N2Africa Annual Report 2016

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N2Africa

Putting nitrogen fixation to work for smallholder farmers in Africa

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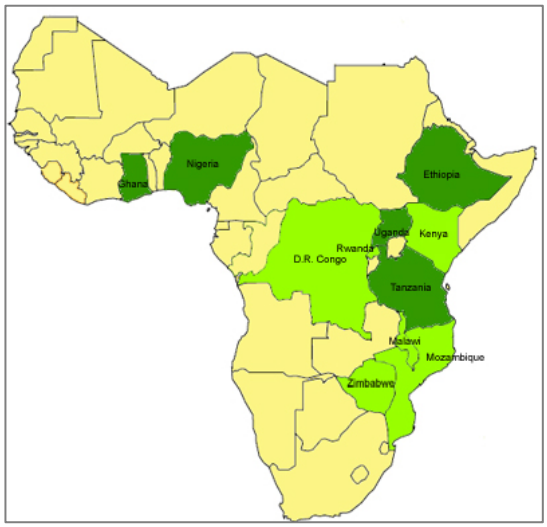
List of abbreviations and definitions

Word	Acronym	Definition
Buyer model		Business model that aims to increase quantity and/or quality of crop sales, also known as contract farming.
Cooperative-Collaboration Agreement	(ca)	Agreements made by consenting organizations to share resources to accomplish a mutual goal.
Grant Agreement	(ga)	Agreements made between organisations where money or something of value is transferred from one organisation to the other to accomplish a mutual goal
Information linkage model		Business model that involves brokering information between actors
Input & Information model		Business model that aims at brokering general value chain information and input sales (demand quantification)
Input supplier model		Business model that aims to increase input sales.
Material Transfer	(mt)	Agreements made where organisations agree to the transfer of tangible research material for their individual research purposes.
Memorandum of Understanding	(MOU)	An agreement between two or more parties, indicating an intended common line of action. It is often used in cases where parties either do not imply a legal commitment or in situations where the parties cannot create a legally enforceable agreement.
Micro-entrepreneur model		Business model that aims to generate income from input and service sales.
Nucleus farm model		Business model that aims to group of farms to generate income.
Producer collective model		Business model that involves producer groups driving access to inputs, services by members
Sub-Contract Agreement	(s)	Agreements made between organisations where the sub-contracted organisation undertakes activities on the behalf of the other.
Sub-Contract Agreement under Cooperative-Collaboration Agreement	(sca)	Agreements where the Lead partner or other partner of the Cooperative-Collaboration Agreement is subcontracted based on expanded scope of work or extra expertise.

N2Africa at a glance

N2Africa is a large scale, science-based "research-in-development" project focused on putting nitrogen fixation to work for smallholder farmers growing legume crops in Africa. The project is funded by The Bill & Melinda Gates Foundation by a grant to Wageningen University & Research who lead the project together with IITA, ILRI, University of Zimbabwe and many partners in all N2Africa countries.

N2Africa aims to contribute to increasing biological nitrogen fixation (BNF) and the productivity of grain legumes among African smallholder farmers; in turn this helps to enhance soil fertility, improve household nutrition, and increase the income of smallholder farmers.



N2Africa Core countries (dark green), Tier 1 countries (light green).

Our vision of success is to build sustainable, long-term partnerships to enable African smallholder farmers to benefit from symbiotic N2-fixation by grain legumes through effective production technologies, including inoculants and fertilizers. N2Africa links scientific knowledge with capacity building and public-private partnerships.

The project is designed to ensure that the benefits of grain legumes are impacting positively on rural livelihoods and their production environment. The initial set of countries (e.g. Ghana, Nigeria, DR Congo, Rwanda, Kenya, Malawi, and Zimbabwe) covered a critical range of agro-ecologies with varying farming systems and priority legumes, providing an excellent framework for evaluating the diversity of legumes and their benefits. During the first project phase (2009-2013), activities in the initial Tier 1 countries focussed on research activities in relation to legume agronomy, cropping system design and rhizobiology and generating interest from the first generation of dissemination partners. During the second phase, the project expanded to a second set of countries, the so-called Core countries (e.g. Ethiopia, Ghana, Nigeria, Tanzania and Uganda). The Tier 1 countries have lower targets that the Core countries.

N2Africa has progressively evolved and adapted from a role of direct implementation to a role of catalyst and knowledge provider. During the early years N2Africa staff were responsible for design and implementation of activities through sub-contracting of local development and research organizations. N2Africa is now a well-known, well-respected and much sought after partner for development partners and private companies as a key knowledge provider concerning diversification and intensification of smallholder farming through legume-based technologies. The flexibility of the major grain legumes in terms of growth habit and duration, seed types and their multi-purpose nature (for food, nutrition, sale, fodder and soil fertility) provides benefits for all farmers from the poorest to the wealthier across agro-ecologies. Farmers enthusiasm is repeatedly expressed through their desire to cease small-scale demonstrations and move to large scale implementation. Barriers faced often occur at the institutional level – in terms of ensuring last-mile delivery and consolidation of produce to ensure marketing at favourable prices. The strong investment in public-private partnerships is yielding promising results in upscaling of technologies and will ensure continuity in the future.

The N2Africa Annual Report 2016 presents the results and progress made against the five project objectives in the eleven countries in 2016. The N2Africa Annual Report 2016 also provides insights in country specific challenges, risks and opportunities. The narrative report provides more detailed information behind the numbers presented in Table 19.

Major achievements

- CAPACITY STRENGTHENING TO SUSTAIN DELIVERY: Capacity building activities focused on both partner staff and value chain actors. In 2016, a total of 24,172 persons were trained, with a female participation of 47%. In total, 32,717 persons were trained from 2014-2016, way beyond the project targets. About 74% of the total persons trained were reached by trainings conducted by partner staff. Training topics cut across the whole legume value chain (e.g. execution of dissemination trials, postharvest practices, data collection using tablets, seed production, handling and application of inoculants, herbicides, market standards, gross margin calculations, business plan development, marketing and legume value addition). The project supported 50 students at MSc and PhD level, with a female participation of 36%.
- ENTRY STEP FOR ADOPTION OF TECHNOLOGIES: In 2016, a total of 117,313 farmers were reached (49% female) through various dissemination approaches. In total, 374,717 farmers were reached up to 2016. This number exceeded the target (253,750 farmers) by 148%. Key among the dissemination approaches are demonstrations, adaptations, field days, media events, and video shows. These approaches have been adjusted in some countries to include partner feedback and implementation strategies (e.g. expanding area of demonstration to accommodate more farmers and including new farmers around adaptation plots). In total, 1,685 demonstrations and 34,897 adaptation trials were established in 2016 across all countries. The majority of households (41%) were reached through demonstration trials, followed by field days and agricultural shows (34%).
- LAST MILE DELIVERY OF INPUTS: Stimulating access to inputs by farmers was a priority across all countries in 2016. Across the countries farmers express the desire to move beyond demonstrations, demanding access to the technologies. At project level, 59% of the 2016 target (3,045 tons year^{-1}) of volume of seed used by farmers was achieved. With regards to inoculants and fertilizers, the project achieved an increase of 47% and 147%, respectively, as compared with 2015. About 61% of volume of inoculant target (25 tons year^{-1}) and 31% of the volume of fertilizer target (5,075 tons year^{-1}) were achieved. In Nigeria, N2Africa facilitated Intrio Synergy Limited, for example, to market inoculants to soyabean farmers. Inoculants were imported and/or produced in all countries and many new products have gained official registration for sale.
- DEMONSTRATED OUTPUT MARKETS OPPORTUNITIES: Collective marketing and value addition is a key topic, stimulating access to profitable markets and consumption of legumes for improved nutritional status. Up to 2016, a total of 119,690 persons (49% female) were involved in collective marketing and value addition activities, achieving 96% of the target. Value addition activities were mainly related to soyabean and groundnuts and resulted in various high value products, such as soyabean flour, beverages, blend of soyabean flour and other cereals, soyabean cake, groundnut oil and cake. Collective marketing activities were mostly done through bulking by cooperatives.
- ENTRY POINT TO REDUCE DRUDGERY: In 2016, 16,035 farmers used labour saving tools. About 63% of the 2016 set target (25,375 farmers) was achieved.

Herbicide use was the most frequent approach to saving labour (e.g. 80%). Other tools included threshers, groundnut shellers and planters.

- EVIDENCE FROM AGRONOMIC RESEARCH: A major aim of N2Africa is to provide a basket of technology options suitable for both wealthier farmers who are able to invest in producing for the market and to improve the nutritional security of poorer farmers. Technology recommendations for different agro-ecologies were made based on their agronomic performance and social factors. For example, by analysing more than 2,000 trials across ten countries and five years, we could evaluate the overall benefits of rhizobial inoculants with soybean, as well as patterns of variation in response. The analysis showed that with an average yield increase of 115 kg ha^{-1}, inoculation is economically beneficial in 97% of cases. In an Ethiopian multi-site, multi-year evaluation, inoculation was shown to increase yields by an average of 400 kg ha^{-1}, while the combined effect of inoculant and phosphorus was 600 kg ha^{-1}. A key learning is that the additional yield obtained through combined use of inoculant and P fertilizer results in strong economic returns to the fertilizer, whereas P fertilizer alone is often barely profitable. A diagnostic study in Ghana showed that soil fertility parameters, particularly those related to soil phosphorus and silt content, were found to be the most influential variables affecting soyabean yield.

  Analysis of yields from N2Africa focal adaptation plots and corresponding farmer's main fields showed that N2Africa technologies resulted in increased yields. The relative increase ranged from 13% to 138% across the countries for N2Africa plots compared with the control. Cowpea yield on the N2Africa plots in Tanzania yielded 138% as compared to the control plots, groundnut yield 61% more in Ghana and climbing bean 13% more in Uganda. The focus for 2017 will be to interpret and document best bet-technologies based on meta-analyses of agronomic data and advance the most promising technologies to ensure their availability to farmers through dissemination activities.

- QUALITY CONTROL OF INOCULANTS: Inoculant quality control is carried out in ten N2Africa countries. N2Africa supported government institutions, such as Sokoine University of Agriculture in Tanzania and Mozambique Agricultural Research Institute (IIAM) in Mozambique, with equipment for inoculant quality control. Results of quality control tests of LegumeFix stored by agrodealers in Nigeria showed that the inoculant packages contained both high density of rhizobia and no detectable contaminants. However, a large proportion of the packages were physically weakened by scratches due to handling emphasising the need for better training in handling to keep boxes sealed prior to use. Quality control tests by MIRCEN laboratory, Kenya indicated that both BioFix and NoduMax contained adequate numbers of rhizobia. However, the degree of contamination in BioFix inoculants is of concern as this means that the effective shelf-life may be too short. By contrast, NoduMax contained no detectable contaminants. Currently Ghana is compiling data to aid registration of NoduMax as the second inoculant brand in the country after LegumeFix.
- PUBLIC-PRIVATE PARTNERSHIPS AS SPRINGBOARD FOR MASSIVE DISSEMINATION: Up to 2016, 90 partnerships were formally signed with partners, such as agricultural research institutes, universities, local governments, private input suppliers, legume buyers, processors and development partners. The number of signed partnerships increased by 11% in relation to 2015 results and 97% of the 2015 partnerships were consolidated in 2016. Also, work plans were expanded to accommodate more results areas. The partnerships mainly cover dissemination, input and output markets, capacity building, and research. Dissemination and

output markets are addressed by 79% and 66%, respectively of the partnerships. Whereas input supply is covered by 62%. In addition to the partnerships, other national, regional, and district stakeholder platforms are used to address issues, such as coordination and policy issues within legume value chains.

The Producer Collective model and the Buyer model were the most frequently used models in partnership agreements, 43% and 18%, respectively. The Producer Collective model, which focuses on building farmer organisations, was used in all countries except in Nigeria and Zimbabwe. The Buyer Driven model is essentially contract farming. Both models link farmers to input and output markets. In Tanzania, for example, Catholic Relief Services through the Soy-ni-Pesa project organized 410 producer groups with 9,477 farmers (38% female) and facilitated the bulking of soyabean. Tanzanian partners, BRiTEN and Faida MaLi, reached many farmers through training on legume marketing and direct linkages to buyers. In Rwanda 3,732 farmers were involved in collective marketing through interventions done by CARITAS, Conseil Consultatif des Femmes and Developpement Rural Durable. In 2016, the volume of legumes sold increased substantially in some countries (e.g. in Kenya the volume of soyabean sold increased by 57%).

Innovation and systematic change towards achieving impact at scale

- LEVERAGING IMPACT THROUGH PARTNERSHIPS: In total, U$122.42 million was leveraged by N2Africa: over $117 million through partner shared budgets directly related to dissemination of N2Africa technologies; $4.6 million realized as new grants (e.g. Scaling up improved Legume Technologies (SILT) (IDRC), Gender and the Legume Alliance (GALA) (UK Aid), AGRA-SSTP (Scaling Seeds and Technologies Project - USAID), $820,000 from sub-contract agreements with IITA-Support to Agricultural Research for Development of Strategic Crops in Africa (SARD-SC) Maize/Soya (Africa Development Bank (AfDB)), Women for Women International (WfWI), World Vision International and ZOA International.
- EXPANDING PARTNERS AND AREA OF COVERAGE: All countries exceeded targets of the number of farmers to be reached in 2016, yet the rate of increase slowed compared with previous years. Dissemination approaches, such as the ICT platforms developed together through new partnerships (e.g. GALA, SILT, Farm Radio International in Tanzania, M'Omulimisa in Uganda) will be explored further and adopted in other countries. We are confident N2Africa will meet targets the remainder of the project. Further effort is needed to consolidate use of labour saving tools to reduce drudgery in dissemination activities. One promising example is the Spray Service Providers Network established in Borno State in partnership with CropLife. The plan for 2017 is to scale up the use of other labour saving tools using the Service Delivery model.
- STIMULATING PRIVATE SECTOR PARTICIPATION FOR INPUT DELIVERY: The biggest challenge for scaling up remains the lack of infrastructure and an enabling environment to allow private sector participation which limits the capacity for last mile delivery and marketing. Key interventions such as registration of inoculants in all countries, input demand quantification (e.g. by BRiTEN in Tanzania) and integration of inputs in government input subsidy programs (e.g. Anchor Borrowers Program in Nigeria) contributed greatly to the increase in input use. In 2017, we will address issues pertaining to last mile delivery (e.g. inoculants, herbicides) high prices, Certified and Quality Declared Seed availability, limited shelf life of inoculants (which hinders agro-dealer sales) and the risk of contamination due to

sharing of inoculant among farmers of packaged in large size sachets. A very promising sign is the increase in the number of private inoculant companies seeking registration and actively marketing their products across the N2Africa countries.

- LINKING FARMER GROUPS TO ACCESS OUTPUT MARKETS: In 2016, various output market models were integrated and/or reinforced in the partnership implementation plans across all countries. However, the project target for 2016 is yet to be met. The focus for 2017 will be to integrate specific interventions, such as building organizational capacity of farmer groups to meet market requirements and addressing country specific output market issues (e.g. policy implications, market requirements, and organizational capacity of farmer groups and modes of aggregation). Furthermore, it will be prudent to focus attention on output market specific partners (such as BRiTEN and FAIDA MaLi in Tanzania) to ensure market identification, requirements, and negotiations for farmer groups within partnerships.
- STRATEGY FOR MEASURING IMPACT
  - SYSTEMATIC STEERING AND LEARNING LOOPS: Further advances were made in the Monitoring, Evaluation and Learning System over the past year. We are rapidly moving to having all data available digitally on the N2Africa online dashboard with quality of uploaded data cross checked by country teams. Available information includes all M&E data which can be aggregated at the partner or country level, farmer feedback on technologies, and results of agronomy trials. A select set of key indicators is calculated automatically on the dashboard. Obtaining data from some partners in a timely manner remains a challenge. The focus for 2017 will be on reviewing the M&E strategies of specific partners based on feedback generated in 2016.
  - ICT FOR TIMELY LEARNING: The functionality of the online dashboard will be expanded for both analysis of agronomy and M&E and made available for use by all stakeholders in 2017.
  - LONG TERM PROJECT LEARNING: The Early Impact Study conducted in 2013 and further analysed in 2016 provided a comparison across eight N2Africa countries. The findings were used to evaluate N2Africa's impact, to draw lessons learned and to provide recommendations for future improvement. The coming two years of the project will be used to design and implement a range of studies using quantitative and qualitative methods to examine the impact of N2Africa and maximize our learning.
  - POLICY OPPORTUNITIES FOR OUTSCALING LEGUME TECHNOLOGIES: The 'N2Africa Review of National Policies Relating to Legume Intensification in N2Africa Countries' showed that some governments acknowledge the importance of legume intensification and its significant potential to contribute to improving food security and health, especially for poor families. While many policies indicate the aim of boosting production of legumes, they are surprisingly silent on specific actions and interventions as to how this might be achieved. The study is being completed and will be used to provide recommendations to governments about best-fit legume technologies, how to increase production and productivity of various legumes and how to stimulate farmers' uptake and use of relevant technologies.

- EXIT STRATEGY: Public Private Partnerships are an important component of the N2Africa exit strategy. We are currently consolidating final exit strategy plans for the Tier 1 countries which are in the final year of funding. Strengthening existing partnerships (e.g. in the areas of partner relationships, modes of delivery and models of input/output markets) will ensure sustained delivery. The focus for 2017 will be to document processes to identify what is working well that can be replicated and what is not working well that needs to be corrected or avoided within the partnerships.

Keywords: Annual report, Results framework, Key milestones, objectives, progress, biological nitrogen fixation, grain legumes, Nigeria, Borno State, Ghana, Tanzania, Ethiopia, Uganda, DR Congo, Rwanda, Kenya, Malawi, Zimbabwe, Mozambique.

1 Progress narrative

The N2Africa Annual Report 2016 presents the results and progress made in reaching the N2Africa Vision of Success. Results and progress are evaluated against the five project objectives in the eleven countries, which are:

1. Project strategy, coordination and implementation, and capacity strengthening;
2. Delivery and dissemination, sustainable input supply and market access;
3. Empower women to increase benefits from legume production;
4. Tailor and adapt legume technologies to close yield gaps and expand the area of legume production within the farm;
5. Enable learning and assess impacts at scale through strategic Management & Evaluation.

The achievements against each milestone from the N2Africa Results Framework are presented in Table 19. The progress narrative provides more detailed information behind the numbers presented in the table.

The Annual Report 2016 benefitted from various sources, namely the minutes from the Annual Planning Meeting held in March 2016 in Zimbabwe, the Annual Country Reports 2016, the Mid-term Review and Planning meetings per country and the ODK database, amongst others.

1.1 Project strategy, coordination and implementation, and capacity strengthening

1.1.1 Project strategy

The N2Africa Master Plans are strategic project documents intended to foster a common approach across the N2Africa countries. The Master Plans completed in 2015 have been used to develop the country-specific plans. In 2016, all countries updated their country plans based on the general annual meeting that was held at Victoria Falls in Zimbabwe. This was to give more visibility and project focus on activities to improve the availability of input and output markets, labour saving technologies, business opportunities for women and household nutrition. Country-specific mid-term review and planning meetings held with partners resulted in more detailed annual country reports and work plans, which were aligned with the overall project focus.

The Podcasters and renewed website provide information to our partners and collaborators, part of a large group of people interested in what we are doing and achieving. In 2016, eight Podcasters were broadcast to inform the N2Africa network about research and project activities. We migrated the N2Africa website was migrated to a new version of the content management system Drupal to improve security and performance.

1.1.2 Coordination and implementation

Sharing research-based knowledge and dissemination approaches and strengthening feedback loops both within the project and with stakeholders outside the project are key to the success of the N2Africa project. The achievement of N2Africa Vision of Success depends on establishing and sustaining long-term strategic partnerships with actors and organizations in the legume value chains being supported. Private-Public Partnerships (PPP) therefore play a key role in the implementation of legume technologies in all countries.

1.1.2.1 **Number of partnerships**

The project has far exceeded its set target for the number of partnerships to be established in 2016, by over 180%. Figure 1 and Figure 2 indicate the total number of partners at project and country levels, respectively. In total 90 partnerships were formally signed with partners, such as agricultural research institutes, universities, local governments, private input suppliers, legume buyers, processors, and development partners (Appendix I). Since 2014, a total of 103 partnerships are developed. The total number of signed partnerships increased by 11%, as compared to achieved results in 2015. In addition, over 15 new partners have been identified, some already integrated in the existing partnerships 2016, whereas others are developing implementation agreements. These new partners contribute mainly in the area of input supply support. Examples are YARA in Ghana and Tanzania, NUTEC project of Palladium Group in Uganda and Syngenta, Minjingu, ASA, MERU Agro, MEA Ltd., World Food Program in Tanzania.

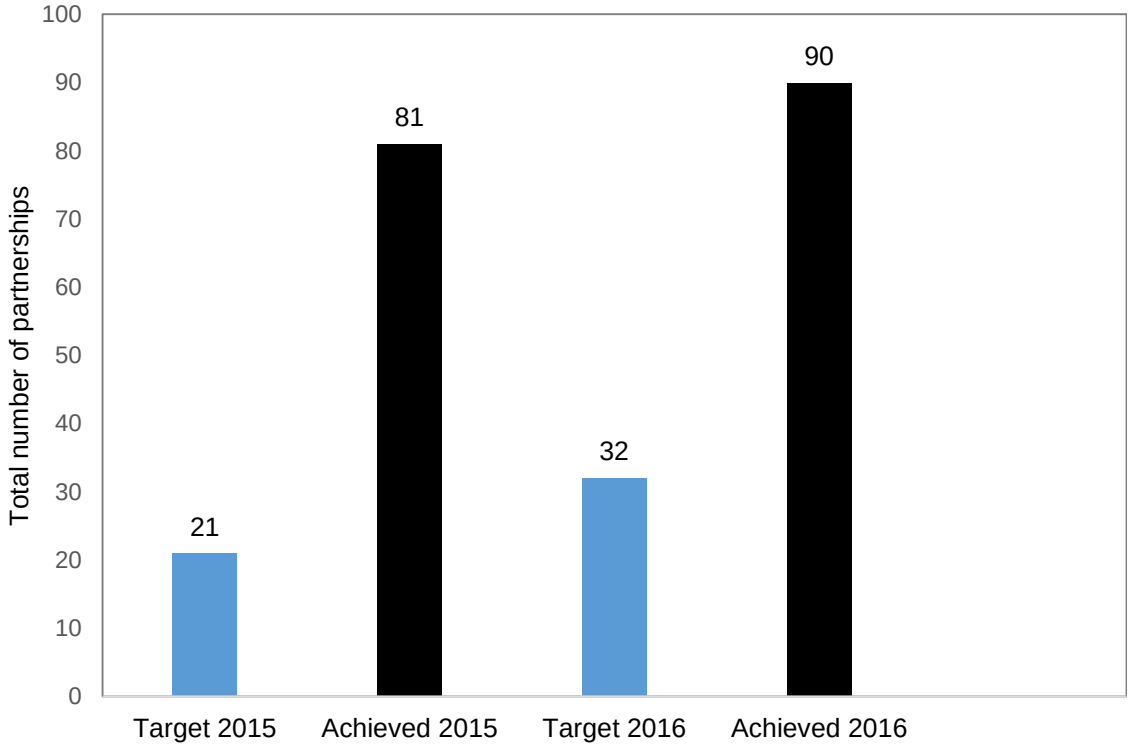


Figure 1. Total number of partnerships (target and achieved) in 2015 and 2016.

