



Stakeholder Consultations Report

Prepared for the proposal elaboration workshop (Lira, Uganda, 22-25 August 2018):

Leveraging seed system development through bi-directional ICTs in input and output markets: A user-oriented agricultural systems approach in Uganda and Ethiopia

**Peter Ebanyat, Tamiru Amanu and
Connetie Ayesiga**

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N2Africa

**Putting nitrogen fixation to work
for smallholder farmers in Africa**



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Email: n2africa.office@wur.nl
Internet: www.N2Africa.org

Name:	Peter Ebanyat	Partner acronym:	IITA
E-mail:	P.Ebanyat@cgiar.org		
Name:	Tamiru Amanu	Partner acronym:	ILRI
E-mail:	T.Amanu@cgiar.org		
Name:	Connetie Ayesiga	Partner acronym:	IITA, WUR
E-mail:	C.Ayesiga@cgiar.org , Connetie.Ayesiga@wur.nl		

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Introduction

Pre-workshop stakeholder interviews were conducted in Uganda and Ethiopia to gather information about the current state of maize and legume seed systems with the specific aim of identifying the existing barriers impeding smallholders from accessing quality seed, and how ICT-options may leverage seed systems. Semi-structured interviews were conducted with different stakeholders/actors along the seed value chain and included; researchers, producers, seed companies (list of respondents in the appendix), regulatory agencies. The interviews were conducted using the following checklist:

1. What are the main changes in the seed systems in Uganda/Ethiopia for maize and legumes?
2. To what extent are seed systems interlinked with other input systems?
3. Are seed systems (or more generally input systems) for maize and legumes in any way interlinked?
4. What are the barriers to providing high-quality seed to farmers through the current seed systems? (for maize and legumes- should be discussed in the context of a specific seed system)
5. What ICT platforms are currently being used or tried out to improve seed systems and why? If you have used any, what were your experiences using them?
6. In what way do you see ICT platforms as a potential solution for the barriers mentioned? (please also discuss specific roles; providing information to farmers (via text messages), providing specific agronomic advises to farmers (based on pictures of their plots that they or others can upload), demand forecasting based on feedback received from farmers)

For Uganda, more specific questions were added on the current functioning and barriers of the m-Omulimisa ICT-platform.



1 Uganda

1.1 Overview of the key seed value chain stakeholders interviewed in Uganda

The interviews covered a range of stakeholders including: breeders (National Agriculture Research organisation (NARO) and Makerere Soybean Breeding and Seed systems; Research Institutes (Harvest Plus); Seed companies (Simlaw Seeds, East African Seeds, Naseco, Equator Seeds, Otis Garden Seeds); Local Seed Businesses (Bedijo LSB); agro-dealers/stockists (Uganda National Agro-dealers Dealers Association); regulatory agencies (District Production department); app developers and ICT-platforms (Makerere University, m-Omulimisa); grain buyers (Ngetta Tropical Holdings, village agents) and processors (Mukwano Industries); and development partners (Integrated Seed Sector Development). Some consultations were conducted during the workshop in Lira, Northern Uganda (Table 1).

1.2 Key insights from the stakeholders' interviews

1.2.1 Changes in Uganda's seed systems

Two main categories of seed supply systems currently operating in Uganda; the formal and informal seed sector. The formal seed supply system involves the entire seed production and certification process and is linked to research, production, processing and marketing. It is organized on a commercial basis by seed companies/enterprises and is fully regulated by government. The seed produced by the formal seed sector is of high genetic value and purity, though only contributing about 15% to the seed supply. On the other hand, the informal seed system's contribution of 85% to the seed supply has no organized seed production chain and is heavily underregulated. The source and quality of seed used for planting purposes is in most cases not known. It is mainly community-based seed production (using farm saved seed) and local seed production. In such a situation, many smallholder farmers in Uganda have no access to a reliable supply of quality seeds that can ensure productivity.

For long, seed systems for grain crops in Uganda were the domain of smallholder farmers relying on home saved seed. Uganda's seed sector has been changing and now has many other actors including the government, national and multinational seed companies, seed multiplication farmer associations, seed dealers/stockists, farmer and civil society organisations. According to USTA (Uganda Seed Traders Association), by 2015, there were 23 registered seed companies that contributed to an estimated 10-fold increase in production to 18,000 MT of certified seed for grain crops as compared to 1998 (MAAIF, Crop Protection Department). Agro-input dealers carry out seed distribution and marketing. The formal seed system also covers international seed trade, including imports of vegetable and hybrid maize seeds, and exports to regional seed markets. Maize seed dominates the formal seed sector, with Monsanto handling the largest business of about 6,000 MT annually (MAAIF, UNSCS). However, the number of seed companies has increased since 2009, with both local and foreign seed companies (SEEDCO, Pannar, Kenya Seed Company etc), coming into the market.

Variety development is the domain of the national research organization for maize and common beans (NaCCRI), groundnut (NaSAARI) and soyabean (NaCCRI & Makerere University). Variety development is often conducted in collaboration with other international research organizations; CIAT for common bean, IITA for soyabean and CYMMT for maize. The collaborative breeding programmes have led to an increase in the number of released varieties to address biotic and abiotic stresses, market preferences, high yields and nutrition. For example, there are three major types of beans grown by Ugandan farmers: red mottled (for income), yellow (for food security and incomes) and sugar (mainly for food). With the increasing demand for improved seed, collaborative research-community seed systems have evolved to multiply foundation seed, which can then be sold to seed companies or directly sold to those demanding. The formal seed system mostly concentrates on maize. Formal-informal community seed systems with some certification are emerging for the legumes. However, in



these collaborative arrangements, the regulatory agency MAAIF is responsible for quality assurance and certification (National Seed Certification Services). Technologies for production have also improved – e.g. labour saving technologies such as bean clean herbicide for weeding, threshers, hermetic bags for storage. There has also been a general change in attitude amongst farmers towards use of quality seed, and there is increased networking amongst actors and stakeholders - e.g. NGOs disseminating for seed companies or research/breeding programmes. There has been an emergence of seed businesses including Uganda Seed Traders Association (USTA), Local Seed Businesses (LSB), and the organisation of agro-dealer businesses under the Uganda National Agro-dealers Association (UNADA). This has led to improved distribution and availability, especially for maize seeds and agro-inputs. The collaboration of various partners and leadership by ISSD, a draft seed policy has also been developed but awaits enacting.

1.2.2 Interlinkage between seed and other input systems

The maize seed system for hybrid maize varieties is well developed. Hybrids are well known and farmers are predisposed to growing them with other inputs in regions where soil fertility is seen as limiting factor (Elgon highlands). Farmers using fertilisers generally apply DAP and Urea. However, in some areas, including northern Uganda perceptions of mineral fertilisers ‘damaging the soil’ the soil persist, limiting farmer purchases, as was indicated during interviews with agro-dealers in Lira.

