
# Annual country reports 2011

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## N2Africa

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

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# 1 Malawi Country Report December 2010 – May 2011

## I. Report specific in country activities, accomplishments and challenges under objective and output headings

**OBJECTIVE 1**

**Activity 1.1** Establish project management structures

**Output 1.1.3:** By month 6 of year 1 project staff engaged and capital investments made in all impact zones.

**Accomplishments and Challenges**: The positions of Research Officer, Farm Liaison Officer, Finance and Administrative Officer and Driver were all filled before the end of year 1. The N2Africa Dissemination Specialist and Acting Country Representative left the project and Malawi in month 1 year two, which resulted in local staff being over-stretched, and some tasks (e.g. agreements with partners) not followed through. A new Dissemination Specialist and Acting Country Representative joined the project and took up post in Malawi in month 4 year 2; due to her need to first become familiarized with the project (both in Malawi and other project countries) some issues absorbed an inordinate amount of the new staff member's time. With most outstanding issues resolved by end of month 6 year 2, the "gap" created by the absence of the Dissemination Specialist/Acting Country Rep at the beginning of year 2 should no longer be a constraint.

**Activity 1.3** Identify new opportunities for targeting legume and inoculant technologies to increase BNF and enlarge the production areas of prioritized grain legumes.

**Output 1.3.2:** By month 6 of years 2, 3&4, tested opportunities are identified prior to each following cropping season. **Accomplishments and challenges:** Delayed in Malawi due to first cropping season just ending in month 7 year 2; final results should be available month 8 year 2. As an interim measure, review and planning meetings were convened with all partners in months 5 and 6 of year 2 where preliminary results from agronomy trials were presented and planning for both agronomy (objective 2) and D&D (objective 4) trials for the 2011/12 season commenced.

**Output 1.3.4:** By month 10 of year 2, a document on market demand linking with TL-II and AGRA developed. **Accomplishments and challenges:** Value chain study on project legumes conducted in month 6 of year two; report (covering all three southern African countries) is expected to map out the market opportunities, region-wide, for all four legumes being tested in Malawi.

**Activity 1.4:** Quantify the current on-farm $N_2$-fixation in the target farming systems and its impact on livelihoods (income, nutrition).

**Output 1.4.2:** By month 12 of year 1 a baseline report quantifying the current level of BNF and its contributions to rural livelihoods is available for all impact zones. **Accomplishments and challenges:** Baseline survey conducted by Bunda College; submission of report delayed to month 6 year two. Survey did not gather GIS data on households (survey team lacked GPS units), and in addition did not cover all districts where the project is working in Malawi due to lack of adequate funding.

**OBJECTIVE 2**

**Activities 2.1-2.3:** Selection of best legume varieties. *And* **Activity 2.5** (identification of best-fit agronomic practices)

**Outputs 2.1-2.3** *and* **Output 2.5.1: Accomplishments:** 4 soybean and 1 bush bean variety trials have been set up to test the response of 6 existing and new varieties of soybean to inoculation without Phosphorus limitation in December 2011 and January 2011. 4 soybean and 1 bush bean Input trials set up with existing varieties to determine their response to the application of P and K fertilisers in December 2010 and January 2011. Fertilisers applied to trials and data collection done on all trials between January and May 2011. The data processing was started in May 2011. **Challenges:** Most of the challenges faced in Malawi were reportedly common in all N2Africa countries and were more administrative than field-related, however the administrative problems drastically affected field work. There was late rolling out of all field activities due to late funding to the partners which subsequently affected every field activity on the timeline. Memoranda of understanding signed with partners were not explicit on some expenses that partners would incur from their budgets. The memoranda were ambiguous hence posed dilemmas at times for partners to make some expenses. Additionally, the 2010/2011 season was affected by brief dry spells which might affect yield in some trial sites. It is however difficult for scientists to justify these claims since there was no rainfall data collection. Lack of comprehensive training for partners' frontline staff on data collection also compromised some data Transport acquisition was a big problem since there were six partners using only one vehicle. Some agronomic data was collected late or missed because of vehicle unavailability at optimum times.

**OBJECTIVE 3**

**Activity 3.2:** Establish and characterize a rhizobium germplasm bank in the impact zones.

**Output 3.2.2:** By month 4 of year 2, at least 10 nodules of soybean and beans collected in at least 200 sites in 3 impact zones, for isolate characterization and inclusion in the germplasm bank. **Accomplishments and challenges:** No progress at all – still waiting for renovation of Chitedze rhizobiology lab to be completed. Delays apparently as a result of slowness of government to complete the job.

**Activity 3.4:** Expand and upgrade inoculant production capacity in sub-Saharan Africa.

**Output 3.4.2:** - By month 12 of year 1, existing rhizobiology laboratories upgraded . **Accomplishments and challenges:** Still waiting for renovation of Chitedze rhizobiology lab to be completed. Delays apparently as a result of slowness of government to complete the job.

**Output 3.4.3:** By month 6 of year 2, at least 50,000 inoculant packets produced per year in at least 4 cooperating laboratories, increasing in years 3&4. **Accomplishments and challenges:** No progress at all for reason give above.

**OBJECTIVE 4**

**Activity 4.1:** Create strategic alliances for facilitating dissemination of legume and inoculant technologies in the impact zones.

**Output 4.1.1:** Memoranda of Understanding are formalized with key partners along the legume value chains in the impact zones. **Accomplishments:** The target period of implementation for this activity is month 6 in the first year. The status of the memorandum of understanding for all partners of N2Africa Malawi was as follows:

| | |
|---|---|
| MoU finalized before November 2010 | • DAES (Department of Agriculture Extension Services)<br>• DARS (Department of Agriculture Research Services)<br>• Bunda College<br>• World Vision Malawi<br>• Concern Universal |
| MoU finalized after November 2010 | Clinton Development Initiative (CDI) |

**Challenges:** Signing of MoA by some partners was delayed as some partners objected to the MoA format was too different from those they usually use and the amount of funding was considered to be very low , further hindering finalization of the agreements.

**Activity 4.2:** Produce specific dissemination tools.

**Output 4.2.1:** By month 6 of years 2, 3 &4, at least one new dissemination tool related to legume and inoculant use are produced per impact zone. **Accomplishments:** The project started developing tools for partner training sessions, such as handouts and references on legume crop production practices and Inoculants use. (Refer *to 4.4.2*)

**Activity 3:** Engage with other legume seed production, marketing, input, processing and nutrition initiatives.

**Output 4.3.1:** By month 12 of year 1, sufficient legume seed is acquired for initial dissemination in the various impact zones. **Accomplishments:** During the 2010 /11 season, the following legume seed was purchased and distributed to the 3229 farmers in all the project sites, as follows:

| District | Partner | Groundnut (kg) | Soybean (kg) | Cowpea (kg) | Bean (kg) | Total | Men | Women |
|---|---|---|---|---|---|---|---|---|
| Dedza | DAES | 291 | 62 | 0 | 305 | **658** | 304 | 354 |
| Lilongwe | DARS, N2Africa | 244 | 134 | 89 | 65 | **531** | 222 | 309 |
| Mchinji | CDI | 202 | 508 | 0 | 0 | **710** | 424 | 286 |
| Ntcheu | CU | 53 | 180 | 0 | 36 | **269** | 163 | 106 |
| Dowa | WVM | 182 | 283 | 0 | 196 | **661** | 273 | 388 |
| Salima | DAES | 64 | 438 | 101 | 0 | **603** | 288 | 315 |
| **Total** | | **1036** | **1605** | **190** | **601** | **3432** | **1674** | **1758** |

The legume seed was purchased from the following institutions:

- TL II for soybean
- ICRISAT for groundnut
- ASSMAG for soybean, groundnut and bean
- Private Certified Farmers for cowpea

**Challenges**

- Quality of seed especially from ASSMAG was not very good (a mixture of soybean varieties in one bag)

- Seed is expensive
- Cowpea seed was difficult to find

**Output 4.3.2:** By month 6 of year 2, at least half of the farming communities engaged in the project are actively producing seed for local distribution. **Accomplishments:** This activity will commence during the next growing season. During the Partner Planning meeting held in month 6 year 2, strategies were developed for seed multiplication. Some farmers in each site will, in 2011/12 season, receive more legume seed (up to 20 kg each farmer) to increase local seed production. This activity will enhance legume seed accessibility at local level by smallholder farmers. **Challenges:** Sufficient seed may not be available for all partners who would like to participate, funds may be too limited to enable quality control measures (farmer registration, inspection services, testing and certification services) and appropriate/adequate storage facilities at the community level may be difficult to find and access.

**Activity 4.3.3:** By month 12 of year 2, at least half the farming communities engaged in the project are actively linked to legume market outlets.

**Output 4.3.3:** By month 12 of year 2, at least half of the farming communities engaged in the project are actively linked to legume market outlets **Accomplishments:** Collaboration with the project " Increasing smallholder farm productivity, income, and health through widespread adoption Integrated Soil Fertility Management (ISFM) in the Great Lake Regions and Southern Africa" that is funded by IFAD and led by CIAT-TSBF began in the first half of year two. Market linkage activities for N2Africa farmers have begun with project farmers in several districts (Salima, Dowa, Lilongwe West and Mchinji). Training of Extension Officers and Lead Farmers has been done (gross margin analysis, market negotiation skills) and introductions made to potential markets (exchange visits to the Agricultural Commodity Exchange). **Challenges:** Soybean prices have been so high this past season that soybean farmers are not motivated to join in collective market initiatives and prefer to sell individually. While the high prices are encouraging in the short term and thus marketing of soybean is relatively easy the prices will not remain high every year and may even fall drastically when production increases. There is a real need for the farmers to gain the skills being delivered to them through this training.

**Activity 4.4:** Conduct collaborative legume and inoculants technology dissemination campaigns and create awareness in rural communities in all impact zones.

**Output 4.4.2:** By month 6 of each year, large scale demonstration and dissemination campaigns launched in each impact zone. **Accomplishments:** 3229 farmers participated in the demonstrations on cowpea, groundnut, bean and soybean technologies in Ntcheu, Dowa, Salima, Lilongwe, Dedza and Mchinji districts (see table below). The farmers grew the legume seed on a plot of 20 m by 10 m. Each farmer received 1 kg of seed on loan. They will repay back 2 kg of the same seed.

**Challenges:** Some partners commenced activities late in the season (late signing of MoA, late provision of inputs) which adversely impacted farming operations.

