



Ethiopia Annual Report 2018

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N2Africa

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



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Acronyms

| | |
|-------|---|
| ACOS | Agricultural Commodity Supply |
| AKF | Alema Koudijs Feed |
| ARARI | Amhara regional agricultural research institute |
| ASHC | African Soil Health Consortium |
| BoA | Bureaus of Agriculture |
| CB | Common bean |
| CP | Chickpea |
| DAP | Di-ammonium Phosphate |
| DO | Development organizations |
| ECC | SDCO-Sodo-Ethiopian Catholic Church Social and Development Commission Coordinating Office Sodo |
| EIAR | Ethiopian Institute of Agricultural Research |
| FB | Faba bean |
| FC | Facilitator for Change |
| FCUs | Farmers' Cooperative Unions |
| FMOs | Farmers' Marketing Organization |
| HARC | Holeta Agricultural Research Centre |
| HwU | Hawassa University |
| IFDC | International Fertilizer Development Centre |
| I | Inoculation |
| M&E | Monitoring and Evaluation |
| MBI | Menagesha Biotechnology Industry Plc |
| MfM | Menschen for Menschen |
| MoUs | Memorandum of Understanding |
| MSc | Master of Science |
| NARS | National Agricultural Research System |
| NGOs | Non-Governmental Organizations |
| NPS | Nitrogen Phosphate-Sulfate |
| OARI | Oromia Agricultural Research Institute |
| P+I | Phosphorus and Inoculation |
| PARC | Pawe Agricultural Research Centre |
| PhD | Doctor of Philosophy |
| P | Phosphorus |
| PPPs | Public-Private Partnerships |
| PRI | Private companies |
| SB | Soyabean |
| SNNPR | Southern Nations Nationalities and Peoples Region |
| SNV | Netherlands Development Organization |
| SYS | Shayashone Consultancy |
| TOTs | Training of Trainers |



1 Introduction

This document reports accomplishments of the N2Africa project in Ethiopia during the 2018 growing season. This was another exciting year for N2Africa-Ethiopia, bringing up the total number of beneficiaries so far reached by the project to 69,333. This contrasts to the 60,000 beneficiaries that the project has targeted to reach at project completion. The project running out next June, activities have been scaled down during 2018, operations were limited to only one or two Kebeles at each of the 31 Project woredas in the four regions (Amhara, Benishangul-Gumuz, Oromia and Southern Ethiopia). However, all the different implementation activities have been maintained including demonstrations, adaptations, training, field days, FTDG, seed multiplication and distribution of extension materials/leaflets, overall reaching 6,133 beneficiaries in 2018.

Among others, the availability and access to improved seeds are useful for the sustainability of grain legume production. This season, 34.9 tons of improved seeds were distributed to the project target locations for planting. Compared to the quantity used for planting during any one of the seasons in the past (2014 – 2018), the amount used in the current growing season was the second largest, only preceded by that in 2016 (37 tons). In view of the relatively small number of farmers that the project engaged in 2018 (6133 farmers), the large volume of improved seeds used this season reflects the increased interest of smallholders to involve in grain legume production. Driven by the prevailing demand for improved seeds, farmers were willing to organize themselves (under the primary farmers cooperatives unions) and to engage in community seed production, thus ensuring the supply of a large enough quantity of certified seeds for wider cultivation of legumes in the coming season.

The PPPs are the main implementation approach that the project has followed for the dissemination of improved legume production technologies and to promote the legume value chain. It is gratifying to see that these PPPs got a foothold and continue to flourish and serve as platforms for networking, to access information, input supplies (seed companies, inoculant manufacturers) and output markets (private processing and export companies). It is hoped that these connections will remain sustainable at project exit. Recently, the Ethiopian Commodity Exchange platform (ECX) has added soyabean and chickpea to its trading floor. This development reflects the increasing demand and emerging market opportunities (local and international) for grain legumes, notably from China and east Asian countries, encouraging wider cultivation of grain legumes in the future.

As the project has been running for the last 5 years (2014 – 2018), it is time to assess its contribution and impacts on the livelihood of smallholders. To this end, a survey has been initiated, from August - Oct. 2018, following the detailed training of the enumerators on the survey tool. The survey was conducted in two selected project Woredas (Districts): Pawe (North West, soyabean intervention site) and Gondar-Zuria (North, chickpea intervention site). Mixed methods have been implemented to collect data on measurable indicators and to check relevant assumptions from the theory of change. Overall, interviews were conducted on 741 respondents. The two selected locations include treated and non-treated villages and sub-villages (Gotsz). It is envisaged that comparison between the two locations will allow identification of the reasons for the presence or lack of success.

N2Africa has produced many promising results over the last years. Great progress has been made by researchers and farmers in identifying the optimum legume varieties, inoculants, fertilizers and agronomic practices for increased production of legumes. The project has also established various partnerships to promote legume value chains, thus facilitating smallholders' access to information, input supply and markets. In addition, by introducing inoculant technology, it has demonstrated improved biomass yield and feed quality in legume crops, contributing to intensification of crop-livestock systems. In this final year of N2Africa, it is necessary to bring these results under the attention of policy makers, hopefully to contribute to more favorable policies and more support in general for growing leguminous crops. Thus, with an aim for making policy advocacy, more than 20 different stakeholders, along the value chain have been engaged in order to find out what aspects could be further strengthened, and how policy could play a role to promote the value chain.

Finally, with an aim of widely sharing the project's success, outcomes, impacts and challenges, preparation of a short documentary video is underway. The video will include key learning areas of the N2Africa project (Best-fit grain legume technologies, Dissemination and Scaling approaches including



the PPPs Models) and partnerships along the legume value chain to ensure sustainability of the achievements of the project.



2 Results achieved per project objective

2.1 Project strategy, coordination and implementation and capacity strengthening

2.1.1 Strategy for implementation and coordination

In the same manner to earlier project periods, the Public private partnership (PPP) approach is used as a mode of project activity implementation. As 2018 is the last project period, partners are further supported to integrate project activities into their regular programs to ensure sustainability in the post-project period. A project exit strategy document is developed jointly by N2Africa and partners and has been used to guide the continued implementation of project activities. **Annex 1 provides a summary of the N2Africa-Ethiopia Public-Private Partnerships, updated from earlier project periods.**

The PPPs are effective in reaching large numbers of beneficiary farmers through either technology dissemination or input-output market services. To realize the effectiveness of the PPPs, existing partners' structures (as identified previously) for technology dissemination and input-output market access were maintained in this implementation year as well. Mainly the Ministry of Agriculture's technology extension approach through use of farmers' training centres (FTCs) and the cooperative models are used to enhance the effectiveness in reaching farmers through technologies. Besides, the cooperative model is maintained as key model to realize the effectiveness in reaching farmers through input-output market service access.

Bi-annual regional PPP cluster meetings (also used as partners' regular platforms) were conducted to coordinate implementation and to evaluate achievements at the respective PPP clusters. The Regional Partners' Meeting (Pre-Season) were conducted with the objectives to review priority cluster activity plans, share responsibilities, and aim for maximum cooperation and synergies among partners based on the exit strategy document for the respective clusters. The End-Season and Mid-Season platforms were conducted with an objective of reviewing and evaluating cluster achievements to set clear future directions for increased performance and sustainability in the major areas of legume technology dissemination, knowledge transfer, input supply and grain market access (see Table 1 below for Summary of Regional PPP cluster Platform events for 2018).

Table 1. Summary table for regional PPP cluster platform events during 2018

| PPP Clusters | PPP Platform Events | Participants of PPP Platforms | Male Participants of PPP Platforms | Female Participants of PPP Platforms |
|--------------|---------------------|-------------------------------|------------------------------------|--------------------------------------|
| Central | 1 | 17 | 15 | 2 |
| Chewaka | 1 | 40 | 36 | 4 |
| Jimma | 1 | 68 | 58 | 10 |
| North | 2 | 76 | 69 | 7 |
| Pawe | 2 | 52 | 50 | 2 |
| South | 2 | 42 | 39 | 3 |
| South-East | 1 | 25 | 24 | 1 |
| Grand Total | 10 | 320 | 291 | 29 |



2.1.2 Degree training

Currently there are only two graduate fellows who are sponsored by the project at PhD program level. Both are conducting their research work (see Table 2. Below for Overview of N2Africa-Ethiopia Graduate Fellows Status). It is to be remembered that eight MSc students and one PhD (animal nutrition, partially supported) had completed their studies in previous years.

Table 2. Overview of N2Africa-Ethiopia graduate fellows status as of 2018

| Name | Gender | Research topic | Program level | Status |
|---------------------------|--------|---|---------------|------------------|
| Ashenafi Hailu Gunnabo | M | Understanding GL x GR interaction in common bean and chickpea in Ethiopia | PhD | On research work |
| Tamiru Amanu | M | Understanding the role of Public-Private Partnerships in overcoming institutional barriers to technology adoption | PhD | On research work |

2.1.3 Non-degree training

Training of Trainers (ToTs) and Follow-Up/general trainings were used to strengthen the capacity of target farmers and subject matter specialists. In total, 18 ToT events and 35 follow-up/general trainings were conducted across the four PPP clusters. Training topics include legume post-harvest management, legume agronomy and extension approaches, and input-output marketing. The ToTs were mainly organized for lead farmers and development agents at Kebele level, experts from bureaus of agriculture, cooperative promotion agencies, farmers' primary cooperatives and unions, and officers of development organizations (NGOs). Participants of ToTs were grain legume growing farmers at their respective *Woredas and Kebeles*. Of the total **1524** trainees (lead farmers and subject matter specialists), **286** trainees (more than 18%) were females (See Table 3 below for the Overview of training events and beneficiaries during 2018).

Table 3. Overview of training events and beneficiaries in the respective partnership clusters during 2018

| PPP Clusters | No. of ToT events | No. of follow-up training events | No. of ToTs and follow-up Training events | Total no. of Training Participants (ToTs and follow-up) | Total no. of Male Training Participants (ToTs and follow-ups) | Total no. of Female Training Participants (ToTs and follow-ups) |
|--------------|-------------------|----------------------------------|---|---|---|---|
| Central | 0 | 0 | 0 | 0 | 0 | 0 |
| Chewaka | 0 | 0 | 0 | 0 | 0 | 0 |
| Jimma | 4 | 12 | 16 | 343 | 280 | 63 |
| North | 2 | 5 | 7 | 503 | 455 | 48 |
| Pawe | 0 | 0 | 0 | 0 | 0 | 0 |
| South | 8 | 8 | 16 | 448 | 301 | 147 |
| South-East | 4 | 0 | 4 | 230 | 202 | 28 |
| Grand Total | 18 | 25 | 43 | 1524 | 1238 | 286 |



2.1.4 How the capacity building efforts will sustain technology delivery

The training programs target employees of partner organizations with clear long-term research and development programs for the legume sub-sector. This is done with the aim to sustain legume technology delivery through producing trained manpower in the national legume sub-sector. Project supported short-term as well as long-term training programs ensure the integration of legume production and productivity enhancing technologies and practices into the national system.

2.2 Delivery and dissemination, sustainable input supply, and market access

2.2.1 Farmers reached

Similar to the previous years, a range of distinct delivery and dissemination activities were used to disseminate improved legume technologies and to transfer knowledge. These include demonstration and adaptation trials, technology evaluation events, trainings, field days and extension materials.

Demonstration trials were established under close follow up of the National Agricultural Research Systems (NARS) partners and experts from Bureau of Agriculture (BoA). Demonstration trials were established to serve as a “Field School” to the farmers. The demonstration trails were established following specific legume technology dissemination models. The Ministry of Agriculture “Farmers’ Training Centre” (FTC) dissemination model and the Cooperative model were the major dissemination models that were used to enhance the learning process among farmers, ensure cost-effective technology dissemination and forthcoming input-output market integration. Adaptation trials, on the other hand, are farmer-managed trials targeted on the adoption and adaptation of specific N2Africa best-bet technologies by many farmers. In the adaptation trials farmers were provided with legume technology packages (seeds, inoculants, and phosphorus fertilizer) following a practical training session on how to apply inoculants and plant legume seeds. In some cases, farmers were required to return grains of equivalent amount to the seed they received via these models. The inputs for adaptation trials were distributed to famers following the Cooperative model. This was done to stimulate and energize legume input supply and grain collective marketing in the course of project implementation through the farmers’ cooperative unions, and through the out-growers model.

A total of **1499** farmers, of which **257 were females**, were reached through demonstration and adaptation trials. Technology evaluation sessions were organized on demonstration trials to enhance group learning. A total of **808 (221 females)** were reached through such evaluation events.