In the case of legumes, there is increasing awareness and interest to use inoculants and improved soyabean seed because it is a commercial crop. For common bean, pest control is what is important to the farmers even though improved soil fertility management could boost productivity. There could be an opportunity of integrating seed systems for common bean and maize if the value of rotation and intercropping in overall system productivity is communicated more and appreciated. There is also a potential for integrating maize with climbing beans varieties if the appropriate varieties of climbers for low and mid- altitudes can be introduced. Agro-dealers however deal in any agro-inputs that they find to marketable in their business environments.

1.2.3 Major barriers to supply quality seeds in the Ugandan seed systems

Notwithstanding the above changes/improvements, the seed sector is still faced with several barriers to provide quality seed and these include:

1. Low interest amongst the seed companies to deal in legume seed. Farmers often plant home saved seed from previous seasons and recycle for many seasons. Awareness campaigns are however being mounted to sensitize farmers not to plant such seed for more than three seasons if they have to obtain good yields.
2. Low productivity of some leguminous crops especially beans and groundnut leaves farmers to buy any kind of seed
3. Unscrupulous business people who mix grain and seed and as well as varieties
4. Weak seed regulatory systems – the policy and regulations have not been enacted as to yet
5. Limited access to breeder and foundation seed from research centers
6. Impure breeder seed
7. Degeneration of seed
8. Perceived high cost of certified seed compared to home saved seed
9. Price fluctuations for output. Sometimes when low, it is a disincentive to using improved seed (currently the low price of maize is likely to discourage farmers from investing in use of improved seed in the subsequent season)
10. Fluid markets - inconsistent
11. Unstructured grain market – erratic demand of specific varieties outstripping seed supplies
12. Distortions through agro-politics. Government seed subsidy programmes like Army led - Operation Wealth Creation buys and supplies grains to meet targets and may promote a single variety everywhere



13. Mismatch between the demand and timely supply of appropriate seed in different localities
14. Erratic climatic patterns affecting on-farm production and productivity
15. Lack of entrepreneurial skills for sustaining Local Seed business which are now the main source of legume seed. The LSBS produce small quantities of seed

1.2.4 Use of ICT platforms to improve seed systems

The use of ICT applications in Agriculture is evolving due to real need to cut transaction costs and solve problems of pest and diseases in real time and provision of advisory services says Dr. Patrick Mirembe, Makerere university. He noted several ICT platforms in agriculture are not necessarily tailored to seed systems, but address various value chain issues including agronomy, marketing and early warning. Some of the platforms include;

Platform	Description/objective
Grameen's CKW	The Grameen CKW (Community Knowledge Worker) program first the major ICT step in agriculture in Uganda. It was aimed at supporting agricultural extension through a network of locally nominated farmers who use smartphones to collect and disseminate real-time, actionable information. The program is no longer active in Uganda
Kudu	Kudu is a double action marketplace for farmers. Instead of listing items that buyers can bid on, buyers and sellers separately communicate their requirements and the prices they are willing to trade at. Kudu then matches specific buyers to specific sellers based on their compatibility. This is done through SMS (Short Messaging Service) and bases on price and location before the matching happens. https://kudu.ug/about/
EZY-Agric by AKORION	Eazy –Agric is a mobile application that brings information closer to farmers. Village Agents are provided with smartphone that they use to collect information on farmers. This information is then uploaded to the Ezy-Agric Platform. The Village agents act as extension workers by providing extension services to farmers on topics such as better agronomic practices, soil testing, weather forecasts, market prices, digital financial services such as savings, transactions and credit and crop insurance. http://www.monitor.co.ug/Magazines/Farming/Two-methods--same-approach--Creating-vital-linkages-for-farmers/689860-3207046-t65lto/index.html
Agromarket day	AgroMarket is a mobile application that features details of agricultural markets, market days, farmers, agriculture tools, agriculture news and the products sold in those markets in different districts in Uganda. This application enables farmers to upload information about their produce onto the system which will therefore be visible to anyone who has the application on their mobile phone. https://play.google.com/store/apps/details?id=com.agromarketday&hl=en
Farmgain Africa	Farmgain is a consultancy firm that specializes in agri-business, market information and agro enterprise development. It provides small and large-scale farmers with professional service and consultation. Farmgain has positioned itself as a specialist in the field of agricultural marketing and market information and facilitating rural agro-enterprise development and market linkages. http://farmgainafrica.org/about-us
Infotrade	Infotrade is a platform built to integrate collection, analysis and dissemination of agricultural and other market information in Uganda. Infotrade collects and compiles information on prices of inputs, organic prices, prices at county/sub county/parish/village level. It eventually aggregates this information so that a user can find information on volumes sold per district market in Uganda. http://www.infotradeuganda.com/index.php/about-infotrade.html



Famunera	Famunera is an online and mobile platform that assists farmers (smallholders and large scale) and agribusinesses with market linkages, agro-inputs sourcing, equipment (machinery) sourcing, agro finance linkages, extension (agronomy) services linkages, freight (transport) linkages, agribusiness information (agro commodity prices, forex, manuals, weather forecast, etc.) within Uganda and across Africa.
NARO Apps	NARO Apps comprise the NARO SMS Platform, 3 Mobile apps available on Google play store (naro maize, naro beans& naro cassava), UARISTS and the Seed Traceability system. The seed traceability system once integrated e-voucher system under the Ministry of Agriculture, Animal Industry and Fisheries will ease the authentication of suppliers of agro-inputs. http://businessfocus.co.ug/naro-launches-shs380m-mobile-apps/
Jaguza	Jaguza livestock App aims at empowering farmers to share indigenous knowledge on farming methods through information communication technologies. Farmers are organized into a network through which they can convene and share this indigenous farming knowledge with each other. Access to this information is through Social Media, blog posts, SMS, USSD, Mobile, banners and fliers. Farmers even meet at the annual knowledge fair which is aimed at facilitating the flow of agricultural practices across ethnic groups and geographic regions. http://www.jaguzafarm.com/
Wefarm	Wefarm is a free peer-to-peer service that enables farmers to share information via SMS, without the internet and without having to leave their farm. Farmers can ask questions on farming and in turn receive crowd-sourced answers from other farmers world over in the shortest time possible. https://wefarm.org/what-is-wefarm/
MUIS	Market-led User-Owned ICT4Ag Enabled Information Service (MUIIS) is a project that uses the power of information and communication technologies and big data to support agricultural productivity in Uganda. http://muis.cta.int/2016/12/08/muis-service-agents-profiling-farmers-across-uganda/
Kakasa (Agro verify)	“Kakasa” is an E-tag system aimed at helping farmers purchase genuine agro-inputs. <i>Kakasa</i> or E-Verification is a brand protection system that uses a unique scratch code packaging label containing a 14 or 16 digit verification number. When the buyer scratches the label, a number is revealed. This code is then sent by SMS to the number indicated on the label and a message will be sent back confirming whether the product is genuine or not. If the message confirms it is genuine then it means the product is a licensed original and the quality is backed by the companies that manufacture and/or import them. If there is a rejection/‘not genuine’ message then the farmer should not buy or use the product. If the agro-dealer has purchased the product for resale to farmers, a complaint then can be lodged to ensure the necessary action is taken against the supplier. https://www.dignited.com/17278/unbs-partners-launch-kakasa-e-tag-system-help-farmers-purchase-genuine-agro-inputs/
Vouch digital	Vouch digital’s objective is to help programs, as well as partners, interpret the impact of their programs by using real-time accurate data derived from our digital platforms. Voucher Digital have tested, piloted, and built digital voucher systems that have enabled thousands of farmers to access seed crops, post-harvest equipment as well as farming equipment. http://vouchdigital.africa/about-us/
Farm Force	Farmforce is a cloud-based software platform which can manage the activities of a group of many smallholder farms and farmers ensure compliance and establish traceability. Farmforce works on all Android smartphones and tablets, and on any computer with a web browser.
Kulima	Kulima- production and marketing