**Activity 4.4.3:** By month 9 of each year, at least 3 extension events organized per season per country.

**Accomplishments:** Field days were conducted in all the six districts. The field days were on all the legume crops that are being promoted by N2Africa, namely, groundnut, soybean, bean and cowpea. The themes for the field days were the themes for the demonstration plots, as follows:

- Use of inoculants in soybean
- The effectiveness of inoculants from different sources (Chitedze Research, Marondela in Zimbabwe and MEA in Kenya .
- Varieties of bean, groundnut, soybean and cowpea

- Planting method (Sole versus Inter-planting) in Cowpea
- Use of P-based fertilizers (TSP and D- Compound) in legumes (groundnut, bean, soybean and cowpea)
- Date of planting

The table below shows the number of farmers that participated in the field days where an N2Africa staff also attended. However, some field days were conducted in the sites whose figures on attendance were not collected.

| District | Dates | Crop | Total | Male | Female | Youth (up to 18 yrs) |
|---|---|---|---|---|---|---|
| Mchinji | 11-Jan-11 | Soybean, Groundnut | 29 | 15 | 12 | 2 |
| | 28-Apr-11 | Groundnut | 212 | 79 | 102 | 31 |
| | 05-May-11 | Soybean | 359 | 134 | 111 | 114 |
| | | **Total for Mchinji** | **600** | **228** | **225** | **147** |
| Dowa | 12-Apr | Soybean | 55 | 27 | 21 | 7 |
| | 12-Apr-11 | Groundnut | 19 | 8 | 11 | 0 |
| | 12-Apr-11 | Bean | 84 | 17 | 26 | 41 |
| | | **Total for Dowa** | **158** | **52** | **58** | **48** |
| Dedza | 11-Feb-11 | Bean, Soybean | 24 | 12 | 9 | 3 |
| | 15-Apr-11 | Bean, Groundnut | 94 | 32 | 44 | 18 |
| | 22-Apr-11 | Groundnut | 67 | 29 | 27 | 11 |
| | | **Total for Dedza** | **185** | **73** | **80** | **32** |
| Lilongwe | 29-Apr-11 | Groundnut | **46** | 18 | 21 | 7 |
| Ntcheu | 22-Mar-11 | Soybean | **68** | 42 | 26 | 0 |
| | 23-Mar-11 | Bean | **90** | 52 | 38 | 0 |
| | 24-Mar-11 | Groundnut | **71** | 29 | 42 | 0 |
| | | **Total for Ntcheu** | **229** | **123** | **106** | **0** |
| Salima | 11-Jan-11 | Cowpea | **12** | 5 | 7 | 0 |
| | 13-Apr-11 | Soybean | **97** | 22 | 48 | 27 |
| | 14-Apr-11 | Soybean | **37** | 17 | 20 | 0 |
| | | **Total for Salima** | **146** | **44** | **75** | **27** |
| | | | | | | |
| **TOTAL** | | | **1364** | **538** | **565** | **261** |

**Challenges:** Due to late planting in most areas, field days were also held late. Some farmers did not participate in field days due to long distances they would have to travel and lack/cost of transport. Better organization of outreach activities is needed to reach out to all farmers at higher level as well (higher level is where extension officers and other stakeholders attend). This would enable farmers to gain more skills and knowledge through discussions held at field days

**Activity 4.4.4:** By month 12 of each year, at least 3 mass media events organized per hub. **Accomplishments:** Two radio programs were produced and aired with Farmer Voice Radio, which is supported by the BMGF; the programs, where were in Chichewa, covered the following topics: About N2Africa, About Environmental Degradation and Nitrogen in the Atmosphere, Legumes and Fertilizers and Tips-CCPs in Crop Production in Every Legume. **Challenges:** When a state function takes place, the broadcast time for the radio program is changed, and farmers are often not informed of the new schedule, thereby depriving them of access to the broadcasted information.

**Activity 4.5:** Develop strategies for empowering women to benefit from project products.

**Output 4.5.2:** By month 9 of year 2, 3 & 4, a report documenting the involvement of women in at least 50% of all farmer-related activities, where relevant, produced. **Accomplishments:** Slightly over half (51.2%) of the participating farmers in the 2010/11 season were women. **Challenges:** The proportion of male to female Extension Officers is high, which means men are favored over women in training programs (especially TOT) which are conducted at the EO level.

**Output 4.5.3:** By month 12 of each year, at least 2 special events on the role of legumes in household nutrition and value added processing conducted per country. **Accomplishments:** A two-day training course on nutrition and legume processing was conducted for Extension Officers (73 women, 36 men). Following this training, the Extension Officers conducted training of other Extension Officers in three districts (7 women, 25 men). **Challenges:** Although this activity was supposed to target women, the Extension Officers (where men greatly outnumber women) did not make the effort required to recruit women participants for the district level training; the partner (DAES) who was given the funds to conduct the training was slow to implement the training; the funds available limit the number of farmers who can be reached (cost of equipment and raw materials is high); differences between country guidelines make it difficult to apply processing procedures developed in one country in another (e.g. Kenya training materials are not in agreement with guidelines issued by Malawi's Extension branch and therefore cannot be utilized).

**OBJECTIVE 5**

**Activity 5.1:** Provide short-term, high level technical training for project scientific and technical staff in essential microbiological skills and BNF technologies.

**Output 5.1.1:** By month 9 of year 1, at least 4 technical staff from the 3 hubs trained on inoculant production and quality control, lab-based PCR methods, N2 fixation quantification, and associated laboratory, greenhouse, and field techniques. **Accomplishments and challenges:** Delayed until month 8 year 2; challenge to find female candidates (very few women in technical agricultural sciences in Malawi).

**Activity 5.2:** Advanced training to MSc and PhD level of an elite young cadre of African scientists focused on topics filling identified knowledge gaps and identified through competitive calls.

**Output 5.2.1:** By month 6 of year 1, at least 14 MSc and 6 PhD candidates divided among three hubs selected for training. **Accomplishments:** Two MSc candidates have been identified and will commence their degree programs at Bunda College in August 2011 (month

9 year 2). A PhD candidate has been identified and his admission to WUR is being processed.

**Activity 5.3:** Training-of-trainers workshops on legume and inoculant technologies for agricultural extension workers and NGO staff.

**Output 5.3.2:** By month 10 of years 2 and 3, at least 8 training-of-trainers workshops (2 workshops in each country), attended by at least 40 extension staff, conducted on inoculation technology (inoculant handling and storage, etc) and legume agronomy [resulting in 640 trainers by the end year 3]. (5.3.2) **Accomplishments:** All partners received Training of Trainers (TOT) training for its extension officers. The training covered the following topics:

- Objectives and expectations of N2Africa
- Legumes, nitrogen and rhizobia
- Increasing legume productivities in cereal-legume cropping systems (and Legume crop production practices; groundnut, bean, cowpea and soybean)
- Inoculants and inoculation (handling and use)
- Practical demonstration of inoculation (handling and use)
- Demo plot layouts and data collection (practical)
- Expectation from farmer groups and lead/master farmers
- Mid season and end of season evaluations
- The change of Lead Farmers from recipients of information to change agents (extension).
- Facilitation skills among the Lead Farmers

The number of Extension Officers and Lead Farmers that attended the TOT are as follows:

| **District** | **Total** | **Lead Farmers** | **Extension Officers** |
|---|---|---|---|
| Ntcheu | 21 | 12 | 9 |
| | 31 | 26 | 5 |
| Dowa | 47 | 33 | 14 |
| Salima | 18 | 12 | 6 |
| Mchinji | 18 | 12 | 6 |
| Lilongwe | 22 | 14 | 8 |
| **Total** | **157** | **109** | **48** |

**Challenges:** The time given for the training (one half day) was too short to cover all topics in detail, there was no follow-up to the TOT (therefore questionable impact) and not all Lead Farmers were included in the training.

**Activity 5.4:** Training workshops on legume and inoculant technologies for agro-dealers and officers of farmer associations and community-based organizations.

**Output 5.4.3:** By month 12 of years 2, 3&4, at least 30 agro-dealers in each hub are trained in accessing, managing and distributing information on inoculant use, resulting in 270 trained agro-dealers by the end of the fourth year. **Accomplishments:** Agro-Dealer Network Institution, AISAM, participated in the 2011 planning meeting (month 6 year 2) and agreed to have some member agro-dealers establish demonstration plots for farmers to observe. **Challenges**: Agro-dealers may not be located in N2Africa sites.

# 2 Nigeria progress report – Narrative

**Introduction**

This report details the progress made in the last eighteen months (January 2010 to June 2011) in Nigeria. During this period, project staff were employed, baseline survey of the action sites conducted, national planning meetings held, partnerships formed, and adaptive research trials and dissemination activities carried out.

***Objective 1: Establish a baseline of the current status of N2-fixation, identify niches for targeting N2-fixing legumes in the impact zones, M&E and impact assessment***

*Activity 1.1. Establish project management structures*

The country coordinator, who also doubles as the Inoculant Delivery Specialist leading Objective 3 activities of the project, started work on 1st March 2011 and is based in Kano, Nigeria. Kano lies within the Sudan and Guinea savanna zones, which constitute the mandate zone of the country. The 3 project staff for Nigeria were engaged, two of which are women. The administrative secretary and research technician started work in November 2010, while the Farm Liaison Officer assumed duty in January 2011. However, the Administrative Assistant, Mrs Fatima Hussein, has recently put in her resignation letter for family reasons and is due to disengage on 30th November 2011. Ten Frajend 125 motorbikes have been purchased for extension activities in Nigeria and are due to be distributed to extension agents (EAs) in the last week of June during the launching of the project's 2011 cropping season. A project vehicle was purchased for activities in Nigeria and was delivered in May 2010. A laptop computer and 2 GPS devices were also procured for the country.

*Activity 1.2. Develop detailed documents for planning and management of N2Africa*

National planning meetings for project implementation in Nigeria were held on 21-22 April 2010 for the 2010 season and on 23-24 March 2011. During the 2010 meeting, the mandate areas (See Table 1) were selected and implementation plans for extension, P access, seed increase and market as well as TLII and AGRA interaction plans were developed and incorporated into the project's respective implementation plan documents. The project started in 2010 in two communities within each of the action sites. During the 2011 meeting, a decision was taken to increase the number of communities to 4 per action site.

**Table 1.** Selected mandate zones and action sites in Nigeria

| Country | Mandate zones | Action sites |
|---|---|---|
| Nigeria | Kaduna State | Giwa, Igabi, Kachia, Soba and Zangon Kataf |
| | Kano State | Albasu, Bichi, Bunkure, Dawakin Kudu, Garko, Tudun Wada, Warawa, and Wudil |

*Activity 1.3. Identify new opportunities for targeting legume technologies [niches] to increase BNF and enlarge the area under the priority legume*

Cowpea, groundnut and soybean were identified as the priority legumes for Nigeria. Eighteen on-farm adaptive trials were conducted for niche assessment involving 5 varieties of each of the priority legumes and inoculation in soybean at sites that are representative of soil and agro-climatic heterogeneities in the country (Table 2). Due to the unavailability of suitable

land in the action sites of Igabi and Giwa, the groundnut and soybean trials for these sites were relocated to Shika for on-farm trials. Early maturing and medium maturing varieties were targeted at sites in the Sudan savanna where the length of the rainy season is relatively short. Early maturing varieties of cowpea were also used in the wetter northern and southern Guinea savannas to take advantage of their growth duration to have 2 or 3 crops in the same season.