Table 4. Summary of total number of farmers reached through different dissemination and training activities during 2018 implementation year

| PPP Clusters | Total no. of Farmers Reached through demonstration and adaptation trials | Total no. of Farmers participated on Technology Evaluations | Total no. of Training beneficiaries (ToTs and Follow-up) | Total no. of Farmers participated on Field Days | Total no. of Farmers Reached through Extension Materials | Total Reach across PPP Clusters |
|--------------|--|---|--|---|--|---------------------------------|
| Central | 52 | 0 | 0 | 0 | 0 | 52 |
| Chewaka | 225 | 173 | 0 | 395 | 0 | 793 |
| Jimma | 23 | 135 | 343 | 120 | 60 | 681 |
| North | 629 | 0 | 503 | 199 | 200 | 1531 |
| Pawe | 207 | 0 | 0 | 247 | 100 | 554 |
| South | 260 | 500 | 448 | 596 | 50 | 1854 |
| South-East | 103 | 0 | 230 | 267 | 50 | 650 |
| Grand Total | 1499 | 808 | 1524 | 1824 | 460 | 6115 |



Field days, which are used as one approach for technology dissemination, are organized on demonstration and adaptation trial plots. Field days also serve as partners' mid-season platform events, bringing together all cluster partners including public research and extension partners, farmers, farmer organizations, input suppliers, grain buyers and NGOs. Partners co-evaluated the performance of technologies at field level, assess the level of coordination of efforts and synergies among the partners in field activity implementations, promote and enhance wider legume technology diffusion, and create an opportunity to the smallholder farmers to share views with the wider public research and extension, the input suppliers, grain buyers and the development organizations. Field days are envisaged to stipulate further engagement of partners to the already designed legume partnership and strengthen collaborations among the existing partners, and to bring forward farmer linkages to technology sources, service centers, and markets. A total of **1824 (545 female)** farmers have been reached through field days during 2018.

Media events, including radio and TV broadcasts and extension materials were organized on field days to reach a wider group of smallholder farmers and other stakeholders, to create awareness about improved legume technologies. National and regional TV programs and FM radio programs were used to reach many more farmers. However, figures are not reported for total reach through TV and radio program as there is no as such accurate and reliable estimation technique. Extension materials (leaflets, manuals and brochures), as one dissemination approach, were developed on improved legume production technologies and improved practices. The materials were developed in collaboration with NARS and legume project partners and distributed to farmers on field day events. About **460 (113 females)** farmers were reached through extension materials.

In total **6115 farmers (1422 females)** have been reached through demonstration and adaptation trials, technology evaluation events, trainings, field days and extension materials. For a detailed summary of the total number of farmers reached during the 2018 cropping season, see Table 4 above and Figure 1. below.

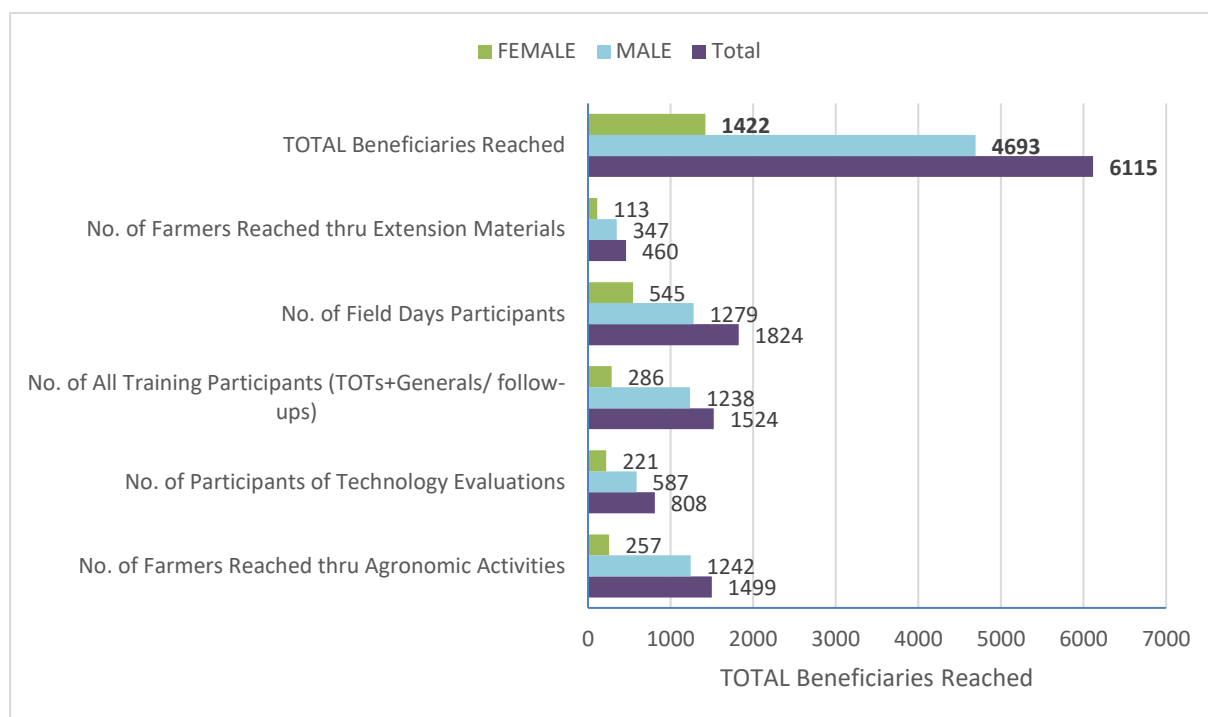


Figure 1. Gender disaggregated total number of farmers reached through different dissemination and training activities during 2018 implementation year



2.2.2 Sustainable Input supply

In a similar manner to earlier project implementation periods, two approaches of input supply have been supported during 2018.

The first one is direct input supply to smallholder farmers through dissemination partners. This approach mainly aims at enhancing input purchase demand by smallholders. In total, **34,860** kilograms of improved legume seeds, **18,638** kilograms of P-fertilizer and **1,579** packets of inoculant have been supplied for dissemination and seed multiplication activities through dissemination partners.

Table 5. Volume of improved legume inputs distributed for dissemination and seed multiplication activities during 2018

| Cluster | Plot Area (ha) | Seed Used (kg) | Fertilizer NPS-DAP Used (kg) | Inoculant Used (pkt) |
|-------------|----------------|----------------|------------------------------|----------------------|
| Central | 2.4 | 4.8 | 1.0 | 52 |
| Chewaka | 31.6 | 2885.6 | 1632.9 | 242 |
| Jimma | 8.6 | 690.0 | 903.0 | 40 |
| North | 170.9 | 18315.3 | 1302.7 | 604 |
| Pawe | 134.5 | 8909.4 | 13375.0 | 284 |
| South | 31.6 | 3359.1 | 1309.5 | 225 |
| South-East | 5.7 | 696.2 | 113.4 | 132 |
| Grand Total | 385.3 | 34860.4 | 18637.5 | 1579 |

The second input supply approach is made through partnership with mainstream input providers. This approach aims to ensure sustainable access to inputs. Particular emphasis is given to realize the availability of a sufficient volume of quality legume seeds through supporting foundation and certified seed multiplication, in partnership with community-based organizations and private seed companies. In a similar manner, to ensure farmers' sustainable access to inoculant, the private inoculant supplier (MBI) has been linked with last mile input deliveries (cooperative unions).

Improved legume Seed Multiplication and Supply

Improved chickpea, common bean, faba bean and soyabean seed multiplication activities have been conducted in collaboration with three cooperative unions. Altogether, 197.4 hectares of land have been covered with improved legume seed multiplication. The seed multiplication activities were conducted on 332 (58 females) farmer plots who are members of the seed multiplying cooperatives. (see Table 6 below for overview of seed multiplication activities during 2018).

Table 6. Overview cooperative unions engaged on improved legume seed multiplication activities during 2018

| Partner Institute | Target Legumes | Seed Multiplication Partners | Area (ha) | No. of smallholder farmers involved | No. of smallholder farmers involved (Male) | No. of smallholder farmers involved (Female) |
|-------------------|----------------|------------------------------|--------------|-------------------------------------|--|--|
| North (ARARI) | Chickpea | Tsehay and Ghion Unions | 82.0 | 243 | 195 | 48 |
| | Faba bean | Debark Union | 7.5 | 23 | 16 | 7 |
| Pawe (EIAR) | Common bean | Mama Union | 12.1 | 22 | 19 | 3 |
| | Soyabean | | 95.8 | 44 | 44 | 0 |
| Grand Total | | | 197.4 | 332 | 274 | 58 |



There is high shortage of foundation seed supply for certified or quality declared seed multipliers. Hence, faba bean and soyabean foundation seed multiplication has been supported at three research sites of the NARS partners.

Table 7. Summary of foundation seed multiplication Activities During 2018

| Partner Institute | Target Legumes | Area (ha) | Sum of Seed Used (kg) | Fertilizer NPS-DAP Used (kg) | Inoculant Used (pkt) |
|--------------------|----------------|------------|-----------------------|------------------------------|----------------------|
| ARARI | Faba bean | 0.6 | 108.0 | 30.0 | 0 |
| EIAR | Soyabean | 2.5 | 200.0 | 302.0 | 10 |
| OARI | Soyabean | 2.5 | 250.0 | 150.0 | 10 |
| Grand Total | | 5.6 | 558.0 | 482.0 | 20 |

Inoculant Supply

During 2018, the farmer cooperative unions played an important role in bridging the huge gap between inoculant supplier (MBI) and smallholder farmers. Four farmer cooperative unions signed a contract agreement with MBI to serve as dealers and marketed a total of 1451 packets of chickpea, faba bean and soyabean inoculant in three of the PPP clusters.

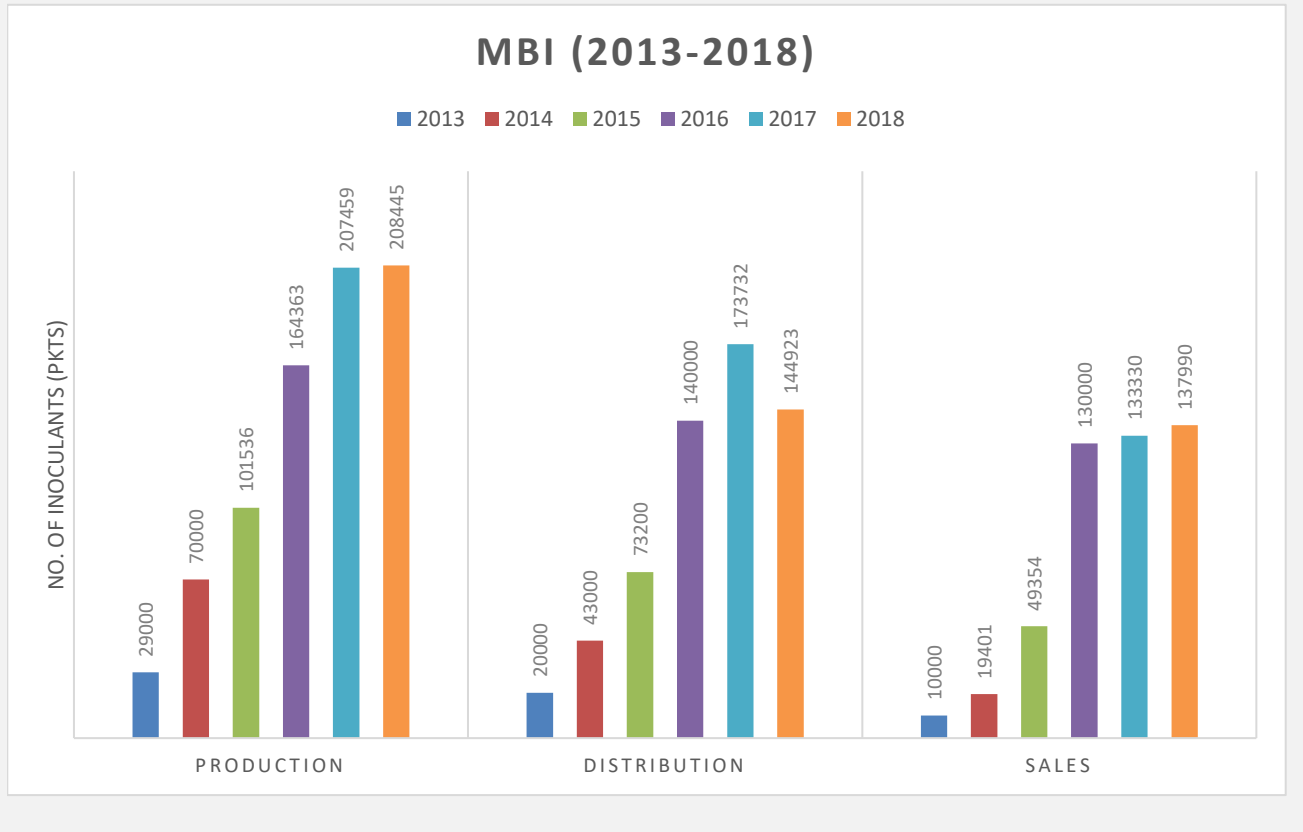
Table 8. Overview of last mile delivery networks used to supply inoculant during 2018

| PPP Clusters | Legumes types | Last mile delivery networks | Type of last mile delivery networks | Quantity of Inoculants marketed (pkt) |
|--------------------|---------------|-----------------------------|-------------------------------------|---------------------------------------|
| Chewaka | Soyabean | Bore Bako Union | Cooperative union | 200 |
| Pawe | Soyabean | Mama Union | Cooperative union | 1039 |
| South-East | Chickpea | Oda-Roba | Cooperative union | 100 |
| | Faba bean | Agarfa-Kajewa | Cooperative union | 112 |
| Grand Total | | | | 1451 |



Box 1:

Inoculant production, distribution and sales performances by MBI have increased over the past three years. This is fairly because of the inoculant dissemination activities through N2Africa-MBI partnerships. The contract agreements with inoculant dealers (cooperative unions and others) has contributed to the sales performance.



ICT platforms for sustainable input supply development: Progresses and way forward from N2Africa-Ethiopia

Although seed multiplication and establishment of last mile input deliveries between input suppliers as well as farmers are key in the input systems development, it cannot ensure sustainable input access to smallholders on its own. In the development of sustainable input supply systems, two things need to be realized. The first one is demand creation and the second is management of effective demand information.