SUFACE	SUFACE, Makerere University for linkages networking between the University and farming communities
m-Omulimisa by AGINSBA	Mobile extension app developed to link farmers with extension service providers. This is now being expanded to include access to inputs and output markets with Village agent linkage for knowledge and information support to communities and input and output aggregation.

Challenges with ICT solutions

Major issues with all these applications that they are project initiated and often **unsustainable**. They are also serving a small segment of more affluent farmers but not smallholder farmers. Applications are often developed without proper understanding the real needs of users and the high costs of internet connectivity. Alongside the above factors, weak farmer organisations/associations, deficient of entrepreneurial and ICT use skills, and a limited market-orientation also contribute to limited uptake of ICT solutions. On the other hand, markets are also weak and less developed (quality and delivery time not critical). “*Demand for ICTs should be organic and integrated for business growth*”, Mirembe says.

Most of our interviewees so far had no experience with any ICT platforms as far as seed distribution and marketing was concerned. However, some had involved (Simlaw Seeds, East African Seed Company) in the electronic voucher system which is a subsidy intervention by Mercy corps who pay 40% of the cost and farmers pay 60%. This has been implemented through their agro-dealer network who are often registered to control the quality of seed distributed through the voucher system.

CEDO seed company uses the *Kulima app* for field diagnosis of pests and diseases. The phone-based *app* is deployed at the production segment for taking and sharing pictures of pests and disease symptoms by the village enterprise agents (seed company extension staff). They also use *whatsapp* for communication amongst themselves and Open Data Kit (ODK) for data collection and profiling of farmers. Together with Mastercard they are now using ICTs to establish seed volumes in farmer stores. The challenges encountered with use of ICTs has been costs of data (MBs), charging – solar chargers are not good enough for some tablets and smart phones, thefts (their staff targeted because of phones), poor network coverages in some remote areas. Attitude and bias amongst some farmers in use of ICTs

ICT as a potential solution

From the respondents point of view, ICTs have benefits in the seed sector including;

- cutting costs especially for transport and saving time especially for market intelligence collection
- Supporting payments for products and services, diagnosis of pests and diseases, weather forecasting to guide time farm operations
- As markets become more specialised and structured, traceability of products is becoming important. ICTs have a role in profiling of farmers and tracing the source of seeds. Equator seeds is already tracing sales of their seeds through E-tags (e-verification of genuine seeds). The problem is lack of awareness amongst smallholder farmers and they hardly scratch the tag and provide feedback to the company. Equator seeds once had an entire lot of maize seed (10 tons sold) but never got any feedback from the buyers as they did not scratch the tags (due to unawareness);
- The farmer reach through agents is till low and ICTs could enable reaching larger numbers of farmers;
- Supporting demand forecasting and linking the specific supply to where it is demanded;
- ICTs have a major role in information sharing and could be helpful in eliminating market information asymmetries, especially for prices which are highly variable within short distances;
- ICTs also have a role in virtual learning but requires good knowledge and information management in order to be relevant;
- ICTs also have a potential role in data management for seed companies;



- ICTs have potential for deployment and use by LSBs established in northern Uganda if they are sensitised;
- Some seed companies like Equator seeds have village-based agents serving 6,500 farmers who have some basic training in ICTs and could be piggybacked on to improve the marketing of seed.

From the discussions a number of key questions emerge:

1. Whose problem are ICT solutions addressing?
2. What innovations are needed to optimise systems functioning and what are the investments?
3. What are the required business models to sustain the ICT-platform and its use?
4. What is the required policy environment to support innovative ICT-options for seed systems?

Respondents noted that ICTs are not a solution, but a means to a solution and as such some steps are needed to make investments in phone Apps that enable farmers making orders through which the seed companies receive alerts and link up with the agro-dealer network to supply the required volumes of seed to smallholders. This requires popularising ICTs through business-oriented agents to champion the use of ICT for marketing and delivery of agricultural inputs (e.g. m-Omulimisa). There is also a need for a reliable demand forecasting system for seed – especially legumes whose demand fluctuates a lot. Innovations for quality assurance of seed systems and traceability of seed should be developed. e.g. every season before the marketing of the seed or pre-qualifying seed companies with traceability interventions. Continued mass awareness creation of need for quality seed to create markets for seed. All the above systems cannot be helpful without concomitant building of entrepreneurship skills and ICT user skills of farmers and their associations, and a supportive seed policy (not enacted to date).



2 Ethiopia

2.1 Overview of the key seed value chain stakeholders interviewed

The interview has covered some key stakeholders in the Ethiopian seed system. Most of the stakeholders play different functions in the seed value chain including production and supply of pre-basic, basic, and certified seeds. Among the interviewees, Oromia Agricultural Research Institute (OARI), is mainly responsible for crop variety development and serves as a source for crop early generation seeds (pre-basic and basic). OARI also demonstrates and promotes the new seed varieties at small scale. Oromia Seed Enterprise (OSE) and Anno Agro-Industry representing public and private seed enterprises, respectively, are interviewed to assess recent changes and challenges in the production and supply of certified cereal and legumes seeds. Menagesha Biotech Industry (MBI), a private inoculant supplier, is among the stakeholders interviewed to learn the inoculant supply and marketing. Inoculant is different from the seeds as the inoculant industry is being developed, and there is still low product promotion as compared to hybrid maize seeds and the product is susceptible to quality deterioration. In the same manner, Tsehay Farmer Cooperative union is interviewed to know recent progresses and bottlenecks in seed distribution and marketing to the farmers. The cooperatives and/or unions serves as last mile deliveries for agricultural inputs. The Ministry of Agriculture and Natural Resources (MoANR) is the one responsible for developing and enforcing strategies and policies for seed systems development. The Input Marketing Directorate of MoANR shared us recent developments of Ethiopian seed strategy.

