has now more than 200 farmers in his area, demanding his mechanization

service. He also does demonstration plots to attract more clients. The income allowed him to diversify his income portfolio and started to fatten ruminants.

His major challenge is the Changchai 2-wheel tractor. It is not functioning for three weeks due to an engine problem. He contacted local mechanics in nearby Debre Birhan, the district capital, who didn't succeed in repairing the engine. Even spare parts are missing. He is now obliged to look for specialized mechanics and parts in Addis Ababa. Fortunately, the benefit he made with the service provision allows him to cover theses costs. He would even have enough savings to purchase a new engine. Mr Margas considers that there is a high demand for chopper and grinding service provision in his region. Farmers are usually cutting grasses like Napier grass, Sesbania hedges, and others with their knives. Mechanized chopping and transport of grasses and legumes could work well as an additional service.

Opportunity: This service provider could be equipped with a chopper to serve farmers in the region, although it's rather a SAPLING intervention area than SI-MFS. Before purchasing the chopper, the technical details concerning the PTO of the Chinese 2-wheel tractor Chungchai have to be shared with the chopper manufacturer to assure the energy transmission and functioning of the 2-wheel tractor driven chopper. The successful repair of the tractor is also a pre-condition.

2.5 Business case "Feed production of youth groups in North Shewa"

Fig 12: Feed processing unit

The EIAR research center in Debre Birhan has received six months ago from ICARDA a locally manufactured feed processing unit to valorize their 35 ha of oats and barley and 10 ha of maize to produce animal feed cheaper than imported concentrates. This feed is fed to their large herd of cattle and small ruminants. The feed producing unit, manufactured by Mecce Engineerin in Addis, with a capacity of 500 kg / h, is used within 4 weeks only 14 days as the storage room has a limited capacity.

They now produce 75% of their feed themselves. Only 25% is purchased; mainly protein-delivering leguminous crops. A real cost/benefit analysis is not available yet. The good experiences with the feed-producing unit have motivated the research center to develop a business idea for two youth groups engaged in sheep fattening. They are also suffering from feed shortages, high feeding costs and poor quality of concentrates.

The feed-producing business plan using the feed processing unit has several objectives: i) produce quality feed as concentrates are often lacking quality, ii) create jobs for youth, iii) deliver quality feed at a minimum cost thus reducing production costs and increasing income of farmers. Beneficiaries will be the two farmer organizations of the sheep fattening farmers, local feed traders and the government as taxes are generated. The two youth groups are in the Menz Gera district (Sapling site) and Bassona Werena district near Debre Birhan (SI-MFS site). Both groups are producing cereals and legumes and raise sheep. They are experienced in group work as they are in the sheep fattening program with ICARDA for years. Besides their own crop production, they would purchase wheat bran, husks from protein crops, and oil cakes from factories to produce animal feed.

The "sapling" youth group in Menz Gira has 60 members and 2 ha of common group land. Everybody fattens sheep and produces cereals and legumes. To make their fattening business more profitable they

intend to produce and sell feed, produced from their own crops and additional ingredients. They would install the feed producing unit on the common land and either employ someone to manage the unit or members would work in shifts. The feed would be packed in 50 kg bags and sold to everybody (not only youth group members)

The biggest constraint is the access to 380 V. The feeding unit requires three phased energy supply, which is not available on the common land. A request needs to be addressed to the public energy provider. This needs time and funds. The research center will enquire about the costs and possibility to get 380 V access for the farmer group. Another weak point is the lack of business calculation. At present, the farmers don't know what the production costs of a 50 kg bag of feed would be and for how much they can sell it to compete with concentrates and make a profit. It is therefore highly recommended that the research center gets engaged in such a profitability study to improve the business plan. Also, the question of financial liquidity (cash flow) needs to be addressed in the plan.

The case of the "SI-MFS" youth group is similar. They are 40 members but are collaborating with other six groups, so targeting about 240 organized farmers being engaged in sheep or oxen fattening. They also have a common land but no access to 380 V. Farmer groups have quota for residues from the nearby beer factory. The barley residues are rich in protein (27%) and can be used for feed production.