In line with the first one, N2Africa has been doing product promotion/dissemination activities using different media. Computer Aided Telephone Interview (CATI) survey used to monitor the state of farmers' demand (willingness to buy) for the different products including legume seeds, inoculant, and P-fertilizer. The results indicate good signals that farmers are willing to buy the legume products if made available.

In a similar manner, so as to realize the management of effective demand information systems, N2Africa made consultations with input supply chain actors as well as ICT based input information management service providers. It aims for fostering partnership for enhanced sustainable legume supply chain development. The consultation involved partners from earlier N2Africa initiated PPPs like the private inoculant supplier (MBI), farmers' cooperative unions (Tsehay and Uta Wayu), and other new partners from research and development projects (GIZ), and an ICT-based information management actor (*apposit*) to discuss and look for potential partnerships in piloting ICT platforms to enhance sustainable input supply development.



Key outcomes from the consultations

The stakeholders have the interest to get into partnership in the legume input supply chain development, provided that *apposit's* ICT platform allows and have input demand information management features. From *apposit's* overview presentation of the basic ICT services that they are offering, it was understood that the input-output transaction is the main takeaway that can potentially resolve a number of challenges in timely tracing transactions online which can minimize a number of paper works for input suppliers and grain output buyers. They can easily monitor or can easily get transaction reports either from *apposit* or from a central database that can be managed by own marketing officers. Typically, the TERRA ICT platform is developed with features that can trace the transaction process. Looking into the transaction process, the market manager can easily make decisions such as reallocation of inputs from stocks with surplus to stocks of supply deficiencies.

Apposit agreed to include the demand information management system in the TERRA platform with the precondition that the partnership needs to ensure having private input as well as private output buyers into the partnerships. The engagement of these can ensure long-term business partnership for *apposit* and makes the partnership more feasible. Service fees are charged from input-output transactions which is mainly realized by the private input suppliers and output buyers.

Way forward

Moving forward, the following points have been suggested:

- N2Africa will make sure the private input-output buyers will be brought into the ICT platform partnership. Two clusters have been considered for piloting the ICT intervention, the North and South clusters. By default, the private partners in these clusters will be engaged. Considering the potential for larger volumes of input-output transactions and a recent N2Africa initiative with AKF (a feed processing company in Pawe PPP), there is an opportunity to use Pawe as a pilot site as well.
- *Apposit* from its side needs to add the input demand information management feature into its existing platform.
- An MoU highlighting key activities, roles and responsibilities of the individual actors is to be developed.
- A final round table discussion will be held among all the stakeholders and implementers of the ICT project.

2.2.3 Access to output market

There are growing national as well as international grain legume output market opportunities, even for soyabean grains. Most of the farmers' cooperative unions which were previously mapped into the respective PPP clusters have maintained their business relationship with smallholder farmers (through the primary cooperatives) to support collective legume grain marketing. Some of the big unions like Tsehay in North, Sidama Elto and Damota Wolayita in South, and Becho Woliso in Central remain the main legume grain buyers from farmers. These unions supply the grains either to the international market (e.g., Tsehay) or to the domestic market like the Disaster Risk Preparedness and Prevention (DRPP) supported by the World Food Program (e.g., Sidama Elto and Damota Wolayita for dry beans).

Some other unions like Bore Bako in Chewaka and Mama Union in Pawe maintain their business relationship with the legume processing national companies.

Key challenges are lack of sufficient volumes of grain legumes and product bulking problems due to organizational gaps.



2.3 Empower women to increase benefits from legume production

2.3.1 Participation of women in activities

Women have participated on the different project activities such as technology dissemination, trainings, and field days (Table 9). Overall, **23% (1422 of the total reached)** women participation has been ensured during the implementation of project activities in 2018.

Table 9. Overview of women participation on different activities in the respective PPP clusters during 2018

| PPP Cluster | Total no. of Female Farmers Reached through demonstration and adaptation trials | Total no. of Female Farmers participated on Technology Evaluations | Total no. of Female Farmers Participated on Trainings (ToTs and Follow-up) | Total no. of Female Farmers participated on Field Days | Total no. of Female Farmers Reached through Extension Materials (leaflets, brochures, manuals) | Total Female Farmers Reached across PPP Clusters |
|--------------------|---|--|--|--|--|--|
| Central | 20 | 0 | 0 | 0 | 0 | 20 |
| Chewaka | 31 | 64 | 0 | 130 | 0 | 225 |
| Jimma | 0 | 40 | 63 | 20 | 12 | 135 |
| North | 78 | 0 | 48 | 26 | 60 | 212 |
| Pawe | 49 | 00 | 0 | 50 | 22 | 121 |
| South | 69 | 117 | 147 | 268 | 13 | 614 |
| South-East | 10 | | 28 | 51 | 6 | 95 |
| Total female | 257 | 221 | 286 | 545 | 113 | 1422 |
| Total reach | 1499 | 808 | 1524 | 1824 | 460 | 6115 |
| %Female | 17.14% | 27.35% | 18.77% | 29.88% | 24.57% | 23.25% |

2.3.2 Labour saving technology

It has been reported in the previous project implementation year that N2Africa, in collaboration with Ethiopian Institute of Agricultural Research's Mechanization Research Directorate and Shayashone (SYS) Consulting, has piloted a common bean and soyabean thresher in four project implementation Woredas. Key results are summarized and presented below.

This report is produced to highlight the pilot results for soyabean and common bean threshing machine conducted by N2Africa in four Woredas in Ethiopia. The report is based on quantitative results obtained from the pilot, feedback collected from focus group discussion and expert observation. Three major parameters were accounted for in the feasibility analysis: Economic, Social and Technical parameters.

The economic parameters investigated were threshing speed, threshing loss, output quality, cost saving, labour saving and bi-product quality. In almost all these parameters the machine threshing outperformed the traditional hand and animal-based threshing. For example, the cost of threshing for a quintal of common bean using the machine is 26.6 birr while it is 82 birr on hand threshing. In the case of soya bean the cost of threshing with the machine is 69.8 birr as compared to 155.9 birr for animal-based threshing. Similarly, the machine threshes 106 kg of soya bean and 240 kg of common bean per hour while only 23 kg of soya bean and 9.5 kg of common bean using animal-based threshing and hand threshing, respectively. In general, farmers' reflection on the economic parameters was highly positive.

On the technical and social aspects, the key parameters analysed were: ease of operation, maintenance and spare parts, durability, portability and power consumption. From the focus group discussion, farmers noted that the machine does not require sophisticated knowledge and skills to operate. However, they raised portability as a limitation, which can be improved by installing wheels on the machine. Issues of



maintenance and spare parts came out strongly based on previous experience with other grain threshers. It was noted that often such machines come once and there is hardly any maintenance and or spare parts available afterwards and hence the technology does not get through to the wider public.

On the supply side the key issues of who could manufacture and what could be the best model of reaching the farmers through the technology have been addressed. Of the three possibilities of manufacturing; Selam Technology Center, ATVET and Private Workshop, it is opted for the latter particularly if there is quantity and value. On another end, rental or lease service can be the other option to reach the community. In terms of possible channels of distribution, three channels were identified: cooperatives, youth enterprise and private agro dealers. The choice of those channels depends on three major criteria (1) ability to develop a market (2) access to finance to supply the service (3) price competitiveness. Given these, we think there is no one single model that fits all areas. As such we suggest using one of the three depending on context.

2.4 Tailor and adapt legume technologies to close yield gaps and expand the area of legume production within the farm

2.4.1 Diagnostic, Demonstration and Adaptation trials

Demonstration and adaptation trials

Demonstration and adaptation activities have been continued as central learnings and core dissemination approaches for the farming communities and other PPP actors. The Ministry of Agriculture Farmers' Training Centre (FTC) dissemination model, the Cooperative and Out-grower models were the major dissemination models that were used to enhance the learning process among farmers, ensure cost-effective technology dissemination and forthcoming input-output market integration. A total of 27 demonstration trials were installed on 22 male- and five female-headed households, similar to previous seasons and in collaboration with PCs/Unions, and public and private partners in the six of the seven PPP clusters. The four conventional N2Africa treatments were demonstrated, i.e. improved legume varieties with and without inoculation and phosphorus fertilizer (+I, +P, I+P, and control-no input). The adaptation trials continue as the best dissemination approach which encourage the farmers to test the best bet N2Africa demonstrated technologies on their own plots. Farmers were provided with their chosen packages, which were either the combinations or one of the inputs from improved legume seed, inoculants and inorganic fertilizer (NPS). A total of 1140 farmers (946 males and 194 females) participated in the adaptation trials.

Table 10. Total number of farmers participated in adaptation and demonstration trials in 2018

| Cluster | Adaptation trials | | | Demonstration trials | | | Total number of farmers participated in adaptation and demonstration trials |
|------------|-------------------|------------|------------|----------------------|-----------|----------|---|
| | Total | Male | Female | Total | Male | Female | |
| Central | 50 | 30 | 20 | 2 | 2 | 0 | 52 |
| Chewaka | 221 | 190 | 31 | 4 | 4 | 0 | 225 |
| Jimma | 18 | 18 | 0 | 4 | 4 | 0 | 22 |
| North | 363 | 340 | 23 | 0 | 0 | 0 | 363 |
| Pawe | 138 | 94 | 44 | 4 | 2 | 2 | 142 |
| South | 250 | 184 | 66 | 10 | 7 | 3 | 260 |
| South-East | 100 | 90 | 10 | 3 | 3 | 0 | 103 |
| Total | 1140 | 946 | 194 | 27 | 22 | 5 | 1167 |



Diagnostic and long-term trials

The diagnostic trials are the continuation of the variety by strain trials for the third season. The ultimate reason behind repeating the trial is to complement the quality of datasets generated in 2016 and 2017. We observed extreme variabilities in the performance of the trials across agro-ecologies which is good by itself to capture the responses of the applied treatments. However, data collected in some districts were unreliable. Thus, reflecting the need for further trials. Eighteen variety by strain trials were established for chickpea (8), common bean (6), and faba bean (4) across the different agro-ecologies.

An MSc student from Wageningen University and Research was involved in the long-term trials at Bako and Pawe. These trials were started in 2016 with nine treatments, with the aim of assessing the contribution of legumes to the sustainability of production in cereal dominated cropping system. Agronomic, soil & biomass samples were taken. Sub-samples have been processed for further laboratory analysis.

Table 11. Number of diagnostic, demonstration and adaptation trials implemented in 2018 cropping season

| Legumes | Diagnostic | Demonstration | Adaptation | Total |
|-------------|------------|---------------|------------|-------|
| Chickpea | 8 | 5 | 256 | 269 |
| Common bean | 6 | 10 | 200 | 216 |
| Faba bean | 4 | 2 | 207 | 213 |
| Soyabean | | 10 | 477 | 487 |
| Grand Total | 18 | 27 | 1140 | 1185 |

Table 12. Number of diagnostic trials (variety by strain trials) sites established in different PPP Cluster in 2018 cropping season

| Clusters | Target legumes for variety by strain trials | | | Total trials established |
|------------|---|-------------|-----------|--------------------------|
| | Chickpea | Common bean | Faba bean | |
| Central | 1 | | | 1 |
| Chewaka | | 2 | | 2 |
| North | 3 | | 2 | 5 |
| South | 2 | 4 | | 6 |
| South-East | 2 | | 2 | 4 |
| Total | 8 | 6 | 4 | 18 |

Recommendation for best-fit technologies

The productivity of the target legumes is still far below the attainable yield due to a number of constraints with smallholder farms. N2Africa-Ethiopia investigated multiple issues in on-farms trials with the full participation of farmers and various actors in the legume value chains. We have learnt in addition to improving grain yields and soil N, legumes can also serve as a cheap source of high-quality protein for both human consumption and for use as animal feed. N2Africa on-farm demonstration trials showed that using improved legume seeds with inoculation and/or phosphorus fertilizer resulted in better grain yields than the national average yield of each legume, with variable responses across agro-ecologies. However, the overall average from on-farm demonstration trials shows the N2Africa technology (+I+P) resulted in higher yield as compared to the national average (Figure 2).

We have compiled a list of best-fit practices that have been tested by N2Africa-Ethiopia with public and private partners in the seven PPP clusters. These best-fit practices (Table 13) are the results of demonstration trials which are deemed proven enough to be scaled out for many more farmers



(Thuijsman et al., 2017). This information would be documented in manuals with explanations on the approaches and the lessons learnt in order to reach to wider farming communities.