Agricultural Transformation Agency (ATA) is interviewed to understand the progresses and challenges of the recent initiatives regarding to the distribution and marketing of certified seeds (and other agricultural inputs in general), i.e., the seed business models. The interview with ATA also covers the pilot ICT intervention for tracking input transaction and information dissemination. Apposit, as an actor in agribusiness information management, develops and manages ICT platforms for information dissemination and tracking input transactions. The interview with Apposit aims at understanding the potential functions and limitation of ICT platforms.

2.2 Key insights from the stakeholders' interviews

2.2.1 Changes in the Ethiopian seed system

Ministry of Agriculture and Natural Resources (MoANR): The seed system as to MoANR includes among others crop breeding, registration, certification and marketing of seed. It is understood that the ministry is responsible for providing policy support to these functions. While newly released seed variety registration is taken care by the federal ministry of agriculture, certification for seed production is also a responsibility of regional government. To large extent seed marketing is being taken care by the public, though there are few private sectors into the business. For the MoANR, the Seed System Development Strategy (<http://www.ata.gov.et/download/seed-system-development-strategy>) is a new development and change in the Ethiopian seed system. The Ethiopian seed system has been highly dominated by the public sector for long. The newly developed seed strategy allows all multinational actors as well as the unions and private sectors to perform seed business. The strategy not only opens up the seed industry for all, but it also provides a policy support that the conventional seed marketing model through government structures is no more a mandatory. The directive allows Direct Seed Marketing (DSM) where seed suppliers deal directly with distribution agents. The seed producers (suppliers) can have their own agents. According to the MoANR, a significant step has been taken and large volume of hybrid maize seed is being marketed through DSM. As understood during our discussion, as a strategy, the seed strategy is inclusive of all seed systems including legumes. However, so far, common bean and chickpea are the main ones as availability of improved varieties are major constraints for other legume seeds. The director for input marketing emphasized that lack of improved varieties for faba bean and field pea is a major constraint for seed systems development. Farmers' demand for legume seeds is low as compared to maize leading to less attention by seed enterprises. Soyabean is relatively better having improved seed varieties (can be brought in the third



place next to common bean and chickpea). As a result, in contrast to maize, the informal seed system plays a great role for legumes. Production and distribution of Quality Declared Seed (QDS) are promoted to ensure farmers access to legumes seeds. *QDS approach also do allow the opportunity to consider local varieties.* The interviews with OSE, Anno Agro Industry, ATA and ISSD (South West Oromia), all suggest that DSM is the major change in the seed system supporting the MoANR's idea. OSE and Anno are using the DSM model to distribute and market seeds, and ISSD (South West Oromia) and ATA are promoting the model to enhance farmers' access to seed and seed suppliers market performance.

Oromia Seed Enterprise (OSE) used the DSM in 104 districts for marketing maize and wheat seeds. Agents are used as market outlets. The agents, either individual entrepreneurs or cooperatives, are paid commission for the seed marketed. In some of the districts, though they are few, Farm Service Centres (FSCs) also serve as agents. The agents are identified by district Bureaus of Agriculture (BoA) in consultation with the seed suppliers. As to OSE, even though DSM is a major change to seed supply, there is no clear change to the seed demand information forecasting. Input demand is collected either through the conventional method or OSE just deliver seeds of certain volume based on the request from the agents. So, there is a high gap again. For legumes the same procedure of seed marketing is being used. However, the volume of legume seed marketed is very low due to low request from the agents. For example, in 2018 cropping season, 287 Qt of common bean, 1402 Qt faba bean and 935 Qts soyabean seeds are marketed through DSM. On the other hand, for maize and wheat over 44,000 and 100,000 Qts, respectively, has been marketed following the DSM model. Supply goes with exiting demand.

Anno Agro-Industry, in a similar manner to OSE, indicates DSM as a recent change in the Ethiopian seed systems. The model is being used in selected districts identified by the government. Agents are selected by the Bureaus of Agriculture and memorandum of understanding (MoU) is signed with the suppliers. Seeds are delivered to the agents. The agents can be cooperatives as well are individuals. As indicated by OSE, the agents are paid commission. Any risk related to the seed stocked at the agents' shop is borne by Anno Agro-Industry. However, the one with cooperative didn't went well due to conflict of benefit between the agents (cooperative) and the cooperative agencies. The cooperative agencies are the upper hand organizations responsible for organizing the cooperatives. The farmers buy seeds directly from the agents. However, there is no proper demand information, '*we are shooting into the dark*', Dr Tesfaye of Anno Agro-Industry indicated. Conventional methods like rain on-set are indicators for seed demand as farmers seed demand does in parallel with rain on-set.

Integrated Seed Sector Development (ISSD-South West Oromia) has piloted DSM practice particularly for maize and wheat seeds. Small seed pack is being piloted targeting farmers with small land size and limited income. The pilot is mainly to promote small seed packs for legumes. Early generation seed (EGS) planning has been introduced to solve shortage of EGS and to help central EGS planning and distribution and avoid uncoordinated wastage.

Agricultural Transformation Agency (ATA) in collaboration with MoANR developed and launched the

Ethiopian Seed Strategy. This development, as to ATA, marks one of the milestones in the Ethiopian seed systems. It traces the whole bottlenecks, and potential solutions in the Ethiopian seed system. Under the umbrella of the Seed Strategy Ata made some interventions including promotion of Seed Production to ensure access to the farmers as well as introduction of the Direct Seed Marketing (DSM). As a pilot, ATA identified and capacitated 12 farmers' cooperative unions to produce quality seeds. Capacity building to enable the union management develop an understanding of 'seeds as business' centring farmers and linking them with agricultural research for continuous access to EGS has been among the changes. The pilot unions certified for seed production and own their brands. However, there was a production push. While demand is said it is there, at the same time there was 40-50% carry over of seed by unions. The DSM model is introduced so as to enhance seed marketing. In this case, as indicated by the other seed suppliers, seeds are directly supplied to the distributors (coops, agents). This has created an opportunity for the suppliers to take full responsibility for seed marketing. The agents are trained by ATA on DSM involving seed regulators. Agents with poor performance will be unsilenced in the course of implementation. As to ATA, since the introduction of



DSM, great improvement in seed sales are being witnessed. This is evidenced in a comparative analysis between the conventional seed marketing (demand assessment made in Sept or Oct.) and DSM.