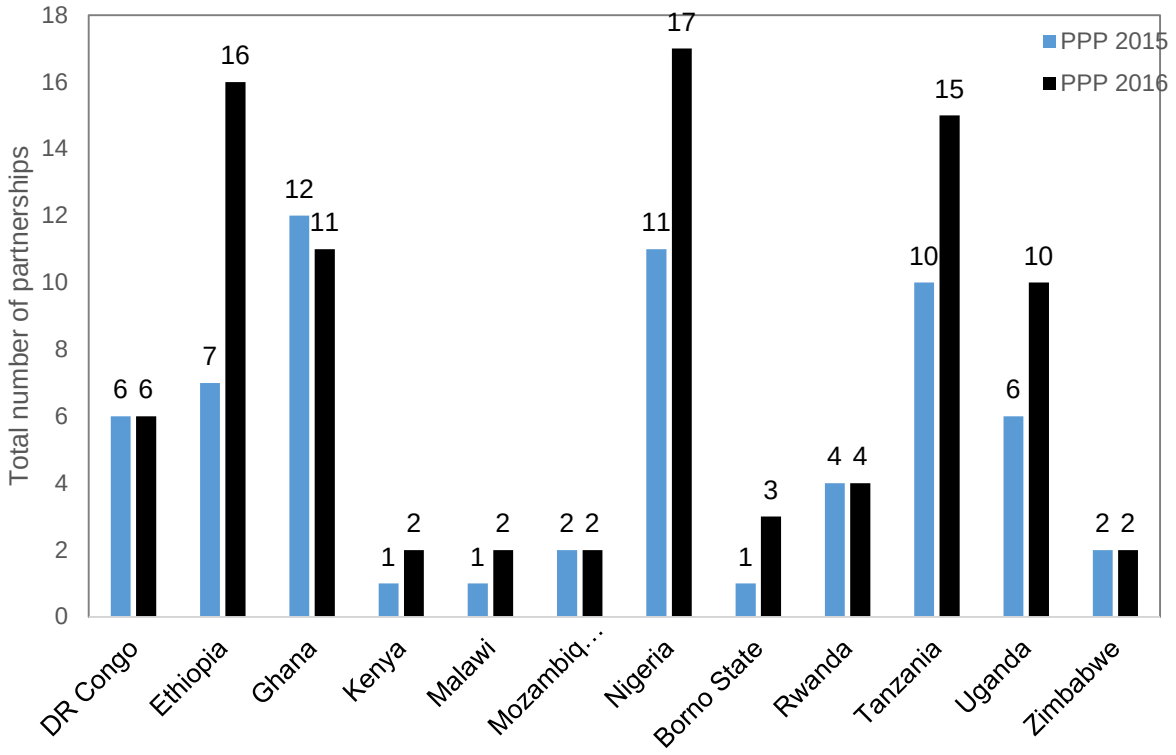


Figure 2: Total number of partnerships achieved per country in 2015 and 2016[1].

The scope of work and budget allocation is the main difference between the Core and Tier 1 countries. The Tier 1 countries have a limited scope of work and less budget available. This explains the different number of partnerships as shown in Figure 2. In 2016, countries assessed the strength of their partnerships in terms of achieving the set targets. The review resulted in new partnerships in Tanzania, Uganda, Kenya, Malawi and Borno State. In Nigeria, Ethiopia, Zimbabwe, Mozambique, DR Congo and Rwanda existing partnerships 2015 were consolidated. In Ghana, new partners supporting input supply have been identified and integrated in the existing partnerships. The Ghanaian partnerships that were not yielding desired results were terminated. Overall, 97% of 2015 partnerships were consolidated in 2016.

1.1.2.2 Partnerships and their main areas of support

In all countries, partners disseminate technologies, including N2Africa best-fit technologies, and implement activities covering at least one of the following areas of support: (i) Capacity Building, (ii) Input Supply, (iii) Output Markets, (iv) Technology Dissemination and (v) Research. In 2016, the main areas of support and work plans were expanded, as compared to 2015 (Figure 3). The number of new partners were particularly related to work towards sustainable input supply systems. This area of support received much attention in 2016, because of the project's challenges to achieve its targets for input usage by target farmers across the countries in 2015. Two of such partnerships in Borno State are Intrio Synergy Limited (ISL) and CropLife. The number of new partners addressing research activities

[1] In this report, we refer to Borno State as a country.

slightly decreased, from 7% to 5%.

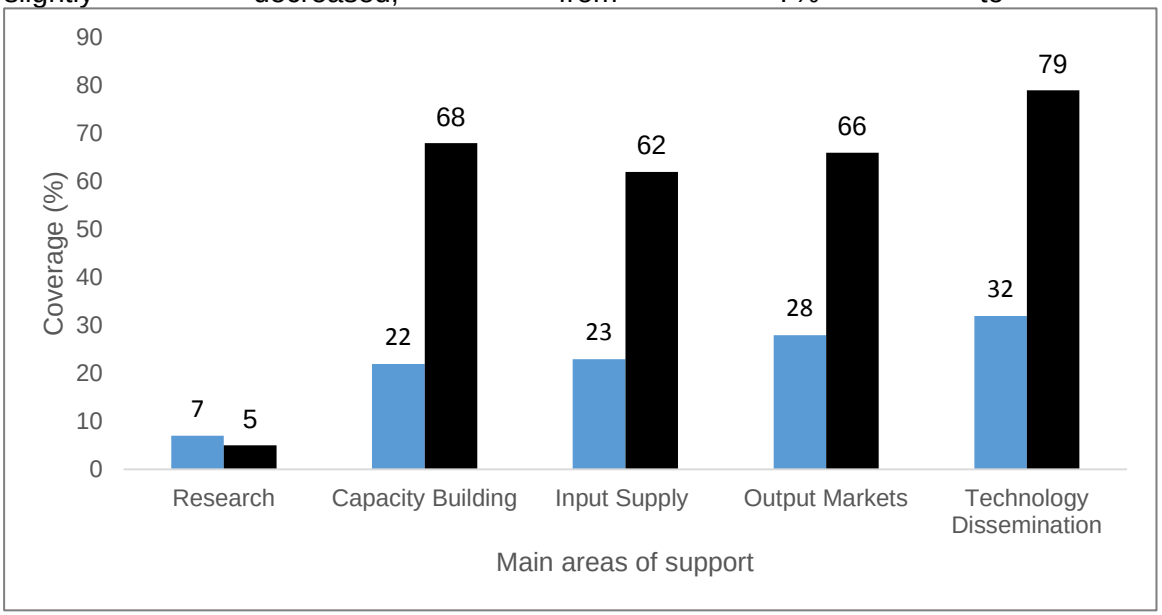


Figure 3. Coverage of main areas of support for all partnerships in 2015 and 2016.

1.1.2.3 Partnership agreement types

All N2Africa countries signed partnership agreements in the period 2014-2016. The most commonly used agreement types across all countries are Cooperative-Collaboration agreements and Sub-contract agreements (Figure 4). Sub-contracting can be done within any form of partnership. The Sub-contract agreement overlaps in other forms of agreements (e.g. Cooperative-Collaboration agreements). The seven Sub-contracts with cost share mainly cut across mainly in Nigeria. The Sub-contracts are mostly developed within partnerships to engage a partner to extend its expertise to other partners outside its operational areas or to implement interventions beyond its scope.

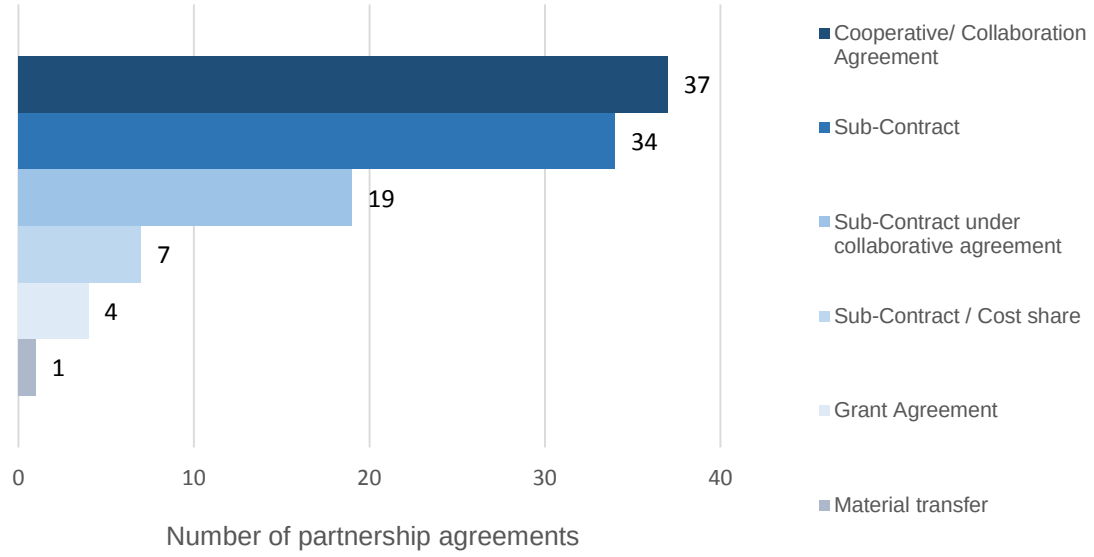


Figure 4. Number of signed partnership agreements per type in 2016.

1.1.2.4 **Partnerships per business model**

To particularly tackle the challenge of sustainable input and output supply chains, N2Africa realized private public partnerships that can be classified into various business models or combinations thereof (USAID, 2015). Eight countries formalised partnerships related to improving input supply systems. For example, Intrio Synergy Limited (ISL) and CropLife became Lead partners in Borno State. The approach in Kenya was slightly different; here Community Based Organizations (CBO) were linked to one-stop-shop agro-dealers for their inputs.

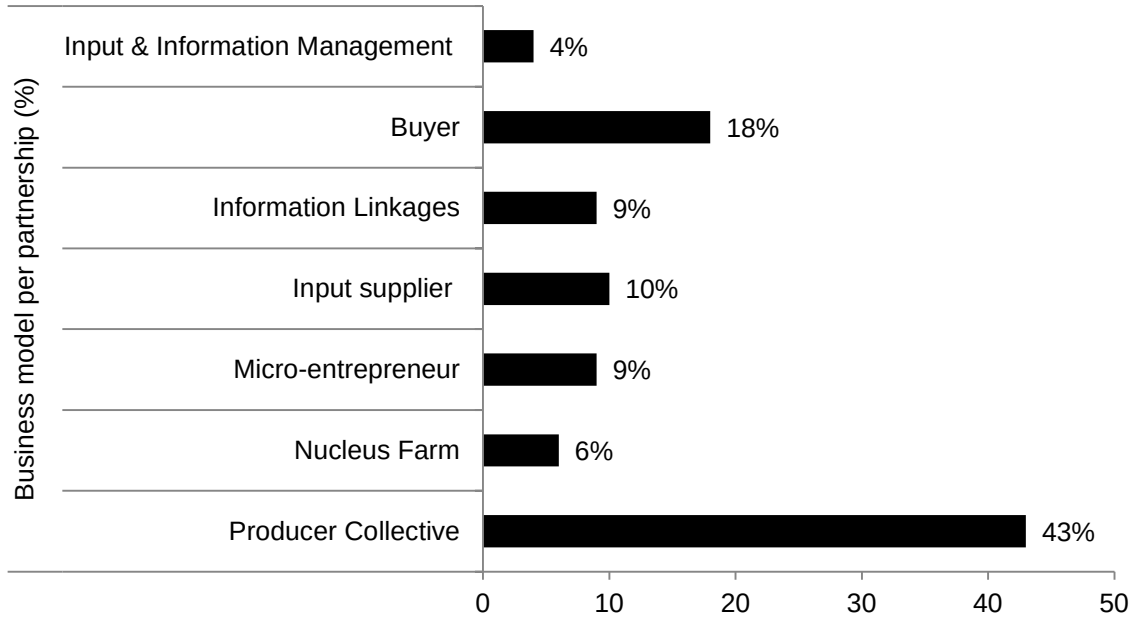


Figure 5. **Percentage of business models used per partnership in 2014-2016. Note: analyses are done for 67 partnerships with unique value chain or cross cutting input supply models.**

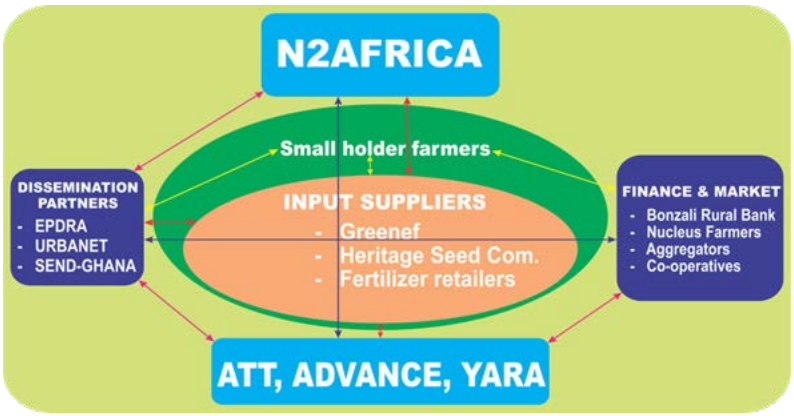
The Producer Collective model and the Buyer model were the most frequently used models in partnership agreements, 43%, 18%, respectively. The Producer Collective model focuses on building farmer collectives and infrastructure and was used in all countries, except in Nigeria and Zimbabwe. The Buyer driven model, also known as contract farming, is defined as binding arrangements leading to a vertical integration of the agricultural value chain, through which a firm ensures its supply of agricultural products by individual or groups of farmers. Both models support the N2Africa Vision of Success and link farmers to output markets. In Tanzania, for example, Catholic Relief Services (CRS) through the Soy-ni-Pesa project organized 410 producer groups with 9,477 farmers (38% female) and facilitated the bulking of soyabean. In Rwanda 3,732 farmers were involved in collective marketing through interventions done by CARITAS, Conseil Consultatif des Femmes (COCOF) and Developpement Rural Durable (DRD).

Box I: Examples of country-specific partnership approaches

Ghana

Grain legume production in northern Ghana is characterized with low yields due to declining soil fertility, inadequate use of farm input and lack of good quality inputs including certified seeds, phosphorus fertilizers and rhizobium inoculants. N2Africa has designed and facilitated partnership with about fourteen partners with the aim of:

- Enhancing technology dissemination and scaling up;
- Building capacities of smallholders and other actors;
- Promoting sustainable input supply and output markets.



Tanzania

N2Africa-Tanzania is collaborating with 31 partners under different agreements categorized into; two local universities, five research institutions and 24 development organizations. Twelve (of these partners have signed the partnership agreements with N2Africa. In 2016, The Tanzania team signed three new agreements with Clinton Development Initiative, BRiTEN and ARI Ilonga.

In Tanzania, N2Africa and partners share a unified message. Partners supporting value chain projects (e.g. N2Africa, ASHC, GALA, UPTAKE, and SILT) provide information about best-fit technologies to partners in value chain project.

Partners supporting value chain projects		Partners of value chain projects
N2Africa – BMFG, WUR, IITA, ILRI, UZ	Scaling Seed Technology Project (AGRA –SSTP)	CRS –Soy ni Pesa
African Soil Health Consortium – BMGF, CABI		BRAC –Lead
Gender and the Legume Alliance – DFID, CABI, IITA		BRiTEN
UPTAKE (USAID) – Farm Radio International, ASHC funded for scale up		Clinton Development Initiative
SILT – IDRC, Farm Radio International, AFAP, CABI, IITA, iLogix, ASA, WUR		RUDI-AGRA FAIDA MaLi

The key collaboration areas in Tanzania are:

1. Delivering messages on improved legume technology through media, demonstration trials and training;
2. Making input and output supply chains function more effectively by predicting demand, stimulating supply and link agro-dealer networks to farmer demand;
3. Examining the effectiveness of different combinations of messages and dissemination approaches;
4. Providing information to supply chain partners and policy audiences, based on lessons learned.

Altogether the different projects, including its partners, aim to reach over 900,000 farmers.

Contributions from Partnerships

Three main partnership types provide resource leverage to N2Africa; Cooperative-Collaboration agreement, Grants agreement and Sub-contract agreement.

In thirteen cases of Cooperative-Collaboration agreement, the budget of the development partner was shared. This gives an indication of the resources available for achieving the common objectives. This 'contribution' amounts to over $117 million in total, which indicates leverage of resources to the N2Africa project.

In ten cases, N2Africa also received grants from partners to implement joint Work Plans. These plans comprised awarded projects from joint proposals and apply to SILT (IDRC), GALA (UK Aid), AGRA-SSTP (USAID), Sub-contract agreement from IITA-SARD-SC Maize/Soya (AfDB) to N2Africa Partnerships and grants from development partners, such as Women for Women International (WfWI), World Vision International and ZOA to IITA-N2Africa. This resulted in a total of $4.6 million in additional funds.

The Sub-contract agreements are defined as what N2Africa disbursed to partners for specific activities. These comprise research activities as in diagnostic trials or on rhizobiology. In other cases, the Sub-contract agreements are linked to VC partners performing specific tasks not initially foreseen by the partners. The specific tasks add value to the partnership, notably regarding Monitoring, Evaluation and Learning activities. In total, $820,000 has been the contributions of such partners to implement sub-contracted activities.

1.1.3 Stakeholder Platforms

To ensure and guarantee access to input and output markets, several country-specific stakeholder platforms have either been established or linked with project activities. Table 1 shows examples of existing national and regional stakeholder platforms in which N2Africa participates. Furthermore, stakeholder platforms have emanated from partnerships, because of the varied nature of partners with diverse roles and responsibilities which requires coordination.

The platforms are of varied levels (e.g. national, regional, district) depending on the objectives and aspirations of its members. Members of these platforms include both government institutions and private sector organisations, mostly supported by development projects. Through the PPP stakeholder platform meetings in Ghana (involving YARA), farmers could access TSP fertilizer in 2016. In Ethiopia, farmer cooperatives and unions have direct linkage to the inoculant producer (MBI) and output market, such as Guts Agro Industries and Agricultural Commodity Supply (ACOS).

Table 1. Examples of stakeholder platforms

Country	Name of stakeholder platform	Level
Tanzania	Three platforms • The soyabean innovation platform led by East African Grain Council (EAGC); • The Legume alliance led by CABI-ASHC; • Seed policy platform led by AFAP and functioning under the SILT project.	Regional
Uganda	Two platforms • SNV –OSSUP • National Maize and beans platform	National
Ghana	One platform • Soyabean Innovation Lab	Regional
Ethiopia	Emanated from PPPs • Regional and District PPP Task Force	Regional/District
DR Congo	One platform: Humid Tropics III – R4D	Regional

1.1.4 Capacity development

Capacity strengthening is key to sustaining continuous delivery of legume production technologies tailored to local settings. Two key strategies for capacity strengthening have been applied, namely (i) non-degree training and (ii) degree training. Students of different levels participated in the degree trainings, which were used to build national legume capacities.

1.1.4.1 Non-degree training

The non-degree trainings were conducted by implementing partners. Table 2 shows that the total number of persons trained in 2016 increased with 262%, as compared to 2015 achievements. Non-degree training involved both Training of Trainers (ToT) and General training. The ToT focused on enhancing the capacities of partner staff, lead farmers and farmer groups, amongst others. The general training targeted a slightly different group, namely (Lead) farmers, community based facilitators, school feeding cooks, agro-dealers and youth agripreneurs. Topics of the General training were related to collective marketing, group dynamics, strategies to access inputs, legume agronomy including seed productions techniques, legume processing and access to credit and savings. In 2016, about 72% of total persons trained were trained in a General training. Overall an equal number of women and men participated in the non-degree training, 47%, 53%, respectively.

Table 2. Total number of participants trained through non-degree training in 2015 and 2016.

Persons trained in 2015 (#)	Target 2016 (#)	Persons trained in 2016 (#)	Persons trained up to 2016 (#)
7,961	320	24,172	32,717

Figure 6 presents the total number participants trained through non-degree training per country in 2015 and 2016. Figure 7 presents the total number of participants disaggregated by gender per country in 2016. It shows that each country surpassed the number of persons to be trained. However, there are differences among the various N2Africa countries. These differences are mainly related to disperse locations, long travel distances and unfortunate security concerns to reach beneficiaries.

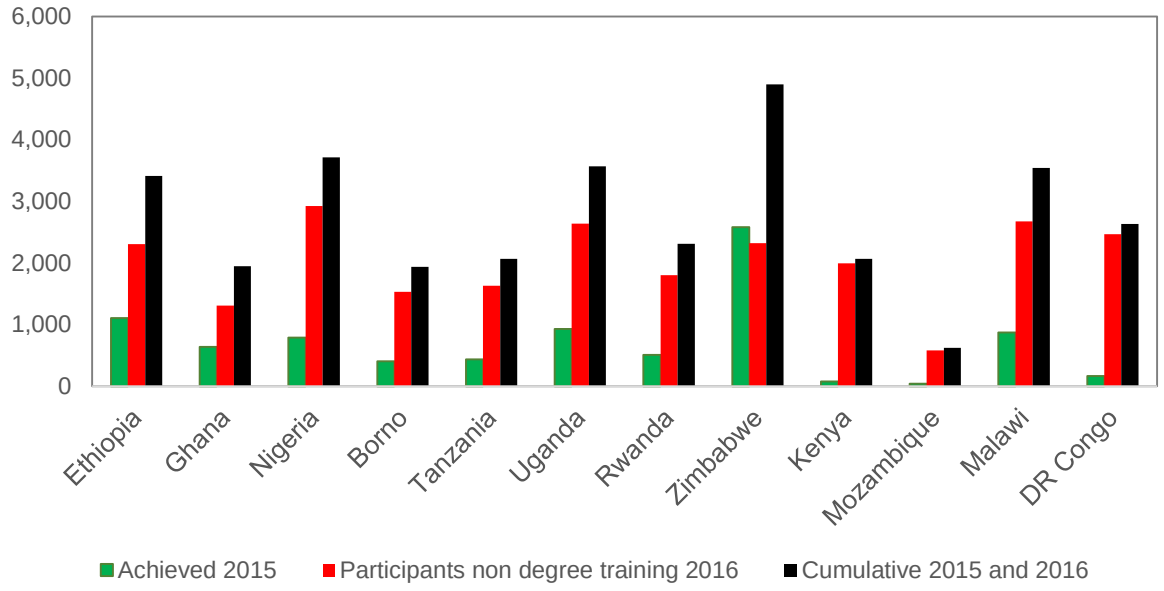


Figure 6. Total number of participants trained through non-degree training per country in 2015 and 2016.

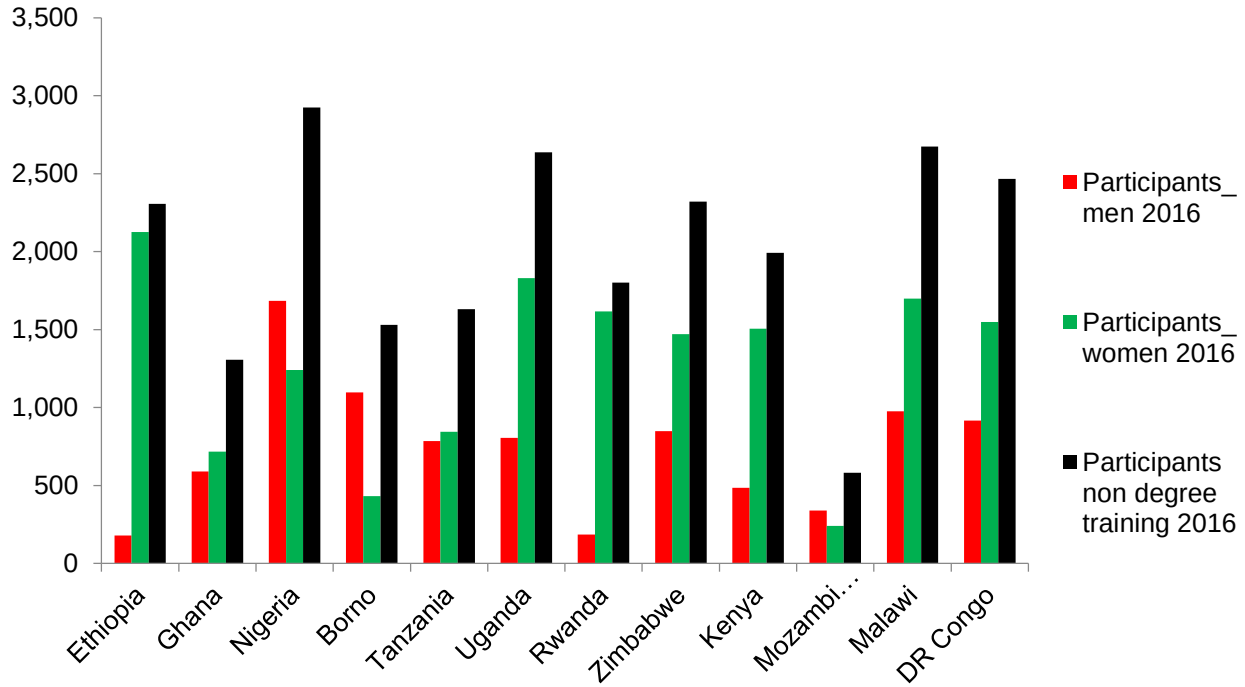


Figure 7. Total number of participants trained through non-degree training segregated by gender per country in 2016.