**Table 2.** Legume varieties used for niche assessment trials in the various mandate zones in Nigeria

| AEZ | Legume | Location of trial (LGA) | Varieties |
|---|---|---|---|
| Sudan | Cowpea, | Warawa, Albasu | IT90K-277-2, IT97K-499-35, IT89KD-391, IT99K-573-1-1 and Danila |
| | Groundnut | Garko,Wudil | SAMNUT 21, 22, 23, RMP 12 and Ex-Dakar |
| | Soybean | Bichi, Garko | TGX1835-10E, TGX1951-3F, TGX 1485-1D, TGX 1904-6F and TGX 1448-2E |
| Northern Guinea Savanna | Cowpea, | Soba,TudunWada | IT90K-277-2, IT97K-499-35, IT89KD-391, IT99K-573-1-1 and Danila |
| | Groundnut | Igabi, TudunWada | SAMNUT 21, 22, 23, RMP 12 and Ex-Dakar |
| | Soybean | Tudun Wada, Giwa | TGX1448, TGX1904-6F, TGX1945, TGX1951-3F, TGX1835-10E |
| Southern Guinea Savannah | Cowpea, | Kachia | IT90K-277-2, IT97K-499-35, IT93K-452-1, IT99K-573-1-1 and IT89KD-288 |
| | Groundnut | Zangon Kataf | SAMNUT 21, 22, 23, RMP 12 and Ex-Dakar |
| | Soybean | Kachia, Zangon Kataf | TGX1448-2E, TGX1904-6F, TGX1945, TGX1951-3F, TGX1835-10E |

In 2011, the same trials will be repeated using the same legume varieties in addition to new ones. Three additional varieties of soybean were obtained from SeedCo, Zimbabwe; these are SC Sequel, SC Saga and SC Squire. Additional cowpea varieties to be evaluated are IT98K-205-8 and IT99K-573-2-1. The characteristics of the various legume varieties are presented in Table 3.

**Table 3.** Characteristics and source of legume varieties selected for niche assessment trials in Nigeria

| Crop | Identified varieties | Important traits | Origin | TL-II variety? |
|---|---|---|---|---|
| Soybean | TGx 1835-10E | Promiscuous, medium duration, rust tolerant | Nigeria | Yes |
| | TGx 1830-20E | Promiscuous, early maturing | Nigeria | Yes |
| | TGx 1485-1D | Promiscuous, early maturing, rust susceptible | Nigeria | Yes |
| | TGx 1448-2E | Promiscuous, medium maturing, high biomass, high grain yield | Nigeria | Yes |
| | TGx 1904-6F | Promiscuous, medium maturity, high grain and biomass yields | Nigeria | Yes |
| | TGx 1945-1F | Promiscuous breeding line, medium maturity | Nigeria | Yes |

| | | | | |
|---|---|---|---|---|
| | TGx 1951-3F | Promiscuous breeding line, medium maturity | Nigeria | Yes |
| | TGx 1935-3F | Promiscuous breeding line, early maturity | Nigeria | Yes |
| | SC Sequel | Yellow seed coat, black hilum, rust resistant, determinate, good shatter resistance, high yielding, responds to rhizobium inoculation, 120 to 125 days to maturity at 1300 masl, 17$^{o}$ 40'E and 31 $^{o}$ 13' S | Zimbabwe | No |
| | SC Saga | Yellow seed coat, brown hilum, rust resistant, determinate, good shatter resistance, high yielding, responds to Rhizobium inoculation, 120 to 125 days to maturity at 1300 masl, 17$^{o}$ 40'E and 31 $^{o}$ 13' S | Zimbabwe | No |
| | SC Squire | Yellow seed coat, yellow hilum, rust resistant, determinate, good shatter resistance, high yielding, responds to rhizobium inoculation, 120 to 125 days to maturity at 1300 masl, 17$^{o}$ 40'E and 31 $^{o}$ 13' S | Zimbabwe | No |
| Cowpea | IT93K-452-1 (SAMPEA 8) | Extra- early maturity, good seed quality, field tolerance to major insect-pests. | Nigeria | Yes |
| | IT90K-277-2 (SAMPEA 9) | Dual purpose(good grain and fodder yields),acceptable seed quality & good fodder quality. | Nigeria | Yes |
| | IT97K-499-35 (SAMPEA 10) | Early maturing, white seeded, striga resistant, white seeded alectra resistant, good seed quality, field tolerance to major insect-pests. | Nigeria | Yes |
| | IT89KD-391 | Medium brown seeds with a rough seed coat. It has combined resistance to major diseases including Septoria leaf spot, scab, baterial blight and nematodes. | Nigeria | Yes |
| | IT89KD-288 | Photo-sensitive dual purpose cowpea line. It has medium to large white seeds with a rough seed coat. It has combined resistance to major diseases including Septoria leaf spot, scab, baterial blight and nematodes. | Nigeria | Yes |
| | IT99K-573-1-1 | | Nigeria | Yes |
| | IT99K-573-2-1 | White seed, rough coated, early maturity (65-70 days), drought tolerant, dual purpose, striga resistant, moderately resistant to common diseases in northern | Nigeria | Yes |

| | | | | |
|---|---|---|---|---|
| | | Nigeria | | |
| | IT99K-205-8 | White seed, rough coated, extra early maturity, drought tolerant, striga resistant, moderately resistant to common diseases in northern Nigeria | Nigeria | Yes |
| Groundnut | SAMNUT 21 | High pod and haulm yield, Medium maturing, dual-purpose (fodder and grain), resistant to rosette, high oil content (51%) | Nigeria | Yes |
| | SAMNUT 22 | High pod and haulm yield, medium maturing, dual-purpose (fodder and grain), resistant to rosette | Nigeria | Yes |
| | SAMNUT 23 | Early-maturing, resistant to rosette, high oil content (53%) | Nigeria | Yes |
| | RMP 12 | High yield (pod and haulms), resistant to rosette ( long duration) | Burkina Faso | No |

*Activity 1.4. Quantify the current on-farm N2-fixation in the target farming systems and its impact on livelihoods (income, nutrition*)

Secondary data for the selected impact zones and mandate areas in Ghana and Nigeria were collated and forwarded to the Farming Systems Specialist for incorporation into the project document. The baseline survey for Nigeria was completed in April 2011.Bayero University Kano (BUK) conducted the survey for action sites within Kano State, and Diamond Development Initiatives (DDI) in Kaduna State. The survey was conducted among 781 households in Kaduna and Kano States (Table 4). Local Government Areas (LGAs) targeted in Kano State were all situated south of Kano city in the transition zone between northern Guinea savanna and Sudan savanna. In northern Kaduna State, Giwa and Igabi LGAs are situated south and west of Zaria city, respectively, and fall into the northern Guinea agro-ecological zone, while Kachia and Kangon Kataf LGAs are located in southern Kaduna and fall in the southern Guinea savanna zone.

**Table 4.** Distribution of interviewed households across Local Government Areas and States in Nigeria.

| Local Government Area | State | Number of households interviewed | Agro-ecological zone |
|---|---|---|---|
| Bunkure | Kano | 93 | Northern Guinea / Sudan savanna |
| Dawakin Kudu | Kano | 95 | Northern Guinea / Sudan savanna |
| Garko | Kano | 97 | Northern Guinea / Sudan savanna |
| Tudun Wada | Kano | 99 | Northern Guinea savanna |
| Giwa | Kaduna (north) | 99 | Northern Guinea savanna |
| Igabi | Kaduna (north) | 99 | Northern Guinea savanna |
| Kachia | Kaduna (south) | 100 | Southern Guinea savanna |
| Zangon Kataf | Kaduna (south) | 99 | Southern Guinea savanna |

Preliminary results show that the average number of people in a household are 14 in Kano State, 8 in northern Kaduna and 7 in southern Kaduna. In 49% of the households, at least one person was member of an association. Membership of an association was more common among interviewed households in Kano State, where 61% of the households had somebody who was member of an association. The aim of the association was often related to agriculture (to gain excess to technologies, to purchase inputs, etc.), finances (access to credit) or to general development (e.g. 'to build the nation'), or simply to help each other. 85% of the interviewed people were head of the household.

The vast majority of households in southern Kaduna State derived most of their income from farming (Table 5). In northern Kaduna State and Kano State, a greater proportion of income was derived from off-farm sources.

**Table 5.** Proportion of income from farming and off-farm sources in Nigeria (% of households interviewed).

| State | All income from farming | Three-quarter from farming | Half from farming, half from off-farm | Three-quarter from off-farm | All income from off-farm |
|---|---|---|---|---|---|
| Kano State | 21 | 2 | 12 | 24 | 43 |
| Kaduna State (north) | 26 | 1 | 45 | 2 | 28 |
| Kaduna State (south) | 77 | 5 | 8 | 2 | 7 |

In Kano State, the majority of interviewed households grew cowpea and groundnut (Table 6). In Kaduna State, soybean and cowpea were the most popular legume crops. In Kano State, the bulk of the produce is sold, while households in northern Kaduna consume much of their cowpea and soybean and sold the bulk of the groundnut.

**Table 6.** Cultivation and utilisation of legumes in Nigeria: % of households cultivating particular legumes and % of produce used for consumption/sale.

| Crop | Kano State | Kaduna State (north) | Kaduna State (south) |
|---|---|---|---|
| ***Cultivation*** | | | |
| Groundnut | 76.8 | 8.6 | 36.2 |
| Cowpea | 91.7 | 56.6 | 44.7 |
| Soybean | 27.9 | 51.0 | 53.8 |
| Bambara nut | 0.8 | 0.0 | 0.0 |
| ***Use (consumption/sale)*** | | | |
| Groundnut | 38.5/61.5 | 3.5/96.5 | |
| Cowpea | 48.3/51.7 | 59.2/40.8 | |
| Soybean | 47.0/53.0 | 62.0/38.0 | |

***Objective 2: Select multi-purpose legumes (food, fodder, stakes, and soil fertility management) for enhanced BNF and integrate these into farming system***

*Activity 2.1. Identify and field test best varieties of soybean for high $N_2$-fixation capacity and adaptation to abiotic and biotic stresses*

Eight soybean varieties were identified and used for varietal trials across the 3 agro-ecological regions of Nigeria in 2010 (Table 7). The amounts of seeds purchased from TL2 seed systems partners and other local seed dealers are as given in Table 4. In 2011, the same varieties will be used with additional new varieties. The new soybean varieties to be evaluated are Squire, Saga and Sequel.

**Table 7.** Amounts of legume seeds purchased for the 2010 varietal trials in Nigeria

| Crop | Varieties | Qty of seed (kg) | Seed source |
|---|---|---|---|
| Soybean | TGX1448-2E | 8 | Seed Project |
| | TGX1835-10E | 6 | Seed Project |
| | TGX1485-1D | 4 | TL II Seed systems |
| | TGX1987 | 4 | TL II Seed systems |
| | TGX1904-6F | 4 | TL II Seed systems |
| | TGX1945 | 4 | TL II Seed systems |
| | TGX1951-3F | 4 | TL II Seed systems |
| | TGX1935 | 4 | TL II Seed systems |
| Cowpea | IT90K-277-2 | 3 | Seed Project |
| | IT97K-499-35 | 5 | Seed Project |
| | IT89KD-391 | 3 | TL II Seed systems |
| | IT99K-573-1-1 | 3 | TL II Seed systems |
| | IT93K-452-1 | 3 | Seed Project |
| | IT89KD-288 | 3 | TL II Seed systems |
| Groundnut | Ex Dakar | 7 | Seed Project |
| | SAMNUT 21 | 8 | Seed Project |
| | SAMNUT 22 | 5 | Seed Project |
| | SAMNUT 23 | 5 | Seed Project |
| | RMP12 | 5 | Seed Project |

Preliminary results of the varietal trial at Bichi in the Sudan savanna show large differences between varieties with no consistent effect of inoculation on grain yield (Figure 1). However, inoculation effect was visible on nodule score and no. of nodules per plant (Table 8). A similar trend was observed at another site (Sarina) within the same agro-ecology.