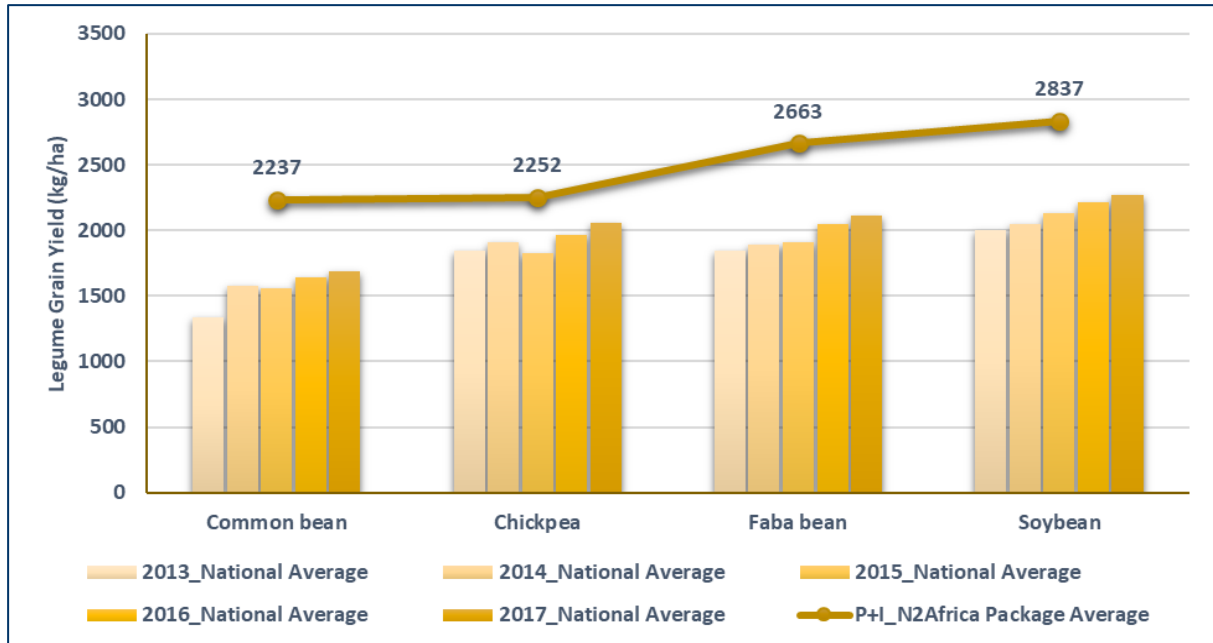


Figure 2. Comparison of the mean national yields (2013-2017) of the four targeted legumes with the N2Africa-Ethiopia demonstration trials across different agro-ecological locations



Table 13. Best-fit recommendations for legume production in the seven PPP clusters based on diagnostic, demonstration and adaptation trials

| # | Cluster | Legume | Woreda | Variety | P fertilizer | Inoculant | Spacing | Seeds per hole | Planting time |
|---|------------|-----------|--|-----------------------------|---|-----------------|-----------|----------------|--|
| 1 | South | Bush bean | Shalla, Boricha, Soddoo, Zuria, Halaba | Nasir, Awassa Dume | 23-46 kg/ha P ₂ O ₅ | HB-429; HB-A-15 | 40cm*10cm | 1 | Mid-July to End-July (Shalla, Halaba); Mid-July to Early August (Boricha); Late August to Early September (Soddoo Zuria) |
| | | Chickpea | Damot Gale | Habru, Arerti | 23 kg/ha P ₂ O ₅ | CP-29 | 30cm*10cm | 2 | Early September to Late-September |
| 2 | South-East | Faba bean | Agarfa, Goba, Sinana | Degaga, Dosha, Shallo, Moti | 23-46 kg/ha P ₂ O ₅ | EAL-110 | 40cm*10cm | 1 | Late August to Early September |
| | | Chickpea | Ginir | Arerti, Habru | 23-46 kg/ha P ₂ O ₅ | CP-29 | 30cm*10cm | 1 | Mid-October to Late-October |
| 3 | North | Faba bean | Dabat, Debark, Yilmana Densa | Wolki, Dosha, Moti | 23-46 kg/ha P ₂ O ₅ | FB04, EAL-110 | 40cm*10cm | 1 | Early-June to Late-June |
| | | Chickpea | Dembia, Gonder Zuria, Enemay | Arerti, Habru | 23-46 kg/ha P ₂ O ₅ ; 30 kg/ha S [GZ] | CP-29 | 30cm*10cm | 1 | Early September to Late-September |
| | | Soyabean | Alefa | TGX-13-3-2644, Belesa-95 | 23 kg/ha P ₂ O ₅ | MAR-1495 | 40cm*10cm | 1 | Mid-June to Early July |
| 4 | Central | Chickpea | Ada'a, Becho, Gimbichu | Arerti | 23-46 kg/ha P ₂ O ₅ | CP-29 | 30cm*10cm | 1 | Late August to Early September |
| 5 | Jimma | Soyabean | Kersa, Tiro Afeta | Clark-63K | 23-46 kg/ha P ₂ O ₅ | MAR-1495 | 60cm*5cm | 2 | Late June to Early July |
| 6 | Pawe | Soyabean | Pawe, Jawi, Mandura | Belesa-95, TGX-13-3-2644 | 23 kg/ha P ₂ O ₅ | MAR-1495 | 40cm*10cm | 2 | Mid-June to Early July |
| | | Bush bean | Mandura, Dibatie | Nasir | 23-46 kg/ha P ₂ O ₅ | HB-429; HB-A-15 | 40cm*10cm | 2 | Early July to Mid-July |
| 7 | Chewaka | Soyabean | Bako Tibe, Dano, Illu Gelan, Gobu Sayo, Wayu Tuka, Chewaka | Dhidhessa, Keta | 23-46 kg/ha P ₂ O ₅ 60 kg/ha K ₂ O and 4.6 t/ha of lime [BT, CW] | MAR-1495 | 40cm*10cm | 1 | Mid-June to Early July |
| | | Bush bean | Bako Tibe, Gobu Sayo, Wayu Tuka | Nasir, Awassa Dume | 23-46 kg/ha P ₂ O ₅ | HB-429; HB-A-15 | 40cm*10cm | 1 | Mid-June to Early July |

Source: Thuijsman et al. (2017)



2.4.2 Rhizobiology

N2Africa-Ethiopia rhizobiology research activities have been undertaken in collaboration with Hawassa University (HwU), Ethiopian Institute of Agricultural at Holeta (EIAR-Holeta) and MBI. The major focuses were the collection of new strains across agro-ecologies and the evaluation of candidate strains for their symbiotic effectiveness under greenhouse and field conditions, before embarking them into inoculant production. Collection generally emphasized on the potential growing corridors of the target grain legumes in Ethiopia. Following collection of nodules, rhizobia were isolated from some of the nodule samples. A total of 12 isolates (3 chickpea, 5 faba bean and 4 soyabean) are ready for field evaluation.

The ongoing variety by strain trials have revealed that there is variety specific interaction with elite rhizobia, and the performances of those rhizobia vary across different agro-ecological locations. Overall, the widely disseminated legume varieties have good responses to inoculation with the rhizobial strains under evaluation. Mostly, the new elite strains performed better than the commercial strains and sometimes even better than the treatment with inorganic nitrogen fertilizer (positive control). However, their responses vary across different agro-ecological locations (**Figure 3**). The overall results of these investigation will substantially contribute to the effort that N2Africa has made to find out and bring multiple candidate elite rhizobia strains for commercial production for closing the yield gaps of the target legumes. For instance, one of the best performing common bean elite strains (HB-A-15) was taken from this trial into the demonstration and dissemination trials. This elite strain performed competently with the existing commercial strain (HB-429) in the last two cropping seasons, and is thus recommended for commercial production and further scaling up.

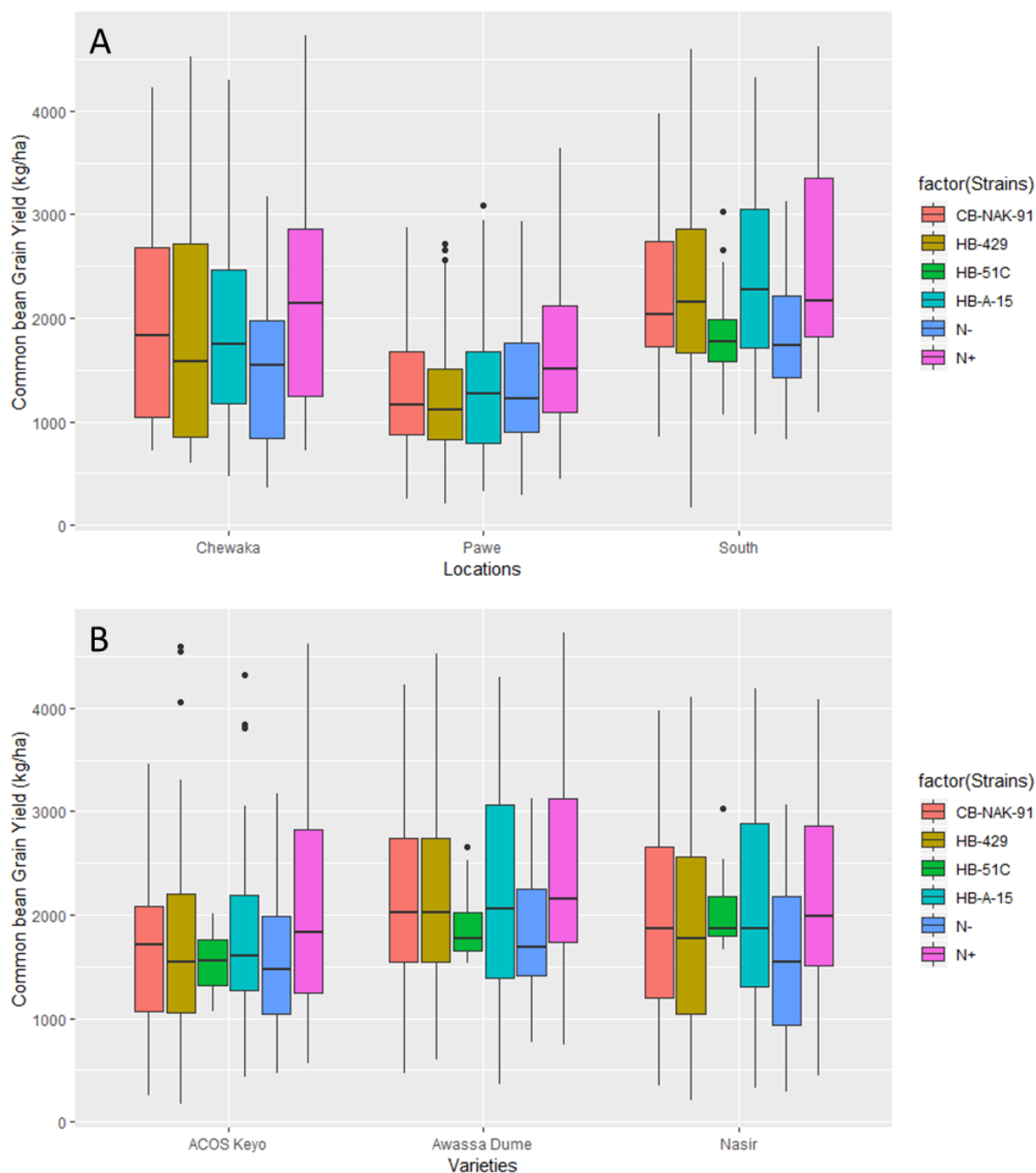


Figure 3. Performances of rhizobial strains at different locations (A) and with different varieties (B) of common bean in 2016-2017 cropping seasons in multiple geographies of Ethiopia

Also in 2018, N2Africa-Ethiopia was an active player and contributor to the development of the national biofertilizer/ inoculants SOPs, registration guidelines and working manuals. Moreover, the development of a national rhizobial standard operation procedure (SOP) for rhizobiology laboratories is another big achievement made in N2Africa-EIAR-HWU-MBI and COMPRO II project collaborations. The Ethiopian Standard Agency published and referred to it as “*ES 3907-1: 2015-Fertilizers-Biofertilizers-part 1: Rhizobial specification and test method*”. Another important involvement of N2Africa-Ethiopia was the Ethiopian Biofertilizer Registration Guidelines, but it is not yet endorsed by the Ministry of Agriculture.



Recently, we have learnt that the Federal Ministry of Agriculture plans to incorporate it under the upcoming modified “Fertilizer law”.

In addition to these efforts, a manual entitled “Rhizobial Inoculant Development and Management” was developed in collaboration with EIAR and submitted for publication in the first week of December 2018. It will be distributed to public and private laboratories working on rhizobia, including higher learning institutes, as reference material. It is hoped that this will support efforts towards capacity development on rhizobiology. Absence of a well-set-up, functional system, well-equipped public and/or private laboratories and lack of sufficient number of experts/ technicians still remains to be the main concern to ensure effective quality control of inoculants at the different supply chains, from factory to farm gates.

2.5 Enable learning and assess impacts at scale through strategic M&E

2.5.1 Strategic for M&E for project implementation at Country level

There were multiple periodic meetings (pre- & end of season regional partnership meetings), mid-season technology evaluation meetings, and reports to gather the feedbacks of partners, farmers and other stakeholders. These moments aim at providing guidance, outline principles, share lessons from monitoring experiences, and make adjustment and/or adaptations to the implementation of the project. In addition, N2Africa-Ethiopia had a wikispaces (<http://n2africa-ethiopia.ilriwikis.org>) for sharing information and resources among partners and other interested users. Recently, ILRI wikis have moved to a new home because our previous provider wikispaces recently closed. The new platform is MediaWiki, which offers a very similar user experience to the previous provider. The new web address is <http://n2africa-ethiopia.ilriwikis.org>.