In Tanzania, many farmers were reached through training on legume marketing, conducted by partner BRiTEN and Faida MaLi. Partners and staff in Nigeria were re-trained on M&E data collection and N2Africa data tools. Furthermore, partners staff and extension officers were trained (ToT) on demonstration trial protocols, inoculant use and storage and legume production technology, amongst others.

Extension materials on legume agronomy and techniques developed with Africa Soil Health Consortium were distributed in Nigeria, Ethiopia, Rwanda, Zimbabwe, Kenya, and Mozambique. All materials are available on http://www.n2africa.org/ and http://africasoilhealth.cabi.org/materials. Materials for Tanzania, Ghana, and Malawi are under development. In Rwanda, partners (e.g. Caritas) have adapted N2Africa materials by assembling all technologies in one book for redistribution.

1.1.4.2 **Degree training**

The degree training targeted students at different levels (e.g. MSc and PhD students). Table 3 shows that 36 MSc students (30% female) and 16 PhD students (31% female) contributed to research activities. Details on research topics, institutions and gender of students are presented in Appendix II.

Table 3. Breakdown of total number of MSc and PhD students trained through a degree training in 2016.

Country	**Student level**				**Total**
	MSc students		PhD students		
	Male (#)	Female (#)	Male (#)	Female (#)	**(#)**
Ghana	6	2	2	0	**10**
Nigeria	7	1	1	2	**11**
Borno State	2	3	1	1	**7**
Tanzania*	1	3	1	0	**9**
Uganda	2	0	1	0	**3**
Kenya	0	0	1	0	**1**
Mozambique	0	0	1	0	**1**
Ethiopia	5	0	0	0	**5**
The Netherlands*	1	1	2	2	**8**
France	1	0	0	0	**1**
Rwanda	0	0	1	0	**1**
Zimbabwe	0	1	0	0	**1**
Total	**25**	**11**	**11**	**5**	**52**

*An additional six interns (33% female) worked in N2Africa in 2016. In Tanzania, four interns, studying on weather forecast and linked to KUKUA, a company working on weather forecast using digital weather stations, were attached to demonstration trials in Moshi and Lushoto Districts, and successfully completed their internship. In the Netherlands, two students worked on the Baseline Study and partnership analyses.

1.2 Dissemination, sustainable input supply and output market

1.2.1 Farmers reached through various dissemination activities

One of the key results to be attained in the project is the number of farmers introduced to the technologies. Farmers were reached through various dissemination activities, such as diagnostic, demonstration and adaptation trials and field days. Introducing farmers to improved legume technologies was a priority project activity during 2016. Major dissemination approaches used include demonstration trials, farmers' adaptation plots, media events and field days. In 2016, a total of 117,313 farmers were reached (49% female). In total, 374,717 farmers have been reached up to 2016 (Figure 8). The total number of farmers reached in 2016 exceeded the 2016 target by 148%.

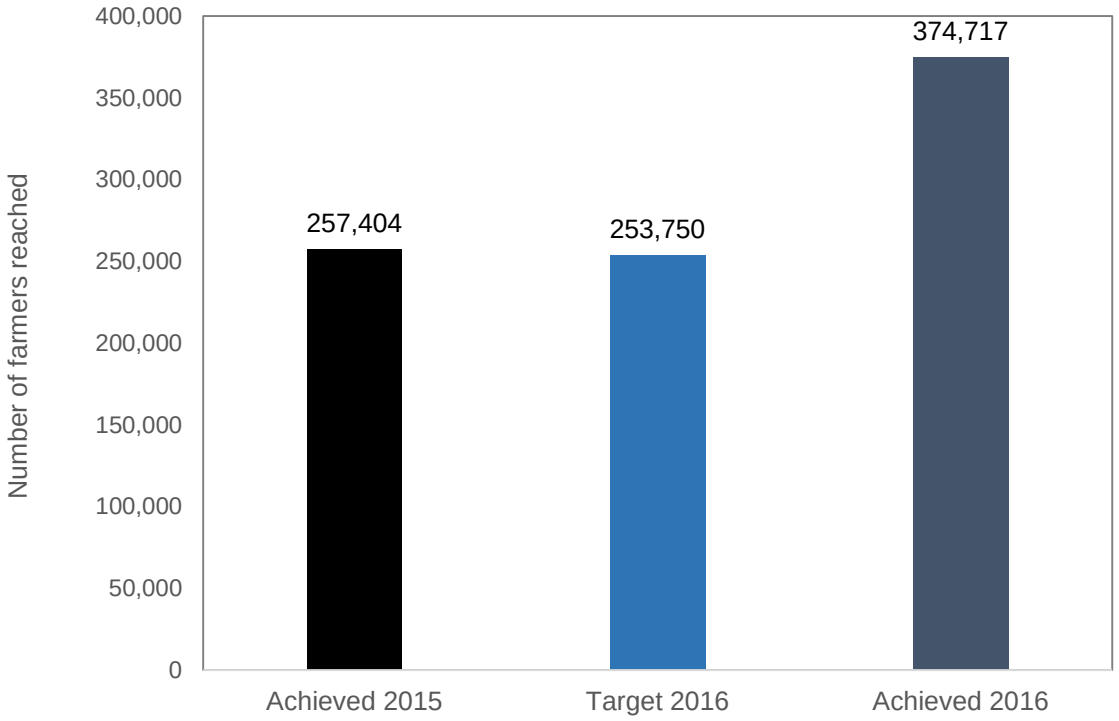


Figure 8. Total number of farmers reached in 2015 and 2016 (target and achieved).

Figure 9 indicates achievements at country level between 2015 and 2016. All countries surpassed the number of farmers to be reached in 2016. However, the increase between 2014 and 2015 was larger than the increase between 2015 and 2016. The project will need to examine partners' capacity to expand their geographical area of coverage and strategize to achieve the final target.

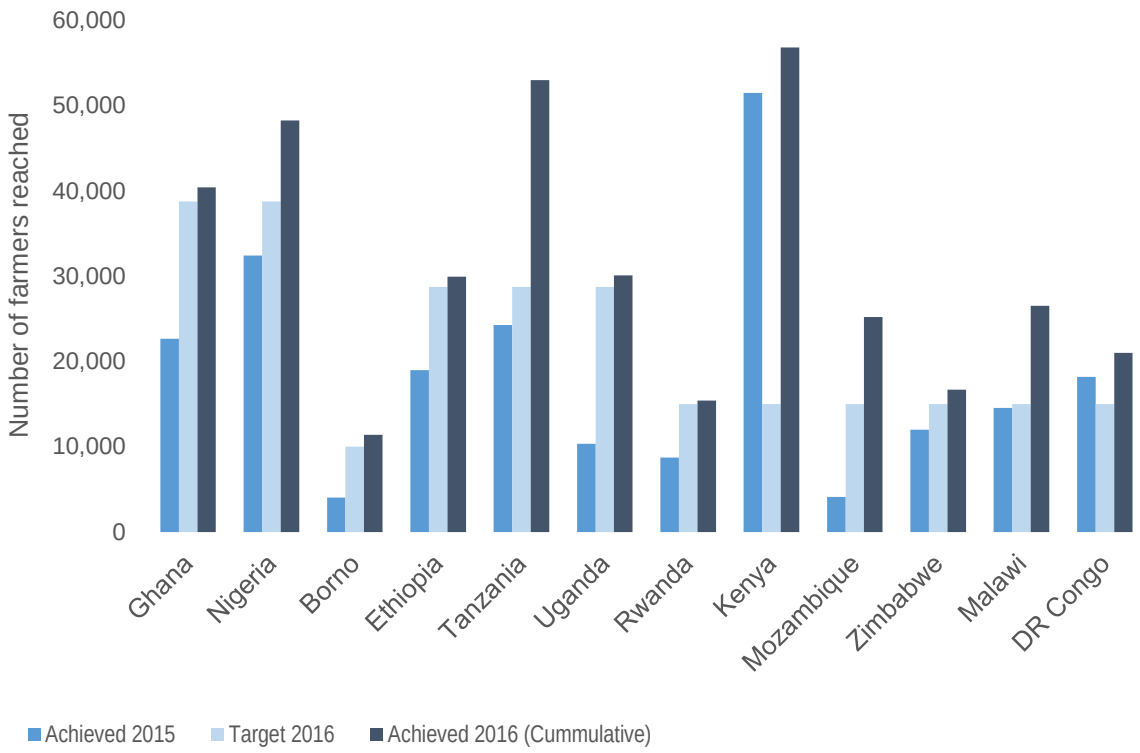


Figure 9. Total number of farmers reached per country in 2015 and 2016 (target and achieved).

1.2.2 Dissemination activities per country

The project and its partners continue to use different dissemination approaches to reach out many farmers. Key among them are demonstrations, adaptations, field days, media events, and video shows. However, these approaches have been adjusted in some countries to include partner feedback and implementation strategies (e.g., expanding area of demonstration to accommodate more farmers and having other new farmers around adaptation plots,). In total, 1,685 demonstration and 34,897 adaptation trials were established in 2016 across all countries. Most households (41%) were reached through demonstration trials followed by field days and agricultural shows (34%). A total of 152,950 farmers had the opportunity to evaluate and learn from the disseminated legume technologies (Table 4).

Though the various dissemination approaches contributed to reaching many households and enhancing farmers' knowledge, field days still proved instrumental to reaching out to 45% of farmers in countries such as Ghana, Ethiopia, Malawi, Mozambique, and Zimbabwe. Over 80 other media events were organized in all countries.

Table 4.Total farmers reached through various dissemination activities per country in 2016.

Country	Total farmers reached	Dissemination activity		
		Demonstration trials	Adaptation trials	Field days, agricultural shows, video
	(#)	(#)	(#)	(#)
Borno State*	7,369	2,000	5,000	369
Ethiopia*	10,934	104	2,925	7,905
Ghana*	17,768	10,246	2,019	5,503
Nigeria*	15,841	3,765	9,807	2,269
Tanzania*	28,726	18,907	8,060	1,759
Uganda*	19,730	8,976	10,197	557
DR Congo	2,829	1,900	NA	929
Kenya	5,331	4,324	NA	1,007
Malawi	11,970	6,000	NA	5,970
Mozambique	21,095	1,200	NA	19,895
Rwanda	6,678	5,448	NA	1,230
Zimbabwe	4,679	251	NA	4,428
Total	**152,950**	**63,121**	**38,008**	**51,821**

* Core countries
NA = Not applicable, since Tier 1 countries do not implement adaption trials.

The effectiveness of the media events (e.g., radio talk shows, video shows, among others) (including reaching out to new actors) is being assessed in Tanzania together with partner projects of Center for Agriculture and Biosciences International (CABI)- Scaling-up Improved Legume Technologies (SILT) project. In Ghana, collaboration with the African Soil Health Consortium is testing some innovative dissemination methods using videos through the GALA project.

1.2.3 Sustainable input supply

1.2.3.1 Inoculant production

One key area to enhance access to inoculants in the countries is for the project to facilitate its availability in all countries by ensuring that at least there are inoculant suppliers through the public-private partnerships. Table 5 summarises the status of inoculant supply in each country and where possible volumes produced or made available.

Table 5. Inoculant distribution channels and volumes produced (tons and number of packets year^{-1}). Note: the number of packets per year are based on the average size of commonly sold inoculant packets.

Country	Mode of availability	Inoculant brand	Main producer /importer	Quantity produced/ imported (tons year^{-1})	Quantity produced/ imported (# of packets year^{-1})
DR Congo	Local production	Inoculant	IITA	0.025	2,500 packets of 10 grams
Ethiopia	Local production		Menagesha Biotech Industry Plc	20.5	164,000 packets of 25 grams
Ghana	Importation	LegumeFix[2]	Green-ef	0.7	2,800 packets of 250 grams
Kenya	Local Production	BioFix	MEA Ltd	3.5	350,000 packets of 10 grams
Malawi	Local Production	NitroFix	Agro-Input Suppliers Limited; Department of Agricultural Research Services	15	300,000 packets of 50 grams
Mozambique	Importation	LegumeFix MasterFix	N2Africa and Partners	0.003	12 packets of 250 grams
Nigeria	Local Production	NoduMax	IITA	8.5	850,000 packets of 100 grams
Rwanda	Local Production	Rizobiyumu	Rwanda Agricultural Board	0.96	12,000 packets of 80 grams
Tanzania	Importation	LegumeFix BioFix	IITA[3] and MEA Ltd	1.3	5,200 packets of 250 grams
Uganda	Local Production	MakFixer	Makerere University	1.5	7,500 packets of 250 grams
Zimbabwe	Local Production		Soil Productivity Research Laboratory	12.5	250,000 packets of 100 grams

[2] Ghana is compiling data to aid registration of NoduMax in the country as the second inoculant brand.

[3] N2Africa Tanzania is discussing with Export Trading Group (ETG) to start the importation of LegumeFix or to get a new importer.

Table 5 shows that the project has exceeded its target of five public-private suppliers of inoculants by 220% by ensuring that all countries (11) have inoculant supply, either through importation and or local production. This achievement made access to inoculants easy in all countries for dissemination activities and increased its availability to farmers. A total of 64 tons year^{-1} of inoculants were either produced and or imported into all target countries. This volume equals 1,944,012 packages. Note, the different package sizes per country. Box II shows progress of Menagesha Biotechnology Industry Plc (MBI) in Ethiopia since 2013.

Box II: Inoculant production, distribution and sales performance at MBI for 2013-2016 in Ethiopia.

As a pioneer private inoculant producing company in Ethiopia, Menagesha Biotech Industry (MBI) was established in 2012 with the objective of producing and distributing inoculants.

The production capacity of the company slightly increased from 30,000 packets (125 grams each enough for a quarter hectare) of inoculant in 2012 to 50,000, 70,000, and 102,000 packets in 2013, 2014 and 2015, respectively. Despite increased production capacity of the plant, MBI has faced different challenges, including limited awareness and use of bio-fertilizers by smallholder farmers, lack of effective input demand information, inefficient distribution infrastructure and poor business linkage all contributing to poor sales performance of the company.

The N2Africa Public-Private Partnership (PPP) has bridged key bottlenecks of inoculant technology promotion, bringing together the National Agricultural Research Systems (NARS), GOs and NGOs working of inoculant promotion, smallholders and the private inoculant producer itself. This approach has further contributed to creating inoculant access to smallholders facilitating business deals through their organization, the Farmers' Cooperative Unions and MBI.

According to the MBI CEO, 2016 was a breakthrough for MBI in inoculant production, distribution and sales as compared to previous years.

Rizobacter: Inoculants for Africa

The presence of Rizobacter, an Argentinian inoculant company established in South Africa, is a promising sign for legume technologies. The company is, with assistance from N2Africa, actively seeking product registration in several African countries. The firm has been a major role player in the bio-fertilizer and adjuvant segments. Through its dealers, products are available in countries like Botswana, Namibia and Zambia. Rizobacter is firmly committed to making its products available to the smallholder African farmer and thus provide them with the latest technologies.

1.2.3.2 Dissemination of legume inputs

The poor availability of legume seed, inoculant and fertilizer was a major challenge. Various strategies were pursued in 2016 in all countries to ensure access by farmers. Most countries, such as Nigeria, Borno State, Ghana, Uganda, Tanzania, produced legume seed (mostly Certified and Quality Declared Seed (QDS)) through community seed producers in 2016. The project's research partners produced Breeder and Foundation Seed, which are used to produce Certified and Quality Declared Seed.

Table 6 shows the quantity of seed produced and used by selected farmers in four countries. On average 36% of the reached farmers in these countries used Certified or Quality Declared Seed in 2016. At project level, the volume of seed used by farmers increased with 45%, as compared to 2015, and has achieved 59% of its 2016 target. In 2016, several community seed producers were trained and linked to seed companies and farmer groups to improve access to certified seeds.

Table 6 shows that seed used by farmers far exceeded volumes produced by seed producers in the four selected countries. This implies that farmers used other stocks provided by agro-dealers and seed companies. In Nigeria, seed production increased through the integration of technologies (e.g. seed, fertilizer, inoculant) into government programs (e.g. Anchor Borrowers Program (ABP)).

Table 6. Seed quantities produced, demanded and used by farmers in 2016 (tons year^{-1}).

Country	Quantity produced	Quantity demanded	Quantity used
	(tons year^{-1})	(tons year^{-1})	(tons year^{-1})
Tanzania	79.3	119.7	163.2
Nigeria	195.72	259.2	277.9
Borno State	58.3	115.5	158.6
Ghana	75	-	116.5
Total	**408**	**294**	**666**

Note: At the time of reporting the four countries had producer group data related to quantity produced, demanded and used in 2016.

In 2016, the volume of seed used by farmers increased. The project achieved an increase of 189% compared to 2015 (Figure 10). In total, 59% of the 2016 target for volume of seed used has been reached.

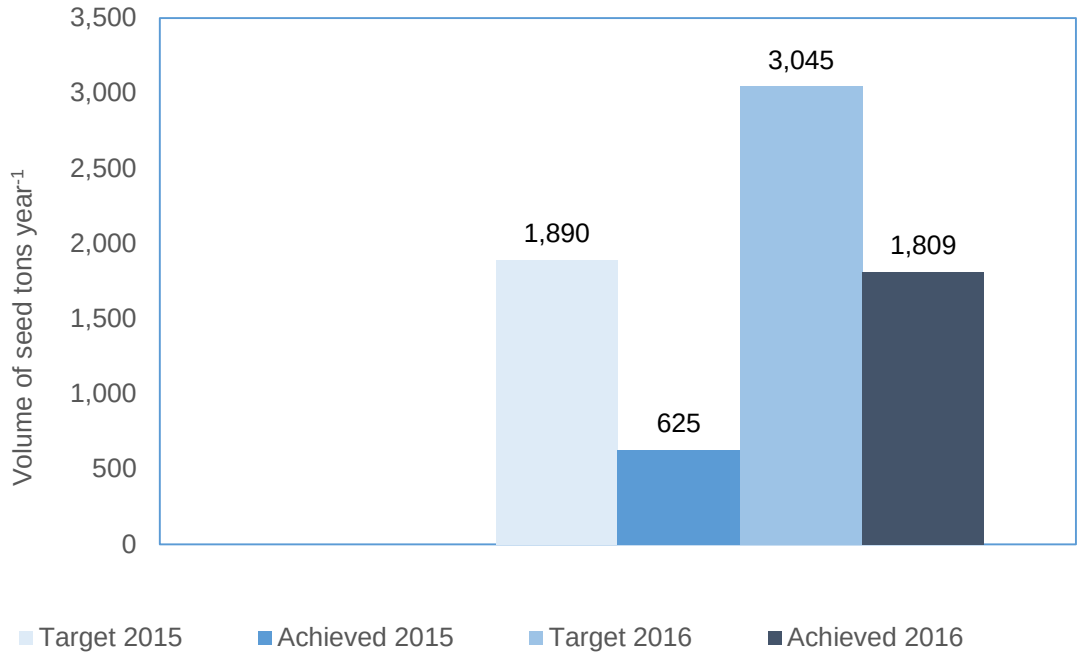


Figure 10. Volume of seed used by farmers in 2015 and 2016 (target and achieved) (tons year^{-1}).

In 2016, the volume of inoculants and fertilizers used by farmers increased with regards to inoculants and fertilizers. The project achieved an increase of 47% and 147%, respectively compared to 2015 (Figure 11 and 12). About 61% of volume of inoculant target (25 tons year^{1}) and 31% of the volume of fertilizer target (5,075 tons year^{-1}) were achieved.

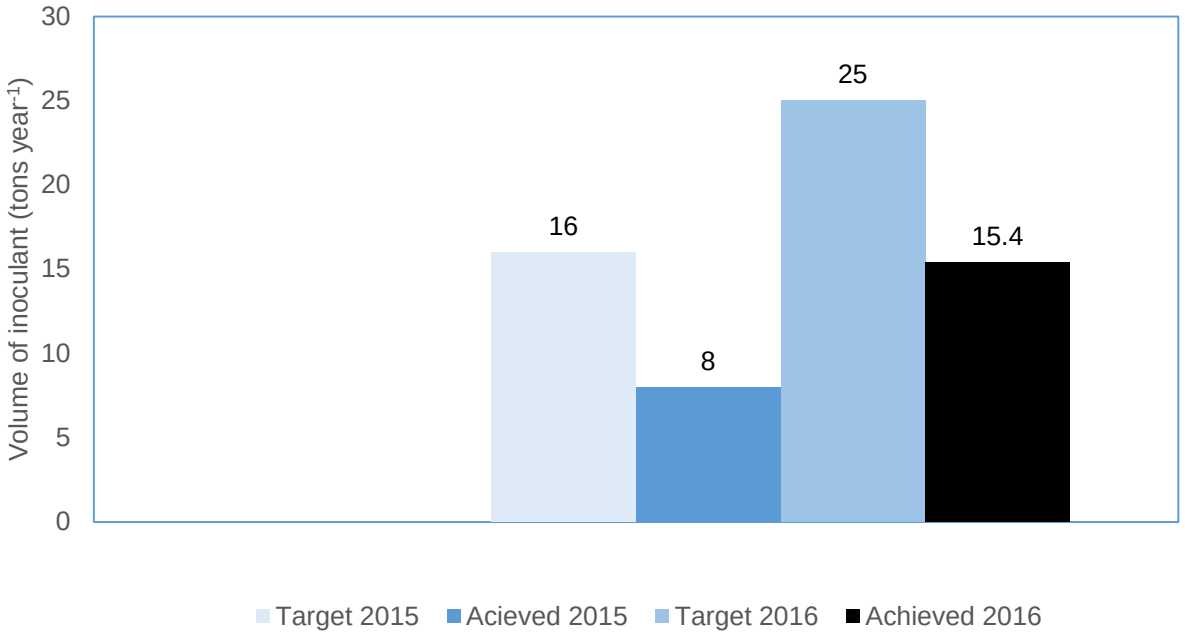


Figure 11. Volume of inoculant used by farmers in 2015 and 2016 (target and achieved) (tons year^{-1}).