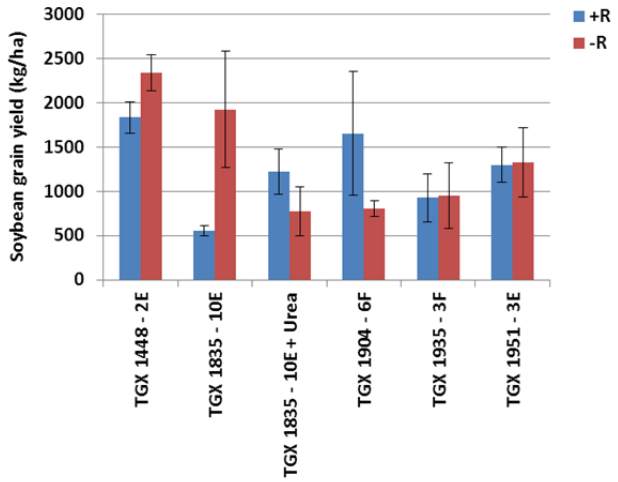



**Figure 1.** Soybean grain yield as affected by variety and the use of inoculants (R) at Bichi, Kano State, Nigeria, in 2010. Error bars represent standard errors of means.

**Table 8.** Average nodule score and number of nodules per soybean plant in variety trial in Bichi, Nigeria, in 2010.

| | Nodule score | | Number of nodules per plant | |
|---|---|---|---|---|
| Variety | +R | -R | +R | -R |
| TGX 1448 - 2E | 3.3 | 1.7 | 10.6 | 5.7 |
| TGX 1835 - 10E | 2.8 | 1.1 | 12.7 | 3.2 |
| TGX 1835 - 10E + Urea | 2.2 | 2.2 | 7.5 | 8.0 |
| TGX 1904 - 6F | 2.7 | 2.3 | 8.5 | 13.2 |
| TGX 1935 - 3F | 2.4 | 1.5 | 14.8 | 4.1 |
| TGX 1951 - 3E | 1.7 | 1.6 | 6.3 | 5.3 |

In the wetter, northern and southern Guinea savanna, soybean yields were much more impressive, with an average yield of 1500-2000 kg/ha (Figure 2). The average increase in yield due to inoculation was 25%, with response at the Zonkwa site (southern Guinea savanna) being the strongest.

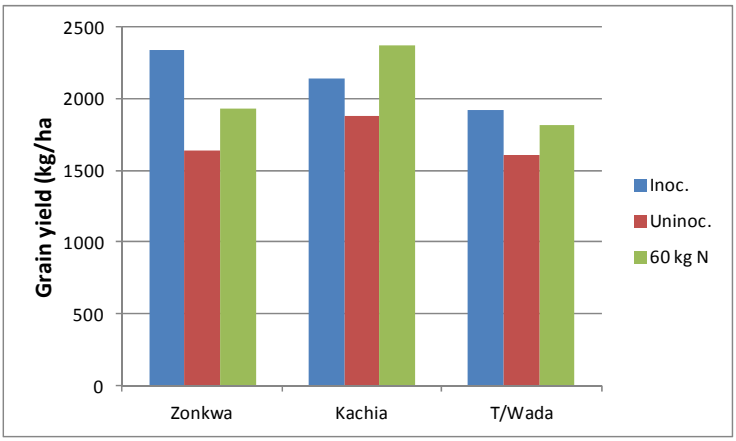



**Figure 2.** Soybean yield response to inoculation at 3 sites within northern (Tudun Wada) and southern (Kachia and Zonkwa) Guinea savannas of Nigeria in 2010.

*Activity 2.3. Select cowpea and groundnut for high BNF potential and less variable capacity to respond to inoculation*

Six cowpea and five groundnut varieties were evaluated under varietal trials in 2010 (Table 7). In 2011, two additional cowpea varieties – IT98K205-8 and IT99K-573-2-1-will be tested along with the existing six varieties. We are expecting 3 groundnut varieties from SeedCo in Zimbabwe; these will be added to the current 5 varieties for trials in 2011.

**Table 5.** Amounts of seeds of cowpea and groundnut varieties purchased for the 2010 varietal trials in Nigeria

| Country | Varieties | Qty of seed (kg) | Seed source |
|---|---|---|---|
| Cowpea | IT90K-277-2 | 1.01 | Seed Project |
| | IT97K-499-35 | 1.01 | Seed Project |
| | IT89KD-391 | 0.81 | TL II Seed systems |
| | IT99K-573-1-1 | 1.01 | TL II Seed systems |
| | IT93K-452-1 | 0.20 | Seed Project |
| | IT89KD-288 | 0.30 | TL II Seed systems |
| Groundnut | Ex Dakar | 3.65 | Seed Project |
| | SAMNUT 21 | 2.43 | Seed Project |
| | SAMNUT 22 | 2.43 | Seed Project |
| | SAMNUT 23 | 2.43 | Seed Project |
| | RMP12 | 2.43 | Seed Project |

In cowpea, an old variety, Dan-Ila had the highest yield where P was not added at Albasu in the Sudan savanna and also produced similar yields as IT99K-573-1-1 with P additions (Figure 3). At another site (Warawa) within the Sudan savanna, there was a strong impact of P fertiliser (Figure 4). At both the Albasu and Warawa sites, however, the yield of cowpea was less than 1000 kg/ha. A possible reason for this rather low yield is low soil fertility due to soil degradation.

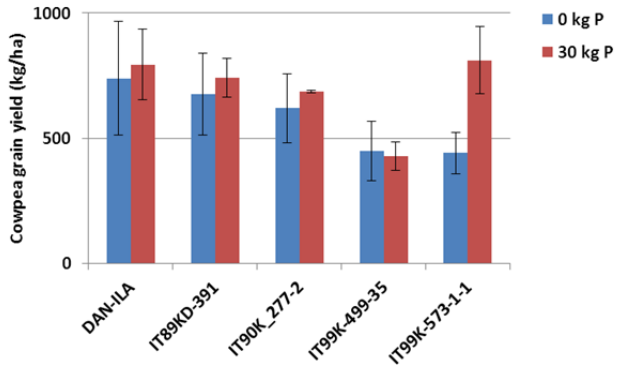



**Figure 3.** Cowpea grain yield as affected by variety and P fertiliser at Albasu, Kano State, Nigeria, in 2010. Error bars represent standard errors of means.

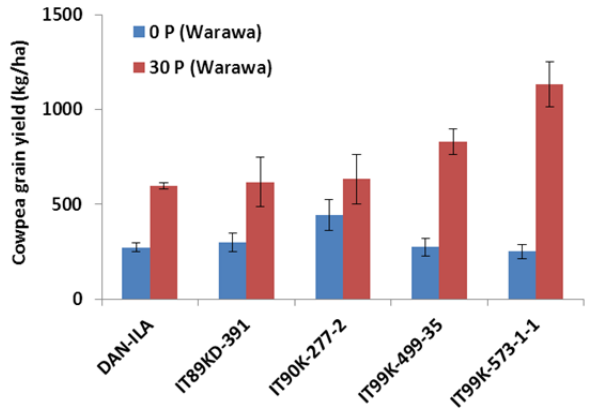



**Figure 4.** Cowpea grain yield as affected by variety and P fertiliser in Warawa, Kano State, Nigeria, in 2010. Error bars represent standard errors of means.

Cowpea yields in the northern and southern Guinea savannas were also very low, often below 800 kg/ha. However, yields of IT99K-573-1-1 and IT89KD-391 at Kachia and Soba were marginally higher than 1000 kg/ha (Figure 5).

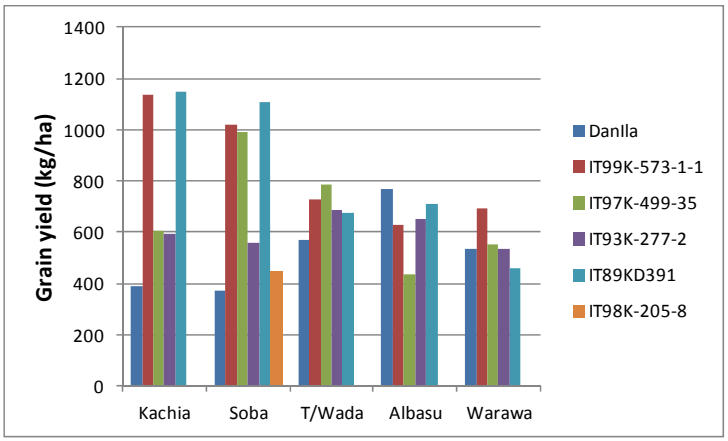



**Figure 5.** Yields of cowpea varieties at different sites in Kaduna State, Nigeria, in 2010.

Groundnut varieties generally produced low yields (less than 1000 kg/ha) at most of the sites in Nigeria due partly to late planting but also soil degradation. The Samnut varieties appear to yield better than the other varieties (Figure 6).

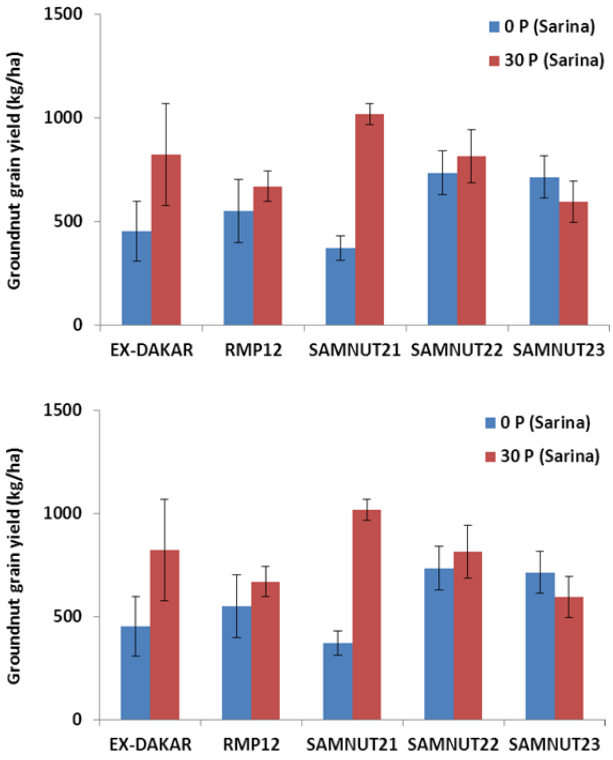



**Figure 6.** Groundnut grain yield as affected by variety and P fertiliser at two sites in, Kano State, Nigeria in 2010. Error bars represent standard errors of means.