Farm Service Centres (FSCs), developed through joint collaboration of USAID, ATA and MoANR, are typical type of one-stop-shops (agents), stocking different inputs together (interlinked inputs). The shop design is made in such a way that all sort of inputs can be stocked together. It provides smallholder farmers with quality farm supplies such as improved seed, chemicals, farm equipment, veterinary drugs and equipment, as well as consultancy services and training.

Tsehay Farmers' Cooperative Union support the fact that farmer organizations licenced for seed multiplication distribute seeds directly to the farmers. This has created an opportunity to the farmers to get the seeds in their village.

2.2.2 Interlinkage between seed and other input systems

The MoANR indicates that the seed system strategy does not as such underline the interlinkage between input systems. However, from the interview with the director of input marketing at the ministry, we understood that the default package approach is often recommended so that farmers will use not only seed but also other associated inputs (fertilizer, chemicals) together with seeds. Though the package approach is recommended, there is no enforcement, it is open to the framers' decision. The ministry also indicates that there is no as such policy to interlink the supply of maize and legume seed systems. However, as a requirement for soil fertility maintenance, the MoA put an enforcement for cereal-legume rotation. This will have an indirect implication that both legume and maize seeds will be made available for framers.

As OSE supplies only seeds and MBI supply only inoculants. OSE indicated that there is no request for other inputs to be supplied together with seeds. Their plan to interlink seed with other inputs is not either clear. OSE indicated that they often get requests for maize and wheat seeds, and supply is being made for these alone. Rotation of cereals with legumes is a requirement even for certification but the demand for legume seeds is a challenge. Anno Agro-Industry, however, has the plan to link other inputs with seed (chemicals for example). But not yet due to access problems for some of the inputs and government pressure. There is high competition with the government. Sometimes, the pressure even goes to agents that they are forced to sell public seed first. The quality of public seed is poor, they need to get it sold first.

ATA, on the other hand, indicates that with the development of FSCs, there is an integration of inputs (inputs systems). ATA has developed a shop design that can allow all kind of inputs to be stocked. Together. Even the chemical fertilizer is going to be part of the inputs supplied at the FSCs. The challenge in this regard is that, there is no one inclusive licensing for the agents (dealers) by now to get licensed for all inputs. Licenses go separately and following their own procedures for the different inputs. ISSD (South West Oromia) refers to the recent developments by ATA. It emphasized ATA's promotion of one-stop-shop, *"The idea is to make available all kind of inputs necessary for farmers at a place including the extension and other advices. However, the legumes are mainly produced by the informal seed system due to the attention it received from the seed companies and public seed enterprises and also the crop is not suitable for mechanization"*.

Tsehay union also indicates that agricultural inputs like fertilizer, seed and chemicals made available to the farmers together at the primary cooperatives. According to OARI, the economics of use of full package agricultural inputs in Ethiopia has clear value addition in terms of increasing productivity across most crops particularly in maize and legumes. However, full scale usage of these inputs (seed and other related agricultural inputs) has increased only marginally over years. In most extension packages, major focus is given for improved seeds and less attention given to other inputs. This is mainly due to limited access to input credit to small scale farmers. Apart from some efforts being made by ATA, seed system is not well interlinked with other input system.



2.2.3 Major barriers to supply quality seeds in the Ethiopian seed system

The interview with the stakeholders indicates positive changes in the Ethiopian seed system, particularly in terms of having a comprehensive strategy and liberalization of the seed industry. However, remains multi-dimensional barriers ranging from the limitations in EGS development, registration and regulation to marketing.

OARI as a public research institute indicated lack of capacity of research centres to develop highly yielding and market demanded varieties and, lack of effective seed demand assessment mechanisms, access to financial resources (input credit), adequate and sustainable seed market, and demand-driven seed multiplication strategy and supply with value addition in the seed value chain (with respect to quality, time and place of supply and fair pricing). OARI also indicates lack of clear and simple institutional and functional linkages between research and seed producing institutions and poor capacity of experts and extension agents that can strengthen the entire integrated seed system. As indicated by OARI, for **maize**, findings show that despite extensive varietal development by the public research system, dissemination of improved varieties to farmers remains limited. This may be partially due to the continued dominance of public sector organizations in the multiplication and supply of seed to farmers, and to the relatively low level of private sector participation. The result is a seed market characterized by limited competition, insufficient supply of seed relative to demand, limited choice in the few varieties that are available, and excessively high costs of maize seed production, shortage of early generation seeds from research centres. In the same manner, **legumes**, productivity is below potential due to low input usage (especially chemical fertilizers capable of increasing yields in field trials by 10 to 80 percent), limited availability of seed and familiarity with the variety of existing legume types, and limited usage of modern agronomic practices. The extension service should incorporate legumes into the curriculum (insufficient extension services dedicated to increasing farmers' knowledge of improved legume varieties that deliver major improvements (e.g., yield increase and disease resistance). OARI suggests strengthening a decentralized production and distribution system to bridge the formal and informal seed sectors, especially to fill gaps in less profitable crops such as most self-pollinating varieties (SPVs) that public and private seed producers cannot address. Community-Based Seed Production and distribution for crops such as legumes and other self-pollinated crops can be a good option.

OSE, emphasized unpredictable farmers seed variety demand as a major barrier in seed business. For unknown reason farmers change demand between varieties. Sometimes they shift to old varieties, varieties that are even affected by plant diseases (e.g., *Gabalcho* wheat variety). It may be linked with limited awareness. There is high farmer seed variety demand fluctuation. For example, there is high wheat seed demand this season for unknown reason. It is difficult to make decision as an enterprise. Demand estimation is being collected following the conventional way and it needs a lot of work. Seed regulation is still a challenge. Although it is being done at two levels, i.e., field and laboratory, there is no an independent body responsible for this activity. Coordination/communication between the different regulatory bodies is weak. There is high EGS shortage. OSE entered into contract with OARI for pre-basic seed production and supply. Unions multiply the basic seed for OSE based on contract agreement. Furthermore, there are issues of affordability of seed process for farmers.

For **ISSD (South West Oromia)**, like OSE, shortage of EGS of preferred varieties, demand forecast problem, and demand shift by smallholder farmers are among the major barriers to supply quality seed to the farmers. Others include under developed marketing infrastructure at cooperatives level (where majority of input and out transaction takes place), limited farmers awareness on improved seed consumption and capacity of seed producer cooperatives and seed companies to grow their business are the major barriers.