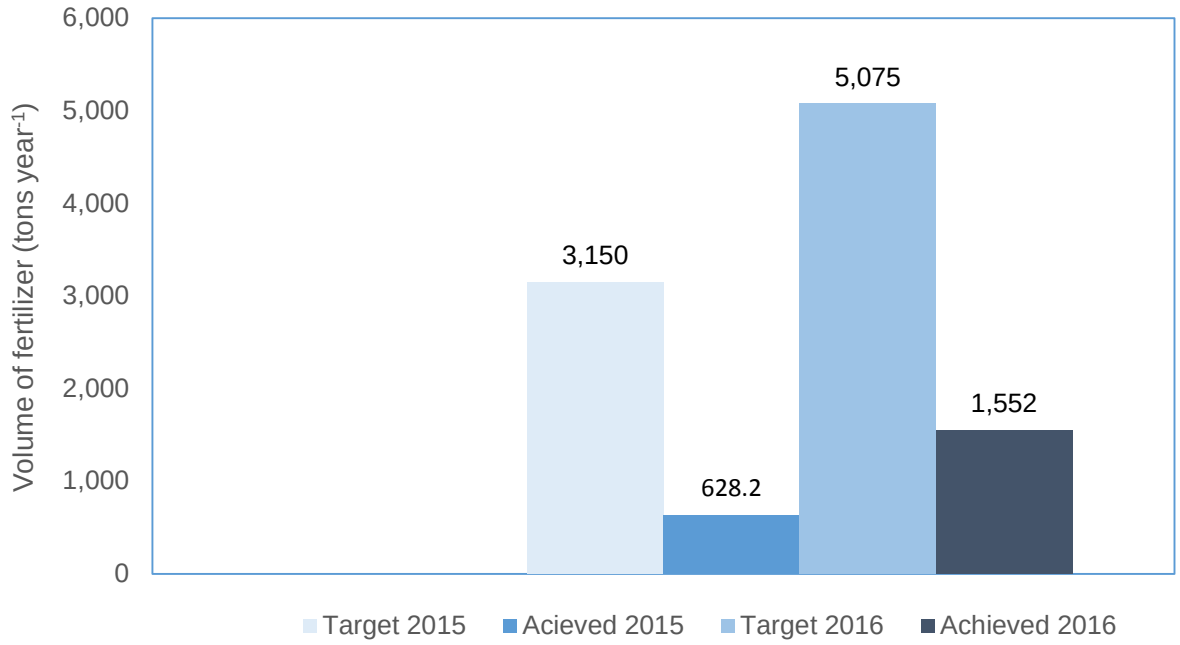


Figure 12. Volume of fertilizer used by farmers in 2015 and 2016 (target and achieved) (tons year^{-1}).

Though the overall targets 2016 have not been met, several input supply strategies implemented in 2016 contributed in achieving results. For example, in Ghana dissemination activities with YARA resulted in an increase in P-fertilizer use by farmers (e.g. from 30.4 tons in 2015 to 150 tons in 2016). In Nigeria, the ABP program contributed to 89% sales of inoculants.

There still remains a number of input supply challenges. Despite the number of trained agro-dealers, 9% of the agro-dealers in the Core countries stocked inoculants in 2016. The main reasons were the limited shelf life and the risk of contamination due to large inoculant packet sizes. Furthermore, many farmer groups were not able to quantify input demand, before the start of the season (e.g. in Tanzania, only 13% of the producer groups provided estimates of their fertilizer demand for supply by agro-dealers).

1.2.4 Output market access and collective marketing

The focus of the project is to ensure farmers have access to output market resulting in improved income. In addition, adding value to grains is key to ensure household consumption and alternative income generation from legumes. In total, 119,690 persons, with 49% female were involved in collective marketing and value addition. Various legumes (mainly soyabean) are processed into high value products, such as soyabean flour, beverages, blend of soyabean flour and other cereals, soyabean cake, groundnut oil and cake, amongst others. The scale of operation was both at household and commercial level, using certified factories (e.g. Kenya).

Collective marketing activities were mostly done through bulking by cooperatives, using formal and informal agreements. The number of farmers accessing output markets (e.g. bulking, cooperatives) is 96% of the target set for 2016 (Table 7). The number of farmers that accessed output markets increased by 35% compared to 2015. The volumes of legumes sold increased substantially in some countries (e.g. Kenya volume of soyabean sold increased by 57%). The increase in number of farmers that accessed output market 2015-

2016 was less as compared to the increase in number of farmers that accessed output market 2014-2015. Various strategies on input-output markets were integrated in the partnerships (e.g. identifying partners with output market expertise to link farmers to buyers and integrating buyer preferred varieties). Although these strategies contributed to achieving the results 2016, several reasons accounted for the decreased percentage of change:

- In Ghana, the major trend indicates that most farmers have quantities of unsold grains of soyabean (some from 2015), because of low prices. Soyabean farmers in Northern Ghana face higher competition due to importation of soyabean (cake).
- Rejection of grains due to low quality;
- High storage cost for bulking and delayed payments.
- Informal agreements with most buyers.
- Most processors are still using local processing techniques, with packaging and hygiene standards as key challenges.

Table 7. Number of farmers accessing output market in 2015 and 2016 (target and achieved).

Achieved 2015	Target 2016	Achieved 2016
(#)	(#)	(#)
80,603	125,000	119,690

Box III. Cooperative Kundumurimo; producing soyabean and bush bean seed in Rwanda.

At the end of Phase I, a group of farmers, now a cooperative called Kundumurimo, started specializing in seed production for soyabean and bush bean. Nowadays, the cooperative sells seed at community level. The cooperative was trained by N2Africa to become a certified seed grower, registered by Rwanda Agricultural Board (RAB). The seeds are produced on a piece of land of 40 ha in a swamp. This swamp provides irrigation possibilities and offers an opportunity to grow seed even off season. The cooperative produces certified soyabean seed and sells them to the Clinton Development Initiative.

1.3 Empower women to increase benefits from legume production

Photo Ken Giller, 2016

Various interventions are being implemented to empower women beneficiaries. These interventions are based on results of gender analysis which identify constraints limiting women participation. The selected interventions include gender specific themes for dissemination activities, identifying business opportunities and supporting their establishment, developing the processing aspects of the value which is key to women, and finally, ensuring the availability of appropriate labour saving tools to resolve drudgery. These interventions are integral part of all partnership agreements depending on the needs.

1.3.1 Overall women participation

About 37% of the lead farmers are female, implementing dissemination trials (e.g. demonstration and adaptation). On average, 42% of the participants of non-degree trainings are female. Overall, women participation in the dissemination activities was about 49%. These women host demonstration and adaptation trials and build capacity of other farmers across the value chain segments (e.g. production, processing, marketing, value addition, amongst others).

1.3.2 Legume processing tools improving nutritional status

Legume processing is a key component to improve household utilization of legumes with a subsequent improvement in nutritional status. It also serves as alternative source of income for women. Activities to support legume processing are integral part of partnerships. Mostly women are trained in the processing of legumes into various products. At country level, opportunities, such as school feeding programs and self-help groups, are identified and combined with activities relating to processing legumes into high value products. In addition to training, over 5,000 women are involved in processing of various products at both household and commercial levels.

To understand the extend of consumption of soyabean products among N2Africa beneficiaries, a study was conducted by the N2Africa Kenya team and led by Ms. Mayam Imbumi. Farmers reported that among children soyabean consumption was important for improving growth and preventing gastrointestinal and health problems. Furthermore, farmers acknowledged that soyabean consumption prevent lifestyle diseases in mothers above 50 years, and contribute to financial gains.

1.3.3 Labour-saving tools

Drudgery is one key constraint within the legume value chain, especially among women. Based on evaluation feedback in 2015, beneficiaries in countries, including Ghana, Nigeria, Tanzania, Malawi and Kenya, have started using labour-saving tools. Other countries conducted an inventory of available labour saving tools in consultation with partners and evaluated soyabean planters, herbicides and soyabean threshers.

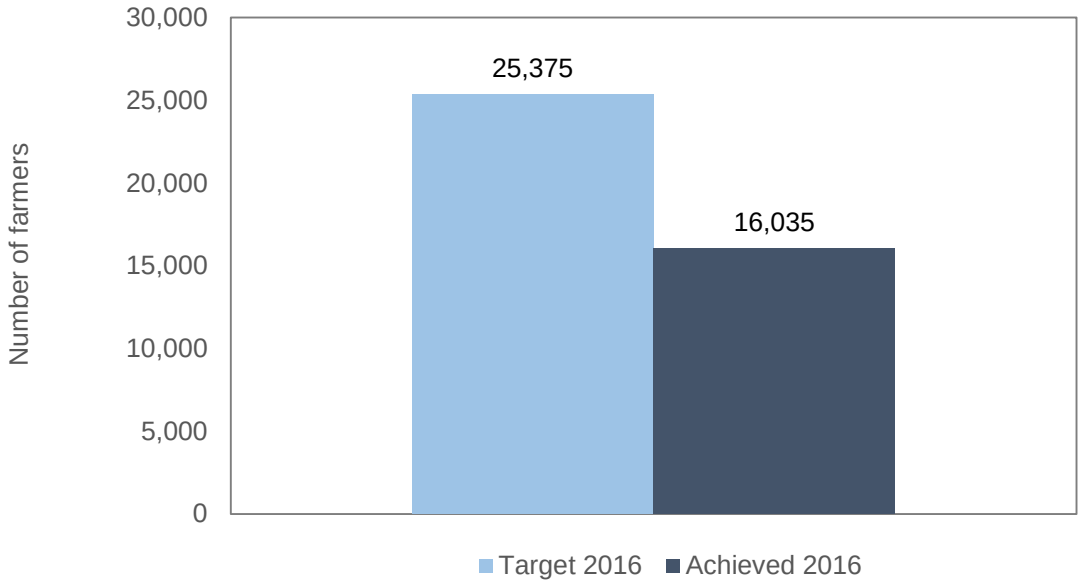


Figure 13. Number of farmers using labour saving tools in 2016 (target and achieved).

In 2016, 63% of the target was reached (Figure 13). About 80% of farmers using labour saving tools are using herbicides, which are obtained mainly from local agro-dealers in the communities. On average, 20% of the farmers are using other tools, including soyabean threshers, groundnut sheller, planters, amongst others. The use of planters is still very minimal. For example, a study in Malawi assessed for example the effectiveness of a groundnut thresher (Box IV). In Borno State, CropLife assessed and started a Spray Service Providers (SSP) Network. Key challenges as indicated by farmers are the limited number of

service providers, leading to high cost and delays in access the tools, inappropriate tools (e.g. groundnut sheller in Tanzania). Though planters have been identified as one of the key labour saving tools, access to these tools has been a challenge due to high cost and limited availability. The service provider model has been identified and a few countries, such as Ghana, Nigeria, Malawi and Rwanda, already identified interested service providers (including Cooperatives in Rwanda) to integrate planters in the dissemination activities.

Box IV. Results of using groundnut sheller in Malawi

Performance criteria groundnut sheller	Threshing machine	Threshing manually
Time needed to thresh one bag of groundnut (30 kg bag^{-1})	9-12 minutes	480-800 minutes
Breakage (%)	2-3%	1-2%
Germination test (%)	96-100%	97-100%
Number of bag of groundnuts threshed (30 kg bag^{-1})	70	-
Number of people who have accessed the threshing machine	60 women and 14 men	-

CropLife Nigeria assessed contract sprayers in Borno State and started a Spray Service Providers (SSP) Network

As part of the monitoring activity done by CropLife Nigeria, the full Spray Service Providers training course was recommended, paying special attention to the practical exercises.

- Crop Life trained 45 Spray Service Providers;
- 41 SSP on average served 593 farmers in one month (approximately one SSP served 15 farmers);
- 85% of the SSPs supply other service in addition to pesticide application;
- 73% scouts for pests and diseases, while 41% provides planting services.
- 85% of the respondent indicated that farmers are always willing to pay the price they are asking for.
- Almost half of the SSPs is very satisfied with their earnings, 44% indicated it is okay.

1.3.4 Businesses opportunities for women

The key to supporting and developing businesses within the values for women is identify opportunities. Situation analysis to identify business opportunities for women have been conducted either through partner systems or formal studies. Box V provides an example of a detailed study conducted in Tanzania to identify women business opportunities. In all, over 15 new business opportunities have been identified across the countries and the value chains' segments and will be pursued in 2017.

Box V. Study on women business opportunities

Situation analysis to identify business opportunity for women was conducted using 43 women groups in production, processing and trading of common bean in Northern Tanzania and 192 women in production, marketing and processing of groundnuts Central Tanzania. The strategy for 2017 is to build the capacity of women on good agronomic practices, business skills and product quality and link them with institutions in marketing, processing and value addition to ensure sustainability.

Table 8. Study results to identify women business opportunities in Tanzania.

Zone	Business opportunity	Strength and opportunities	Weakness and Threats	Remark
Central - groundnut	Groundnut flour for children, pregnant and nursing mothers	Ready market; Raw Materials available	Lack knowledge on preparation; Aflatoxin	required training on preparation and on entrepreneurship
	Powder of groundnuts for spicing vegetables	Ready market; Raw materials available	Common to many households	Feasible for villages with low production potentials
	production of groundnut quality declared seeds	Ready market Women are interest and have experience in groundnut production	Lack of knowledge on seed production Lack of f foundation seeds	Feasible for areas with high production potentials Training on QDS production needed
Northern - common bean	Bean production	Ready market Women interested in bean production Required input available	High incidences of pest and diseases Lack of quality seeds Lack of capital	Highly feasible
	Bean sorting and packaging	Ready market Government promotes value addition	Lack of entrepreneurial skills Low capital	Require capacity building on entrepreneurial skills and value addition
	production of bean quality declared seeds	Ready market Interest and experience in bean production	Lack of knowledge on QDS production High inspection cost Preferred varieties not released in country	Feasible for areas with high production potentials Training on QDS production required

1.3.5 Businesses led by women

Some businesses were established to identify such opportunities. The project aims to establish at least two businesses per each core country (a total of ten by end of the project) with a target of seven businesses to be established in 2016. Figure 14 and 15 show the number of women businesses established at project level and the number of women involved, respectively. An increase of over 120% was achieved on the 2016 target of businesses to be established. There was also a 22% increase in the number of women involved with about 60% being in seed production. Livestock feed as a niche market was identified in northern Ghana by one of the N2Africa PhD students.

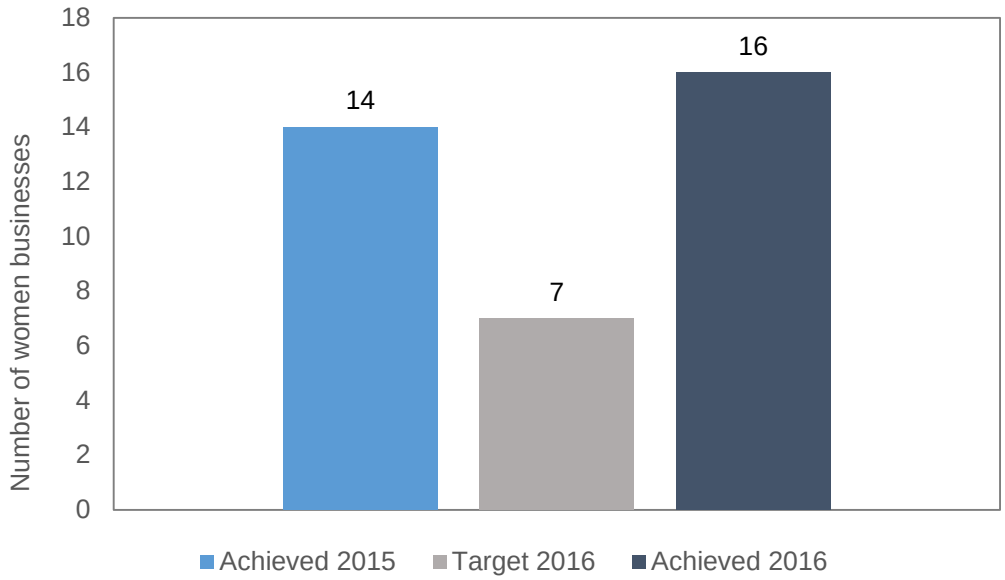


Figure 14. Number of women businesses established in 2015 and 2016 (target and achieved).

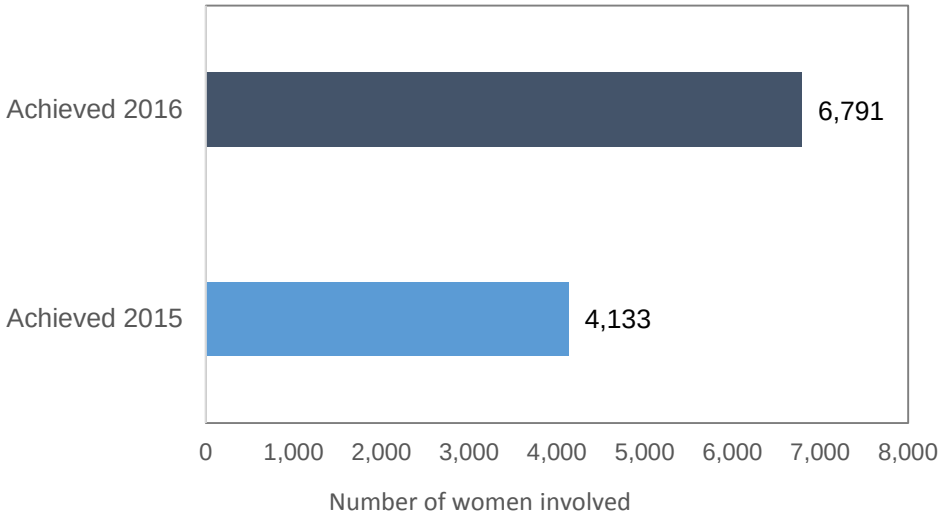


Figure 15. Number of women involved in 2015 and 2016 (target and achieved).

Box VI. Gross profitability analysis for seed production in Uganda

Gross Profit Margin Ratio= (Gross profit/sales) x 100
1. Seed sales Ushs3,025,000
2. Cost of production of seed Ushs1,138,750
3. Gross Profit Ushs1,886,250
Gross Profit Margin Ratio: 62%

Development of new businesses in Rwanda

N2Africa in Rwanda was very successful with BNF technologies increasing legume productivity and the level of technology adoption was strong. There are a number of local initiatives who took over from the formal technology dissemination process and contribute to ensure continuity of N2Africa interventions in Rwanda.

Mrs Nyirandama Marie, Lead farmer in Kamonyi District, Rwanda for example stated: "I started working with N2Africa in February 2010 with a demonstration plot of beans and cassava. I started using mineral fertilizer and improved seeds and became a lead farmer helping other farmers using these technologies. I planted1.8 kg of bean and harvested 32 kg and sold 10 kg to Conseil Consultatif des Femmes (COCOF) to disseminate the seed to other farmers. Five kg was sold to my neighbours. I planted 15 kg using modern techniques, and harvested 250 kg in 2011A. I sold 80 kg to COCOF to disseminate to other farmers, at the price of 500 FRW kg^{-1}. I became popular in the neighbourhood, because of the new variety of bean, RWR2245. Everybody was looking for this new variety and I continued to grow this bean. We grew it during three seasons. On average, we harvested 200 kg each season, sometimes even 300 kg per season. Per year, we have around 600 kg of bean harvested. We keep around 100 kg for home consumption. On average, we sell at 450 FRW kg^{-1}, now it is 500FRW kg^{-1}. It is a superior variety in terms of cooking time, taste and colour. We have a good market for seed and grain of RWR2245 bean variety."

In addition to women businesses, youth are also supported under N2Africa Borno State to earn a living through engagement in the various value chain activities. At least 2,000 youth living in Borno State are to be engaged in agribusiness models. In total 87 trained youth agripreneurs were empowered with starter packs (worth US$117,000) to commence business activities. A total of 127 youth (28 % female) have been trained and are engaged in various agribusinesses with the expectation of each creating direct and indirect job opportunities for at least ten other youth in Borno State.

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

1.4.1 Diagnostic, demonstration, and adaptations trials

A total of 428 diagnostic trials were established in 2016 responding to key research questions emanating from dissemination activities with partners (Table 9). A total of 2,183 demonstration trials were established focusing on disseminating a single or a combination of technologies. The demonstration trials showcased the best-best technologies to large numbers of farmers and are used to collect data on the performance of these technologies. Evaluation of these technologies are conducted with farmers to ascertain their preferred technologies which are used to reshape the technology packages to be accessed by farmers. Adaptation trials are small trials established and managed fully by farmers (with limited backstopping) to determine how technologies are adapted by farmers to their settings. In 2016, a total of 29,178 adaptation trials were established by farmers on their farms. A selection of these adaptation trials are closely monitored to assess the performance of the technologies under the heterogeneous farmers' conditions and management. Table 9 gives an overview of the total number of trials established in the Core and Tier 1 countries in 2016.

Table 9. Total number of trials per type established in 2016.

Country	Diagnostic trials	Demonstration trials	Adaptation trials
	(#)	(#)	(#)
Ghana	15	394	2,019
Nigeria	88	638	4,088
Borno State	40	80	5,000
Ethiopia	40	104	2,925
Tanzania	37	308	8,060
Uganda	208	260	10,197
Rwanda	**	8	**
Kenya	**	27	**
Mozambique	**	248	**
Zimbabwe	**	50	**
Malawi	**	50	**
DR Congo	**	16	**
Total	**428**	**2,183**	**29,178**

** Not applicable

1.4.2 Results from adaptation trials

Table 10 shows the relative yield increase (%) of various legumes on N2Africa plots (adaptation trials) as a proportion of the yield on control plots (farmer main field plots) in 2016. These yields are plot-level estimates based on ten by ten meter plots, located in Ghana, Uganda and Tanzania. There is an experimental error associated with such estimates, which may inflate the proportion of fields with more than 50% yield gain. Regarding yield gains, the relative increase ranged from 13% to 138% across the countries and legumes for N2Africa plots compared to the control. Cowpea yield on the N2Africa plots in Tanzania yielded 138% as compared to the control plots, 61% in groundnut yield in Ghana and 13% climbing bean in Uganda. The latter increase was not significant, related to the observation that responses to TSP were low in the 2016B season.

Table 10. Preliminary results of adaptation trials in 2016.

Country	Legume	Mean Yield N2A	Mean Yield Control	Mean absolute increase	LSD *	Increase Relative	Observed proportion of plots with yield gain >50%	Sample size
		(kg ha^{-1})	(kg ha^{-1})	(kg ha^{-1})		(%)	(%)	# control versus treatment comparisons (n)
Ghana	Soyabean	1470	1077	393	65	36	46	61
Ghana	Groundnut	1578	981	597	152	61	54	54
Uganda	Climbing bean	1986	1758	228	424	13	28	18
Tanzania	Bush bean	418	297	121	25	41	42	151
Tanzania	Cowpea	602	253	349	39	138	81	158
Tanzania	Groundnut	929	811	118	158	15	33	9

* Least Significant Difference

The proportion of N2Africa plots with more than 50% yield was also high for soyabean and groundnut in Ghana, 46%, 54%, respectively. Similarly, 42% of bush bean plots, 81% of cowpea plots and 33% of groundnut plots in Tanzania showed a yield gain of over 50%. In Uganda, N2Africa climbing bean plots yielded over 50% more than farmers' plot in only 28% of the cases. The very low yields observed for Tanzania reflected the effects of poor rainfall on productivity.

In terms of recommendations, the distributed packages resulted on average in yield gains. The various technology packages were, because of the yield increases, integrated in the dissemination activities (e.g. demonstration and adaptation trials). These enabled farmers to learn, assess and evaluate such technologies for adoption to improve their productivity.

Table 11. Selected recommended technology packages in 2016.

Country	Legume	Treatment
Ghana	Soyabean	Soyabean varieties (Atairak, Soungpung), TSP, Inoculant
Ghana	Groundnut	Groundnut varieties (Samnut 22, Samnut 23), TSP
Ethiopia	Bush bean	Bush bean varieties (Nasir, Anger), DAP
Uganda	Bush bean	Rwr (iron-enriched 2154, iron-enriched 2245, TSP
Uganda	Climbing bean	Flat white, nyiramuhondo (iron-enriched, Nabe 12c), TSP
Uganda	Soyabean	Maksoy 2N, Maksoy 3N, Maksoy 4N, Maksoy 5N, TSP and MakbioFix (inoculant)
Tanzania	Bush bean	NPK fertilizers and seeds of improved varieties (Jesca and Lyamungu 90)
Tanzania	Cowpea	Cowpea improved variety (Tumaini, vuli, raha), DAP, insecticide
Tanzania	Groundnut	Farm yard manure, Minjingu Rock Phosphate (MRP) and gypsum

Table 11 indicates selected country specific technologies disseminated. In Tanzania, NPK fertilizers and seeds of improved varieties emerged as most farmer preferred especially for farmers in Moshi District. Though in Lushoto District, there was no significant response to NPK in most the demonstrations. Nevertheless, the use of NPK fertiliser in bean production is firmly recommended in Northern Tanzania based on previous experience. Recommended input packages for groundnut are readily available and more affordable to smallholder farmers in Kongwa District. However, the emerging challenge is to transfer these legume-based technologies and to facilitate farmers' use, considering diverse farm factors. For example, good yields were obtained in fields where soil moisture prevailed and vice versa. This therefore requires a critical analysis of available data to identify niches (soils, other environmental factors) and develop recommendation domains for use of tested technologies.