*Activity 2.5. Identify best-fit agronomic practices for maximizing potential benefits of legume and inoculant technologies on increasing and stabilizing productivity*

Eighteen on-farm adaptive trials were conducted in 2010 to assess the input response of the three legumes (Table 6). The objectives of the trials were to determine under varying biophysical conditions (i) the response of soybean to rhizobium inoculation and (ii) the response of cowpea, groundnut and soybean to fertiliser P fertilizer and micronutrients application.

**Table 6.** Location of sites for the input trials in the various mandate zones in Nigeria

| AEZ | Legume | Location of trial (LGA) | Variety |
|---|---|---|---|
| Sudan | Cowpea, | Warawa, Albasu | IT90K-277-2 |
| | Groundnut | Garko,Wudil | SAMNUT 21 |
| | Soybean | Bichi, Garko | TGX 1835-10E |
| Northern Guinea Savanna | Cowpea, | Soba,TudunWada | IT90K-277-2 |
| | Ground nut | Igabi, TudunWada | SAMNUT 21 |
| | Soybean | Tudun Wada, Giwa | TGX1448-2E |
| Southern Guinea Savannah | Cowpea, | Kachia | IT90K-277-2 |
| | Groundnut | Zangon Kataf | SAMNUT 23 |
| | Soybean | Kachia, Zangon Kataf | TGX1448-2E |

The inputs used as treatments in the trials were (i) single superphosphate (SSP), which is the commonly available P straight fertiliser in the country, (ii) 'Crystaliser', a commercially available rock P (RP) fertiliser that is mined from Sokoto in Nigeria, and (iii) 'Agrolyser' (AGRL), a commercially available blend of micronutrients (Mn, Fe, Mo, Bo, Cu) and some secondary elements (Ca, Mg, S). The same trials using the same legume varieties are to be repeated in 2011.

Preliminary results of soybean input trials in the Sudan savanna show variable grain yield response to inoculation, with a positive inoculant effect at Bichi and a non-effect at Sarina (Figure 7). Treatments with SSP generally had higher yields than those without. This effect was more consistent at Bichi than at Sarina.

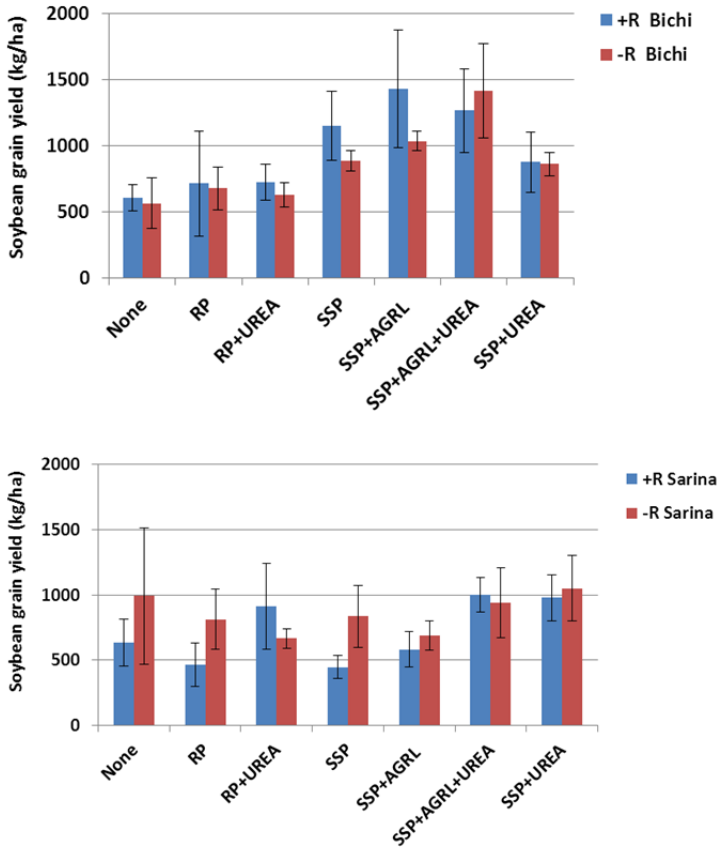



**Figure 7.** Response of soybean grain yield to nutrient inputs and inoculation (R) at Bichi and Sarina in Kano State, Nigeria, in 2010. Error bars represent standard errors of means.

Cowpea yields were generally higher when supplied with P fertiliser than without (Figures 8 and 9). Crystallizer (RP) showed inconsistent effect on grain yield but generally had no better effect on yield than the control.

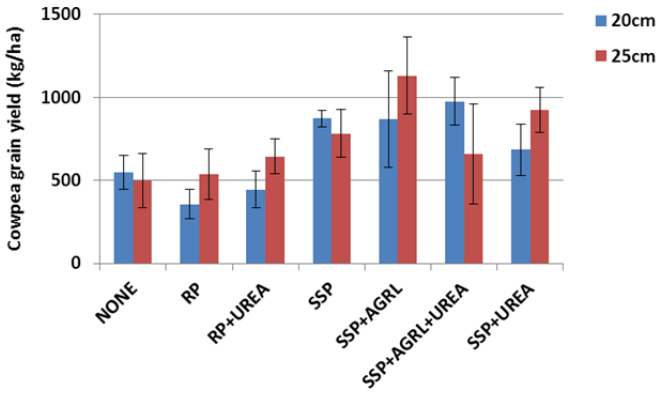



**Figure 8.** Response of cowpea grain yield to different fertiliser inputs and planting distance at Albasu, Kano State, Nigeria, in 2010. Error bars represent standard errors of means.

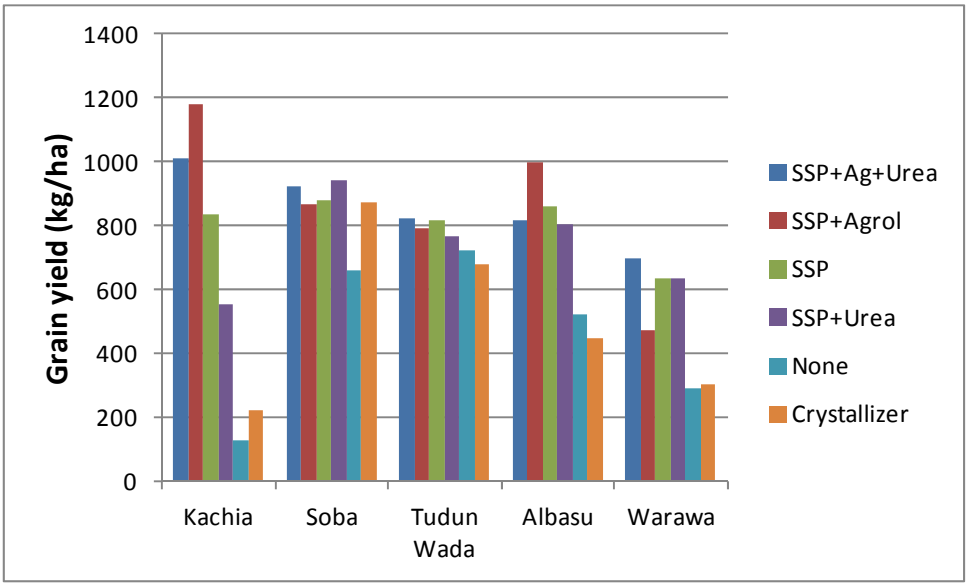



**Figure 9.** Cowpea grain yield (kg/ha) in response to inputs at different sites in Kaduna State in Nigeria, in 2010.

Although the grain yields of groundnut were generally low, yields were better when P fertiliser was applied (Figure 10). Yields in Sarina (Sudan savanna) were better than those in Tudun Wada (Northern Guinea savanna) (Figure 9)

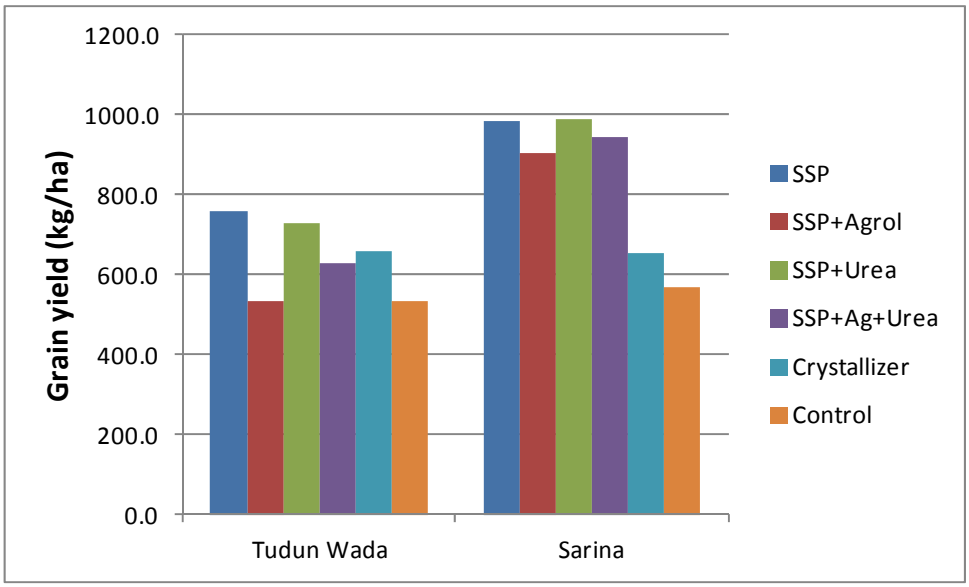



**Figure 10.** Groundnut grain yield (kg/ha) as affected by inputs at Tudun Wada and Sarina, Nigeria in 2010.

***Objective 3: Select superior rhizobia strains for enhanced BNF and develop inoculum production capacity in sub-Saharan Africa, including private sector partner***

*Activity 3.1. Assess the need-to-inoculate for the target legumes and identify elite strains across the impact zones*

Protocols for nodule sampling, rhizobia isolation and characterization has been updated and shared with partners. (**Activity 3.1.1.**). Additionally, standard MPN methods for target legumes have been identified and documented and existing capacity to conduct MPN has been determined for partner laboratories. The need-to-inoculate trials have been nested in varietal and input trials. Additional need-to-inoculate trials are currently being conducted in a greenhouse and will be completed in August 2011. MPNs are currently being set up and are expected to be completed by August 2011. Soil samples have also been collected from various sites in Mozambique and are ready to be sent to IITA Ibadan for MPN count as soon as import permit from Nigeria is obtained. (Activity 3.1.2. partially achieved).

*Activity 3.1.3. At least 2,000 strains screened for effectiveness under greenhouse conditions to select the top 5% for field testing*

In Mozambique, soybean nodules have been collected for a graduate student's work and awaiting import permit to be sent to EMBRAPA for the commencement of nodule recovery before the student's arrival in Brazil. Additionally, about 60 isolates have been recovered from soybean nodules sent to IITA Ibadan from Mozambique and are being authenticated in the greenhouse (Activity 3.1.3. ongoing).