Anno Agro-Industry mentions, among other, high human labour cost due to lack of seed cleaning machine, poor soyabean seed market, poor seed genetic purity for most private seed suppliers, and limitations in capital as well personnel resources. As with others, Anno Agro-Industry also emphasized limitations in getting access to EGS. EGS is often sourced from public in quota and will limit most private sectors to fully operate at their full capacity. The government uses this as a control tool to the private sector. Anno has started producing basic seed for maize (another recent change), it seems the government is gradually liberalizing EGS production. Certified price is not yet liberalized. Hybrid maize



price is set by the big government seed sectors, i.e., Ethiopia Seed Enterprise (ESE), Oromia Seed Enterprise (OSE), South Seed Enterprise (SSE) and Amhara Seed Enterprise (ASE). Except for hybrid maize, there is low seed demand including soyabean and teff. For hybrid maize there was high promotion by different actors. However, for legumes like soyabean, promotion is still needed, there is low utilization skill, and local processing companies need to be linked. It needs more market development as well as promotion of household utilization.

ATA associates most of the barriers with the fact that the Ethiopian seed sector is mainly dominated by the public sector and that there is minimum support for the private sectors in creating an enabling business environment. There is wrong perception regarding to the private sector that the private is for own prosperity. As indicated by the others, ATA too, shares the idea that shortage of best performing varieties is a major factor for not having farmers demand. Pioneer, a private multinational hybrid maize seed supplying company has been indicated as an example. Farmers are going for very expensive but high yielding pioneer maize varieties. ATA also indicated the low value accrued to improved seeds by agricultural experts at district and village levels and that seeds are used as political agenda, not like any other commodity.

MoANR indicates that the barriers limiting supply of high quality seeds are not just observed at few of the nodes along the seed supply chain. It ranges from the development of EGS to variety release, extension, production and marketing. MoANR emphasizes that there is high limitation of new seed variety development and release. For example, BH-660 hybrid maize seed variety has been in the production for more than 20 years. In the same manner, there are limitations of new seed varieties for faba bean and field pea. Besides, there is poor extension or promotion of the exiting newly released seed varieties that farmers are forced to use long released seed varieties. The variety release system is not participatory. Farmers are not represented in the seed release committee and farmer preferences are not well considered while releasing. For the released varieties, there is limitation in EGS supply, even for commercialized varieties. Seed inspection has a lot for challenges. For one reason, the inspectors are not well informed of the newly released varieties (there is not catalogue of the newly released varieties). There is low specific knowledge of the specific seed varieties. The inspectors are often trained common agronomic practices and not specific knowledge of the new varieties. As with the inspectors, farmer training of seed use focus on default agronomic practices. The infrastructure for the inspectors, including field vehicles and laboratories, are underdeveloped. Input marketing information systems is very weak. No ICT infrastructure to coordinate the information communication. While there is seed shortage in Ahmara, for example, there is huge seed carryover in Oromia. Although there is a positive step ahead that the seed enterprises to invest on marketing intelligence, input demand estimation (assessment) is still a gap.

The major barriers include:

- Government policy towards private sector involvement and getting payment through transaction or subscription fee, cost of devices to provide service or collect information
- Cost associated with disseminating information to farmer
- Cost associated with collecting information from farmer

2.2.4 The role of ICT: potential intervention, functions, impacts and key knowledge gaps

In general, most of the seed stakeholders interviewed have positive views towards the potential role of ICT in input supply chain development. However, there are differences in terms of awareness and integration of the ICT platforms in the seed market operations. Neither of the two big seed suppliers interviewed, i.e., OSE and Anno Agro-Industry, are aware nor integrated ICT in the seed market. The same holds true for MBI, except recent participations on ICT discussions convened by N2Africa. However, MBI want an efficient tool to collect data on farmer demand for inoculant to scale and invest more on their distribution channels. In the same manner, Anno Agro-Industry think to follow up with farmers after seed distribution as there is no feedback from farmers to Anno currently. There is no connection with farmers, the connection is with agents only. Anno offers whatever it produced.



Therefore, it seems there is a need for coordination of efforts among other input actors indicating potential interest for ICT. Conducive environment by gov't so each actor can play its role.

ISSD (South West Oromia), is fully aware of the need and penitential role of ICT interventions in the input supply chains. ISSD described the role of ICT saying, "The importance of ICT is unarguable to enhance seed system. Existing problems observed in demand forecasting and demand shift, input and output marketing information can be addressed through the development of ICT". As learned from ATA's intervention, ISSD indicated "ICT is very useful though it is only suitable for literate farmers, I think to address this, in addition to DAs, contact persons can be used in each village that can serve as disseminator of information received from the text". The tool can solve the serious problems observed on demand forecasting and demand shift by smallholder farmers. In addition, this tool may also help the producers of seed to have up to date information about which varieties and seed type they should produce.

ATA in collaboration with **Apposit** and other partners have introduced the ICT platforms in to the agricultural sector. The ICT has multiple functions including provision of extension services depending on the locality and need, and tracking of input transactions (marketing). ATA's ICT intervention includes the TERRA platform for tracking of input transactions and the Interactive Voice Response/Short Message Service (IVR/SMS) system for bi-directional agricultural information communication (improved agronomic practices, plant disease outbreak, etc). The TERRA platform is used for tracking input market information including input demand, allocation, delivery and distribution. According to ATA, these information systems are being managed (relatively easily) for fertilizer transaction. However, for the seeds the scenario is different. Seed demand information is not reliable for different reasons. For one reason, seed suppliers are multiplying and supplying seeds without knowing the actual demand from farmers. On the other hand, in cases when seed demand information (forecast) exists for the seed supplier, there are circumstances whereby farmers are enforced to change their stated seed demand. Whether fluctuation can be one such circumstance. This has direct implication on the relevance of the demand-allocation feature of the TERRA ICT-platform. Demand-allocation of seeds are by variety which can easily be affected by whether (short/long rain distribution, etc.). As understood from our discussion, demand should be dynamic. So, people down in the village should continuously provide updated demand information. This might be possible, but again the supply by variety can be a problem. Supply is being made based on the available stock, it cannot be automatic just like that of demand information.

For their ICT intervention, ATA relies on district personnel staff. But, in the course of the intervention, the district people started saying, the data entry is becoming a burden to them. Often the district input market experts are sued to aggregate and cross-check input transaction information which is coming to them from the Kebele level cooperatives. As a result, ATA made changes into the TERRA ICT platform and the demand and allocation features are disabled. However, it was learnt that modifications can be made again to the platform to instate the input demand and allocation information. In Oromia region, there is more interest to have the input demand feature of the ICT. The other change based on feedback was the use of text format features with feature phones. Earlier, with the need for internet service, it was Smart phones that were being used. Data collection for input transaction is made at village cooperative level. Survey is done in text type only for input delivery and sales (demand and allocation disabled now).

General feedback

According to ATA, there is a positive appreciation for the ICT intervention (for example Amhara region have appreciated the input transaction intervention), that it has minimized a lot of paper work. However, there are a lot of challenges including lack of capability to use the ICT solutions and lack of directives by the government to enforce the use of ICT. The cooperatives and cooperative agencies where the pilot was made, assume that the involved data collection and information sharing is additional work. It is understood that data validation and accuracy is mandatory for an informed decision making in input business. However, besides the personnel resources, facility as well as internet services are key challenges.