In Uganda, the results showed that location effect was significant, resulting in bush bean yield response three times better in Kibale District than in Rakai District. These findings are useful and indicate a need to devise strategies to adapt to poor rainfall. In case of TSP. Use of TSP requires agro-dealers to supply, as it is not available in the input shops in both locations. Whereas, the bio-fortified bush beans are promoted for nutritional purposes, the marketability is important to farmers for their uptake. Preferred market traits, such as seed size, should be included in the criteria for selection of varieties for dissemination. Production of climbing beans improves by applying lime and phosphorus (Figure 16). Soyabean yield benefited from applying inoculants and phosphorus (and lime). These packages could be released for adaptation trials in 2017 and the extent to which these technologies close yield gaps will be analysed, including 2016B data (not yet harvested) for their profitability. These technologies also need to be customized to different types of farmers and cropping systems.

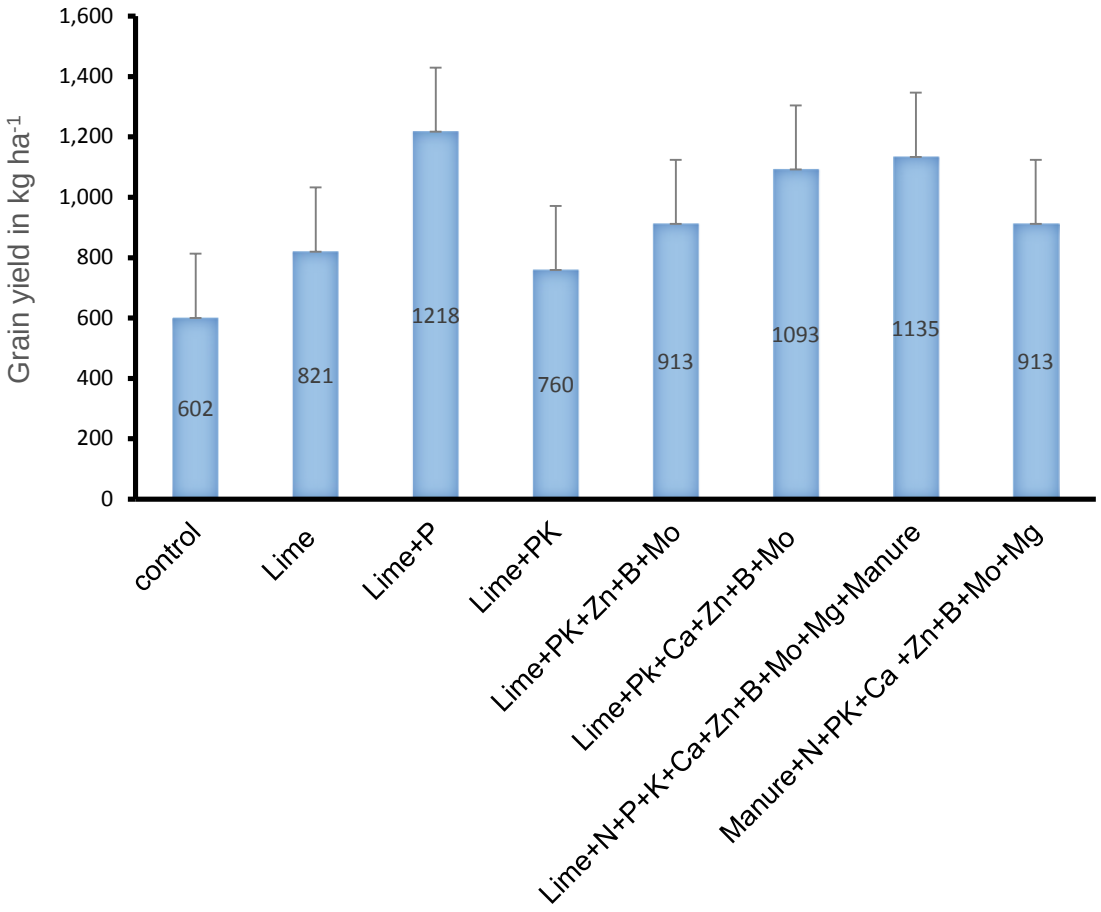


Figure 16. Grain yield of climbing bean (NABE 12C) to different combination of fertilizer blends, 2016A in Uganda.

In Ethiopia, the application of phosphorus and/or inoculants resulted in increased yields in most of the trials, though there was wide variability in responses across farms in different agro-ecologies. Phosphorus application to soyabean resulted in only 10% yield increase, thus indicating how farmers lose the benefit of the application of P-fertilizer without sufficient nitrogen available to the plant, for which inoculation provides the most affordable option for resource poor farmers.

Farmers benefiting from legume crop residue in Ghana.

1.4.3 Use of crop residue for livestock feed

Intensification of crop-livestock interactions is done through enhancing feed availability of legume crop residues, amongst others. The niches for use of legume crop residues within and between farms have been identified in Ghana through the PhD study of Daniel Akakpo. The study results stimulate availability of feed in the dry seasons in northern Ghana. Farmers have been trained in handling and storage of legume crop residues for dry season feeding livestock. Haulms of legumes (e.g. soyabean, cowpea and groundnut) are stored by livestock farmers or by other farmers, who sell or exchange the haulms for manure. About 900 farmers are expected to store and trade legume residues during the dry season.

In Ethiopia, the results of a study to evaluate farmers' perception showed legume haulms are used as feed (77%), fuel (12%), mulching and compost making (9%) and income generation (3%). About 62 of the respondents perceived inoculant and P-fertilization as having positive impact on haulm biomass yield. Analysis of the biomass yield data revealed that soil fertility treatments resulted in a significant (P<0.05) improvement in haulm dry matter yield over the control, except for chickpea. Variations were, however observed among the studied legumes in their responses to the selected treatments. A study on the nutritional quality of the grains and crop residues revealed significant improvement in % crude protein content. For example, Figure 17 presents the effects of P-fertilizer and inoculant on haulm crude protein content of common bean, Shalla District, Ethiopia.

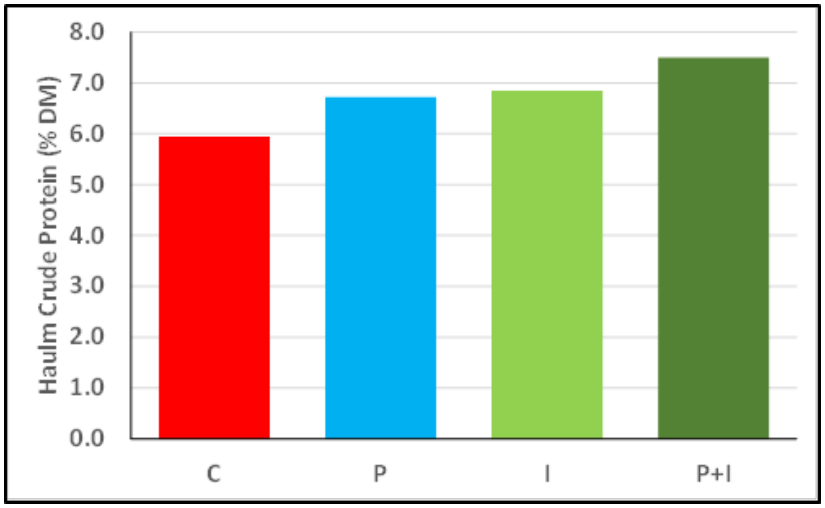


Figure 17. Effects of P-fertilizer and inoculant on haulm crude protein content of common bean, Shalla District, Ethiopia (DM%).

Key: C = Control (-I-P), P = Phosphorus fertilizer without inoculant (+P-I), I = Inoculant application without Phosphorus fertilizer (-P+I), P+I = Phosphorus fertilizer and inoculant (+P+I)

1.4.4 Rhizobiology

Key interventions of N2Africa under rhizobiology were to isolate, authenticate and evaluate new strains of rhizobia for the target legumes. Analyses for high symbiotic effectiveness identified elite strains and inoculant formulations for bean, groundnut and cowpea., The competitiveness and survival of introduced strains as affected by management and environment were evaluated. And finally, standard operating procedures for the production, quality control and application of rhizobium inoculants were developed. A total of 446 new strains (e.g. 300 in Uganda, 128 in Ethiopia and 18 in Tanzania) have been isolated and 920 candidate strains authenticated (including isolates from 2015). These include strains for chickpea, common bean, faba bean and soyabean in Ethiopia, climbing bean in Uganda, common bean in Tanzania and cowpea in Nigeria. Eight of these strains have been identified as elite strains (e.g. chickpea in Ethiopia, common bean in Tanzania and climbing bean in Uganda). In Ethiopia, the effective candidate strains are being tested in Strain x Variety field trials for verification, before being made available for inoculant production.

Table 12. Details of country specific strain isolation and evaluation.

Country	Type of Legume	New isolates (indigenous) collected	Candidate strains evaluated and authenticated	Elite rhizobia identified
		(#)	(#)	(#)
Ethiopia	Chickpea	40	28	3
	Common bean	43	23	-
	Fababean	30	24	-
	Soyabean	15	6	-
Uganda	Climbing bean	300	9	3
Tanzania	Common bean	18		2
Ghana	Soyabean		7	
	Cowpea		7	
	Groundnut		6	
Kenya	Pea	11	2	
	Soyabean	67	8	
Nigeria	Cowpea	800	800	-

For characterization of rhizobium for use as inoculant strains it is critical to determine its ability to nodulate effectively. A greenhouse experiment was conducted using ten selected isolates from a greenhouse at Embrapa Agrobiologia, Brazil. Seven out of ten isolates could induce nodule formation. DNA Extraction and Partial Sequencing of sixteen SrRNA gene was also done in Ghana. Cluster analysis showed that five of the isolates belonged to the Bradyrhizobium japonicum clade. The characterization of strains in Ethiopia is underway using commercially available strains (EAL-029, HB429, EAL-110) as references in the evaluations.
In all, four elite strains have been identified for inoculant production out of which one has been advanced into production as a faba bean inoculant in Ethiopia. In Ghana, twenty candidate strains are being evaluated and a study is also ongoing in northern Ghana to evaluate seven strains (NC92, SNN336, MJR493C, SBG234, IGB469, SNN345, and BR326) using cowpea and groundnut hosts. The strains were gathered from N2Africa collaborators in different countries to ascertain whether these strains could be readily advanced into inoculant production.

1.4.5 Inoculant quality control

N2Africa supports quality control of inoculants being used in the various countries through partnership with in-country institutions. Currently, quality control is carried out in ten of the target countries (e.g. Nigeria, Ghana, Ethiopia, Tanzania, Uganda, Zimbabwe, Kenya, Rwanda, DR Congo and Malawi). Efforts made include supporting government institutions, such as Sokoine University of Agriculture (SUA) in Tanzania and Mozambique Agricultural Research Institute (IIAM) in Mozambique, with equipment for quality control. Due to staff turnover, planned quality control activities have not yet started in Mozambique. Table 13 shows quality control results in Tanzania, Ethiopia and Ghana.

Routine quality control tests were conducted in most countries, either by the inoculant producers or designated institutions in the target countries. So far, N2Africa has results from Kenya, Ghana, Nigeria, Tanzania, Ethiopia and Uganda for the following products; BioFix, NoduMax, LegumeFix, MakFix, and inoculants from Menagesha Biotechnology Industry Plc in Ethiopia.

Table 13. Quality Control results of inoculants in Tanzania, Ethiopia and Ghana.

Country	Product	Number of packages (n)	Rhizobia (CFU g^{-1})		Contaminants (CFU g^{-1})
			Min.	Max.	
Tanzania	LegumeFix	7	$4.4*10^6$	$5.7*10^9$	0*
Tanzania	LegumeFix	1	$1.2*10^4$	-	$2.4*10^7$
Tanzania	MEA Ltd	1	$4.6*10^7$	-	$2.6*10^6$
Ethiopia	MBI	-	$4.4*10^6$	$5.7*10^9$	0*
Ethiopia	EIAR-HARC	-	$1.2*10^4$	-	$2.4*10^7$
Ghana	NoduMax	5	$2.5*10^9$	$9.0*10^9$	-*
Ghana	LegumeFix	6	$1.2*10^9$	$8.0*10^9$	-*

* Not detectable (0); Not determined (-).

The inoculant quality control tests conducted by MIRCEN laboratory, Kenya indicated that both BioFix and NoduMax contain adequate numbers of rhizobia given the established threshold of >1 x 10^9 rhizobia g^{-1} inoculant (Table 14). BioFix exceeded this threshold 5.7-fold and NoduMax 12.3-fold. However, the amount of contamination occurring in BioFix, with 29-fold more non-rhizobia than the threshold <1 x 106 g^{-1}, is of concern. In contrast, NoduMax contained no detectable contaminants. This could be the result of sterilization of the carrier material.

Table 14. Results of the inoculant quality control (QC) tests conducted by MIRCEN laboratory in April 2016 (± SEM).

Legume host	QC samples	Rhizobia	Contaminants
BioFix	N	x 10^9 g^{-1}	x 10^6 g^{-1}
Bean	8	4.9 ± 0.7	32.7 ± 2.3
Desmodium	2	6.3 ± 0.1	37.5 ± 4.2
Green gram	4	7.4 ± 0.3	14.2 ± 1.8
Lucerne	2	6.1 ± 1.3	18.3 ± 10
Pea	4	5.6 ± 1.3	41.7 ± 7.7
Soyabean	4	5.6 ± 1.0	26.7 ± 5.6
Overall	24	5.7 ± 0.2	28.9 ± 1.3
NoduMax			
Soyabean	4	12.7 ± 4.3	none detected

1.4.6 Quality control of inoculants along distribution channels

Quality control tests of inoculants have been conducted by inoculants suppliers in several countries in West Africa and in Uganda. The tested inoculants were sampled along distribution chains. In West Africa, LegumeFix (United Kingdom), NoduMax (IITA-BIP, Nigeria) and Wageningen University & Research (WUR, The Netherlands) jointly followed up on quality of LegumeFix inoculants. The inoculants were initially supplied to N2Africa in Nigeria and later transferred to Ghana (Tamale) for distribution during the 2016 growing season. The quality control tests were extended to include the NoduMax inoculants distributed over the same period in Nigeria. In Uganda, the quality of the locally produced inoculant (e.g. MakFix) was examined from samples collected from agro-dealers.

1.4.6.1 **Distribution channels in Ghana**

Results of quality control tests of LegumeFix inoculants stored in Nigeria at the time of its transfer to Ghana are presented in Table 15. The results show that the inoculant packages contained both high density of rhizobia and no detectable contaminants, which suggest that the inoculant properties were likely not compromised by storage conditions imposed in Kano. However, a great proportion of the packages were physically weakened by scratches, likely through manipulation. Results of subsequent analysis conducted in Ghana confirmed that product concentrations in rhizobia remained high before distribution. Analysis by LegumeFix Ltd. of packages collected from distribution channels in Ghana confirmed the poor physical appearance of inoculant packages (Image 1). Loss of physical integrity of packages was reported, which caused air and contaminants to get inside the inoculant package, thus compromising its quality. The major recommendation is that inoculant distribution actors, such as agro-dealers, need to improve greatly on inoculant package handling to preserve the quality of product to the benefit of farmers.

Table 15. Results of quality control (QC) tests conducted at NoduMax on LegumeFix inoculants stored in Kano, Nigeria.

LegumeFix (batch Ref.)	Number of inoculant packages	Count (CFU g^{-1})		Observation
		Rhizobia	Contaminants	
A	1	1.0E+10	0*	≥40% of the packages have lost their tightness
A	2	1.7E+09	0*	
B	1	1.2E+10	0*	
B	2	4.3E+09	0*	
C	1	1.0E+10	0*	
C	2	2.3E+09	0*	
D	1	2.0E+09	0*	
D	2	1.8E+09	0*	
E	1	1.3E+09	0*	
E	2	3.7E+09	0*	
Average	**-**	**4.9±0.4E+09**	**0***	

* Not detectable (0)

Image 1. Physical appearance of LegumeFix packs from Ghana agro-dealers showing airtight intact pack (left) and aerated or loosed pack (right) (Courtesy: Legume Technology Ltd.).

1.4.6.2 Distribution channels in Uganda

Table 16 presents data on density of rhizobia for inoculant packages (MakFix) distributed in 2016 in Uganda. These count ranges were about 2-3 units (Log) below the standard value adopted by the N2Africa project. This indicated that there is room for improvement of product handling across distribution channels. More data, such as product quality at factory gate and the status of contaminants, may be needed to address potential problems and provide solutions.

Table 16. Quality control MakFix under distribution channels in Uganda 2016.

Serial number	District	Inoculant packets (#)	Cell Count (CFU g^{-1})		Observation
			Min.	Max.	
1	Tororo	6	$3.5*10^6$	$4.6*10^7$	Samples not analysed for contaminants
2	Lira	6	$7.0*10^6$	$4.6*10^7$	

1.4.6.3 Distribution channels in Nigeria

Studies on inoculant quality recovered from distribution channels in Nigeria focused on NoduMax. These inoculant packages are locally manufactured, which allows easy follow up on quality changes, against the initial properties observed at the factory gate (Table 17). In 2016, packages containing >10^9 cells g^{-1} were issued for distribution to a main private distributor, coordinating a network of agro-dealers. Subsequently, random sampled packages from agro-dealers in different States indicated that populations of rhizobia had seriously dropped to values as low as 10^7 to 10^6. Storage conditions were observed along the supply chain at times of sampling. However, there was no evidence that storage conditions played a clear role in product quality changes. The number of contaminants randomly increased, which resulted into poor product quality relative to the initial standard. Physical parameters (e.g. temperature) around the distribution conditions (e.g. transportation and storage facilities) are important indicators that may need to be monitored for a better understanding of quality changes to address the issues.

Table 17. Quality control of NoduMax under distribution channels in Nigeria in 2016.

Date	State / Lg	Conditions of storage	Batch ID	Packs	Cell count (CFU g^{-1})			
				(n)	Product under distribution		Product at Factory gate	
					Rhizobia	Contaminants	Rhizobia	[a]Contaminants
					Mean ± SEM	Mean ± SEM	Mean ± SEM	Mean ± SEM
20/7/16	Kaduna/ pampaida	A	**SN 16-012**	2	1.3±0.01*10^9	2.8±0.5*10^8	6.7±1.4*10^9	2.0±0.7*10^5
20/7/16	kaduna/Kubau	B	**SN 16-027**	2	1.3±0.2*10^7	3.5±2.5*10^7	1.0±.3*10^9	0
2/8/2016	Kaduna/Giwa	A	**SN 16-10**	2	1.8±0.8*10^7	1.1±0.1*10^7	3.0±1.4*10^10	2.3±0.2*10^5
4/8/2016	Kano/ Bukure	A	**SN 16-001**	2	3.2±2.2*10^8	6.3±4.4*10^7	2.6±0.8*10^9	0
9/8/2016	Kaduna/ pampaida	A	**SN 16-115**	2	4.5±0.6*10^8	2.3±1.2*10^6	1.0±0.2*10^9	0
10/8/2016	Kano/Rogo	A	**SN 16-18**	2	1.2±0.8*10^7	7.5±5.3*10^6	2.0±1.2*10^9	0

**: Staked on the floor in the store (A); On the floor inside the house (B); Not detectable (0); Not determined (-).

To support partner institutions, carry out production, quality control and application of inoculants, Standard Operating Procedures (SOPs) for quality control and application have been developed in conjunction with the COMPRO II project. These SOPs were shared with partners in various countries. Most partners have adapted the SOPs. In Tanzania, Uganda, and Ghana, SOPs have been adapted by Tanzania Fertilizer Regulatory Authority (TFRA), Makerere University and Kwame Nkrumah University of Science and Technology (KNUST), respectively. In Ethiopia, there are drafts of Standard Operating Procedures for culture preparation, inoculant production, quality control and storage and inoculant application. These drafts are awaiting approval of the Ministry of Agriculture and Natural Resources (MoANR) in Ethiopia.

1.4.7 Agronomic studies and lessons learned

This year saw the completion of a number of agronomic studies reporting on findings from N2Africa agronomy trials. One study forms the culmination of a large-scale effort to draw lessons from the past six years of on-farm trials on soyabean inoculation. By analysing more than 2,000 trials across ten countries and five years, we could evaluate the overall expected benefits of the use of inoculant, as well as patterns of variation in response (Figure 18). Major findings of this study were that despite of a moderate average effect of around 115 kg ha^{-1}, inoculation is expected to be economically beneficial in 97% of cases. However, large variation in response between years and locations was observed, much of it at the level of individual plots. This result suggests that dissemination trials may benefit from farmers observing multiple plots. Response to inoculation tended to be strongest for non-promiscuous varieties, without apparent yield penalties in the absence of inoculation, except for sites where bacterial populations seemed insufficient.

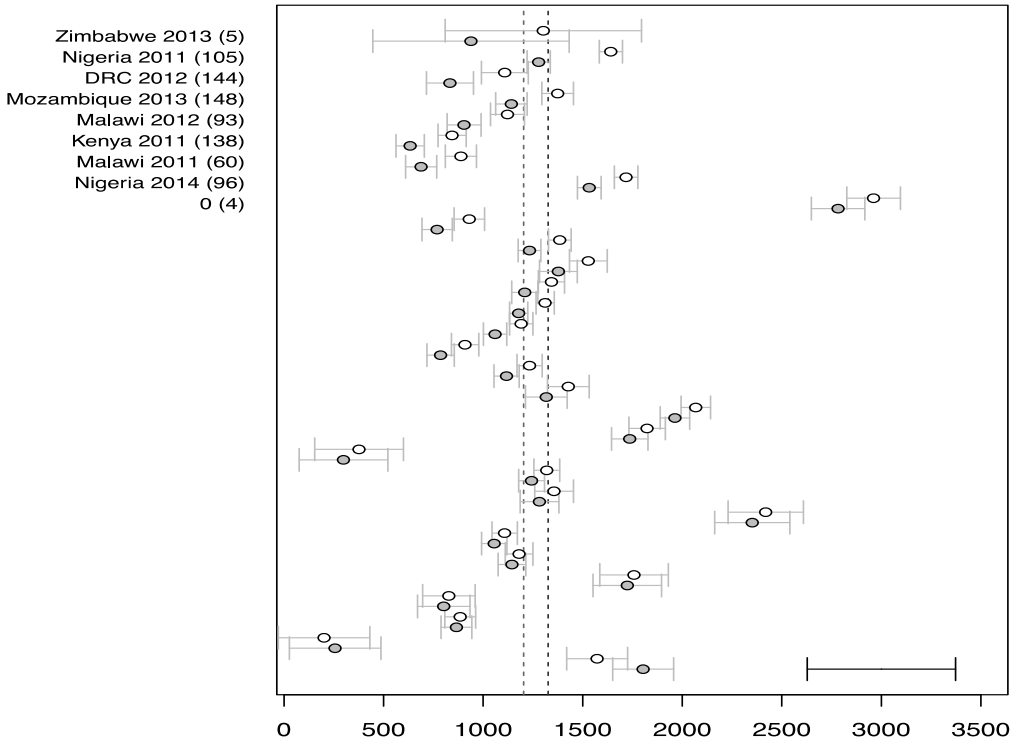


Figure 18. Average grain yields per country $year^{-1}$ without inoculation (grey), with inoculation (white) (kg ha^{-1}). Note: Grey whiskers indicate standard errors of difference within country $year^{-1}$, black whiskers at the bottom right indicate the average least significant difference for between country $year^{-1}$ comparisons. Entries are sorted vertically by magnitude of inoculation response. Numbers between parentheses indicate the number of trials for each country $year^{-1}$. Vertical grey/black dashed lines mark mean yields without or with inoculation.

Another study done in Ethiopia provided the first systematic evidence for the benefit of inoculation in chickpea on-farm. In a multi-site, multi-year evaluation, inoculation was shown to elevate yields by an average of 400 kg ha^{-1}, while the combined effect of inoculant and phosphorus was as high as 600 kg ha^{-1} (Table 18). The results also suggest that the benefits from inoculation are likely to be greatest in soils that are low in nitrogen.