Opportunity: The business idea of producing feed by youth groups with a feed producing unit could be beneficial at first glance. But to have a clear idea of the benefit and sustainability of such a project a proper profitability study needs to be undertaken showing all the involved costs over the year (labor, electricity, ingredients, packaging, marketing etc), price calculation and organizational aspects. Either the research center or ICARDA could collaborate with the youth groups to develop the detailed business plan. In addition, the question of access to 380 V needs to be solved before any engagement. If the business case and project is not feasible, the delivery of a chopper / grinder could be a cheaper alternative to reduce feeding costs and improve production.

3. ICT

3.1 Public service – ATI (Ex-ATA)

ATI, as a public institution supporting MoA and aiming agricultural development of small-scale farmers, is actively using ICT for knowledge sharing and strengthening farmers. They collaborate and have received funds from a number of partners and donors like USAID, BMGF, World Bank, ILRI and GIZ. They are focusing on IVR (Interactive Voice Response) as a digital tool as many farmers don't have smart phones and are illiterate (over 50%). ATI has a short number (8026), farmers can call free of charge to obtain information about 21 types of crops and 5 types of livestock, including small ruminants. Besides technical information, ATI also provides market and early warning information. They collect market information in five regions on 157 marketplaces and have disseminated over 78,000 market information to almost one million registered callers.

The IVR livestock information includes different feeding rations for sheep and is available in 5 languages. Farmers can also contact experts via ATI and IVR to demand specific questions. ATI will follow up and provide the requested information.

Opportunity: ICARDA could verify and help to improve the IVR feed rationing information. Ideally, farmers could give their personal situation (availability of feed and need for feeding for a certain number of

livestock and period) and obtain a personalized response. Maybe a smart phone application in this sense could be developed.

3.2 Private services - VIAMO

Mr. Brook Ashime, the country coordinator of VIAMO – Ethiopia explained that VIAMO's objectives are to collect and deliver information via ICT to communities. They are specialized in online surveys, awareness creation and capacity development. VIAMO is worldwide active and collaborates with organizations like AKDN, USAID, UNICEF, Unilever, GIZ, World Bank, Stanford Medicine, CRS and many other NGOs.

In Ethiopia VIAMO mainly works with IVR and has their own platform, which is very flexible. It could be used for early warnings, like weather hazard or crop diseases. Partners can enter this information directly to the platform to make it available for their target group. They also develop IVR training modules for extension agents in collaboration with the partner. These are prerecorded modules between 3 – 8 minutes and trainees can select the time they want to receive the training. In general, they propose 12 to 24 different modules being sent every week at the same time. Trainees will receive a reminder SMS and a certificate at the end when passing a final test.

Opportunity: IVR training modules for youth groups and extension agents on small ruminant livestock production including sheep fattening, health and reproduction could be an interesting capacity-strengthening activity to explore. As the VIAMO prices are quite expensive (about 40,000 $ for ex-ante, ex-post survey, platform and development of training modules); co-financing between SAPLING and SI-MFS could be a possibility. The possibility of elaborating a personalized sheep fattening ration advise platform or application (see ATI) could be further discussed with VIAMO and ICARDA scientists.

4. Conclusion and general recommendation

After discussing with actors of the public and private sector as well as the partner organization CIMMYT and GIZ, the survey team can conclude that the introduction and scaling of feed processing small scale mechanization could be a promising research and development domain in the ongoing SI-MFS initiative. In addition, youth groups, farmer organizations and private mechanization service providers show a keen interest in this topic. Specially the introduction of feed choppers and grinders, mixers and whole feed processing compound units have the potential to improve the efficiency of feed and forages.

The survey did not allow us to determine to what extent the technologies could be used as income-generating activities of youth groups in North Shewa. The idea is convincing but needs the collection of further data like potential costs and returns to determine the profitability of such an investment. It is therefore recommended that EIAR and ICARDA develop a data-based business plan and collect information about access to 380 V.

Regarding youth groups in Dogoyena, the team supports the idea of purchasing a chopper and grinder for improved feed processing. It is recommended to collect three invoices proforma for combined chopper / grinders from local manufacturers and initiate a discussion with local authorities and youth groups about the management of the machine; an MoU and code of conduct should be prepared.