Like the previous seasons, N2Africa-Ethiopia project activities have been strategically implemented through public-private partnerships with public institutions, private sector players, farmer cooperatives and NGOs. The staff members of these institutions at all levels are involved in taking care of the N2Africa project activities as part of their own program. This is effected by an agreement made between the partner institutions and ILRI-N2Africa, where the project activities, roles and responsibilities of the parties are clearly defined in the agreement document. The agreement between parties (ILRI-N2Africa and the partner institution) is signed on an annual basis following joint preparation of the work-plan and after common understanding has been reached through iterative communications. Accordingly, N2Africa data collection tools were used to maintain the project approaches without any modifications. The 2018 datasets have been uploaded on the N2Africa ODK server. In addition, cleaned datasets from the 2016-2017 season were also uploaded on the N2Africa intranet. However, there are continued gaps in data collection and uploading commitments from partners’ institutions.

In addition to producing formal research articles and theses, field data and information gathered from interactions with smallholders farmers at various events (field days, technology evaluation, pre- and post-season PPP meetings) were put together to generate recommendations used in decision making (see table 13 above and Thuijsman et al., 2017).

2.5.2 Impact assessment

The impact survey is conducted in two sites, namely; Gondar Zuria and Pawe. The two sites were purposively selected among the other project implementation sites, considering representations in terms of anticipated impact effect, legume type, access to input-output markets, partner diversity and synergies. Pawe has a low-land agro-ecology. N2Africa has been targeting common bean and soyabean at Pawe. The second impact study site, Gondar Zuria, has a mid-land agro-ecology. At Gondar Zuria, chickpea was targeted.

In Pawe, 15 villages (5 control and 10 treated) villages were identified for the impact study. In the same manner, for Gondar Zuria, 24 villages with 13 control and 11 treated villages were identified. A list of households for the respective villages make up the sampling frame. An equal sample of households



were drawn from each village for interviews following a random sampling technique. Assuming a total sample of 750 households from both study sites (a relatively larger sample size compared to the initial sample size per country, i.e., 600, so as to get more robust impact effect), 19 samples were randomly drawn and interviewed from each village. Following this procedure, while a total of 285 samples were interviewed in Pawe site, a total of 356 samples were interviewed in Gondar Zuria. Note that samples were drawn proportional to village sizes as compared to the common tradition in which samples are drawn propositional to household sizes.