Table 18. Average chickpea grain yields (kg ha^{-1}) for control (no inputs), P, I and P+I treatments in on-farm demonstration trials in different years and locations in Ethiopia. P= 23kg P_2O_5 kg ha^{-1} applied as DAP, TSP or NPS; I=seeds inoculated with *Mesorhizobium* inoculum.

Year/ Location	Sample size	Treatment				LSD	SE
		Control (-P-I)	Inoculant (-P+I)	Phosphorus (+P-I)	Phosphorus + Inoculant (+P+I)		
	(#)	(kg ha^{-1})	(kg ha^{-1})	(kg ha^{-1})	(kg ha^{-1})	(treatments within Year/Location)	
2012/Damote	17	1593^{a}	2043^{bc}	1951^{b}	2194^{c}	152	128
2013/Damote	3	1747	1796	2029	1843	ns	306
2014/Adaa	41	1937^{a}	2272^{b}	2197^{b}	2548^{c}	98	83
2014/Damote	25	2006^{a}	2560^{b}	2501^{b}	3091^{c}	125	106
2015/Adaa	4	1693^{a}	2348^{bc}	2089^{b}	2453^{c}	313	265
2015/Damote	7	1443^{a}	1588^{ab}	1746^{bc}	1919^{c}	237	200
2015/Gimbichu	6	1510^{a}	2413^{c}	1806^{b}	2326^{c}	256	216
2015/Ginir	4	958^{a}	1170^{ab}	1252^{ab}	1349^{b}	313	265
Total	**107**	**1611^{a}**	**2024^{b}**	**1946^{b}**	**2215^{c}**	**88**	**74**

Subscripts indicate the groups within location year^{-1} (the row) different at P<0.05 level after Tukey adjustment for multiple comparisons. ns = non-significant at P<0.05. SE and LSD are the standard error of the means and the 0.05 LSD within year location^{-1}, respectively.

The effect of soil factors on productivity was also the subject of a diagnostic study in Ghana. This study analysed data on carefully measured farmer main-field soyabean yields as a function of soil texture, soil chemical and crop management factors. Statistical variable selection yielded a regression model explaining 50% of the observed variation in yield (Figure 19). Soil fertility parameters, particularly those related to soil phosphorus and silt content, were found to be the most influential variables.

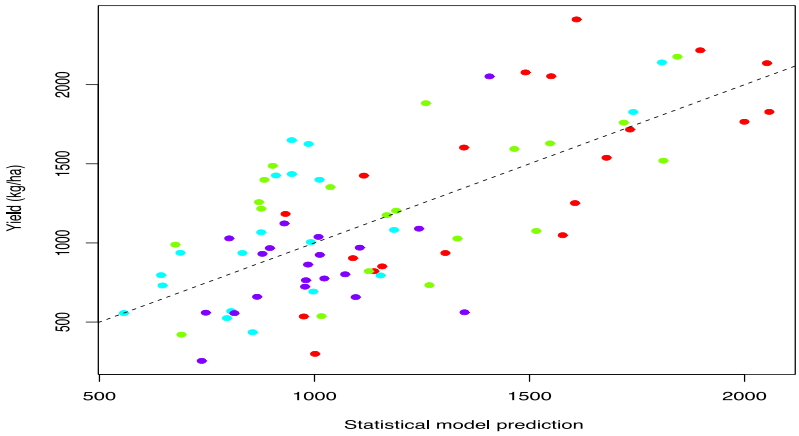


Figure 19. Relation between statistical model prediction of soyabean yield in four communities in Ghana (coloured separately) and observed yield in farmers' main fields.

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

This objective aims at providing guidance, outline principles, allow for country teams and partners to learn lessons from monitoring experiences, and make adjustment and/or adaptations to the implementation of the project. It also provides partners with information on effectiveness and efficiency of dissemination approaches in their programmes across target countries.

1.5.1 ICT tools to collect data and provide feedback to stakeholder groups

To enable timely learning, integration of feedback in planning and evidence of results achieved, most challenges encountered in data flow in 2015 were partly resolved by re-emphasizing roles and responsibilities of both N2Africa and its partners, developing new strategies where possible. In 2016, N2Africa has improved greatly the flow of data from field to analysis. Most data collection was done using tablets and data for reporting has been uploaded per achieved result (e.g. feedback on performance of technology packages are accessible in addition to farmer feedback on technology preferences). Such feedback will be used in 2017 planning and to reshape technologies according to farmer preference and performance. Also, data on key indicators (Results Framework) can be accessed by country, partner and by location. The ODK database provided more uniform data for reporting across the countries, as compared to 2015. The developed online analysis tool (e.g. Shiny) uses this database and provides a summary of key variables. By generating early feedback on data analysis, country teams and data analysts can quickly draw lessons from, for example, the most recent trials and agronomic data. This has facilitated the rapid evaluation of treatment effects across agronomy trials in different countries, allowing these results to serve as input for planning of dissemination and agronomy activities in 2017 (Figure 20).

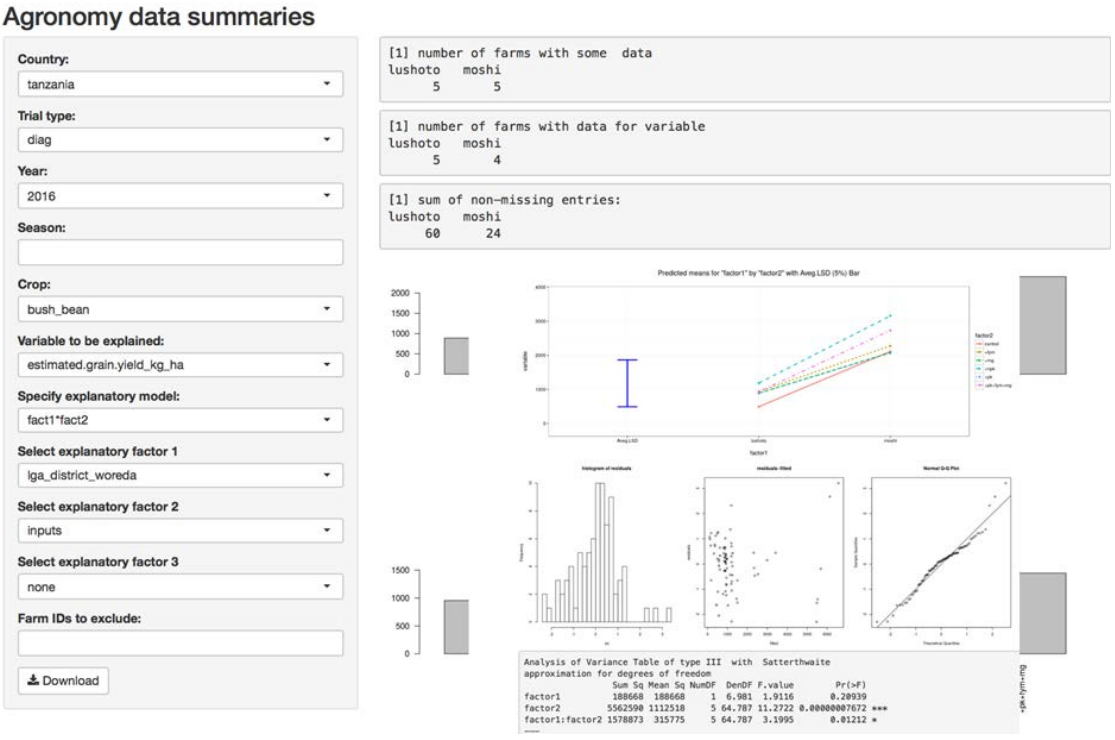


Figure 20. Combined screenshot of standard analysis of the on-line agronomy data tool, Shiny. Data for 2016 bush bean diagnostic trials in agronomy are shown.

Shiny is being finalized and available for use by all stakeholders in 2017. Furthermore, N2Africa and the GALA-project agreed to develop a common M&E framework that includes common data collection system, sharing data and data platforms. Other platforms used for feedback and learning are through Annual Planning Meetings, Mid Season's Evaluations, Periodic Meetings with specific partners and N2Africa reports.

The main challenge remains with some partners' delay in sharing data from their system, as agreed in partnership agreements. Also, the inability of some partner staff to use the ODK database remains a challenge. This needs to be addressed, as partnership agreements are amended and new strategies developed.

1.5.2 Recommendations Early Impact Study

Designing development-to-research approaches that support positive changes in livelihoods of farmers require actions that are based on solid project evaluations and impact studies. The N2Africa project evaluations are based on the results framework and distinguish results on activities, outputs and outcomes. The analysis of the Early Impact Study in 2016 provided a comparison across eight N2Africa countries, that were involved in the first phase. The findings were used to evaluate N2Africa's impact, to draw lessons learned and to provide recommendations for future improvement. The next two years of the project will be used to design and implement a range of studies using quantitative and qualitative methods to examine the impact of N2Africa and maximize our learning.

2 Achievements in relation to project milestones

Table 19. Progress Key Milestones Table 2016 N2Africa Project.

Milestone	Indicator	Cumulative target at grant end	Target 2016	Achieved 2016	% achieved target 2016
Objective 1					
1.3. Partners along the legume input and output value chains cooperate actively towards achieving the overall N2Africa goals.	No. of partnerships developed and active.	32	32	90	281%
1.4.1. By Q3 of Year 1, an internal and external communication strategy developed	Communication plans	1	1	1	100%
1.5.1. By Q4 of Year 1, country specific research and dissemination implementation plans formalized, including an exit strategy.	No. of specific research and dissemination plans formalized.	5	5	6	120%
1.7.1. By Q4 of Year 1, a research plan, engaging at least five PhD and 10 MSc candidates, developed.	Project wide research plans to engage PhD and MSc students developed & no. of PhD and MSc students (men/women) engaged.	1	1	1	100%
1.4. By Q4 of Year 5, at least 320 partners trained in N2Africa technologies and approaches.	No. of persons trained (gender disaggregated data) in N2Africa technologies and approaches & no. of N2Africa technologies (by type) in which the persons were trained. *(Note: Count the total number of persons trained from the collaborating partners for dissemination. Disaggregate data by gender).*	320	320	32,717 (43% women)	Over 100%
Objective 2					

Milestone	Indicator	Cumulative target at grant end	Target 2016	Achieved 2016	% achieved target 2016
2.2. Dissemination partners attain/surpass the anticipated number of households targeted and continue to engage in legume intensification post-project.	No. of target households (men/women) reached *(outcome level: these farmers continue to engage in legume intensification activities after participating in dissemination activities).*	555,000	253,750	374,717 (49% women)	147.7 %
2.3. Local agro-dealers marketing fertilizer, seed, and inoculants are aligned with grassroot producer groups and input wholesalers and manufacturers.	*Volume of seeds, fertilizers, and inoculants used per targeted producer group per land area, *Volume of seeds, fertilizers, and inoculants sold by agro-dealers.	6660; 11,100; 56	3045; 5075; 25	Seed (1,532 tons); Fertilizer (1,551.8 tons); Inoculant (15.4 tons)	Seed (50.3%); Fertilizer (31%) Inoculant (62%)
2.3.1. By Q4 of Years 1-4, at least two media events (e.g., radio, newspaper articles, field days, etc.) per country implemented.	No. of media events implemented.	50	50	80	(160%
2.4. A preset (see Returns-on-Investment calculations) number of households engaged in the collective marketing and value addition of legume grains and value-added products.	No. of households (men/women) engaged in collective marketing, 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.	275,000	125,000	119,690 persons (5,869 value addition) with 49% women	96%
2.5.1. By Q4 of Years 1–4, inoculants available through public-private partnerships, through importation and/or local production, the latter facilitated by the inoculant production pilot plant.	No. of inoculant outlets in the target areas, volume of inoculants imported, and/or produced in the identified outlets.	5	4	11 Volume imported/produced (55.9 t)	275%
Objective 3					
3.2.2. By Q4 of Years 4–5, at least two businesses led by women established per country.	No. of businesses established and led by women & no. of women involved in the businesses established.	10	7	16	229%
3.3. Better knowledge of and access to household-level legume processing tools improves the nutritional status of women and children in at least two target countries	No. of women using household-level legume processing technologies	5,000	3,000	5,869	195%

Milestone	Indicator	Cumulative target at grant end	Target 2016	Achieved 2016	% achieved target 2016
3.4. Women use pre- and postharvest labour-saving tools, resulting in higher net profits from legume production and processing	No. of women using pre- and postharvest labour-saving tools.	55,500	25,375	16, 035	63%
3.5.1. By Q4 of Year 3, relationships between grain nutritional quality and management/environmental conditions quantified	No. of relationship equations quantified	5	5	Relationship equation not quantified yet. A study carried out on effect of N and P on two common bean varieties (Gloria and NUA 45), P alone, or N + P at 20 kg/ha P and 40 kg/ha N in Zimbabwe. Analysis of other crops is being done	In progress
Objective 4					
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). No. of target households (men/women headed) with 50% increased productivity through adaptation trials	275,000	125,000	-Range: 6 to 138% for soyabean, groundnut, climbing bean, bush bean, and cowpea -Farmers	
4.1.2. By Q4 of Years 2–4, improved legume production recommendations integrated in the dissemination campaigns	No. of improved legume production recommendations (based on diagnostic trials) integrated in dissemination campaigns	15	15	19	
4.2. Inoculant producers avail improved inoculant formulations for the target legumes resulting in at least 10% increase in legume productivity and BNF	No. of inoculant formulations applied/used by inoculant producers for target legumes in core countries (Productivity will be measured by milestone 4.1)	3	2	3 (soyabean, beans and groundnut)	150%

Milestone	Indicator	Cumulative target at grant end	Target 2016	Achieved 2016	% achieved target 2016
4.6.2. By Q4 of Year 5, elite strains used for inoculant production for beans groundnut, and/or cowpea	# new effective and elite rhizobia identified	6	6	920 candidate strains evaluated for chickpea, common bean, faba bean, and soyabean in Ethiopia, climbing bean in Uganda, common bean in Tanzania, and cowpea in Nigeria.	In progress
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	No. of inoculant producers and retailers (public private suppliers) using standard operating procedures.	5	4	11	275%
Objective 5					
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	100%
5.2. Dissemination partners integrate effective and efficient dissemination approaches for legume technologies in their future development initiatives	Number of dissemination partners integrating effective and efficient dissemination approaches in their programs across target countries. (Effectiveness and efficiency of dissemination approaches will be measured by activity 5.6).	16	0		In progress, dissemination approaches being evaluated
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	No. of quantified relationships integrated in improved recommendations. Best-fit recommendations available to all target legumes in each country.	16	8		In progress

Milestone	Indicator	Cumulative target at grant end	Target 2016	Achieved 2016	% achieved target 2016
5.7.1. By Q4 of Year 4, the sustainability of legume interventions for smallholder farmers evaluated through impact assessment studies	Project wide impact assessment conducted with available report indicating level of sustainability of project interventions	1	1		This will be planned in 2017

3 Lessons learned and decisions made

3.1 Tanzania

- Private sector participation in partnerships creates greater synergy in technology promotion and sustainability as seen with the expansion of soyabean production as a result of readily available output market (e.g. Silver land Farms). Thus, involvement of active private sector in seed production and sale of inoculants in 2017 work plan will be priority.
- Though legume seed is recycled by many legume farmers in Tanzania, this still leaves a demand gap for certified seeds which is not easily predicted and mapped and makes the private sector hesitant to invest in small-scale farmer supply chains. The partnership with SILT project is focusing on developing an ICT solution (by iLogix) that will increase seed companies' capacity to efficiently work on smallholder seed supply by predicting, mapping and following up on demand for certified legume seeds. Meanwhile the project will focus on Quality Declared Seed (QDS) production and build capacity of QDS farmers to grow into seed companies.

3.2 Uganda

- Marketability of the grain legume is critical for farmers and other value chain actors (private sector) to access input and output markets. This is seen with soyabean viewed as cash crop with expanded production as reflected in the input use and grain marketing. Soyabean is thus one successful commodity that can now be disseminated on a large scale and needs characterization of dissemination domains at a large spatial scale including the economic benefits and this will require inoculation and Phosphorus at larger scales for impact.
- Use of improved varieties contributes to nearly 35% increases in yields over local varieties and this influences farmers' priority in varieties than the soil fertility inputs. Some varieties such as Iron enriched beans although high yielding and nutritious, are yet to be readily accepted by smallholders due to its grain size and marketability. Mass sensitization efforts are needed for nutrition but breeders have to consider improving traits for marketability to achieve a greater impact.
- Soil acidity management is important to improve productivity of climbing beans in highlands as well as soyabean in the low lands with acid soils. Inclusion in production guidelines is important but how to reduce costs and improve access are critical to be considered in management.

3.3 Ghana

- Agricultural innovation is driven by access to remunerative output market. Inadequate access to such markets by soyabean farmers as a result of importation of soyabean grains and product into Ghana resulted in farmers reducing their acreage of production and the use of inputs such as certified seeds, fertilizers and inoculants.
- Public Private Partnership (PPP) enhances accessibility to input where critical input suppliers are integrated in the partnerships. Initiation and facilitation of PPP by the project resulted in the availability of phosphorus fertilizers in northern Ghana by fertilizer companies.

3.4 **Malawi**

- The use of inoculants resulted in yield increase of between 52-54% for soyabean. A combination of inoculants, organic manure and NPK fertilizer was identified to have the highest yield.
- Double row planting of groundnuts resulted in 54% increase in both grain and stover weights.

3.5 **Rwanda**

- Partner organizations and farmers who benefited from interventions of N2Africa phase 1 are perpetuating the dissemination of technologies introduced with a minimum direct support from the project. This shows the importance of introducing technologies which address the needs of farmers. The selection of local partners is also key to mobilize community members. Partners who have means other than from the project scale up and out better technologies.

3.6 **Nigeria**

- Greater number of farmers are ready to adopt the technologies introduced by accessing them on credit. Integrating inoculants in the government Anchor Borrowers Program resulted in 89% of the total inoculant sales in Nigeria.
- In the face of climatic challenges, crop failure as result of insufficient rainfall can be avoided by early planting especially on demonstration plots and this was assisted by the early delivery of necessary inputs.

3.7 **Borno State**

- Understanding and appreciation of the principles of agricultural value chain is germane to the identification of viable agribusiness opportunities by youth. In addition, provision of tangible starter pack after training, is critical to business take-off, while access to bank credit is important to growing the business of the youths.
- Need for caution in scaling out because of the lingering issue of insurgency, notwithstanding the position of the political leadership. Likelihood of risk occurrence is high in North Eastern Nigeria.

3.8 **Kenya**

- Application of Dual Gold herbicide can effectively substitute for one hand weeding and may improve yields, but economic benefits are not pronounced. Herbicide application is best considered where labour is limited. Dual Gold may be applied as a pre-emergent to both maize and beans/soyabeans, opening opportunity to better intercropping.
- Inoculant quality control testing is reliably conducted by the University of Nairobi MIRCEN, and BioFix samples consistently exceed the rhizobia threshold, but contain excess contaminants. These contaminants do not appear to preclude response to inoculation.

3.9 **Zimbabwe**

- After a few cycles of training farmer groups, there are champion farmers that can be cost-effectively engaged to train more farmers. Therefore, relying on the more expensive ‘nutrition experts’ to spread the technologies is unwarranted at this stage in the dissemination pathway. New wards can be attracted to such trainings as farmers take the lead.

3.10 Mozambique

- The massive participation of women in the dissemination of legume technology need to be highlighted. Upscaling the use of legume technologies by making them available close to the farmers at affordable price is crucial. Given that LegumeFix are relatively easy to store for longer periods, procurement can be done ahead of time. However, whether LegumeFix will be successfully used by farmers will depend on the return on investment. At the moment, the price of LegumeFix is relatively higher when compared to MasterFix.

3.11 DR Congo

- The dissemination model of N2Africa is being adopted by other organizations which will ensure sustainability and continuously reach many farmers. This is being achieved through the partnerships; collaborating with local and internationals organizations.

3.12 Ethiopia

- The application of P-fertilizer and/or inoculant recorded higher in most of the demonstration trials, though there were high variability in responses across farms in different agro-ecologies. However, phosphorous application to soyabean resulted in only 10% yield increase, thus indicating how farmers lose the benefit of applying P-fertilizer without sufficient nitrogen available to the plant, which inoculation technology provides the cheapest alternative to resource poor farmers.

4 Challenges per country encountered in implementation

4.1 Ethiopia

Description of challenge or risk	Likelihood of occurrence	Risk management strategy
Topic: Government policies (regulated and import/export) and programs		
Fertilizer blend targeted for legume crops is not available	high	Use fertilizers (DAP & NPS) with variable rates for different agro-ecologies
Lack of inoculant quality control (QC) and/or lack of authority to test inoculants quality at the different supply chains	High	N2Africa works closely with inoculant producers (private and public institutions) to exercise internal control; Educate stakeholders on handling of inoculants
Lack of functional input demand and supply information system (as is employed for chemical fertilizers)	Medium	N2Africa tries to ensure that information on input demand and supply as well as produces (marketable grain) flow through its PPPs
Topic: Climate in 2015 and 2016 (drought, rainfall, amongst others)		
2015/16 was an El Niño year and there was late onset and abnormal distribution of rainfall. This affected a number of target locations, the severity of which varied depending on sites	medium	Not much at hand to avert natural calamities to planted field, but possibilities with irrigation exploited (where possible)
Topic: Security		
2016 was the most unpredictable season, scattered civil unrests and state of emergency. Travel to project target locations and electronic and mobile communications were almost impossible. This condition significantly affected project activities such as data collection, farmer mobilization, field days (particularly in Oromia and Amhara regions) and ultimately affected planned number of farmers to be reached in 2016	medium	Capacitate partners and grass-root institutions (i.e. PCs, BoA) to follow up implementations; and frequent communication through mobile, email (if available)
Topic: Inflation		
Low prices for grain legumes versus other crops may render legumes uncompetitive in the target farming systems	Low	Through PPPs and agri-business clusters, efforts will be made to create output market at domestic and international markets. Food and feed processing companies are also interested in purchasing produce 'locally'
Topic: Pest and disease outbreaks		
Pests (aphids, African boll worm, bean maggot, etc.) and diseases (faba bean gall, soyabean rust, chocolate spot, etc.) infestations	Low-medium	Adapt the recommendations given by NARS i.e. use of resistant varieties and efficient pesticides uses and awareness creation
Topic: Other		
Staff turnover in partner organizations and less commitment of staff in partner	Medium to High	Engage with focal persons at partner institutions and frequent meetings to harmonize

institutions (demands for salary top-ups and other benefits)		the gaps; Extensive awareness creation; field visits to harmonize with national programs; create incentive mechanisms (allowances for communication and extra time payments)
Inconsistent input (legume seed and inoculant) purchase by farmers could discourage legume seed business for private seed/inoculant producers/suppliers	Low to Medium	Intensify input and output value chain via PPP, seed marketing business, grading and value addition of legume grains Farmer segmentation and targeting for the different cropping seasons
Lack of mechanized farming for legume production could lead to low enterprise competition for faba bean as compared to wheat and could limit its adoption in Ethiopian Cereal belts (Arsi-Bale)	Medium	Intensified awareness creation on the potential of crop rotation for soil fertility maintenance and cereal disease control; on human nutritional value of grain legumes; create better market access for the legumes
Inconsistent, small volume and poor quality legume grain supply can jeopardize seed business (discourage seed buyers)	Low to Medium	Targeting farmers' organizations (like unions) or clustering farmers for realistic product bulking and grading legume seeds and foster/facilitate partnership between organized smallholder farmers and buyers and put in place quality standards for marketability
Committee decision making by FCU contributed to indecisiveness	High	Closely work with government authorities and NARS and capacitate members of FCU with marketing/business skills