With regards to ICT and IVR we see less priority as ATI is already engaged in it. The high costs demanded by VIAMO do hardly justify such an investment, although IVR training is an interesting approach.

Annexes

i) Program (with contact persons)

Date	Activity
Monday, 19.09 Addis Ababa	Travel Tunis – Addis Ababa
Tuesday, 20.09 Addis Ababa	Ministry of Agriculture (afternoon 2 pm) = **Mr. Bereket Forisido** (forsidob@gmail.com, +251912226169) Ethiopia Agricultural Mechanization Directorate Director.
Wednesday, 21.09 Addis Ababa	Meet VIAMO (morning) **Brook Ashime (+251912648082**) ATA (afternoon) • Dr Yosef Mekasha, ATA General Director (Yoseph.Mekasha@ata.gov.et, +251930000354) • Mr Temesgen, ICT Director (+251943082923) • Mr Gebre G/Tsadik, Mechanization Director cc=(gebre.gebretsadik@ata.gov.et+251914707494)
Thursday, 22.09 Adama	Travel to Melkasa and meet EIAR (Ethiopia Institute of Agricultural Research) National Agricultural Mechanization Research Directorate Director, Dr. Laike Kebede (laikewsk@gmail.com, +251911771891).
Friday, 23.09 Adama	Visit GIZ established mechanization center at Kulumsa Research center Mr. Debele (+251923317398), Director of Kulumsa research and GIZ mechanization center.
Saturday, 24.09 Addis Ababa	Discussion with Doyogona sheep fattening youth groups and champion farmers from Community based breeding program (CBBP)
Sunday, 25.09 Addis Ababa	Travel to Addis Ababa
Monday, 26.09 Addis Ababa	Meet CIMMYT Dr. Samuel Gamada (s.gameda@cgiar.org) and Dr Rabe Yahaya (morning); meet Barbara (afternoon)
Tuesday, 27.09 Addis Ababa	**Exaltation of the Holy Cross, Holiday.**
Wednesday, 28.09 Addis Ababa	Private enterprises engaged in small-scale mechanization • Electro Mecce Mr. Efrem (+25191121132) = Appointed • Selam Engineering (suggested by EIAR +251912613194) =Appointed • Amio-engineering= Mr Ibrahim Yassin • Haile Engineering (+251910626155) = Appointed
Thursday, 29.09 DebreBirhan	**Morning** 09-11 am= Meet Dr. Andrea at the GIZ-DIC office **Afternoon** = Travel to Debre Birhan
Friday, 30.09 Addis Ababa	**Morning=** • Discusses with Debre Brehan agricultural research center researchers on mechanization and business case model for feed formulation. Email Adamu_molla@yahoo.com, asfawsheno@gmail.com, and leulalemayehu84@gmail.com • Meet with CIMMYT mechanization service provider **Afternoon**= back to AA
Saturday, 01.10	Travel Addis – Tunis

ii) Characteristics and prices of different feed processing machines

	Mecce Engineering	Amio	Hayle engineering	Salam
Characteristics of feed chopper				
Energy sources	220 / 380 V, PTO, diesel engine	220 / 380 V, PTO, diesel engine	220 / 380 V, PTO, diesel engine	220 V, PTO, diesel engine
Capacity	3 t / h	0.5 t / h	N / A	0.5 t /h
Price (in Birr)	100,000 (elect) 180,000 (engine)	60,000	N / A	74,000
Characteristics of grinder / top feed hammer				
Capacity	N / A	N / A	N / A	N / A
Price (in Birr)		80,000	N / A	185,000
Characteristics of feed mixer				
Capacity	500 kg	3 t / day	N / A	N / A
Price (in Birr)	N / A	N / A	N / A	210,000
Characteristics of feed producing chain				
Energy source	380 V	380 V	380 V	380 V
Capacity	0,5 t / h	3 t / day	N / A	N / A
Price (in Birr)	450,000	700,000	700,000	270,000

NB: All prices are subject to rapid changes due to inflation