*Activity 3.2. Establish and characterize a rhizobium germplasm bank in the impact zone*

Eight elite strains for cowpea/groundnut (USDA3384, USDA3451 and NC 92), bean (USDA 9030 & USDA 9032) and soybean (USDA 110, USDA 136 and USDA 138) obtained from USDA collections in the U.S. Additional 4 soybean strains (*B. japonicum* CNPSo 6, *B. Japonicum* CNPSo 7, *B. elkanii* CNPSo 9 and *B. elkanii* CNPSo 14)) from EMBRAPA Brazil was sent to laboratories in Zimbabwe and Nigeria. We have also been expecting 4 strains from the Agricultural Research Council (ARC) Rhizobium Collection in South Africa but delivery has been delayed due to problems of paperwork (Activity 3.2.1 on-going). Information on procedures for cross-border movement of root nodules, rhizobial strains, and

rhizobial inoculants has been collected from participating countries and has been used effectively for the importation of inoculants and strains in most countries.

*Activity 3.2.2. At least 10 nodules of soybean and beans collected in at least 200 sites in the impact zones, for isolate characterization and inclusion in the germplasm bank*

*Activity 3.3.1 Quality assurance protocols are developed for legume inoculants based on existing knowledge*

A quality assurance protocol has been developed as a basis for evaluating compliance of African inoculants. Quality thresholds have been established based on international standards. Modalities for quality assessment of inoculants are in place. QA for Nigeria will be done at IITA Ibadan.

*Activity 3.4.2. Three existing rhizobiology laboratories upgraded* In Nigeria, some glassware and reagents was procured locally in September last year for the laboratory at the Institute of Agricultural Research Zaria. The list of these items is presented in Table 7.

**Table 7.** Equipment purchased locally for IAR Zaria, Nigeria

| S/N | Item | Quantity | cost$ |
|---|---|---|---|
| 1 | Sodium hypochlorite | 1 | 44.7 |
| 2 | Sodium chloride (500g) | 1 | 21.28 |
| 3 | Sodium azide (100g) | 1 | 95.3 |
| 4 | Silica gel (500g) | 1 | 19.65 |
| 5 | Potassium dihydrogen orthophosphate (500g) | 4 | 36.74 |
| 6 | Sodium hydroxide (500g) | 1 | 45.45 |
| 7 | Calcium hypoclorite (500g) | 1 | 45.3 |
| 8 | Congo red (5g) | 1 | 25.3 |
| 9 | Bromothymol blue (25g) | 1 | 64.7 |
| 10 | Magnesium sulfate heptahydrate (500g) | 1 | 24.04 |
| 11 | Yeast Extract powder (500g) | 1 | 56.35 |
| 12 | Hydrochloric acid (2.5litre) | 1 | 64 |
| 13 | Methanol (2.5litre) | 1 | 31.91 |
| 14 | Ethanol 96% (2.5l) | 1 | 29.2 |
| 15 | Aluminium foil | 1 | 9.487 |
| 16 | Beaker (plastic 250ml) | 5 | 135.36 |
| 17 | Beaker (Plastic 500ml) | 10 | 131.55 |
| 18 | Flask (2000ml) (conical) | 8 | 57.37 |
| 19 | Petri dish (1000pcs) | 2 boxes | 133.49 |
| 20 | Conical flask (1litre) | 2 | 30.7 |
| 21 | Conical flask (500ml) | 5 | 135.4 |
| 22 | Parafilm | 7 | 101.78 |
| 23 | Microscope glass cover slip (100pieces) | 1 | 21.68 |
| 24 | Spray container (500ml) | 1 | 5.28 |
| 25 | Cotton wool | 5 | 70.38 |
| 26 | Paper bag (size 25) | 2 | 48.316 |
| | | | |
| | | | **1484.713** |

Additional equipment (Table 8) ordered from the UK has arrived and is due to be delivered to the institute on 22nd June 2011. The construction of a greenhouse at the Institute has also commenced. The institute has already employed an MSc graduate in soil microbiology to be assigned to the laboratory when it becomes fully operational.

**Table 8.** Laboratory equipment procured for IAR Zaria

| Line No | Item No | Item Desc | Supplier Item No | UOM | Qty | Price (GBP) | Total (GBP) |
|---|---|---|---|---|---|---|---|
| 1 | | Balance (100g, 3-4d.p); cat No: BFE-210-015H, Model: PL83-SI03 | | EACH | 1 | 879.49 | 879.49 |
| 2 | | Balance (200g-2.00kg) | | EACH | 1 | 1,403.74 | 1,403.74 |
| 3 | | High powered compound Microscope (50-5000e);cat no: 450-712 Model lynx | | EACH | 1 | 4,479.00 | 4,479.00 |
| 4 | | Laminar flow cabinet, SIZE 1.2 CAT No: BPG-575-010V | | EACH | 1 | 5,347.00 | 5,347.00 |
| 5 | | Microwave Oven; Cat No: OVM-100-030F, Model; SANYO | | EACH | 1 | 223.31 | 223.31 |
| 6 | | Refridgerator freezer (20c to -5c); cat no: RFN-132-0100 | | EACH | 1 | 1,010.37 | 1,010.37 |
| 7 | | Wrist action shaker (Cat no: SGM-200-010F) | | EACH | 1 | 925.57 | 925.57 |
| 8 | | autoclave (cat no. AUX-512-010G, Model: Astell (A) | | EACH | 1 | 4,970.00 | 4,970.00 |
| 9 | | autoclave 1l &2l bottles Cat No: BTF-400-1130S | | EACH | 1 | 57.69 | 57.69 |
| 10 | | pH meter; Cat No: PHL-565-010N, model Mettler toledo | | EACH | 1 | 467.88 | 467.88 |

Potential private sector inoculant producers have been invited to planning meetings and will also be invited to midterm assessment workshops. A potential inoculant producer has been identified and has expressed a willingness to set up an inoculant plant in Nigeria. The proposed plant manager will be attending the inoculum training course being organised at MIRCEN in 17th June to 25th July 2011.

***Objective 4: Deliver legume and inoculant technologies to farmers throughout sub-Saharan Africa***

*Activity 4.1.1. Memoranda of Understanding are formalized with key partners along the legume value chains in the impact zones*

Dissemination platforms have been formed involving key partners in governmental, non-governmental and community-based organisations as well as the private sector. Sub-contract agreements for this year's activities have been signed by Sasakawa Global and Kaduna State Agricultural Development Project (KADP), the dissemination leaders in countries. Collaboration with the Kano State Agricultural and Rural Development Authority (KNARDA) was established early this year. This has given us the opportunity to use their extension agents (EAs), which are more experienced, better trained and more dedicated than the existing pool that are employees of the Local Government Authorities. Getting the KNARDA

EAs on board has also made it possible for us to substantially increase the number of EAs to cover this year's dissemination activity which has been scaled five-fold.

We are also forming partnerships with other organisations to increase our reach, especially outside the project's action site. The Soil Health Programme (SHP) in Nigeria's sorghum belt is being implemented jointly by Bayero University Kano (BUK) and the Kano State Agricultural and Rural Development Agency (KNARDA). Both organisations are involved with N2Africa activities. Dr Jibrin of BUK, who is leading N2Africa agronomic activities in Kano State, is also leading the SHP. Part of the activities of the SHP is the demonstration of rotation and strip cropping of soybean and sorghum. For this season, about 500 farmers will be involved. Our entry point is the provision of inoculants for the demonstration. The plot size for soybean will be 1,500 sq. m. The plot will be divided into 2, one inoculated and the other left uninoculated. These demonstrations are located in several communities that are outside N2Africa's operational areas; they allow us to show-case inoculant technology outside our action sites and also allow us to use data for rotation effect on subsequent cereal crop.

The Department of Soil Science of Ahmadu Bello University (ABU) Zaria is leading the SHP in the maize belt. The project is led by Prof E.N.O Iwuafor and Prof Ishaku Amapu. They are operating in 7 states of the country. They have demonstrations in 21 communities for soybean seed production. The plot size is 625 sq. m (25 m x 25 m). We have agreed to apply inoculant to half of the plots and the other half left uninoculated. This allows us to cover 3 communities in at least 7 states with the inoculant technology at little cost to N2Africa. Extension agents for both SHPs and some key staff will be trained by N2Africa on the handling and use of inoculants.

We are also partnering with IFDC to demonstrate inoculant in soybean in some of their demonstration plots under the Nigeria Agro-Dealer Support (NADS) Project, which is funded by AGRA. The project operates technology transfer centers in nine Nigerian states, with nearly 12,000 agro-dealers, farmers, extension workers and other stakeholders from the agricultural industry participating. The project supports trade associations and assists agro-dealers to access investment capital through risk-sharing. Dealers are also trained to provide services such as field demonstrations, soil testing and teaching best practices to farmers. The NADS project has soybean demonstration only in one state – Taraba – and the total demonstration area is only 1 ha. We are, however, hoping that we could leverage this collaboration to have access to agro-dealers to show-case the inoculant technology and train the dealers on handling and application.

*Activity 4.1.3. At least 10 additional satellite sites have been identified per impact zone*

Collaborating with other partners has widened our reach outside our actin sites. The SHP for the sorghum and millet belt enables us to reach farmers in six LGAs where we are not operating. The maize belt SHP allows us to further reach 21 communities in at least 7 states of the Federation. The NADS programme will take inoculant technology to some communities in Taraba State, while a parallel programme undertaken by SG2000 will disseminate inoculant technology in 3 other states in northern Nigeria.

*Activity 4.2.1. At least 1 dissemination tool for each action site related to legume and inoculant use is produced per impact zone, resulting in about 24 different tools by the middle of year 3*

Three soybean technologies, 4 each of cowpea and groundnut were developed during the 2010 season. Each farmer was supplied with 1 kg of seed and 5 kg of P fertiliser, in addition to inoculants and adhesive for soybean demonstrations. A similar number of technologies has been produced for 2011.

*Activity 4.3.1. Sufficient [several tons] legume seed is acquired through cooperation with TL-II and the private sector, for initial dissemination in the various impact zones*

Seeds for dissemination and adaptive research were procured from TL II seeds systems and private sector organisations that are AGRA grantees. Partnerships are being explored for market opportunities. The quantities of seeds used for 2010 campaign are presented in Table 9. Farmers were expected to return 2 kg of seeds for every 1 kg given to them (2 for 1

approach). However, seed recovery turned out to be cumbersome and time-consuming partly because the message was not properly relayed by the EAs to the farmers but also due to lack of diligence on the part of the EA. Seed recovery was most successful in Kaduna State where the EAs are more experienced and better trained. They recovered 396.5 kg of soybean, 59 kg of cowpea and 71.7 kg of groundnut The 2 to 1 system will again be used to generate seeds for 2012.