4.2 **Tanzania**

Description of challenge or risk	Likelihood of occurrence	Risk management strategy
Topic: Government policies (regulated and import/export) and programs		
Local government levy on farm products reducing profit for farmers	medium	Addressed through soyabean platform, a group dealing with policy
Topic: Climate in 2015 and 2016 (drought, rainfall, amongst others)		
Prolonged drought	high	Introduced drought and disease tolerant varieties; focus on core drought tolerant crops e.g. cowpea especially in central Tanzania
Topic: Pest and disease outbreaks		
High incidences of pest and diseases	High	Introduce disease pest tolerant varieties Training of farmers on pesticide use
Aflatoxin in groundnuts in Kongwa District	high	introduced cowpea as an alternative legume; testing the use of Aflasafe bio-agent for control of aflatoxin producing fungi
Topic: Other		
Some partners not sharing data on time	medium	Discussion with key decision makers in the organization, affirm MoU to ensure sharing of information
Reduced interest of inoculants registrants in	high	Provide registrants with the information on current demand of inoculants for them to make

Tanzania		decision on supply; Engage other potential registrants

4.3 Nigeria

Description of challenge or risk	Likelihood of occurrence	Risk management strategy
Topic: Other		
Life span of Inoculants designed for only one year is a big challenge to farmers	High	Good storage facility

4.4 Borno State

Description of challenge or risk	Likelihood of occurrence	Risk management strategy
Topic: Security		
Insecurity in North Eastern Nigeria especially in Borno State	High	Working in safer areas in the state and taking precautions when travelling
It was not possible to transport fertilizers in the project area due to security (fertilizer as bomb material)	High	The project gave cover letters introducing one trusted agro-dealer to supply fertilizers to our farmers
Striga, insect pests and diseases infestation; Incorrect use of pesticides especially herbicides	Medium	Improved tolerant and or resistant crop varieties (seeds) were disseminated. Trained contract sprayers on appropriate use of agro-chemicals
Low soil fertility	High	Composite soil samples collected from diagnostic trials fields for analysis which will be used to determine the soil fertility status and disseminating the use of P-fertilizer (SSP), inoculants and organic manure and legume-cereal intercropping to improve soil fertility
There is high intention to buy NoduMax by farmers from the project area earlier in the season, but when it was supplied little was purchased by the farmers	High	A sustainable input supply system for farmers to access inoculants, SSP and improved seeds in Nigeria was developed and an agreement between IITA and ISL was signed to address this issue

4.5 Mozambique

Description of challenge or risk	Likelihood of occurrence	Risk management strategy
Topic: Climate in 2015 and 2016 (drought, rainfall, amongst others)		
El Niño	High	Multiple planting, soil cover whenever its possible
Topic: Security		
Military conflicts	High	Avoid conflict zones

4.6 **Zimbabwe**

Description of challenge or risk	Likelihood of occurrence	Risk management strategy
Topic: Government policies (regulated and import/export) and programs		
Retrenchments of technicians at inoculant factory	Low	Graduate students to help with lab procedures if needed
Topic: Quality of cropping season (drought, rainfall, amongst others)		
Low rainfall in mandate areas	Very likely to occur like happened in the previous season	Farmers advised to stagger their planting date so that if one crop fails other will be harvested.
Topic: Security		
Civil war in Mozambique spilling into Zimbabwe	Low	NA
Topic: Inflation		
USD versus new bond notes	Low	Research funds to be kept in USD account by University of Zimbabwe
Topic: Pest and disease outbreaks		
Pest and disease outbreaks	High for cowpea	Appropriate treatment with commercial chemicals

4.7 **Rwanda**

Description of challenge or risk	Likelihood of occurrence	Risk management strategy
Topic: Climate in 2015 and 2016 (drought, rainfall, amongst others)		
Severe drought occurred in the last 2 seasons (2016B and 2017A) affected seriously crops especially legumes in East and Southern provinces	High	The Government is promoting hill side irrigation program, with subsidies up to 50% on equipment and installation
Heavy rains in high altitude regions of the Northern province in 2016B washed away crops killing human beings as well		Settlement of the population in secure areas, soil erosion control

4.8 **DR Congo**

Description of challenge or risk	Likelihood of occurrence	Risk management strategy
Topic: Government policies (regulated and import/export) and programs		
The policies exist but are not implemented	Low	Engage with government
Topic: Climate in 2015 and 2016 (drought, rainfall, amongst others)		
The rains come late and sometimes no rain or too much	Medium	Impact the production! yield
Topic: Security		

Security in good in the area who operate	Low	We need to go or the security is guaranteed and total
Topic: Inflation		
Farmers faced a problem of currency fluctuations; the price is still not stable	High	Farmers need to do collective marketing
Topic: Pest and disease outbreaks		
Identification and recognition of the disease difficult for actors	Low	Training limited of the technical team of partners
Topic: Other		
Presence of humanitarian organizations who distributed the seeds for free	High	Hard to move to the humanitarian actions in the sustainable development This requires training and awareness

4.9 **Malawi**

Description of challenge or risk	Likelihood of occurrence	Risk management strategy
Topic: Government policies (regulated and import/export) and programs		
Setting of minimum prices for produce but no mechanisms to ensure adherence	High	Farmers encouraged to form associations/cooperatives to form a solid front for bargaining good prices
Unavailability of qualified personnel to conduct inoculant quality checks at production, distribution and user levels	High	AISL following laid down procedures provided by IITA in ensuring quality is maintained. Responses from users to determine acceptability and by extension quality appraisal
Topic: Climate in 2015 and 2016 (drought, rainfall, amongst others)		
Intermittent drought and rainfall curtailed too early	Medium	Planting drought tolerant varieties and short season crop varieties
Topic: Security		
Theft of crops while in the field	Low	Ensure timely harvesting time
Topic: Inflation		
Unstable local currency against major world currencies	High	Intensification of value addition to increase opportunities for export
Topic: Pest and disease outbreaks		
Occurrence of soyabean rust	Medium	Use of pesticides to control the disease

4.10 **Uganda**

Description of challenge or risk	Likelihood of occurrence	Risk management strategy
Topic: Government policies (regulated and import/export) and programs		
The weak regulatory framework on managing aflatoxin groundnut has affected access to international markets beginning to affect local consumption with more health	High	Work with IITA to develop Aflasafe for groundnut

ware population		
Introduced taxes on inputs affecting use of inputs and export marketing of grains	High	Exploring cost effective strategies for a step up and judicial use of inputs (follow the ISFM framework)
Topic: Climate in 2015 and 2016 (drought, rainfall, amongst others)		
Low rainfall and dry spells	High	Early planting and deploying SWC practices (ridging) where they can be applicable, explore linkages for acquisition of effective irrigation systems where water sources are available
Topic: Security		
Insecurity (land wrangles)	Low	Avoid scaling to areas that have some kind of insecurity
Topic: Inflation		
Increasing costs of inputs affecting use of inputs such as fertilizers	Medium	Providing low cost management packages
Topic: Pest and disease outbreaks		
Poor quality of pesticides on the market and resistance of pests to pesticides	Medium	Seeking quality suppliers of pesticides. Joint testing the efficacy of the pesticides with private sector and involvement the regulatory bodies (UNBS and MAAIF)
Topic: Other		
Partner organisations staff turnover	medium	Work with several staff of organizations as an insurance measure and build local capacity (resident capacity)

4.11 Kenya

Description of challenge or risk	Likelihood of occurrence (Please indicate: low-medium-high)	Risk management strategy
Topic: Government policies (regulated and import/export) and programs		
Agricultural extension devolved from national ministry to individual counties results in discontinuation of service	High, this is indeed occurring and county level extension is slow to improve	We work with the strongest counties, unable to carry others. County extension officers invited to all events
Topic: Climate in 2016 (drought, rainfall, amongst others)		
Moderate drought affects legumes more than maize, discouraging farmer adoption	Moderate drought occurred in both seasons of 2016	Healthy soyabean is more tolerant of mid- and late-season drought
Topic: Security		
Post-election violence may accompany next year's scheduled elections	Medium, severe in 2008, not so in 2013, but it seems nobody concedes defeat	Farmers cannot afford to miss the long rains growing season so partner services proceed with care
Topic: Inflation		
Weakening Kenya Shilling makes raises cost of inputs	Low, the Shilling remains fairly stable for the past three years (about KES 100 = US $1)	Search for better legume markets, commodity prices rise in proportion to inflation

Topic: Pest and disease outbreaks		
Asian rust affects soyabean	High	Grow more resistant varieties SC Squire and SC Saga

4.12 Ghana

Description of challenge or risk	Likelihood of occurrence (Please indicate: low-medium-high)	Risk management strategy
Topic: Government policies (regulated and import/export) and programs		
Importation of soyabean cake and meal	High	Facilitate stakeholder platform to bring about institutional innovation in marketing of soyabean grains
Topic: Climate in 2015 and 2016 (drought, rainfall, amongst others)		
Erratic rainfall and drought	High	Early maturing varieties, drought tolerant varieties, timely planting
Topic: Inflation		
Increase in cost of inputs	Medium	
Topic: Pest and disease outbreaks		
Cowpea pod borer	Medium	Improved and tolerant varieties, chemical control

5 Opportunities per country identified

5.1 DR Congo

Description of opportunity	Likelihood of occurrence	Management strategy
Access of credit (Finance)	Low	This is the first time that these associations have access to credit; ELLs have the problem to understand the financial circuit and cooperative
Associations must move to cooperative	Medium	This is a process that takes time and awareness to understand the co-operative movement
Existence of seed companies in the region	High	Good quality seed can be now available close to farmers

5.2 Ethiopia

Description of opportunity	Likelihood of occurrence	Management strategy
Increasing popularity of inoculant technology for legume production and increased demand for inoculants	High	-Increased involvement of ILRI-N2Africa in business facilitation/deals between MBI and FCUs] -Increase inoculant production capacity of the private institution with due attention given to maintaining an acceptable level of quality product
The need for inoculants and improved seed demand/supply information emerged as a new dimension of activity (Private seed and inoculant companies would survive the future i.e. willing to stay in the business, only if this information system is functional in the future)	Low- medium	-Fertilizer supply/demand information is enforced by the government – demand information flow from Kebele to Woreda BoA up to Zone and Regions. Then, the supply is ensured via FCU (play a bridging roles). This hierarchy and flow is missing for inoculants and seed -Awareness creations to government authorities about the emerging needs for inoculant/seed demand/supply information. And capacitating FCU to bridge the gap in collaboration with BoA (Woreda) local staff (DAs) at Kebeles following the same operating hierarchy as for fertilizers
The FCU involvement in output market is increasing (as part of the functioning PPPs), through the different FCU are at different levels	Medium	-Strengthen the decision making and business skills of FCU -Train members of FCU, together with supports from NARS, BoA officials to increase the business skills of FCU

5.3 Ghana

Description of opportunity	Likelihood of occurrence	Management strategy
Presence of development projects targeting grain legumes	Medium	Leverage with other projects in the implementation of project activities

5.4 **Kenya**

Description of opportunity	Likelihood of occurrence	Management strategy
Register and franchise NoduMax in Kenya and other countries to improve the selection and competitiveness of soyabean inoculants	Medium	Coordinate NoduMax expansion with IITA Business Incubation Platform, establish franchise arrangements, obtain funds from Business Development unit
Develop Sympal fertilizer into a composite fertilizer rather than a mixed blend	High	MEA is developing a composite fertilizer plant, express need for composite Sympal, assist in product testing, alert agrodealers to new product
Involve Youth Agripreneurs in soyabean product development and develop agribusiness spin offs	High	Compile information of current status of products (e.g. soymilk, porridge), link to IYA Value-Added Business Model and new AfDB ENABLE country projects
Develop granular legume inoculant, and other formulations, for application with legume seeds containing heavy doses of pesticide, particularly bean and groundnut	Medium	Obtain APT granulated peat, distribute to Rhizobiology team, develop protocols for processing granular inoculants, field test compared to powdered formulations, provide protocols to inoculant manufacturers

5.5 **Malawi**

Description of opportunity	Likelihood of occurrence	Management strategy
Wide use of groundnut threshing machine	High	Increasing number of threshing machines to women farmers Increase awareness during field days and any other farmers' gatherings
More farmers abandoning tobacco production and venture into legumes (especially Soya) production	Medium	Increase accessibility of legumes technology and inputs especially improved seeds and inoculants

5.6 **Mozambique**

Description of opportunity	Likelihood of occurrence	Management strategy
CLUSA PROMAC willing to demonstrate to farmers the benefit of using new inoculants such as LegumeFix targeting large number of farms	High	Collaborate with provision of inoculants
ACOF interested on testing LegumeFix on 60 ha of land and conduct field days targeting large number of farms	High	Collaborate with provision of inoculants as well as technical backstopping

5.7 **Nigeria and Borno State**

Description of opportunity	Likelihood of occurrence	Management strategy
Abundant commercial gaps in the grain legumes value chain ✓ Abundant R4D technical information to tap ✓ Available input and output market to explore ✓ Availability of several agricultural finance schemes and youth in agribusiness initiatives to leverage ✓ Available professional institutional partnerships to explore – SMEDAN, BOA, BOI, etc.	High	Engage youth to make sustainable living out of agriculture
More Farmers and communities are asking to be involved after seeing the benefits of N2Africa technologies from N2Africa contact farmers, and more had started adapting the technologies. The farmers testify to the increased in yield after using the disseminated technologies.	High	Increase activities to accommodate more farmers

5.8 **Rwanda**

Description of opportunity	Likelihood of occurrence	Management strategy
The crop intensification program of the government	High	There are priority crops selected per agro ecological zone, Soyabean and common beans are part of this program
The agriculture inputs distribution network organized at national level, with significant subsidies on fertilizers and seeds	High	The inputs distribution network organized from national to the sector level

5.9 **Tanzania**

Description of opportunity	Likelihood of occurrence	Management strategy
Announcement of Soyabean among the focus crop in Southern Agricultural Growth Corridor of Tanzania (SAGCOT) becomes a new opportunity for advancing N2Africa technologies across the SAGCOT area	High	N2Africa is registered member of SAGCOT and participate fully in Soyabean development initiatives
SILT, Africa Rising-NAFAKA, SAIRLA – GALA projects provides an opportunity to leverage resources and broadens N2Africa zone of influence in Southern Highlands, East and Central Tanzania	High	N2Africa is a partner to these projects
Inclusion of Tanzania in TAAT program creates another opportunity to extend N2Africa legume technologies to more areas in Tanzania	High	N2Africa technologies included in a list of technologies TAAT will scale

5.10 Uganda

Description of opportunity	Likelihood of occurrence	Management strategy
Increasing demand for soyabean	High	Better organize producer associations and sensitize them on the realistic pricing of soyabean grain
Linking with MAIAF programme of school feeding with beans	Medium	Strategically link farmer cooperatives to grow bio-fortified beans
Increasing inoculant demand	Low	Quality assurance and appropriate management (storage and application for better results to sustain demand)
Increasing demand for beans	High	Need to organise producer associations to produce beans to sustain school feeding programmes and thus the access to seed is critical

5.11 Zimbabwe

Description of opportunity	Likelihood of occurrence	Management strategy
Well trained farmers as new trainers	High	Scout for good farmers for expanded training programs

6 Policies relating to legume intensification

The 'N2Africa Review of national policies relating to legume intensification in N2Africa counties' showed that governments in N2Africa countries acknowledge the importance of legume intensification and its significant potential to contribute to improving food security and health, especially for poor families.

At global level, the seventeen Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development developed by the United Nations (UN) aim to end all forms of poverty, fight inequalities and tackle climate change, while ensuring that no one is left behind. The SDGs recognize that ending poverty must go hand-in-hand with strategies that build economic growth and addresses a range of social needs including education, health and job opportunities, amongst others. Governments are expected to take ownership and establish national frameworks for the achievement of the seventeen goals. Particularly, SDG2 'End hunger achieve food security and improved nutrition and promote sustainable agriculture' seeks sustainable solutions to end hunger in all its forms and to achieve food security. It entails improving the productivity and incomes of small-scale farmers by promoting equal access to land, technology and markets, sustainable food production systems and resilient agricultural practices.

The Comprehensive Africa Agriculture Development Programme (CAADP) is the pan-African policy framework for agricultural transformation, wealth creation, food security and nutrition, economic growth and prosperity for all. The CAADP Results Framework 2015 – 2025 is prepared by the Food and Agriculture Organisation (FAO) of the UN in cooperation with the New Partnership for Africa's Development (NEPAD) Steering Committee. It recognizes the importance of increasing yield of food grains, tubers and legumes to catalyse transformation of Africa's agricultural systems and presents critical actions required to achieve agricultural development agenda targets. Furthermore, the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) serves as a platform for promoting regional research and in the sharing of benefits and spill overs that derive from such research. The association focuses on four thematic areas that are well aligned to the major ongoing regional and continental initiatives. These include (i) Integrated capacity strengthening, (ii) Development and scaling up of technologies and innovations, (iii) Policy advocacy, market analysis and institutional arrangement, (iv) Knowledge and information management. High yielding climbing bean varieties and training on different staking options are included in ASARECA projects that scale up best practices to address farmers' needs

National governments in the N2Africa countries all developed national policies aimed at increasing agricultural productivity, improving food security, diversifying food production to improve nutrition, and increasing agricultural incomes of the rural people. All national policies refer to legumes, mostly indirectly (e.g. intercropping practices, as measure for soil fertility, amongst others). Table 20 presents the N2Africa target legumes mentioned in national policies per N2Africa country.

Table 20. N2Africa target legumes mentioned in national policies per N2Africa country.

Country	N2Africa target legumes promoted in national policies
DR Congo	Legumes, bean, cowpea, groundnut
Ethiopia	Cowpea, chickpea, bean, groundnut, soyabean, legumes, rhizobia
Ghana	Cowpea, soyabean, groundnut
Kenya	Bean, pigeonpea, cowpea, chickpea, soyabean, legumes, rhizobia
Malawi	Local inoculant, groundnut, soyabean, pigeonpea, common bean and cowpea
Mozambique	Bean, soyabean, groundnut, legumes, pulses
Nigeria	Soyabean, cowpea
Rwanda	Bio-fortified bean, soyabean, rhizobia
Tanzania	Bean, oil seed crop, chickpea, cowpea
Uganda	Bean, soyabean, groundnut
Zimbabwe	Bean, soyabean, groundnut

All national policies aim at increasing the production and productivity of various legumes by various strategies, such as (i) adopting modern production techniques, (ii) strengthening coordination, institutional capacity and skills across the key actors, (iii) providing timely and appropriate market entry support for effective market development and (iv) scaling up production and trade, amongst others. Rhizobia are only referred to in a few national policies (e.g. Ethiopia, Kenya, Malawi and Rwanda). The Tanzanian government is the only government that developed an explicit policy tool to promote the pulses sector (e.g. common bean, cowpea, pigeonpea, green gram and chickpea, mung bean and Bambara nut).

While many policies indicate the aim of boosting production of legumes, they are surprisingly silent on specific actions and interventions as to how this might be achieved. The study results will be completed and used to provide recommendations to governments about best-fit legume technologies, how to increase production and productivity of various legumes and how to stimulate farmers' uptake and use of relevant technologies.

Exposure

Pan-African Grain Legume & World Cowpea Conference

The Pan-African Grain Legume and World Cowpea Conference was held in Livingstone, Zambia, in late February. The conference was organized by International Institute of Tropical Agriculture (IITA), Feed-the-Future Innovation Lab for Collaborative Research on Grain Legumes (Legume Innovation Lab), and the International Center for Tropical Agriculture (CIAT), in collaboration with major international agricultural research organizations and development partners and sponsors. N2Africa representatives presented their research results and hosted plenary presentations.

In the News

One way that N2Africa shares its knowledge is through its vast library of Podcasters, videos, reports and scientific publications. This enables spill over benefits and maximizes the return on research investments. In 2016, N2Africa published eight Podcasters. N2Africa also published reports, extension materials and legume booklets for shared use (Appendix III). Its focus is on publishing open access.

http://www.n2africa.tv/

N2Africa staff in 2016

N2Africa said goodbye to former Senior Program Officer Charlene McKoin, who retired after three years of dedicated work. Charlene has provided wise counsel to N2Africa from her business and value chain perspective. She passes the torch to Senior Program Officer Christian Witt.

Appendix I – Overview of active partnerships

Table 21. Active public-private partnerships in 2016.

Country	N2Africa lead partner	Type of organization*	Type of partnership**	Main areas of support***	Value of partnership N2Africa: partner ($)
DR Congo	Adventist Development and Relief Agency	NGO	Cooperative/Collaboration Agreement		Undisclosed
DR Congo	PAD	NGO	Cooperative/Collaboration Agreement	Capacity building, technology dissemination	Undisclosed
DR Congo	Plantations Ndagano	NGO	Cooperative/ Collaboration Agreement	Seed multiplication, capacity building, technology dissemination	Undisclosed
DR Congo	Women for Women International (WfWI)	NGO	Grant Agreement	Dissemination	8,012[a]
DR Congo	World Vision International	NGO	Grant Agreement	Capacity building, technology dissemination	17,405[a]
DR Congo	ZOA	NGO	Grant Agreement		14,275[a]
Ethiopia	Menagesha Biotech Industry PLC (MBI) – AGRA-SSTP	Private Organization	Grant Agreement	Dissemination, Input Supply, Market linkage, Capacity Building	299,846[a]
Ethiopia/Chewaqa	International Fertilizer Development Centre (IFDC)—2SCALE Project	NGO	Cooperative/Collaboration Agreement	Dissemination, Input Supply, Market linkage, Capacity Building	Undisclosed
Ethiopia/Chewaqa	Anno Agro Industry Plc.	Private Organization	Subcontract under collaborative agreement	Seed supply	6,908[C]
Ethiopia/South East	Bale Green Spice and Development Plc. (BSGD)	Private Organization	Cooperative/Collaboration Agreement	Dissemination, Input Supply, Market linkage, Capacity Building	Undisclosed
Ethiopia/South East	Bale Green Spice and Development Plc. (BSGD)	Private Organization	Subcontract under collaborative agreement	Capacity building, input supply, market linkages, dissemination	25,674[C]
Ethiopia/Chewaqa and South East	Oromia Agricultural Research Institute (OARI)	Research Institution	Subcontract under collaborative agreement	Dissemination	118,344[C]
Ethiopia/Central Shoa	SNV/Agriterra-Cooperatives for Change (C4C)	NGO	Cooperative/Collaboration Agreement	Dissemination, Input Supply, Market linkage, Capacity Building	Undisclosed
Ethiopia/Pawe	Ethiopian Institute of Agricultural Research (EIAR)–Pawe Agricultural Research Centre	Research Institution	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	Undisclosed
Ethiopia / Central Shoa and Pawe	Ethiopian Institute of Agricultural Research (EIAR)	Research Institution	Subcontract under collaborative agreement	Dissemination	147,283 [C]
Ethiopia/Jimma	Facilitator for Change (FC)	NGO	Cooperative/Collaboration Agreement	Dissemination, input supply,	Undisclosed