Feedback from **Tsehay union** piloted for ICT intervention indicates that the ICT helps in decision making. It helps to save time and effort and providing real time information in commodities exchange specified by type, quantity, and price. Farmers input demand can be tracked and confirmation against supply can be obtained. However, there concerns related to issues of internet access, lack of an ICT expert at union level and that the cost is also expensive. Another union, **Uta Wayu**, is piloted for malt barley seed and grain transaction by BGI Ethiopia. This union too shares the positive services of the ICT.

Potential Impacts of ICT-ATA

The TERRA ICT platform which is used for tracking input transaction can play a great role in minimizing input carry over. Besides, reallocation of input between cooperatives can be possible. Tracking of input transactions can be used to make decision in re-adjusting input allocation between cooperatives of less input demand to cooperative of high demand. The reallocation can be from district to district as well.

According to **Apposit**, ICT interventions in the input system is essential, because correct and timely input demand estimates can be collected from farmer level and aggregate to give better view. It helps to gather accurate data on where input stocks are located (seed enterprises, Warehouses, on route from port, at coops or private dealers), analyse where deficit and surplus are seen, manage distribution of inputs to coops and then to farmers and disseminate information on prices, usage and also collect feedback on quality. ICTs can also play a role in profiling farmers and farmer organisations (cooperatives), recording and analysing input transactions to support decision making by management of cooperatives in the Apposit's E-Voucher system

The other counterpart, the **TERRA** is a management information system can help unions and agro-processors to manage all data and transactions made with clients or members. Market information, weather forecast and vegetation index dissemination can also be added to the current services.

Challenges with ICT use

The envisaged knowledge gaps depend on the type of ICT intervention we want to put in place. Input transaction at village (cooperative) level is collected by the cooperative managers. Often the information on the demand out is not well articulated input suppliers and is a gap that could be filled with ICTs. However, another challenge is about the use capacity of the ICTs. The users are at different capacity levels ranging from trained farmers to certificate holders. Limited Infrastructure, such as phones both at the cooperative levels as well the district input marketing agency, and internet services for information sharing.

Table 1. List of interviewed stakeholders in Uganda and Ethiopia

(a) Uganda – Stakeholder interviewed during the workshop

Stakeholder	Stakeholder type	Functions	Persons interviewed
ISSD – Integrated Seed Sector Development and NARO	Public	Supports farmer groups with training and certification of Quality Declared Seed	Ms. Christine Adong Mr. Jackson Otim
Equator Seed	Seed Company	Production, processing and marketing of maize, groundnut, soyabean and common bean seed	Mr. Walter Okol Mr. Franco Alia Mr. Walter Ross



OTIS Garden Seed Ltd	Private Seed Company	Production and Marketing of seed for maize, soghum, bush beans and soyabean	Mr. James Olwi
Jalson Foundation	Agro-dealer	Marketing of agro-inputs including seeds	Mrs. Susan Ojok
Nile farmers centre	Agro-dealer	Marketing of agro-inputs including seeds	Mrs. Topista
Mukwano processors	Grain buyers	Buyer of grains and processing of cooking oil and cake	Mr. Ved Prakash
Ngeta Tropical Holdings	Grain buyers	Buying and marketing grains	Mr. George Enyang
Bedijo Local seed business, Oyam District	Farmer organisation producing Quality Declared Seed	Production of maize, bean and soyabean quality declared seed	Mr. Francis Odyek and members (15 persons)
District Production Department, Oyam	Public organisation	Extension support and quality assurance for quality declared seed	Mr. Patrick Odyomo

(b) Uganda - stakeholders interviewed prior to workshop

Stakeholder	Stakeholder type	Functions	Persons interviewed
Harvest plus	International Research organisation	Dissemination of biofortified orange Flesh sweet potato and common beans for nutrition and distribution seed production	Ms. Sylvia Magezi Mr. Charles Musoke
NARO- NaCRRRI, National Bean and cereals programme	National Research organisation	Breeding and production of breeder, basic seed	Dr. Stanley Nkalubo & Mr. Gorge Aogon Dr. Godfrey Asea
CEDO Seed Company	Private Seed Company	Produce and market certified common bean seed	Mr. Charles Katalwa
Uganda National Agro-dealers Dealers Association	Private organisation	Training, certification and coordination of agro-dealers in the country	Mr. Moses Nangulu
Makerere University	Public Tertiary institution	Training and research, software development	Dr Drake Mirembe
Simlaw Seeds	Private Seed company	Private seed Company-producing and marketing maize, legume seed and	Mr. Isaac Owino



		vegetable seed	
East African Seeds	Private Seed company	Regional company distributing/marketing hybrid maize, and vegetable seeds	Mr. Johnson Mugisa
Naseco	Private Seed company	Production and distribution of hybrid maize, sorghum, beans, soyabean, common bean	Mr. Godfrey Katwere

(c) Ethiopia - Stakeholders interviewed prior to the workshop

Stakeholder	Stakeholder type	Functions	Persons interviewed
Oromia Agricultural Research Institute (OARI)	Public research organization	<ul style="list-style-type: none"> • Crop breeding (development) • Source of EGS (pre-basic, basic) • Demonstration (small-scale) 	Dr Tesfaye Letta
Oromia Seed Enterprise (OSE)	Public seed enterprise	<ul style="list-style-type: none"> • Production and supply of certified (hybrid maize, legumes, etc) 	Mr Tafa Jobie
Anno Agro-Industry	Private seed company	<ul style="list-style-type: none"> • Production and supply of certified seed (hybrid maize, legumes, etc) 	Dr Tesfaye Kumsa
Menagesha Biotech Industry (MBI)	Private inoculant company	<ul style="list-style-type: none"> • Production and supply of inoculant 	Mrs Mignote Zecharias
Tsehay Union	Farmer organization	<ul style="list-style-type: none"> • Seed production, distribution and marketing 	Mr Endalkachew Abie
Agricultural Transformation Agency (ATA)	Public organization	<ul style="list-style-type: none"> • Policy support for seed (input) systems: production, supply, and marketing among others 	Dr Yitbarek Semeane (Seed Systems) Mr Ermias (ICT)
Ministry of Agriculture and Natural Resources (MoANR)	Public organization	<ul style="list-style-type: none"> • Policy support for release, registry, certification and marketing • Extension services 	Mr. Tefera Zeray
Apposit	Private ICT	<ul style="list-style-type: none"> • ICT based agribusiness information management ➢ Information dissemination Track input-output 	Mr Elias Gossaye