3 Achievements in relation to Specific Project Milestones

Table 14. Achievements with related Milestone Targets

| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|--|---|-----------------------|---------------|---|--|
| Objective 1 | | | | | | |
| 1.3. Engage research, development, private sector, and other relevant partners in each of the target countries | 1.3. Partners along the legume input and output value chains cooperate actively towards achieving the overall N2Africa goals. | # of partnerships developed and active | – | – | 41* | <i>*All partners identified during earlier project periods, i.e., 2015-2017 were active too in 2018 project activity implementations through the respective seven Public-Private Partnerships (PPPs). It is to be noted that the mode of partnerships by N2Africa ranges from creating access to technologies, knowledge sharing, input-output market linkages, direct financial support through Collaborative Research Agreements (CRA), indirect financial support through the sub-grantees.</i> |
| | 1.3.1. By Q2 of year 1, potential partners operating within priority legume value chains mapped | # partners within N2Africa legume value chains mapped | – | – | 41* | <i>Partners mapped during earlier project periods are further strengthened and used. No new partners mapped during 2018.</i> |
| | 1.3.2. By Q3 of year 2, MoUs with priority partners in each of the target countries signed. This links to 2.1.1 and 2.1.2, indicate if stakeholder responsibilities are integrated in agreements | # MoUs signed with priority legume partners | 4 | 4 | 26* | <i>Earlier signed Umbrella Partnership Agreements as well as Collaborative Research Agreement (CRAs) are also maintained during 2018. Amendments of CRAs were made with four previous sub-grantees (ARARI, EIAR, HWU & OARI). All the rest were active in project activity implementations but through different mechanisms explained under 1.3.</i> |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|---|--|-----------------------|--------------------|---|---|
| 1.5. Develop country-specific research and dissemination implementation plans, including a sustainable exit strategy | 1.5.1. By Q4 of year 1, country-specific research and dissemination implementation plans formalized, including an exit strategy. Links to 2.4.1 | # of specific research and dissemination plans formalized | 7 | 7*+1 exit strategy | 7*+1 exit strategy | <i>1 exit strategy and seven comprehensive research and dissemination plans (one each per the Public-Private partnership clusters) developed and discussed with the cluster partners, formalized and implemented.</i> |
| | 1.5.2. By Q4 of each year, implementation plans are updated based on M&E feedback | # implementation plans updated with M&E feedback | 7 | 7* | 7* | |
| 1.6. Organize seasonal/yearly project-wide and country-specific planning workshops | 1.6 Scientists and other stakeholder groups are empowered to further the N2Africa research and development | # Scientist and stakeholder groups leading implementation of activities in N2Africa yearly plans | – | – | – | <i>The 7 PPP clusters have (1.5.1) have NARS partners as lead. The respective NARS partners assigned an institutional contact person under which a number of professionals (at least a socio-economist, an agronomist and a soil nutritionist) from the lead institution involved. One to two (1-2) experts also are actively involved in the project activity implementations from the other cluster partners (1.3.1).</i> |
| | 1.6.2. By Q4 of each year, 1 or 2 seasonal, in-country implementation plans developed, evaluated, and revised through in-country- planning meetings | # Seasonal in-country plans developed | 7 | 7 | 21 | <i>Seven comprehensive implementation plans (one each per the Public-Private partnership clusters) have been developed, discussed with the cluster partners, formalized and implemented. Seven regional PPP planning meetings (one each per cluster) (pre-season) organized for evaluation, revision and formalization of implementations plans.</i> |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|--|--|-----------------------|-------------------|---|---|
| 1.7. Develop and implement a degree (PhD and MSc)-related research plan | 1.7.1. By Q4 of year 1, a research plan, engaging at least 5 PhD and 10 MSc candidates, developed | # of Project wide research plans to engage PhD and MSc students developed & # of PhD and MSc students (men/women) engaged | 1 MSc + *2PhD | 1 MSc + *2PhD | 9 MSc/MA + *2PhD | <i>A total of 9 MSc/MA students (7 males and 2 females) and 2 PhD (both males) are supported by N2Africa. In 2018, 1 MSc from WUR (Bouwiene) working on long-term trials and 2 PhD students are on study, but the rest of the students are completed their studies and submitted their theses.</i> |
| 1.8. Develop and implement a non-degree-related capacity strengthening plan for relevant partners working within legume value chains | 1.8.2. By Q4 of each year, at least 4 relevant and demand-driven training materials developed in cooperation with the African Soil Health Consortium (ASHC) | # training materials developed with ASHC | – | – | | |
| | 1.4. By Q4 of year 5, at least 320 partners trained in N2Africa technologies and approaches | # of persons trained (gender disaggregated data) in N2Africa technologies and approaches & # of N2Africa technologies (by type) in which the persons were trained. | – | 1524 (1238M+286F) | 12,245 | <i>*Initially, no trainings were planned at the beginning of the cropping season, but partners were interested to conduct more trainings: on legume post-harvest management, legume input-output business and marketing, and legume processing and nutrition.</i> |
| Objective 2 | | | | | | |
| 2.1. Constitute and facilitate in-country/in-region N2Africa stakeholder platforms | 2.1. Country-specific inoculant, seed, and fertilizer supply strategies guarantee the sustainable supply of high quality seeds and inoculants and legume-specific fertilizer | # and types of input supply strategies related to seed, fertilizers and inoculants. Performance of various strategies identified in relation to sustainable input supply | 3 | 3* | 3* | <i>*The 'four' input supply strategies, i.e., the private (private seed commercial farm, or private inoculant investment), community based seed system, unions and combination of either of the approaches initiated during earlier project periods are comprehended into 'three', i.e., the 'cooperative, out growers and agro-dealers' approach and used as input supply strategies</i> |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|---|--|--|-----------------------|--------------------|---|--|
| | | | | | | under each PPP clusters. <i>The performance of each strategy will be assessed.</i> |
| | 2.1.1. By Q2 of year 1, N2Africa stakeholder platforms operationalize | # N2Africa stakeholder platforms operational | 16 | 10 | 34 | <i>Two regional PPP meetings per cluster (pre-season, and end of season) and two other national workshops (one Mid-Annual and M&E, and one Annual Review and Planning Workshops). The End of season regional PPPs and National Annual Review and Planning will be organized.</i> |
| | 2.1.2. By Q4 of years 1-4, stakeholders agree on specific roles and responsibilities across the various N2Africa objectives | # N2Africa stakeholders with agreed roles and responsibilities | 41* | 41* | 41* | Refer to 1.3.2 above. |
| 2.2. Facilitate <u>N2Africa-led</u> dissemination campaigns in the context of development-to-research learning cycles with specific attention to gender | 2.2. Dissemination partners attain/surpass the anticipated number of households targeted and continue to engage in legume intensification post-project | # of target households (men/women) reached (<i>outcome level: these farmers continue to engage in legume intensification activities after participating in dissemination activities</i>) | 10,488 | 6115 (4693M+1422F) | 40,015 | <i>From the total of 6115 farmers directly reached during 2018, about 1422 (23.25%) were women farmers (not included reaches through diagnostic trials). Farmers reaches through all agronomic and dissemination approaches are 69,333: - in 2014 (7,291), in 2015 (21,999), in 2016 (10,910), in 2017 (23,000) and in 2018 (6,133).</i> |
| | 2.2.1. By Q1 of years 1-4, specific dissemination guidelines for legume intensification assembled | Document indicating specific dissemination guidelines for legume intensification. This links to narratives 2.4 and 2.5 above | — | — | 2* | <i>The two previous dissemination guidelines, one each for demo and adaptation trials used this year as well.</i> |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|---|---|---|---------------------------|----------------------------|---|--|
| | 2.2.2. By Q4 of years 1-4, specific dissemination guidelines evaluated by a preset (see Returns-on-Investment calculations) number of male and female farmers | # of farmers (men/women) who evaluate the guidelines (Note: # of farmers (men/women) who have evaluated technologies and dissemination activities and methods (Disaggregated by type of dissemination activity) | 10,488 | 6115 (4693M+1422F) | 40,015 | Refer to 2.2. above |
| 2.3. Create widespread awareness on N2Africa technologies and interventions | 2.3. Local agro-dealers marketing fertilizer, seed, and inoculants are aligned with grass-root producer groups and input wholesalers and manufacturers | *Volume of seeds, fertilizers and inoculants used per targeted producer groups per land area, | Seed (tons): 2.221 | Seed (tons): 34.860 | Seed (tons): 97.87712 | <i>*Total volume of inputs distributed through different dissemination and on-farm research activities.</i> |
| | | | Fertilizers (tons): 1.627 | Fertilizers (tons): 18.637 | Fertilizers (tons): 37.93715 | |
| | | | Inoculants (tons): 0.1424 | Inoculants (tons): 0.197 | Inoculants (tons): 1.09075 | |
| | | *Volume of seeds, fertilizers and inoculants sold by agro-dealers | | | | <i>*An increasing number of agro-dealers and farmers' cooperative unions are engaged in inoculant marketing in collaboration with the private inoculant supplier (MBI).</i> |
| | 2.3.1. By Q4 of years 1-4, at least 2 media events (e.g., radio, newspaper articles, field days, etc) per country implemented | # of media events implemented | 8 | 5 | 28 | <i>Media events (TV and Radio broadcasts) were done to reach wider farming communities. In addition, about 460 extension materials were distributed for 347 males and 113 females.</i> |
| 2.4. Facilitate <u>partner-led</u> dissemination campaigns with | 2.4. A preset (see Returns-on-Investment calculations) number | # of individual households (men/women) engaged in collective marketing, | – | – | – | |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|---|--|---|-----------------------|---|--|---|
| specific attention to gender | of households engaged in the collective marketing and value addition of legume grains and value-added products | value addition of legumes and value-added products. Volume of produce sold through collective marketing, volume of value addition products and types of value-added products | | | | |
| | 2.4.1. By Q4 of years 2-4, household targets (see Returns-on-Investment calculations), dissemination approaches, and content for partner-led dissemination activities agreed and implemented, with specific attention to gender. This links to 1.5.1 | # of partner-led agreements/ partnerships with agreed target households, dissemination approaches & activities focusing on gender | – | – | 3* | <i>*Of the three partners who have agreed and were disseminating N2Africa proved legume technologies, i.e., IFDC and MfM in Chewaka. *MfM give great emphasis on women business in their implementation.</i> |
| | 2.4.2. By Q4 of years 3-5, feedback on the performance of the dissemination models and the demonstrated content fed back to N2Africa | *Performance reports of dissemination models*Type of performance feedback fed back into N2Africa | – | | | |
| 2.5. Facilitate private-public partnerships towards the sustainable | 2.5.1. By Q4 of years 1-4, inoculants available through public-private partnerships, through | # of inoculant outlets in the target areas Volume of inoculants imported and /or | – | Total production (MBI): 208,445 sachets; Total Distribution (MBI): 144,923 sachets; | Total production (MBI): 415,904 sachets; Total Distribution (MBI): 318,655 sachets; Total Sales (MBI): 271,320 sachets | <i>Menagesha Biotechnology Industry (MBI), a private inoculant producer and supplier, is used as the major inoculants outlet. It partners with coops unions and agro-dealers to distribute inoculants. Of</i> |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|---|--|--|--|---|---|
| supply of inoculants and fertilizer | importation and/or local production, the latter facilitated by the inoculant production pilot plant | produced with the identified outlets | | Total Sales (MBI): 137,990 sachets K ₂ O | | <i>course, the National Soil Testing Laboratory and EIAR-HARC produced in smaller quantity and used similar outlet.</i> |
| | 2.5.2. By Q4 of years 1-4, legume-specific fertilizer made available to smallholder farmers by fertilizer companies/retailers | # of fertilizer outlets in the smallholder target areas | Existing outlets, i.e., the Farmers' cooperatives and cooperative unions at Kebele and Woreda levels, respectively | Existing outlets, i.e., the Farmers' cooperatives and cooperative unions at Kebele and Woreda levels, respectively | Existing outlets, i.e., the Farmers' cooperatives and cooperative unions at Kebele and Woreda levels, respectively, have been used. | <i>Farmers' Cooperative Unions are the only outlets for fertilizer supply and there is no as such problem in supply and availability except the challenges in line with access to credit to finance farmers to purchase fertilizer. Fertilizer supply is highly controlled and centralized by government.</i> |
| | | Volume of legume-specific fertilizer at the retail shops | – | – | – | <i>Farmers' Cooperative Unions are the only outlets for fertilizer supply and there is no as such problem in supply and availability except the challenges in line with access to credit to finance farmers to purchase fertilizer. Fertilizer supply is highly controlled and centralized by government.</i> |
| 2.6. Facilitate the establishment of private sector-led and/or community-based legume seed systems | 2.6.1. By Q4 of years 1-4, sufficient legume foundation seed produced by private enterprises and/or government institutions | # of private enterprises & government institutions producing legume foundation seed in the target countries. | 3 | 3 (ARARI, EIAR & OARI) | | <i>*Soyabean and faba bean foundation seeds were multiplied in partnership with Pawe, Gondar and Sinana Agricultural Research Centers. These seeds are to be maintained and made available for the certified seed producing partners in the respective clusters.</i> |
| | | Volume of legume foundation seed produced by private | | 8400 kg of foundation seed (7500 kg) | | |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|---|---|--|-----------------------|---|---|---|
| | | enterprises & government intuitions in the target countries | | soyabean and 900 kg faba bean) | | |
| | 2.6.2. By Q4 of years 1-4, sufficient quality legume seed available to farming communities | Volume of quality legume seed available to target farming communities in the target countries | | 16.643 tons of certified legumes seeds (8.2 tons chickpea; 1.15 tons faba bean; 1.213 common bean; 16.643 soyabean) | | *16.643 tons of certified seeds of the four legumes were supplied to seed multiplication cooperatives/union and planted on total land area of 197.4 ha. We expect that >300 tons of quality declared legumes seed will be available for the coming cropping season. *Refer to progress narration for details of certified seed production and partners above under 2.2b. |
| 2.7. Engage agro-dealer and other last-mile delivery networks in supplying legume agro-inputs | 2.7.1. By Q4 of years 1-2, a minimum number of agro-dealers and other delivery network partners trained in the storage, handling, and use of inoculants | # of agro dealers & other delivery network partners trained in storage, handling and use of inoculants | – | – | 21* | Earlier identified inoculant dealers, i.e., Tadesse Mega and Mirko, other last mile deliveries (unions, primary cooperatives) have been refreshed/trained in storage and distribution of inoculants. |
| | 2.7.2. By Q4 of years 2-5, agro-dealer and other last-mile delivery networks engaged in the commercial supply to farmers of agro-inputs, including inoculants | # of agro-dealers & other last mile delivery networks in full business of supplying agro-inputs to target farmers including inoculants | – | – | 6* | The two agro-dealers and four other delivery networks (farmers' coops unions, i.e., Agarfa Kajewa, Mama,Mancheno and Sidama Elto) have been supplying inoculants to N2Africa target areas with an agency permit from MBI. Contract agreement with the unions was facilitated by N2Africa to play "an agent role". |
| 2.8. Establish agri-business clusters around legume marketing | 2.8.1. By Q4 of years 1-4, opportunities for collective marketing and value addition for | # of collective marketing and value addition opportunities identified for | 10* | 10* | 10* | Opportunities for collective marketing and value addition were identified in line with formal existing farmers' organizations (cooperatives and cooperative unions). A minimum of 10 |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|---|--|-----------------------|---------------|---|--|
| and value addition | smallholder farmer associations identified | smallholder farmer associations | | | | <i>producer groups (inclusive of the ones identified in 2016) are expected to benefit from collective seed and grain marketing.</i> |
| 2.9 Assess the effectiveness and efficiency of various input delivery and marketing systems especially for women | 2.9.1. By Q4 of year 2, inventory and analysis of input supply and marketing systems conducted across all countries | Report of inventory and Analysis of the input supply & marketing systems in target countries | | | | |
| Objective 3 | | | | | | |
| 3.1. Sensitize partners, farmer associations, and farming households and mainstream approaches to address gender inequity in farming and decision-making | 3.1. Female farmers increasingly lead N2Africa promotion and dissemination activities | # Female farmers leading N2Africa promotion and dissemination activities | – | 1,422 | 6,915 | A total of 1422 female farmers have been involved and made contributions (with different capacities) to N2Africa legume technology dissemination activities. |
| | 3.1.1. By Q4 of years 1-4, all partners and households engaged in N2Africa activities that address gender inequity | # of Partner agreements with gender specific activities | 1 (with EIAR-MARC) | 1 | 2* | <i>Two earlier initiated women specific agreements, one with FC to capacitate Women Self-Help Groups in soyabean processing and household utilization, and the other with EIAR-MARC on CBOs for seed multiplication targeting women farmers.</i> |
| 3.2. Assess business opportunities for women in agro-input supply and legume marketing | 3.2.1. By Q4 of years 2-4, business opportunities for women identified | # business opportunities identified with focus on women | – | – | 3* | Three women business groups (saving and credit associations) identified in Chewaka cluster, Dano Woreda. They originally organized by a local partner, MfM and found to deal inputs and value addition activities. |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|--|--|-----------------------|---------------|---|--|
| and value addition opportunities | 3.2.2. By Q4 of years 4-5, at least 2 businesses led by women established per country | # of businesses established and led by women & # of women involved in the businesses established | 1* | 1* | 1* | <i>The Community Based seed production at Shalla (EIAR-MARC) involving 7 individual farmers led by innovative woman is further strengthened in 2018.</i> |
| 3.3. Conduct dissemination campaigns targeting women farmers | 3.3. Better knowledge of and access to household-level legume processing tools improves the nutritional status of women and children in at least 2 target countries | # of women using household level-legume processing technologies | – | – | – | |
| | 3.3.1. By Q4 of years 1-4, themes and models for women-specific dissemination campaigns identified | # and types of women specific dissemination campaign themes and models identified. | | | | |
| | 3.3.2. By Q4 of years 2-5, at least 25% of the female farmers participating in the overall N2Africa dissemination activities are also actively engaged in the women-specific dissemination campaigns | % female farmers participating in women specific dissemination campaigns | | | | |
| 3.4. Develop labour-saving pre- and post-harvest legume | 3.4. Women use pre- and post-harvest labour-saving tools, resulting in higher net profits from legume | # of women using pre- and post-harvest labour-saving tools | | | | |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|---|--|---|-----------------------|---------------|---|---|
| tools for female farmers | production and processing | | | | | |
| | 3.4.1. By Q4 of year 2, prototype labour-saving pre- and post-harvest tools for female farmers validated | # and type of prototype labour-saving pre- and post-harvest tools for female farmers validated | – | – | 1 | <i>One common bean and soyabean thresher is demonstrated in four project implementation Woredas in collaboration with Ethiopian Institute of Agricultural Research's Mechanization Research Directorate and SYS Consulting.</i> |
| | 3.4.2. By Q4 of years 2-4, labour-saving tools included in the various dissemination campaigns | # pre and post-labour saving tools included in dissemination campaigns | 1 | 1 | 1 | <i>The legume thresher was demonstrated and evaluated with common bean growing community groups in the three project sites. The technologies are appreciated by the farmers and the project is looking for appropriate service delivery models.</i> |
| 3.5. Evaluate the impact of environment (E) and management (M) on nutritional quality of legume grain | 3.5.1. By Q4 of year 3, relationships between grain nutritional quality and management / environmental conditions quantified | # of relationship equations quantified | | | | |
| Objective 4 | | | | | | |
| 4.1. Develop variety x inoculant x nutrient management recommendations for the target legumes and legume production areas | 4.1. Recommendations for the intensification of legume production result in at least 50% increase in legume productivity | % change in legume productivity among target households participating in adaptation trials (early adoption instead of adaptation trials. Can look at progressive farmers). # of target households | | | | * In comparison to the national average yield reported (CSA, 2017), the productivity of the target legume crops from N2Africa on-farm (demonstration) trials in average shows increased yield from 11% (chick pea) to 26% (faba bean). However, % change in legumes productivity at household level needs |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|---|---|---|--|---|--|--|
| based on yield gap analysis | | (men/women headed) with 50% increased productivity through adaptation trials | | | | specialized study using tools designed for this specific purpose. |
| | 4.1.1. By Q4 of years 1-4, seasonal research campaigns towards legume intensification and yield gap closure implemented | # and type of Diagnostic trials conducted by N2Africa | 36 diagnostic trials with 1 type (V*S); 38 demonstration trials; 950 adaptation trials | 18 diagnostic trials with 1 type (V*S); 27 demonstration trials; 1140 adaptation trials | 485 diagnostic trials with five types; 809 demonstration trials; 13067 adaptation trials | <i>We wished to add dataset to overcome the high variabilities observed in last two seasons and want to see the seasonal effects on the V*S trials. Some dissemination partners preferred to use larger plots for demo & adap trials which decreased the target to reach more farmers.</i> |
| | 4.1.2. By Q4 of years 2-4, improved legume production recommendations integrated in the dissemination campaigns | # of improved legume production recommendations (based on diagnostic trials) integrated in dissemination campaigns | - | - | - | |
| 4.2. Develop recommendations for rehabilitation of non-responsive soils for legume production | 4.2. Inoculant producers avail improved inoculant formulations for the target legumes resulting in at least 10% increase in legume productivity and BNF | # of inoculant formulations applied/used by inoculant producers for target legumes in core countries (Productivity will be measured by milestone 4.1) | - | - | 1 (lignite powdered formulation) | <i>1 (lignite powdered formulation): this is the only carrier used in Ethiopia for inoculant production</i> |
| | 4.2.1. By Q4 of year 2, major mechanisms leading to non-responsiveness understood | Major mechanisms contributing to non-responsiveness identified, analysed & documented | - | - | 2 documents | Soil acidity, nutrient deficiencies (K, S) were identified as causes for non-responsiveness {(Msc thesis of Negash and Beza (201&))} |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|--|---|-----------------------|---------------|---|--|
| | 4.2.2. By Q4 of years 3-4, prototype rehabilitation measures for non-responsive soils validated | Validated measures (Prototype) for non-responsive soils | | | | |
| 4.3. Intensify crop-livestock interactions through enhancing feed availability of legume crop residues | 4.3.1. By Q4 of year 2, niches for use of legume crop residues within and between farms identified | # niches for use of legume crop residues documented | – | – | | Crop-livestock interaction is a common phenomenon in the highlands of Ethiopia where the different target legumes are being produced. Legume residues as feed has been studied by two graduate fellows (an M.Sc. and PhD thesis works). In addition to these studies, 2 articles have been published as related to the use, yield and quality of legume residues as feed. |
| | 4.3.2. By Q4 of years 3-4, feed availability and quality enhanced through appropriate use of grain legume residues | % of livestock feed quality dependent on appropriate use of legume residues | – | – | - | The contribution of crop residues is estimated to reach up to 30-80% of the total dry matters available for livestock in the crop-livestock systems in the highlands of Ethiopia, (according to findings from the theses work of our M.Sc. and PhD fellows, and Africa RISING, 2014). In addition, results from these work shows that inoculation and P fertilization (n2Africa technology) improves feed quality of crop residues. However, the proportion of legume residues of the total available needs a specialized study. |
| 4.4. Evaluate the medium- to long-term impact of legumes on overall farming | 4.4. Overall farming system productivity and soil fertility status is improved through | % increase in overall productivity and soil fertility of various farming systems as a | – | – | | Analysis of results from the long-term legume-based intensification trials (conducted for the last 2 seasons) expected to provide this information. However, overall improvements in |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|--|--|--|---|---|--|
| system productivity and natural resource conditions | increased legume productivity | function of increased legume productivity | | | | productivity and soil fertility at the different agro-ecologies needs specialized study. |
| | 4.4.1. By Q4 of year 2, at least 1 long term legume monitoring site established per priority region/country approaches | # long term monitoring sites established | Maintain 3 long-term trials (2 maize-common bean & 1 maize-soyabean) | 3 long-term trials (2 maize-common bean & 1 maize-soyabean) | 3 long-term trials (2 maize-common bean & 1 maize-soyabean) | <i>One MSc student from WUR works on the long-term trials and agronomic & biomass samples were taken.</i> |
| | 4.4.2. By Q4 of year 5, the medium- to long-term impact of legumes on overall system productivity and natural resource conditions evaluated using time series analysis and modelling | % contribution of legumes production on overall productivity and natural resources evaluated | | | | This requires a specific design and study |
| 4.5. Isolate, authenticate, and evaluate new strains of rhizobia for the target legumes for high symbiotic effectiveness | 4.5.1. By Q4 of years 2-4, at least 50 new strains of effective rhizobia genetically characterized using molecular techniques | # New rhizobia strains collected | – | – | 543 | The 10 candidate elite strains (4 CB, 3 CP, 3 FB, 0 SB) are under evaluation in the variety by strain trials. Soil and root nodules samples collected from different sites and work in progress by the rhizobiology researchers at HWU and EIAR-HARC and by a PhD candidate. |
| | | # strain evaluated | 10 (4 CB, 3 CP, 3 FB, 0 SB) | 22 (4CB, 6CP, 8 FB, 4 SB) | 294 | |
| | | # effective rhizobia genetically characterized | 6 CP | 6 CP | 12 (6 CB, 6 CP) | |
| | 4.5.2. By Q4 of year 5, newly identified effective rhizobium strains for common bean, cowpea, groundnut conserved | # Newly identified rhizobium strains conserved in a gene bank. % of identified effective rhizobium | | | | |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|--|---|-----------------------|---------------|--|---|
| | in a rhizobium gene bank and at least 5% of these used for inoculant | strains used for inoculant production | | | | |
| 4.6. Identify elite rhizobium strains and inoculant formulations for beans, groundnut, and cowpea | 4.6.1. By Q4 of year 3, at least 5 new effective and elite rhizobia for beans, groundnut, and/or cowpea identified | # new effective and elite rhizobia identified | – | – | 18 | |
| | 4.6.2. By Q4 of year 5, elite strains used for inoculant production for beans, groundnut, and/or cowpea | # of elite strains used for inoculant production | – | – | 6 strains (2 CB, 1 CP, 2 FB, 1 SB) | Six strains for each of the target legumes (2 CB, 1 CP, 2 FB, 1 SB) have been used for wider N2Africa disseminations which were developed by NARS. |
| 4.7. Evaluate competitiveness and survival of introduced rhizobium strains as affected by M x E | 4.7.1. By Q4 of year 4, environmental and management conditions affecting the competitiveness and survival of introduced rhizobia elucidated | Documented explanation of M x E on introduced rhizobium strains | | | | |
| 4.8. Develop standard operating procedures for the production, quality control and application of rhizobium inoculants | 4.8.1. By Q4 of year 2, standard operating procedures of quality control (storage), product registration and application of inoculants used by inoculant producers and retailers | # of inoculant producers and retailers (public private suppliers) using standard operating procedures | – | – | 3 Producers (MBI, NSTC, EIAR-HARC); 7 Retailers (FCUs: Chewaka, Sidama Elto, Tsehay, Mama, Oda Roba; private agrodealer: Tadesse-Soddo, Mirko-Aje) | <i>Producers: There are three inoculant producers: 1 private (MBI), & 2 public/research centers-NSTC and EIAR-HARC (produced at smaller scale). Retailers: (i.e. FCUs and private agro-dealers) have been engaged in retailing of inoculants besides the improved seeds & chemical fertilizers; and their capacities have not that much developed. Partners in the designed</i> |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|--|---|-----------------------|---------------|---|--|
| | | | | | | <i>PPPs are also serving as supplier of inoculant to the farming communities.</i> |
| Objective 5 | | | | | | |
| 5.1. Develop an innovative framework for strategic M&E, allowing for timely feedback loops | 5.1. National system scientists use the G _L x G _R x E x M framework and the obtained information to advance legume research for development within their countries | # of national institutions partnering N2Africa in D2R activities (Also # of participating scientists in those institutions) # of national institutions in target countries using G _L x G _R x E x M for research | – | – | 50+ scientists and technicians in 4 research institutions EIAR, OARI, ARARI & HWU) and 9+ MSc student advisors in 4 universities. | |
| | 5.1.1. Throughout the project, a strategic M&E framework provides timely feedback to learning and future planning | Existence of M&E framework that outlines the types of feedback for planning and provides timely data. | 1 | 1 | 1 | Different PPP clusters wide discussion and agreements reached to collect and share data on dissemination, partnerships and research. These data collected using tablets in ODK format. However, timely submission of data and information could not be fulfilled as expected even if there are encouraging progresses. |
| 5.2. Set-up data collection, management, and analysis infrastructure | 5.2. Dissemination partners integrate effective and efficient dissemination approaches for legume technologies in their future development initiatives | # of dissemination partners integrating effective and efficient dissemination approaches in their programmes across target countries. (Effectiveness and efficiency of dissemination approaches will be | 17 | 17 | 17 (dissemination partners: NARS, NGOs, FCUs) | |