Country	N2Africa lead partner	Type of organization*	Type of partnership**	Main areas of support***	Value of partnership N2Africa: partner ($)
				market linkage, capacity building	
Ethiopia/Jimma	Facilitator for Change (FC)	NGO	Subcontract under collaborative agreement	Dissemination, input supply, market linkage, capacity building	36,519 [C]
Ethiopia/South	Hawassa University (HwU)	Research Institution	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	Undisclosed
Ethiopia/South	Hawassa University (HwU)	Research Institution	Subcontract under collaborative agreement	Dissemination, Input Supply, Market linkage, Capacity Building	82,286 [C]
Ethiopia/South	Soddo Catholic Secretariat (SCS)	NGO	Subcontract under collaborative agreement	Capacity building, input supply, market linkages, dissemination	37,733 [C]
Ethiopia/North	Tsehay Multi-Purpose Cooperative Union (Tsehay Union)	Other	Cooperative/Collaboration Agreement	Dissemination, Input Supply, Market linkage, Capacity Building	Undisclosed
Ethiopia/North	Amhara Region Agricultural Research Institute (ARARI)	Research Institution	Subcontract under collaborative agreement	Capacity building, input supply, market linkages, dissemination	95,713 [C]
Ghana	Evangelical Presbyterian Development and Relief Agency YENDI (EPDRA-Yendi)	NGO	Subcontract	capacity building, input supply, market linkages, dissemination	20,214 [C]
Ghana	Urban Agriculture Network (UrbANET)	NGO	Subcontract	Capacity building, input supply, market linkages, dissemination	24,619 [C]
Ghana	Sungbawiera Foundation (SBF)	NGO	Subcontract	Capacity building, input supply, market linkages, dissemination	13,253 [C]
Ghana	Evangelical Presbyterian Development and Relief Agency—CHEREPONI (EPDRA- CHEREPONI)	NGO	Subcontract	Capacity building, input supply, market linkages, dissemination	8,886 [C]
Ghana	CSIR-Savanna Agricultural Research Institute, Ghana (SARI, Ghana)	Research Institute	Subcontract	Capacity building, input supply, market linkages, dissemination	50,212 [C]
Ghana	Kwame Nkrumah University of Science and Technology (KNUST)	Government Organization	Subcontract	Rhizobiology, evaluation of non-responsive soils	119,901 [C]
Ghana	The Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance (ACDI/VOCA)	NGO	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	37,556,780[b]
Ghana	BUSAKA Agribusiness Company Limited	Private organization	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	Undisclosed
Ghana	BUSAKA Agribusiness Company Limited	Private organization	Subcontract under collaborative agreement	Dissemination, input supply, market linkage, capacity building	3,582 [C]
Ghana	AgDevCo Ghana Limited	Private organization	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	3,406,000[b]

Country	N2Africa lead partner	Type of organization*	Type of partnership**	Main areas of support***	Value of partnership N2Africa: partner ($)
Ghana	SEND-GHANA	NGO	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	8,032,151 [b]
Ghana	Youth Advocacy on Rights and Opportunities (YARO)	NGO	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	Undisclosed
Ghana	Youth Advocacy on Rights and Opportunities (YARO)	NGO	Subcontract under collaborative agreement	Dissemination, input supply, market linkage, capacity building	10,391 [C]
Ghana	Green-Ef Eco-Business Village Limited (Green-Ef)	Private Organization	Cooperative/Collaboration Agreement	Input supply and ICT information management	Undisclosed
Ghana	CABI-IITA: Gender and the Legume Alliance: Integrating multi-media communication approaches and input brokerage (GALA)	NGO	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	389,117 [b]
Kenya	Western Region Agricultural Technology Evaluation (WERATE)	NGO	Subcontract	Capacity building, market linkage, technology dissemination	190,775 [C]
Kenya	Annapolis Wonder Enterprises (AWE)	Private Organization	Subcontract	Market Linkage, Technology Dissemination	18,900 [C]
Malawi	Inter-church Organization for Development Cooperation (ICCO) - Churches Action in Relief and Development (CARD)	NGO	Cooperative/Collaboration Agreement	Capacity building, input supply, market linkages, technology dissemination	260,860 [b]
Malawi	Agro-Inputs Suppliers Limited (AISL)	Private Organization	Cooperative/Collaboration Agreement	Capacity building, input supply, market linkages, technology dissemination	Undisclosed
Mozambique	The USAID AgriFUTURO (AgriFUTURO)	NGO	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	Undisclosed
Mozambique	The National Cooperative Business Association. CLUSA International (NCBA CLUSA)	NGO	Cooperative/Collaboration Agreement	Capacity building, technology dissemination	14,300,000 [b]
Nigeria	Kaduna State Agricultural Development Project (KADP)	NGO	Subcontract	Dissemination	15,516 [C]
Nigeria	Sasakawa Global 2000 (SG 2000) Nigeria	NGO	Subcontract	Dissemination	15,106 [C]
Nigeria	Niger State Agricultural and Mechanization Development Authority (NAMDA)	Government Institution	Subcontract	Dissemination	21,387 [C]
Nigeria	CRS Support to Vulnerable Households for Accelerated Revenue Earnings (CRS-SHARE)	NGO	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	20,000,000 [b]

Country	N2Africa lead partner	Type of organization*	Type of partnership**	Main areas of support***	Value of partnership N2Africa: partner ($)
Nigeria	CRS Support to Vulnerable Households for Accelerated Revenue Earnings (CRS-SHARE)	NGO	Subcontract under collaborative agreement	Dissemination, input supply, market linkage, capacity building	93,832 C
Nigeria	Institute for Agricultural Research (IAR) Ahmadu Bello University, Zaria	Research Institute	Subcontract	Diagnostics	20,000 C
Nigeria	Abednego Youth Development Foundation (AYDF) under the IFDC-2SCALE Project	NGO	Subcontract/Cost share	Dissemination, input supply, market linkage, capacity building	98,880 C
Nigeria	The Inventive Minds (TIM) - Makurdi – Benue under the IFDC-2SCALE Project	NGO	Subcontract/Cost share	Dissemination, input supply, market linkage, capacity building	200,345 C
Nigeria	The Inventive Minds (TIM), Gboko, Benue under the IFDC-2SCALE Project	NGO	Subcontract/Cost share	Dissemination, input supply, market linkage, capacity building	149,966 C
Nigeria	Palm Valley Nigeria Limited (PVNL) under the IFDC-2SCALE Project	Private Organization	Subcontract/Cost share	Dissemination, Input Supply, Market linkage, Capacity Building	76,604 C
Nigeria	Hybrid Agro-business Consultant Limited (HABC) under the IFDC-2SCALE Project	Private Organization	Subcontract/Cost share	Dissemination, input supply, market linkage, capacity building	187,259 C
Nigeria	SG2000/AGRA-IEP: Improving Productivity and Incomes of Smallholder Farming Households Through Innovative Extension and Advisory Services in Northern Nigeria	NGO	Cooperative/Collaboration agreement	Dissemination, input supply, market linkage, capacity building	Undisclosed
Nigeria	SG2000/AGRA-IEP	NGO	Subcontract under collaborative agreement	Dissemination, input supply, market linkage, capacity building	19,082 C
Nigeria	Federal University of Technology Minna (FUT Minna)	Research Institute	Subcontract	Diagnostics	14,196 C
Nigeria	Bayero University Kano (BUK)	Research Institute	Subcontract	Diagnostics	4,085 C
Nigeria	United States Agency for International Development—Maximizing Agricultural Revenue and Key Enterprises in Targeted Sites II Project (USAID-MARKETS II)	NGO	Cooperative/Collaboration agreement	Dissemination, input supply, market linkage, capacity building	Undisclosed
Nigeria	EGALF Ventures Limited (EGALF)—MARKETS-II	Private Organization	Subcontract under collaborative agreement	Dissemination, input supply, market linkage, capacity building	14,663 C
Nigeria	Diamond Development Initiative (DDI)	NGO	Subcontract under collaborative	Dissemination, input supply,	6,518 C

Country	N2Africa lead partner	Type of organization*	Type of partnership**	Main areas of support***	Value of partnership N2Africa: partner ($)
	– MARKETS-II		agreement	market linkage, capacity building	
Nigeria	SG2000 – MARKETS-II	NGO	Subcontract under collaborative agreement	Dissemination, Input Supply, Market linkage, Capacity Building	11,480 [C]
Nigeria	Notore Chemical Industries Limited (NOTORE)–SARD-SC-Maize-Soya	Private Organization	Subcontract under collaborative agreement	Input supply, capacity building	54,586 [C]
Nigeria	SG2000–SARD-SC-Maize-Soya	NGO	Subcontract under collaborative agreement	Dissemination, input supply, market linkage, capacity building	127,572 [C]
Nigeria	Intrio Synergy Limited (ISL)	Private Organization	Subcontract/Cost share	Dissemination, input supply, market linkage, capacity building	81,535 [C]
Nigeria (Borno)	The Borno State Agricultural Development Project (BOSADP)	NGO	Subcontract	Dissemination, seed systems, market linkages	104,740 [C]
Nigeria (Borno)	CropLife	NGO	Subcontract	Capacity building—spray service providers (SSP_	14,850 [C]
Nigeria (Borno)	Intrio Synergy Limited (ISL)	Private Organization	Subcontract/Cost share	Dissemination, input supply, market linkage, capacity building	28,635 [C]
Rwanda	Development Rural Durable (DRD)	NGO	Subcontract	Capacity building, input supply, market linkages, technology dissemination	16,000 [C]
Rwanda	Conseil Consultatif des Femmes (COCOF)	NGO	Subcontract	Capacity building, input supply, market linkages, technology dissemination	8,000 [C]
Rwanda	Caritas Rwanda (Caritas Rwanda)	NGO	Subcontract	Capacity building, input supply, market linkages, technology dissemination	8,000 [C]
Rwanda	Eglise Presbyterienne au Rwanda (EPR)	NGO	Subcontract	Capacity building, input supply, market linkages, technology dissemination	8,000 [C]
Tanzania	Nelson Mandela Africa Institute of Science and Technology (NM-AIST)	Research Institute	Subcontract	Rhizobiology	58,495 [C]
Tanzania	Farm Radio International (FRI)—Scale up of improved legume technologies through sustainable input supply and information systems (SILT)	NGO	Cooperative/Collaboration agreement	Dissemination, input supply	3,216,542 [b]
Tanzania	Farm Radio International (FRI) - New Alliance ICT Extension Challenge Fund: Up-scaling of interactive information and communication	NGO	Cooperative/ Collaboration agreement	Dissemination	2,075,692 [b]

Country	N2Africa lead partner	Type of organization*	Type of partnership**	Main areas of support***	Value of partnership N2Africa: partner ($)
	technologies to increase uptake of agricultural innovations in Tanzania (UPTAKE)				
Tanzania	CABI—Renewal of Africa Soil Health Consortium (ASHC-II)	NGO	Cooperative/Collaboration agreement	Dissemination, input supply, market linkage, capacity building	4,500,000 [b]
Tanzania	iLogix under CABI African Soil Health Consortium (ASHC-II)	NGO	Sub-Contract under collaborative agreement	Seed systems	79,102 [c]
Tanzania	Catholic Relief Services (CRS) – Soya ni Pesa Project	NGO	Cooperative/Collaboration agreement	Dissemination, Input Supply, Market linkage, Capacity Building	10,500,000 [b]
Tanzania	Rural Urban Development Initiatives (RUDI) - Integrated Project to Increase Agricultural Productivity in the Breadbasket Area of Southern Highlands of Tanzania Project	NGO	Cooperative/Collaboration agreement	Dissemination, Input Supply, Market linkage, Capacity Building	1,827,302 [b]
Tanzania	Clinton Foundation Imitative (CDI) - Farmers First: Building a Path Out of Poverty in Tanzania and Beyond / The Anchor farm Project	Private Organization	Cooperative/Collaboration agreement	Dissemination, Input Supply, Market linkage, Capacity Building	3,671,000 [b]
Tanzania	Agricultural Research Institute, Makutupora (ARI Makutupora)	Research Institute	Subcontract	Dissemination, diagnostics	12,829 [c]
Tanzania	Agriculture Research Institute -Uyole (ARI-UYOLE)	Research Institute	Subcontract	Dissemination, diagnostics	13,833 [c]
Tanzania	FAIDA MARKET LINK (FAIDA MaLi)	NGO	Subcontract	Market linkage, capacity building	71,096 [c]
Tanzania	ARI—SELIAN (ARI—SELIAN)	Research Institute	Subcontract	Dissemination, diagnostics	29,480 [c]
Tanzania	BRAC Maendeleo Tanzania (BRAC, Tanzania)	NGO	Cooperative/Collaboration Agreement	Dissemination, input supply, market linkage, capacity building	11,285,800 [b]
Tanzania	Building Rural Incomes Through Enterprise (BRiTEN)	NGO	Subcontract	Dissemination, input supply, market linkage, capacity building	35,200 [c]
Tanzania	CABI-IITA: Gender and the Legume Alliance: Integrating multi-media communication approaches and input brokerage (GALA)	NGO	Cooperative/Collaboration agreement	Dissemination, input supply, market linkage, capacity building	389,117
Uganda	World Vision, Uganda (WVU)	NGO	Cooperative/Collaboration agreement	Dissemination, input supply, market linkage, capacity building	Undisclosed
Uganda	World Vision, Uganda (WVU)	NGO	Subcontract under collaborative agreement	Dissemination, input supply, market linkage, capacity building	105,035 [c]

Country	N2Africa lead partner	Type of organization*	Type of partnership**	Main areas of support***	Value of partnership N2Africa: partner ($)
Uganda	National Agricultural Research Laboratories (NARL)	Research Institute	Subcontract	Diagnostics	30,000 [C]
Uganda	Makerere University (MAKERERE)	Government Organization	Subcontract	Rhizobiology	20,000 [C]
Uganda	National Crops Resources Research Institute (NaCRRI)	Research Institute	Subcontract	Dissemination	30,000 [C]
Uganda	Africa 2000 Network Uganda (A2N)	NGO	Subcontract	Diagnostics, dissemination, seed systems, capacity building	35,000 [C]
Uganda	Netherlands Development Organization (SNV) - The Uganda Oilseed Subsector Platform (OSSUP)	NGO	Cooperative/Collaboration agreement	Innovation Platform (IP)	Undisclosed
Uganda	National Agricultural Research Organization (NARO)	Research Institution	Subcontract	Groundnuts, diagnostics, dissemination, capacity building	20,000 [C]
Uganda	Agricultural Innovation Systems Brokerage Association Limited (AGINSBA)	Private Organization	Subcontract	ICT-Platform—Dissemination, input and output market linkages	8,256 [C]
Uganda	CARD Uganda Agribusiness Development Solutions (CARD)	Private Organization	Subcontract	Capacity building, market linkages, technology dissemination	35,000 [C]
Uganda	Enterprise Development and Management (EDM LTD)	Private Organization	Cooperative/Collaboration agreement	Input supply, market linkages	1,400[b]
Uganda	Jay Fortune	Private Organization	Cooperative/Collaboration agreement	Capacity building, market linkages, technology dissemination	Undisclosed
Uganda	Simlaw Seeds Company Uganda Ltd	Private Organization	Cooperative/ Collaboration agreement	Seed supply	Undisclosed
Uganda	Agency for Sustainable Rural Transformation Limited (AFSRT)	Private Organization	Subcontract		28,663 [C]
Zimbabwe	International Livestock Research Institute (ILRI)—University of Zimbabwe (UZ)	Research Institute	Material transfer		-

* Type of organization: Farmer association/cooperative (fa), NGO (ngo), Government institution (gi), research institution (ri), private organization (po), others
** Type of partnership: Sub-contract (s), Collaboration agreement (ca), Grant agreement (ga), Project support consultancy agreement (psca), Material transfer (mt)
*** Main areas of support: capacity building (cb), input supply (is), market linkages (ml), technology dissemination (td)
[a] N2Africa received grants to implement joint Work Plans with partners.
[b] Overall budgets from development partner, which gives an indication for resource leverage.
[c] Contributions of sub-contracted partners

Appendix II – PhD and MSc student overview

Table 22. Overview of PhD students involved in N2Africa Phase II.

Country	Name	Gender	Research topic
Ethiopia	Ashenafi Hailu Gunnabo	M	Use of crop residues for livestock.
Ghana	Daniel Brain Akakpo	M	Use of grain legume residues as livestock feed resource for smallholder farmers in Northern Ghana.
Ghana	Michael Kermah	M	Exploring opportunities for sustainable intensification of grain legumes towards improving crop productivity, food security and livelihoods of smallholder farmers in northern Ghana.
Kenya	George Mwenda	M	Evaluation of competitiveness for nodulation of Phaseolus vulgaris L. in Kenyan rhizobial strains.
Mozambique	Amaral Machaculeha Chibeba	M	Nodule occupancy of elite rhizobial strains inoculated in soybean in Mozambique.
Nigeria	Ojo Comfort	F	Host legume x rhizobium strain interactions in cowpea.
Nigeria	Tolorunse Kehinde Dele	M	Phenotyping and Yield Stability Studies in Soyabean (*Glycine Max* (L.) Merrill) Under *Rhizobia* Inoculation.
Nigeria	Adediran Olaotan Abimbola	F	Physiological Responses of Cowpea (*Vigna Unguiculata* (L.) Walp) Varieties to Rhizobia Inoculation, Nutrient Management and Sowing Dates in Nigeria Southern Guinea Savannah.
Borno State	Faruk Galadanchi Umar	M	Response of Groundnut Varieties to *Rhizobia* Inoculation in The Sudan And Northern Guinea Savannas of Nigeria.
Borno State	Binta Ali Zongoma	F	Impact of Improved Cowpea Technology on Women Farmers in Southern Part of Borno State, Nigeria.
Rwanda	Rurangwa Eduard	M	Improving nitrogen fixation in common beans and soyabean in Rwanda.
Tanzania	Eliakira Kisetu Nassary	M	Intensification of maize-bean cropping systems in Northern Tanzania.
The Netherlands	Ilse de Jager	F	Agriculture and nutrition linkage in N2Africa.
The Netherlands	Esther Ronner	F	Impact of sustainable intensification of agricultural production through legume technologies on smallholder farming systems in Sub-Saharan Africa.
The Netherlands	Wytze Marinus	M	Using the NUANCES approach to examine benefits of legumes in farming systems of East Africa
Uganda	Allan Ochieng	M	Understanding the need for inoculation of common bean in Uganda.

M= male, F= female

Table 23. Overview of MSc students involved in N2Africa Phase II.

Country	Name	Gender	Research topic
France	Ugo Verlingue	M	Guiding varietal choice for soyabean in Africa: A comparison of bottom-up and top-down modelling approaches to assess water limited potential yields.
Ghana	Kennedy Ahlija	M	Response of soyabean to rhizobial inoculation and nitrogen management in the Guinea Savanna zone of Ghana.
Ghana	Wuni Mawia	M	Effect of genotype and plant population on growth, N-fixation and yield of soyabean in Northern Guinea

			Savanna zone of Ghana.
Ghana	Gifty Kuma	F	Effect of genotype and plant population on growth, N-fixation and yield of soyabean in southern Guinea Savanna Zone of Ghana.
Ghana	Kuma Florence Jessicah	F	Influence of P source on growth, nodulation and nitrogen fixation by different soyabean genotypes in two acid soils in northern Ghana.
Ghana	Godfrey Wilson	M	Bio-prospecting for effective rhizobia isolates for groundnut and cowpea production in northern Ghana.
Ghana	Kwasi Gyan	M	Market research.
Ghana	Ibrahim Issifu	M	Effect of liming, phosphorus application and rhizobial inoculation on growth, N-fixation and yield of soyabean.
Ghana	Abdul Rahaman Karim	M	Effect of farmers' storage practices on soyabean seed viability, vigour and germination.
Kenya	Martin Kiagayu Koinange	M	Influence of biochar amendment on the effectiveness of elite Kenyan rhizobia nodulating common bean (*Phaseolus vulgaris* L.).
Kenya	Wycliffe W. Waswa	M	Evaluation of yield potential and management practices affecting soyabean production in western Kenya.
Malawi	Donald Siyeni	M	Effect of rhizobia inoculation and phosphorus fertilizer on nodulation and yield of soyabean (*Glycine max* (L.) Merril) in Dedza, Kasungu and Salima districts of Malawi.
Nigeria	Ngwu Chuwudi Hillary	M	Genotype X Environment Interaction and Stability Analysis for Yield and Its Components In 24 Lines of Soyabean (*Glycine Max*) in Three Agro Ecological Zones of Nigeria.
Nigeria	Muhammed Mustapha Ibrahim	M	Optimization of Biological Nitrogen Fixation and Yield of Groundnut in Savanna Affisol Through Rhizobium Inoculation.
Nigeria	Musa Muhammed	M	Response of Cowpea Varieties to Rhizobium Inoculant and Phosphorous Fertilizer in Sudan Savanna.
Nigeria	Muhammed Haliru	M	Determinants of Inputs Demand and Adoption of Grain Legumes and Associated Technologies of N2africa in Kano State, Nigeria
Nigeria	Andy Okpoho	M	Effects of Tillage, Variety and Starter Nitrogen on Soil Physical Quality, Root Profile, Biological Nitrogen Fixation and Inoculated Soyabean Performance at Minna, Nigeria.
Nigeria	Ekle Angu Sunday	M	Soil Science.
Nigeria	Damilola Samuel Abikoye	M	Assessment of The N2africa Project on Empowering Women Involved in Soyabean (*Glycine Max*).
Nigeria	Joy Ekaette	F	Soyabean Response to Inoculation in Niger State
Nigeria – Borno	Muhammad Nurudeen ISA	M	Characterization and evaluation of indigenous *Rhizobia* of cowpea for biological nitrogen fixation and improved crop yield in the Nigerian savanna.
Nigeria – Borno	Hauwa Mohammed Alkali	F	Analysis of Market Participation by Women Soyabean Farmers in Kwaya Kusar Local Government Area, Borno State, Nigeria.
Nigeria – Borno	Maryam Baba Kyari	F	Analysis of Cowpea Marketing in Biu Local Government Area, Borno State, Nigeria.
Nigeria – Borno	Muhammad Sheriff ALI	M	Effect of different single superphosphate (SSP) rates and plant spacing on yield of groundnut in Sudan savanna zone of Borno State, Nigeria.
Nigeria –	Sahbong Lucy	F	Gender difference in the adoption and impact of improved

Borno	Kamsang		soyabean varieties in Southern Borno State, Nigeria.
Tanzania	Yusufu Namkeleja	M	Isolation, authentication and evaluation of symbiotic effectiveness of elite rhizobia strains for *Phaseolus* bean in Hai District, Tanzania.
Tanzania	Fides Temu	F	Dynamics of Common Bean (*Phaseolus Vulgaris L.*) Insect Pests with Altitudes, Cropping Seasons and Cropping Patterns in Hai District Tanzania.
Tanzania	Verena Mitschke	F	The effectiveness of different dissemination methods.
Tanzania	Eva Thuijsman	F	The competition of legumes with maize under maize-legume intercropping systems in Northern Tanzania.
The Netherlands	Kohji Nakasaka	M	Evaluating farmers' decision making on choosing technologies and practices in adaptation trials.
The Netherlands	Tijmen Kerstens[1]	M	Integration GYGA and N2Africa N.P.K. pesticides and herbicides use in Netherland.
The Netherlands	Lisa Piper[1]	F	N2Africa Public Private Partnership Review.
The Netherlands	Laurie van Reemst	F	Understanding drivers behind the implementation and adaptation of improved climbing bean (*Phaseolus Vulgaris* L.) technologies by smallholder farmers in Kapchorwa district, Eastern Uganda.
Zimbabwe	Vongai Chekanai	F	Nitrogen, phosphorus and rhizobia inoculation interactions on nutritional components of common bean (*Phaseolus vulgaris* L.) in Zimbabwean smallholder farms.
Uganda	Kennedy Mwesigewa	M	Characterizing nutrients limiting soyabean production in central Uganda.
Uganda	Eriya B. Kule	M	Unravelling intra-household gender dynamics affecting women participation in climbing bean marketing in Kabala, Uganda.
Ethiopia	Beza Shewangizaw	M	Response of Chickpea to Sulfur and Zinc Nutrients Application and Rhizobium Inoculation at Gonder Zuria, North Ethiopia.
Ethiopia	Negash Teshome	M	Response of Soyabean to Potassium fertilizer and Liming at Gobu-Sayo District, Western Ethiopia.
Ethiopia	Tadele Ereso	M	Symbiotic Effectiveness of Rhizobia Nodulating Chickpea (*Cicer arietinum L.*) and Faba Bean (*Vicia faba L.*) in Ethiopia.
Ethiopia	Fenta Mesfin	M	Adoption of improved Chickpea Technology Packages in North Gondar Zone.
Ethiopia	Galmesa Abebe	M	Determinants of Adoption of Improved Soyabean Production Practices: The Case of Chewaka and Gobu Sayo Districts, Oromia Region, Ethiopia.

M= male, F=female

[1] Student having collaborative research or internship with N2Africa

Appendix III – 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 soyabeans, common beans, cowpeas and groundnuts varieties with proven high BNF potential and sufficient seed availability in target impact zones of N2Africa Project
10. Project launch 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 seed 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 Seed 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. Identified 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. Launch 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 Launch 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

Partners involved in the N2Africa project

A2N

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