**Table 9.** Quantities of seeds used for 2010 campaign and their sources

| | | **Quantity (kg) procured from each source** | | | |
|---|---|---|---|---|---|
| | | | | | |
| **Cowpea var.** | | TLII | Seed Coy | CSC | **Total (kg)** |
| IT90K-277-2 | | | | 290 | **290** |
| IT97K-499-35 | | 300 | | 100 | **400** |
| IT89KD-391 | | 150 | | 50 | **200** |
| IT99K-573-1-1 | | 120 | | | **120** |
| Danila | | | 50 | 50 | **100** |
| IT93K-452-1 | | | | 100 | **100** |
| IT89KD-288 | | 50 | | | **50** |
| **Total** | | **620** | **50** | **590** | **1260** |
| | | | | | |
| **G/nut var.** | | | | | |
| SAMNUT21 | | | 150 | 50 | **200** |
| SAMNUT22 | | | 150 | 50 | **200** |
| SAMNUT23 | | | 150 | 50 | **200** |
| RMP12 | | | 150 | | **150** |
| Ex Dakar | | | 100 | | **100** |
| **Total** | | | **700** | **150** | **850** |
| | | | | | |
| **Soybean var.** | | | | | |
| TGX1835-10E | | 50 | 130 | | **180** |
| TGX1485 | | | 100 | | **100** |
| TGX1448 | | 50 | 50 | 150 | **250** |
| TGX1904-6F | | | 50 | 150 | **200** |
| TGX1945 | | 140 | | | **140** |
| TGX1951-3F | | 120 | | | **120** |
| TGX1935-F | | | | 120 | **120** |
| **Total** | | **360** | **330** | **420** | **1110** |

CSC – community seed cooperative

The quantities of seeds procured for 2011 are presented Table 10.

**Table 10.** Quantities of seeds purchased for the 2011 dissemination campaigns

| Variety | Quantity (kg) | Source |
|---|---|---|
| **Cowpea** | | |
| IT90K-277-2 | 100 | Community cooperative |
| IT93K-452-1 | 200 | Community cooperative |
| IT97K-499-35 | 500 | TLII |
| IT98K-205-8 | 300 | TLII |
| IT99K-573-1-1 | 200 | TLII |
| IT89KD-391 | 100 | TLII |
| IT89KD-288 | 200 | TLII |
| IT93K-452-1 | 100 | TLII |
| IT97K-499-35 | 500 | Jirkur Seed Cooperative |
| **Groundnut** | | |
| Samnut23 | 227 | Community cooperative |
| Samnut23 | 500 | BUK Agron Dept |
| Samnut23 | 240 | TLII/BUK |
| Samnut22 | 155 | TLII/BUK |
| Samnut21 | 155 | TLII/BUK |
| Gnut | 376 | Community cooperative |
| RMP91 | 318.3 | Seed Project |
| Samnut23 | 86 | Seed Project |
| Samnut22 | 532.8 | Seed Project |
| **Soybean** | | |
| TGX1835-10E | 1500 | Jirkur Seed Cooperative |
| TG1951-3F | 2000 | Jirkur Seed Cooperative |
| TGX1904-6F | 3000 | Jirkur Seed Cooperative |
| TGX1935-3F | 1000 | Jirkur Seed Cooperative |
| TGX1448-2E | 500 | Jirkur Seed Cooperative |

*Activity 4.3.2. At least half of the farming communities engaged in the project are actively producing legume seed for local distribution*

The transition farmers (first year farmers) are expected to cultivate 0.4 ha with legume. Some of these farmers will be organised to act as community seed producers.

*Activity 4.3.3. At least half of the farming communities engaged in the project are actively linked to legume market outlets.*

Contacts have been made with several processors and aggregators on linkage with N2Africa. Table 11 provides a list of market operators that have shown willingness to make bulk purchase from N2Africa farmers.

**Table 11.** Potential buyers of produce from N2Africa farmers

| S/N | BUSINESS NAME | PRODUCE | Time of purchase |
|---|---|---|---|
| 1 | Grand Cereals | Soybean, Groundnut. | Bulk of their purchase is from October-December. |
| 2 | Tahir oil Mill | Soybean. | Bulk of their purchase is from October-December. |
| 3 | Alhaji Dalha- Girawa oil mill | Soybean. | Bulk of their purchase is from October-December. |
| 4 | Alhaji Aminu Dawaki oil mill | Soybean. | Bulk of their purchase is from October-December. |
| 5 | Dawanau Market Association | All the crops. | All year round. |
| 6 | Alhaji Lawan Umar –Janbulo oil mill | Groundnut. | Bulk of their purchase is from October-December. |
| 7 | Obasanjo Farms Ltd | Maize | All year round. |
| 8 | Abraks Vet. Farms Ltd | Maize | All year round. |

A soy processing company with a capacity of 75,000 tonnes per annum has opened in Abuja. The owners of the plant are in contact with N2Africa and a memorandum of understanding between the parties is under consideration.

*Activity 4.3.4. At least half of the farming communities engaged in the project are linked to legume processing initiatives*

Trainings on post-harvest technologies are due to be held in August 2011.

*Activity 4.4.2. Large-scale demonstration and dissemination campaigns held in each impact zone*

About 2000 farmers from 26 communities were mobilised for dissemination. Three soybean technologies, 4 each of cowpea and groundnut were developed and deployed during the season. Each farmer was supplied with 1 kg of seed and 5 kg of P fertiliser, in addition to inoculants and adhesive for soybean response to inoculation demonstrations. The summary of the number of household reached is presented in Table 12.

**Table 12.** Summary of 2010 dissemination activities in Nigeria: Number of farmers reached

| **Crop** | **Kano** | **Kaduna** | **Total** |
|---|---|---|---|
| Cowpea | 560 | 368 | 928 |
| Groundnut | 256 | 176 | 432 |
| Soybean | 304 | 448 | 752 |
| | | | |
| **TOTAL** | **1,120** | **992** | **2,112** |

For the 2011 season, N2Africa will work directly 13,200 farmers with 4,580 working in Kaduna State and 8,620 in Kano State. A total of 578 demonstrations, made up of 348 for soybean, 137 for cowpea and 118 for groundnut are to be set up. Dissemination activities will be implemented by groups or clusters of 20 farmers. The Lead farmer in each group will manage a demonstration plot of 30 m x 20 m, while the other 19 members (herein after called satellite farmers) will each have plots of 20 m x 10 m dimension. Every lead farmer will be provided with 2 kg of seeds of improved varieties and 13 kg of P fertilizer in form of single superphosphate (SSP). In addition, soybean farmers (both Lead and satellite farmers) will have rhizobial inoculant sufficient for the plot size being managed. Lead farmers of cowpea and groundnut will, in addition to seed and fertilizer, be supplied with 2 litres of insecticide. All satellite farmers will each be given 1 kg of seeds of improved varieties and 4 kg of SSP. The distribution of the demonstration and location are presented in Table 13.

**Table 13.** Distribution of 2011 demonstration across action sites

| **State/LGA** | **SB** | **CP** | **GN** | **Total** | SB | CP | G/nut | Total | EAs | Community | Farmers |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Kaduna State** | | | | | | | | | | | |
| Soba | 540 | 320 | 200 | 1060 | 27 | 16 | 10 | 53 | 6 | 4 | 1007 |
| Giwa | 660 | 220 | 240 | 1120 | 33 | 11 | 12 | 56 | 6 | 4 | 1064 |
| Igabi | 280 | 260 | 260 | 800 | 14 | 13 | 13 | 40 | 6 | 4 | 760 |
| Kachia | 700 | 60 | 40 | 800 | 35 | 3 | 2 | 40 | 6 | 4 | 760 |
| Z/Kataf | 740 | 40 | 20 | 800 | 37 | 2 | 1 | 40 | 6 | 4 | 760 |
| **Total** | **2920** | **900** | **760** | **4580** | **146** | **45** | **38** | **229** | **30** | **20** | **4351** |
| **Kano State** | | | | | | | | | | | |
| Bichi | 420 | 260 | 160 | 840 | 21 | 13 | 8 | 42 | 6 | 4 | 798 |
| Garko | 520 | 200 | 160 | 880 | 26 | 10 | 8 | 44 | 6 | 4 | 836 |
| T/Wada | 520 | 180 | 180 | 880 | 26 | 9 | 9 | 44 | 6 | 4 | 836 |
| Wudil | 440 | 340 | 200 | 980 | 22 | 17 | 10 | 49 | 7 | 4 | 931 |
| Bunkure | 500 | 160 | 140 | 800 | 25 | 8 | 7 | 40 | 6 | 4 | 760 |
| Warawa | 300 | 240 | 340 | 880 | 15 | 12 | 17 | 44 | 5 | 4 | 836 |
| Albassu | 400 | 240 | 200 | 840 | 20 | 12 | 10 | 42 | 6 | 4 | 798 |
| D/Kudu | 440 | 220 | 220 | 880 | 22 | 11 | 11 | 44 | 5 | 4 | 836 |
| Gaya | 200 | 360 | 240 | 800 | 10 | 18 | 12 | 40 | 5 | 4 | 760 |
| Ungogo | 300 | 280 | 260 | 840 | 15 | 14 | 13 | 42 | 5 | 4 | 798 |
| **Total** | **4040** | **2480** | **2100** | **8620** | **202** | **92** | **80** | **349** | **57** | **32** | **6631** |
| **Grand Total** | **6960** | **3380** | **2860** | **13200** | **348** | **137** | **118** | **578** | **87** | **52** | **10982** |

*Activity 4.4.3. At least 3 extension events (e.g., field days, exchange visits) organized per season per country*

A field visit was made by N2Africa project team to 10 communities in Nigeria, during which mini field days were held. Additional field days were held at 3 action sites in Kaduna State.

***Objective 5: Develop and strengthen capacity for BNF research, technology development, and application***

*Activity 5.1.1. At least 4 technical staff from the 3 hubs trained on inoculant production and quality control, lab-based PCR methods, N2 fixation quantification, and laboratory, greenhouse, and field techniques*

Six trainees from West Africa (with 40 percent women representation) attended a 2-week technician training at IITA Ibadan, which took place 29th November to 10th December 2010. The Technician training for the Southern African Hub has now been fixed for 25th July to 5th August, to be held at SPRL Marondera.

*Activity 5.3. Training-of-trainers workshops on legume and inoculant technologies for agricultural extension workers, NGO staff*

Two Training of trainers for lead farmers and extension agents were held for 74 farmers (17 females and 57 males) in Nigeria in 2010. Four ToTs were held in Kano State and two in Kaduna State in preparation for the 2011 season. A total of 59 EAs and 251 lead farmers were trained in Kano, while 24 EAs and 96 lead farmers were trained in Kaduna State (Table 14). Of these numbers, women constituted 4% of the lead farmers in Kano and 11% in Kaduna State.