| Activity per Objective | Milestone | Indicator | Milestone Target 2018 | Achieved 2018 | Achieved so far-Cumulative (2017+ 2018) | Remarks/Reasons for Variance with Planned Target (if any) |
|--|--|--|-----------------------|---|--|---|
| | | measured by activity 5.6) | | | | |
| | 5.2.1. By Q4 of year 1, data management infrastructure is in place and data population initiated | Data Management system established with all project data | – | Available agronomic & M&E data uploaded. Wikispace maintained in to another site. (http://n2africa-ethiopia.ilriwikis.org) | Available data populated/ uploaded on www.n2africa.org , & workshops/events materials uploaded on www.n2africa-ethiopia.wikispaces.com/ http://n2africa-ethiopia.ilriwikis.org . | |
| 5.5. Unravel $G_L \times G_R \times E \times M$ interactions for legume production towards the development of best-fit recommendations | 5.5.1. By Q4 of year 4, the relative important of G_L , G_R , E , and M understood for specific legumes and production environments and integrated in improved recommendations | # of quantified relationships integrated in improved recommendations. Best-fit recommendations available to all target legumes in each country | – | – | | |



4 Lessons Learned

- **Biofertilizers recognized as important inputs and included in the extension packages:** As the result of the efforts made by N2Africa and local partners in the last five years, the importance of inoculants in the cultivation of legumes is now well recognized. For instance, biofertilizer technology is a major component of extension packages in Jimma PPP cluster. A detailed legume-focused planning was developed; and monitored in the 2018 cropping season, specifically in the N2Africa-Ethiopia target woredas (Kersa and Tiro Afeta) in Oromia region. Another encouraging measure was also taken in the South PPP cluster. The Boricha woreda Bureau of Agriculture in SNNP region created a position for the “biofertilizer expert” to solely work on the promotion and access of inoculant and legume technologies.
- **The market connections via the N2Africa PPP channel keep moving.** As indicated above (section 2.2.3), bulking and marketing of grain legumes is taken care of mostly by farmers’ cooperative unions. The project mapped the main cooperative unions into the respective PPP clusters. These were connected to grain buyers (exporters and local processors). These connections are kept functional and grains are being marketed to buyers (members of PPPs, such as AKF, Guts Agro...) and other emerging potential buyers via cooperative unions. Nowadays, the unions are proficient in searching market for grains produced by smallholders (union members), some of them (such as Tsehay Union) even going further to looking for an export market abroad.
- **N2Africa’s improved legume production technologies continue to spill-over beyond project target locations:** While the use of improved seed, the application of inoculation and P-fertilizer and good agronomic practices are acknowledged to enhance yields in target legumes at the project target locations, the spill-over of soyabean production technology exceeds all. Pawe is the project action site for soyabean in the Benishangul-Gumuz region. Currently, the crop is extended and widely cultivated in the western lowlands of Amhara region (including Jawi, Alefa and Quara woredas) and Humera (North western tip of the country). These areas were known to be important sesame production areas. Driven by increasing local and export demands and available market, it seems sesame is being replaced by soyabean production.
- **Rhizobiology research efforts identified rhizobial isolates better and/or as good as elite strains in N-fixing efficiency:** The results of the variety-by-strain multi-location trials revealed that the performances of the candidate elite strains were specific to legume varieties and locations, thus providing opportunities for MBI (private inoculant production company) for targeted commercial production of inoculants for specific legume crops and locations.
- **Best-fit technology packages specific to different locations made possible:** Based on information collected (field days and technology evaluation events; diagnostic, demonstration and adaptation trials etc.) and farmers’ feedback, specific recommendations (adapted varieties, inoculants, P fertilizers and agronomic practices) were made to target locations. The changes and their reasons and initiators are listed in tables per crop reported in Thuijsman et al. (2017).
- Targeted soil fertility research need to continue: On-farm diagnostic/ demonstration/ adaptation trials demonstrated that the inoculant technology works for most of the smallholders. However, there are farms where the technology fails to show expected benefits, thus calling for specific soil fertility research among others. Research carried out by graduate students has shown that S and K deficiency and soil acidity are important constraints (Teshome, 2017; Woldearegay, 2017). Strengthening the understanding of soil fertility variability and developing targeted fertilizer blends

for legumes are important tasks to be taken up. Legumes, due to their inherent capacity to fix atmospheric nitrogen biologically, substantially differ from cereals in their fertilizer requirements. However, despite their importance (food/feed, income, soil fertility) and roles in farming systems, there is no fertilizer blend in Ethiopia for legume crops.

- Legume residues are important feed resources in smallholder's systems: In the mixed crop-livestock systems in Ethiopia, legume residues are an important feed resource for livestock during the dry months of the year when green fodder is unavailable. While inoculation enhances feed quality, the conservation, utilization and trade-off between feed and other uses (mulching, soil fertility maintenance) are important research areas for effective utilization of crop residues and intensification of smallholder's systems where grain legumes are prominent features.

5 Opportunities identified

- The Ethiopian Commodity Exchange (ECX) has added soyabean and chickpea to its trading floor. Common bean was included since the establishment of the ECX in 2008. Three of the four N2Africa-Ethiopia target legumes (common bean, chickpea, and soyabean) are now ECX commodities pushing the total number of commodities traded by ECX to nine. This development followed the increasing demand for grain legumes abroad, a huge market that emerged, notably from China and east Asian countries (see box). We hope this will have an impact and pushes further the desire for more production, and together with it propelling the need for farm mechanization.

China will start allowing soybean imports from Ethiopia, customs authorities said September 2018, as the world's top importer seeks to reduce its reliance on supplies of the oilseed from the United States amid a trade row with Washington. Soybean production in Ethiopia has more than tripled in seven year, from 35,000 metric tons in 2011/12 market year to around 120,000 metric tons in 2018/19 market year in response to growing local demand for cooking oil, soy-based foods, and livestock feed. Future production is expected to continue its upward climb to respond to rising consumer demand.

Source: Addis Fortune Newspaper, Published on Nov 03,2018 [Vol 19, No 966]

- The biodiversity of rhizobia identified in local collections is an important biological resource, providing ample opportunities to identify strains with N-fixing potential better than references elite strains. This justifies further germplasm collection and exploration for symbiotic effectiveness and conservation.
- The partnership approach that N2Africa has established has led to the formation of a consultation platform for the key legume value chain actors including smallholders and promises to offer a self-sustaining solution. Thus, preservation of the institutional network and the partnership as legume value chain platform ensures smallholders' access to scientific outputs in terms of technologies (NARS), input supplies (seed companies, inoculant manufacturers) and output markets (private processing and export companies) and fosters the development of the legume production sector

References

- Teshome, N. (2017). Influence of potassium fertilization and liming on growth, grain yield, and quality of soyabean (*Glycine max* L. (Merrill)) on acidic soil in Gobu Sayo District, western Ethiopia. Wageningen: Wageningen University. <https://www.n2africa.org/influence-potassium-fertilization-and-liming-growth-grain-yield-and-quality-soybean-glycine-max-l>.
- Thuijsman, E., Ronner, E. & Van Heerwaarden, J. (2017). Tailoring and adaptation in N2Africa demonstration trials. Wageningen: Wageningen University. <https://www.n2africa.org/tailoring-and-adaptation-n2africa-demonstration-trials>.
- Woldearegay, B.S. (2017). Response of chickpea (*Cicer aritenum* L.) to sulphur and zinc nutrients application and Rhizobium inoculation in north western Ethiopia. Wageningen: Wageningen University. <https://www.n2africa.org/response-chickpea-cicer-aritenum-l-sulphur-and-zinc-nutrients-application-and-rhizobium>.