List of project reports

1. N2Africa Steering Committee Terms of Reference
2. Policy on advanced training grants
3. Rhizobia Strain Isolation and Characterisation Protocol
4. Detailed country-by-country access plan for P and other agro-minerals
5. Workshop Report: Training of Master Trainers on Legume and Inoculant Technologies (Kisumu Hotel, Kisumu, Kenya, 24-28 May 2010)
6. Plans for interaction with the Tropical Legumes II project (TLII) and for seed increase on a country-by-country basis
7. Implementation Plan for collaboration between N2Africa and the Soil Health and Market Access Programs of the Alliance for a Green Revolution in Africa (AGRA) plan
8. General approaches and country specific dissemination plans
9. Selected soyabean, common bean, cowpea, and groundnut varieties with proven high BNF potential and sufficient seed availability in target impact zones of N2Africa Project
10. Project launching and workshop report
11. Advancing technical skills in rhizobiology: training report
12. Characterisation of the impact zones and mandate areas in the N2Africa project
13. Production and use of rhizobial inoculants in Africa
18. Adaptive research in N2Africa impact zones: Principles, guidelines and implemented research campaigns
19. Quality assurance (QA) protocols based on African capacities and international existing standards developed
20. Collection and maintenance of elite rhizobial strains
21. MSc and PhD status report
22. Production of seeds for local distribution by farming communities engaged in the project
23. A report documenting the involvement of women in at least 50% of all farmer-related activities
24. Participatory development of indicators for monitoring and evaluating progress with project activities and their impact
25. Suitable multi-purpose forage and tree legumes for intensive smallholder meat and dairy industries in East and Central Africa N2Africa mandate areas
26. A revised manual for rhizobium methods and standard protocols available on the project website
27. Update on Inoculant production by cooperating laboratories
28. Legume seeds acquired for dissemination in the project impact zones
29. Advanced technical skills in rhizobiology: East and Central African, West African and South African Hub
30. Memoranda of Understanding are formalized with key partners along the legume value chains in the impact zones
31. Existing rhizobiology laboratories upgraded
32. N2Africa Baseline report



33. N2Africa Annual Country reports 2011
34. Facilitating large-scale dissemination of Biological Nitrogen Fixation
35. Dissemination tools produced
36. Linking legume farmers to markets
37. The role of AGRA and other partners in the project defined and co-funding/financing options for scale-up of inoculum (Banks, AGRA, industry) identified
38. Progress towards achieving the vision of success of N2Africa
39. Quantifying the impact of the N2Africa project on Biological Nitrogen Fixation
40. Training agro-dealers in accessing, managing and distributing information on inoculant use
41. Opportunities for N2Africa in Ethiopia
42. N2Africa project progress report month 30
43. Review & Planning meeting Zimbabwe
44. Howard G. Buffett Foundation – N2Africa June 2012 Interim Report
45. Number of extension events organized per season per country
46. N2Africa narrative reports Month 30
47. Background information on agronomy, farming systems and ongoing projects on grain legumes in Uganda
48. Opportunities for N2Africa in Tanzania
49. Background information on agronomy, farming systems and ongoing projects on grain legumes in Ethiopia
50. Special events on the role of legumes in household nutrition and value-added processing
51. Value chain analyses of grain legumes in N2Africa: Kenya, Rwanda, eastern DRC, Ghana, Nigeria, Mozambique, Malawi, and Zimbabwe
52. Background information on agronomy, farming systems and ongoing projects on grain legumes in Tanzania
53. Nutritional benefits of legume consumption at household level in rural sub-Saharan Africa: Literature study
54. N2Africa project progress report month 42
55. Market analysis of inoculant production and use
56. Soyabean, common bean, cowpea, and groundnut varieties with high Biological Nitrogen Fixation potential identified in N2Africa impact zones
57. A N2Africa universal logo representing inoculant quality assurance
58. M&E workstream report
59. Improving legume inoculants and developing strategic alliances for their advancement
60. Rhizobium collection, testing and the identification of candidate elite strains
61. Evaluation of the progress made towards achieving the Vision of Success in N2Africa
62. Policy recommendation related to inoculant regulation and cross-border trade
63. Satellite sites and activities in the impact zones of the N2Africa project
64. Linking communities to legume processing initiatives
65. Special events on the role of legumes in household nutrition and value-added processing
66. Media events in the N2Africa project



67. Launching N2Africa Phase II – Report Uganda
68. Review of conditioning factors and constraints to legume adoption and their management in Phase II of N2Africa
69. Report on the milestones in the Supplementary N2Africa grant
70. N2Africa Phase II Launching in Tanzania
71. N2Africa Phase II 6 months report
72. Involvement of women in at least 50% of all farmer-related activities
73. N2Africa Final Report of the First Phase: 2009-2013
74. Managing factors that affect the adoption of grain legumes in Uganda in the N2Africa project
75. Managing factors that affect the adoption of grain legumes in Ethiopia in the N2Africa project
76. Managing factors that affect the adoption of grain legumes in Tanzania in the N2Africa project
77. N2Africa Action Areas in Ethiopia, Ghana, Nigeria, Tanzania, and Uganda in 2014
78. N2Africa Annual Report Phase II Year 1
79. N2Africa: taking stock and moving forward. Workshop report
80. N2Africa Kenya Country report 2015
81. N2Africa Annual Report 2015
82. Value Chain Analysis of Grain Legumes in Borno State, Nigeria
83. Baseline report Borno State
84. N2Africa Annual Report 2015 DR Congo
85. N2Africa Annual Report 2015 Rwanda
86. N2Africa Annual Report 2015 Malawi
87. Contract Sprayer in Borno State, Nigeria
88. N2Africa Baseline Report II Ethiopia, Tanzania, Uganda, version 2.1
89. N2Africa rhizobial isolates in Kenya
90. N2Africa Early Impact Survey, Rwanda
91. N2Africa Early Impact Survey, Ghana
92. Tracing seed diffusion from introduced legume seeds through N2Africa demonstration trials and seed-input packages
93. The role of legumes in sustainable intensification – priority areas for research in northern Ghana
94. The role of legumes in sustainable intensification – priority areas for research in western Kenya
95. N2Africa Early Impact Survey, Phase I
96. Legumes in sustainable intensification – case study report PROIntensAfrica
97. N2Africa Annual Report 2016
98. OSSOM Launch and Planning Meeting for the west Kenya Long Rains 2017
99. Tailoring and adaptation in N2Africa demonstration trials
100. N2Africa Project DR Congo Exit Strategy



101. N2Africa Project Kenya Exit Strategy
102. N2Africa Project Malawi Exit Strategy
103. N2Africa Project Mozambique Exit Strategy
104. N2Africa Project Rwanda Exit Strategy
105. N2Africa Project Zimbabwe Exit Strategy
106. N2Africa Annual Report 2017
107. N2Africa review of policies relating to legume intensification in the N2Africa countries
108. Stakeholder Consultations report



Partners involved in the N2Africa project