Annex. 1: Summary table of N2Africa-Ethiopia Public-Private Partnerships update as of 2018 (adapted from previous years).

| Partnership Clusters | Partners Name | Partner Type | Partner Classification | N2Africa's mode of partnership (collaboration) |
|----------------------|---|--|----------------------------|---|
| Central | Ethiopian Institute of Agricultural Research (EIAR) | National agricultural research system (NARS) | Research and dissemination | Sub-contracting (financing) activities |
| | SNV Netherlands Development Organization | Development organizations (DO) | Dissemination | Supporting through research evidences, technologies and knowledge |
| | Agricultural Commodity Supply (ACOS) Ethiopia | Private companies (PRI) | Out-put marketing | Supporting linkage and business relationships |
| | Menagesha Biotechnology Industry Plc (MBI) | Private companies (PRI) | Input marketing | Supporting linkage and business relationships |
| | Erer Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |
| | Becho Woliso Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |
| Chewaka | Oromia Agricultural Research Institute (OARI) | National agricultural research system (NARS) | Research and dissemination | Sub-contracting (financing) activities |
| | Guts Agro Industry Plc | Private companies (PRI) | Out-put marketing | Supporting linkage and business relationships |
| | International Fertilizer Development Centre (IFDC) | Development organizations (DO) | Dissemination | Supporting through research evidences, technologies and knowledge |



| Partnership Clusters | Partners Name | Partner Type | Partner Classification | N2Africa's mode of partnership (collaboration) |
|-----------------------------|--|--|---------------------------------------|---|
| | Ano Agro Industry | Private companies (PRI) | Input marketing | Sub-contracting (financing) activities |
| | Menagesha Biotechnology Industry Plc (MBI) | Private companies (PRI) | Input marketing | Supporting linkage and business relationships |
| | Menschen for Menschen (MfM) | Development organizations (DO) | Dissemination | Supporting through research evidences, technologies and knowledge |
| | Bore Bako Farmers Cooperatives Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing, linkage with companies and facilities |
| | Hunde Chewaka Farmers Cooperatives Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |
| | Nano Dano Farmers' Primary Cooperative | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |
| Jimma | Ethiopian Institute of Agricultural Research (EIAR) | National agricultural research system (NARS) | Research and dissemination | Sub-contracting (financing) activities |
| | Facilitator for Change (FC) | Development organizations (DO) | Dissemination | Sub-contracting (financing) activities |
| | Menagesha Biotechnology Industry Plc (MBI) | Private companies (PRI) | Input marketing | Supporting linkage and business relationships |
| | Facilitator for Change (FC)-Farmers' Marketing Organization (FMOs) | Community Organization | Dissemination/ Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |



| Partnership Clusters | Partners Name | Partner Type | Partner Classification | N2Africa's mode of partnership (collaboration) |
|----------------------|---|--|----------------------------|---|
| North | Amhara Region Agricultural Research Institute (ARARI) | National agricultural research system (NARS) | Research and dissemination | Sub-contracting (financing) activities |
| | SNV Netherlands Development Organization | Development organizations (DO) | Dissemination | Supporting through research evidences, technologies and knowledge |
| | Menagesha Biotechnology Industry Plc (MBI) | Private companies (PRI) | Input marketing | Supporting linkage and business relationships |
| | Tsehay Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing, linkage with companies and facilities |
| | Ghion Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |
| Pawe | Ethiopian Institute of Agricultural Research (EIAR) | National agricultural research system (NARS) | Research and dissemination | Sub-contracting (financing) activities |
| | Alema Koudijs Feed (AKF) | Private companies (PRI) | Out-put marketing | Supporting linkage and business relationships |
| | Diguai Farm Development PLC | Private Partner | Input marketing | Supporting linkage and business relationships |
| | Menagesha Biotechnology Industry Plc (MBI) | Private companies (PRI) | Input marketing | Supporting linkage and business relationships |
| | Mama Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing, linkage with companies and facilities |



| Partnership Clusters | Partners Name | Partner Type | Partner Classification | N2Africa's mode of partnership (collaboration) |
|----------------------|--|--|----------------------------|---|
| South | Hawassa University (HwU) | National agricultural research system (NARS) | Research and dissemination | Sub-contracting (financing) activities |
| | Ethiopian Institute of Agricultural Research (EIAR) | National agricultural research system (NARS) | Research and dissemination | Sub-contracting (financing) activities |
| | Ethiopian Catholic Church Social and Development Commission Coordinating Office Sodo (ECC-SDCO-Sodo) | Development organizations (DO) | Dissemination | Sub-contracting (financing) activities |
| | Agricultural Commodity Supply (ACOS) Ethiopia | Private companies (PRI) | Out-put marketing | Supporting linkage and business relationships |
| | Menagesha Biotechnology Industry Plc (MBI) | Private companies (PRI) | Input marketing | Supporting linkage and business relationships |
| | Sidama Elto Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing, linkage with companies and facilities |
| | Uta Wayu Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |
| | Damota Wolayita Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |
| | <i>Mancheno Farmers' Cooperative Union</i> | <i>Farmers' Organization</i> | Input-output marketing | <i>Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies</i> |
| South East | Oromia Agricultural Research Institute (OARI) | National agricultural research system (NARS) | Research and dissemination | Sub-contracting (financing) activities |



| Partnership Clusters | Partners Name | Partner Type | Partner Classification | N2Africa's mode of partnership (collaboration) |
|----------------------|---|-------------------------|---------------------------------------|---|
| | Balegreen Spice and Grain Development | Private companies (PRI) | Dissemination/ Input-output marketing | Sub-contracting (financing) activities |
| | Agricultural Commodity Supply (ACOS) Ethiopia | Private companies (PRI) | Out-put marketing | Supporting linkage and business relationships |
| | Menagesha Biotechnology Industry Plc (MBI) | Private companies (PRI) | Input marketing | Supporting linkage and business relationships |
| | Agarfa Kajewa Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |
| | Siko Mendo Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |
| | Sof Umar Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |
| | Oda Roba Farmers' Cooperative Union | Farmers' Organization | Input-output marketing | Supporting farmers' groups through access to technologies, knowledge sharing and linkage with companies |

Note: In all of the Partnership clusters, the Zonal and Woreda Bureaus of Agriculture (BoA) play a decisive role in technology dissemination as they are mandated by the respective government body. N2Africa is collaborating and contributing to this ongoing effort through provision of research evidences, technologies and knowledge networking them with the National Agricultural Research Systems.



Annex. 2: Best-fit recommendations for legume production based on diagnostic, demonstration and adaptation trials for the seven PPP cluster woredas in Ethiopia.

| # | Cluster | Legume | Woreda | Variety | P fertilizer | Inoculant | Spacing | Seed per hole | Planting time |
|----|------------|-----------|---------------|--------------------|---|-----------------|-----------|---------------|-----------------------------------|
| 1 | South | Bush bean | Shalla | Nasir | 23-46 kg/ha P ₂ O ₅ | HB-429 | 40cm*10cm | 2 | Mid-July to End-July |
| 2 | South | Bush bean | Boricha | Nasir, Awassa Dume | 23 kg/ha P ₂ O ₅ | HB-429; HB-A-15 | 40cm*10cm | 2 | Mid-July to Early August |
| 3 | South | Bush bean | Soddo Zuria | Awassa Dume | 50 kg NPS | HB-429 | 40cm*10cm | 1 | Late August to Early September |
| 4 | South | Bush bean | Halaba | Nasir, Awassa Dume | 23-46 kg/ha P ₂ O ₅ | HB-429; HB-A-15 | 40cm*10cm | 2 | Mid-July to End-July |
| 5 | South | Chickpea | Damot Gale | Habru, Arerti | 23 kg/ha P ₂ O ₅ | CP-29 | 30cm*10cm | 2 | Early September to Late-September |
| 6 | South-East | Faba bean | Goba | Degaga, Dosha | 23 kg/ha P ₂ O ₅ | EAL-110 | 40cm*10cm | 1 | Late August to Early September |
| 7 | South-East | Faba bean | Agarfa | Degaga, Moti | 23-46 kg/ha P ₂ O ₅ | EAL-110 | 40cm*10cm | 1 | Late August to Early September |
| 8 | South-East | Faba bean | Sinana | Degaga, Shallo | 23-46 kg/ha P ₂ O ₅ | EAL-110 | 40cm*10cm | 1 | Late August to Early September |
| 9 | South-East | Chickpea | Ginir | Arerti, Habru | 23-46 kg/ha P ₂ O ₅ | CP-29 | 30cm*10cm | 1 | Mid-October to Late-October |
| 10 | North | Faba bean | Dabat | Wolki, Dosha | 23 kg/ha P ₂ O ₅ | FB04, EAL-110 | 40cm*10cm | 1 | Early-June to Mid-June |
| 11 | North | Faba bean | Debark | Wolki, Dosha | 23 kg/ha P ₂ O ₅ | FB04, EAL-110 | 40cm*10cm | 1 | Early-June to Mid-June |
| 12 | North | Faba bean | Yilmana Densa | Wolki, Moti | 23-46 kg/ha P ₂ O ₅ | FB04, EAL-110 | 40cm*10cm | 1 | Mid-June to Late-June |



| # | Cluster | Legume | Woreda | Variety | P fertilizer | Inoculant | Spacing | Seed per hole | Planting time |
|----|---------|-----------|--------------|--------------------------|--|-----------------|-----------|---------------|-----------------------------------|
| 13 | North | Chickpea | Dembia | Arerti | 23-46 kg/ha P ₂ O ₅ | CP-29 | 30cm*10cm | 1 | Early September to Late-September |
| 14 | North | Chickpea | Gonder Zuria | Arerti, Habru | 23-46 kg/ha P ₂ O ₅ ; 30 kg/ha S | CP-29 | 30cm*10cm | 1 | Early September to Late-September |
| 15 | North | Chickpea | Enemay | Arerti, Habru | 23-46 kg/ha P ₂ O ₅ | CP-29 | 30cm*10cm | 1 | Mid-September to Late-September |
| 16 | North | Soyabean | Alefa | TGX-13-3-2644, Belesa-95 | 23 kg/ha P ₂ O ₅ | MAR-1495 | 40cm*10cm | 1 | Mid-June to Early July |
| 17 | Central | Chickpea | Ada'a | Arerti | 23-46 kg/ha P ₂ O ₅ | CP-29 | 30cm*10cm | 1 | Late August to Early September |
| 18 | Central | Chickpea | Becho | Arerti | 23-46 kg/ha P ₂ O ₅ | CP-29 | 30cm*10cm | 1 | Late August to Early September |
| 19 | Central | Chickpea | Gimbichu | Arerti, Natoli | 23-46 kg/ha P ₂ O ₅ | CP-29 | 30cm*10cm | 1 | Late August to Early September |
| 20 | Jimma | Soyabean | Kersa | Clark-63K | 23-46 kg/ha P ₂ O ₅ | MAR-1495 | 60cm*5cm | 2 | Late June to Early July |
| 21 | Jimma | Soyabean | Tiro Afeta | Clark-63K | 23-46 kg/ha P ₂ O ₅ | MAR-1495 | 60cm*5cm | 2 | Late June to Early July |
| 22 | Pawe | Soyabean | Pawe | Belesa-95, TGX-13-3-2644 | 23 kg/ha P ₂ O ₅ | MAR-1495 | 60cm*5cm | 2 | Mid-June to Early July |
| 23 | Pawe | Soyabean | Jawi | Belesa-95, TGX-13-3-2644 | 23 kg/ha P ₂ O ₅ | MAR-1495 | 60cm*5cm | 2 | Mid-June to Early July |
| 24 | Pawe | Soyabean | Mandura | Belesa-95, TGX-13-3-2644 | 23 kg/ha P ₂ O ₅ | MAR-1495 | 40cm*10cm | 2 | Mid-June to Early July |
| 25 | Pawe | Bush bean | Mandura | Nasir | 23-46 kg/ha P ₂ O ₅ | HB-429; HB-A-15 | 40cm*10cm | 2 | Early July to Mid-July |
| 26 | Pawe | Bush bean | Dibatie | Nasir | 23-46 kg/ha P ₂ O ₅ | HB-429; HB-A-15 | 40cm*10cm | 2 | Early July to Mid-July |



| # | Cluster | Legume | Woreda | Variety | P fertilizer | Inoculant | Spacing | Seed per hole | Planting time |
|----|---------|-----------|------------|--------------------|---|-----------------|-----------|---------------|-------------------------|
| 27 | Chewaka | Soyabean | Bako Tibe | Dhidhessa | 23 kg/ha P ₂ O ₅ ; 60 kg/ha K ₂ O and 4.6 t/ha of lime | MAR-1495 | 40cm*10cm | 1 | Late June to Early July |
| 28 | Chewaka | Soyabean | Dano | Keta, Dhidhessa | 23 kg/ha P ₂ O ₅ | MAR-1495 | 40cm*10cm | 1 | Late June to Early July |
| 29 | Chewaka | Soyabean | Illu Gelan | Dhidhessa | 23-46 kg/ha P ₂ O ₅ | MAR-1495 | 40cm*10cm | 1 | Mid-June to Early July |
| 30 | Chewaka | Soyabean | Gobu Sayo | Dhidhessa | 23-46 kg/ha P ₂ O ₅ | MAR-1495 | 40cm*10cm | 1 | Mid-June to Early July |
| 31 | Chewaka | Soyabean | Wayu Tuka | Dhidhessa | 23-46 kg/ha P ₂ O ₅ | MAR-1495 | 40cm*10cm | 1 | Mid-June to Early July |
| 32 | Chewaka | Soyabean | Chewaka | Dhidhessa | 23 kg/ha P ₂ O ₅ ; 60 kg/ha K ₂ O and 4.6 t/ha of lime | MAR-1495 | 40cm*10cm | 1 | Mid-June to Early July |
| 33 | Chewaka | Bush bean | Bako Tibe | Nasir, Awassa Dume | 23-46 kg/ha P ₂ O ₅ | HB-429; HB-A-15 | 40cm*10cm | 1 | Mid-June to Early July |
| 34 | Chewaka | Bush bean | Gobu Sayo | Nasir | 23-46 kg/ha P ₂ O ₅ | HB-429; HB-A-15 | 40cm*10cm | 1 | Mid-June to Early July |
| 35 | Chewaka | Bush bean | Wayu Tuka | Nasir | 23-46 kg/ha P ₂ O ₅ | HB-429; HB-A-15 | 40cm*10cm | 1 | Mid-June to Early July |



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
109. Dissemination survey Tanzania
110. Climbing bean x highland banana intercropping in the Ugandan highlands
111. N2Africa Annual Report 2018
112. N2Africa Annual Report 2018 Ethiopia



Partners involved in the N2Africa project



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Diobass



Still Helping Livelihoods



Eglise Presbyterienne Rwanda



Ethiopian Institute of Agricultural Research



Federal Cooperative Agency (FCA) Ethiopia



GeAgrofia



INDUSTRY PLC



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COOPERATION



Research to Nourish Africa



INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE



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Ministry of Agriculture



PERTH WESTERN AUSTRALIA



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NCRBA



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SNV



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World Vision