**Table 14.**Number of extension agents and lead farmers trained

| s/n | Training Dates | venues | Venues Provider | LGAS in Attendances | No of EAS Trained | No of APC Trained | No of Lead Farmers Trained | No of Resources persons | Total participants |
|---|---|---|---|---|---|---|---|---|---|
| | | **Kano Stae** | | | | | | | |
| 1 | 17/5/2011 | Wudil Islamic center Hisbah hall Wudil LGA | Wudil LGA | Wudil, Waraw a, Gaya LGAS. | 18 | 2 | 61 | 7 | 93 |
| 2 | 18/5/2011 | Panda government secondary class room Albasu LGA | KNARDA. | Albasu and Garko LGAS. | 12 | 2 | 54 | 6 | 75 |
| 3 | 19/5/2011 | Bichi Islamic center Hisiba hall, Bichi LGA | Bichi LGA | Bichi and Ungogo LGAS. | 12 | 2 | 54 | 5 | 75 |
| 4 | 20/5/2011 | Kadawa, KNARDA training centers Garin Malam LGA | KNARDA. | Tudun Wada, Bunkur e, and Dawaki n kudu | 17 | 3 | 74 | 5 | 104 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | LGAS. | | | | | |
| | | **Kaduna State** | | | | | | | |
| 1 | 23/5/2011 | Kachia LGA training hall Kachia | Kachia LGA | Kachia ZANGON KATAF LGAS | 11 | 0 | 28 | 5 | 47 |
| 2 | 24/5/2011 | KADP Maigana training hall Maigana soba LGA | Soba LGA | Giwa, Soba and IGABI LGAS. | 13 | 0 | 68 | 5 | 91 |
| | Total | | | | 24 | 0 | 96 | 10 | 138 |

*Activity 5.2.1. At least 16 MSc and 6 PhD candidates selected for training from the impact zones*

Two MSc and 1 PhD nominees have been selected for the graduate programme. The two nominees for MSc are female and the PhD nominee a male.

# 3 Mozambique Country Report December 2010 – May 2011

## I. Report specific in country activities, accomplishments and challenges under objective and output headings

**OBJECTIVE 1**

**Activity 1.1** Establish project management structures:

**Output 1.1.3** By month 6 of year 1 project staff engaged and capital investments made in all impact zones.

**Accomplishments and Challenges:** Two project technicians were hired by November 2010 and additional staff was engaged in March 2011 to help coordinate project activities. A Toyota Hilux pick-up vehicle and two motor bikes were purchased for project activities. In addition, some Lab instruments and apparatus have been ordered and are expected to arrive in July-August 2011. The major challenge is the delays in the ordering process

Project implementation and management structures were established before October 2010. This involved meetings with partners in particular Technoserve and CLUSA for the implementation of on-farm demonstration plots in the targeted districts with direct participation of project technicians and supervisors. We have also established collaboration with IKURU to implement D&D activities on both soybean and groundnuts

**Output 1.3.4:** By month 10 of year 2, a document on market demand linking with TL-II and AGRA developed. **Accomplishments and challenges:** Value chain study on project legumes conducted in month 6 of year two; report (covering all three southern African countries) is expected to map out the market opportunities, region-wide, for all four crops

**Output 1.4.2:** By month 12 of year 1 a baseline report quantifying the current level of BNF and its contributions to rural livelihoods is available for all impact zones. **Accomplishments and challenges:** The survey was carried out in January-February 2011. Data entry in digital forms was delayed and data has only recently become available to the wider project. The survey was carried out in Gurue, Sussundenga and Mandimba among 247 households. This was less than the target of 400 households, *due to logistic and budget constraints.* Moreover, all interviewed households were located in the direct vicinity of road ways and perhaps did not represent the farmers who live on farmsteads far away from road ways in the relevant districts. Though most of the farmers who live along road ways have farms far away from where they live. The survey results highlight the importance of beans, soybean and groundnut for the current farming systems as well as the low or zero use of inputs such as mineral or organic fertiliser and inoculants.

**OBJECTIVE 2**

**Activities 2.1-2.3:** Selection of best legume varieties. *And* **Activity 2.5** (identification of best-fit agronomic practices)

**Outputs 2.1-2.3** *and* **Output 2.5.1: Accomplishments and Challenges:** Based on previous research activities in Mozambique, five new soybean varieties (TGx 1485-1D, TGx 1740-2F, TGx 1904-6F, TGx 1908-8F and TGx 1937-1F) and the most popular and best yielding existing variety (Storm) were selected for the field activities. The agronomic trials were established in December 2010 in Domue, Angonia district, Ruace, Gurue district and Sussundenga, Sussundenga district. Two trials were conducted at each location to evaluate the response of the varieties to rhizobial inoculation and to determine the effects of P and starter N application on the growth and yields of the varieties selected. Field activities ended

during the second week of June. Processing of experimental samples and data analysis are on-going. An additional report will be submitted when the analysis is completed.

Drought incidence in Mogovolas district delayed the establishment of the groundnut agronomic trials in Nametil. The two trials were conducted but due to the late planting in addition to the low rainfall they were discarded. The project management has decided to conduct future trials in Muriaze in Rappale district in addition to Nametil under the direct control of IITA with the participation of IIAM and IKURU technicians.

**OBJECTIVE 3**

**Activity 3.2:** Establish and characterize a rhizobium germplasm bank in the impact zones.

**Output 3.2.2:** By month 4 of year 2, at least 10 nodules of soybean and beans collected in at least 200 sites in 3 impact zones, for isolate characterization and inclusion in the germplasm bank. **Accomplishments and challenges:**

- Isolate indigenous rhizobia strains from nodules and evaluate the symbiotic effectiveness and performance.

Soybean plants across several locations in Mozambique and Malawi (Table 1) were randomly sampled from both experimental and farmers' fields in March 2011 for nodules. The fields have no recent history of rhizobial inoculation. At least 15 soybean nodules from each site were collected and sent to IITA Ibadan for rhizobia strain isolation. The isolates are being tested in the greenhouse in Ibadan for symbiotic ability. Nodule samples have also been collected for shipment to Dr. Mariangela Hungria in Brazil for isolation and characterization.

Soil samples from the Agronomic research sites are ready and will be sent to IITA Ibadan for MPN count and also to Kenya for soil analysis as soon as an import permit from the two countries are received.

**Table 1.** Geographic information of sites in Malawi and Mozambique where soybean nodules were sampled for isolation of indigenous rhizobia strains

| Sites | Region/Province | Coordinates | Altitude (m) |
|---|---|---|---|
| Chitedze | Central Malawi | 15° 55' S, 35° 04' E | 1146 |
| Namadzuada | Central Malawi | 13.58° S, 33.88° E | 1434 |
| Domue | Tete, Mozambique | 14.545 ° S, 34.182° E | 1239 |
| Gondola | Manica, Mozambique | 19.02° S. 33.68° E | 1173 |
| Mutequelesse | Zambesia, Mozambique | 15° 19' S, 36° 42' E | 678 |
| Namialo | Nampula, Mozambique | 14° 56' S, 40° 00' E | 203 |
| Nampula | Nampula, Mozambique | 14° 09' S, 39° 18' E | 398 |
| Ncame | Tete, Mozambique | 14.626° S, 33.981° E | 1112 |
| Ruace | Zambesia, Mozambique | 15° 14' S 36° 43' E | 707 |
| Sussundenga | Manica, Mozambique | 19° 19' S, 33° 14' E | 630 |
| Vanduzi | Manica, Mozambique | 18° 58' S, 33° 13' E | 682 |

**Activity 3.4:** Expand and upgrade inoculant production capacity in sub-Saharan Africa.

**Output 3.4.2:** By month 12 of year 1, existing rhizobiology laboratories upgraded**. Accomplishments and challenges:** Mozambique doesn't have a rhizobiology lab that could be upgraded. Instead, IIAM decided to allocate one lab in a new building under construction to be used as a microbiology lab. The building is near completion and could be used in the near future for rhizobiology activities. Thus, Mozambique will continue to depend on colleagues in other labs for rhizobiology activities in terms of equipment, greenhouse, MPN counts and strain isolation.

**OBJECTIVE 4**

**Activity 4.1:** Create strategic alliances for facilitating dissemination of legume and inoculant technologies in the impact zones.

**Output 4.1.1:** Memoranda of Understanding are formalized with key partners along the legume value chains in the impact zones. **Accomplishments:** One MoA finalized with TechnoServe, an international NGO (June 2011), one with NARS being negotiated.

**Output 4.1.2:** By month 8 of year 1, the role of AGRA and other partners in the project defined and co-funding/financing options for scale-up of inoculums identified. **Accomplishments**: Working with Technoserve which provides inputs on a "scaling down" each season basis, i.e. after first season, farmers have to pay for inputs until they eventually pay the entire price by year 3 towards the goal of having farmers purchase all inputs, including inoculants. Local company IKURU interested in and may take on importation of inoculants. For 2011/2012 season, Technoserve will purchase all inoculants they distribute to their farmers, most likely in conjunction with IKURU.

**Activity 4.2:** Produce specific dissemination tools.

**Output 4.2.1:** By month 6 of years 2, 3 &4, at least one new dissemination tool related to legume and inoculant use are produced per impact zone**. Accomplishments:** In Mozambique at least 3 technology packages consisting of improved soybean seed, inoculants and P fertilizer were developed and disseminated. These were accompanied by instructions on the crop management practices including the best time to plant row spacing and plant population. Field observation forms were also included for participants to record field information

**Activity 4.3:** Engage with other legume seed production, marketing, input, processing and nutrition initiatives.

**Output 4.3.1:** By month 12 of year 1, sufficient legume seed is acquired, e.g. through cooperation with TL-II and the private sector, for initial dissemination in the impact zones. **Accomplishments:** The N2Africa project collaborated with other on-going projects in Mozambique including TL II and Platform Mozambique to source seeds of soybean for multiplication. More farmers have expressed interest in the dissemination activities; hence we intend to source more seed from other projects for the 2011/2012 growing season. N2Africa is also in discussion with Technoserve and IKURU to facilitate the supply of seeds of recently released soybean varieties. N2Africa will acquire groundnut seed from IKURU and ICRISAT for agronomic and demonstration/dissemination activities.

**Output 4.3.2:** By month 6 of year 2, at least half of the farming communities engaged in the project are actively producing seed for local distribution. **Accomplishments:** Two hectares of seed multiplication were established in Angonia and we expect to have at least 2 tons of good quality seeds for activities during coming season. We will expand our seed multiplication to produce more seeds in the coming season.

**Output 4.3.3:** By month 12 of year 2, at least half of the farming communities engaged in the project are actively linked to legume market outlets **Accomplishments:** Through partners Technoserve and CLUSA, linkages are being established between soybean farmers participating in dissemination trials and soybean processors (poultry feed) as well as seed companies.

**Activity 4.4:** Conduct collaborative legume and inoculants technology dissemination campaigns and create awareness in rural communities in all impact zones.

**Output 4.4.2:** By month 6 of each year, large scale demonstration and dissemination campaigns launched in each impact zone. **Accomplishments:** A total of 68 soybean demonstrations were established across the Manica, Tete and Zambesia provinces during the 2010/2011 growing season. The project reached a total 8687 farmers of which 1499 were females. The low percentage of women reached in the first season's trials can perhaps be attributed to lack of awareness on the part of the partnering organization of N2Africa's goal of at least 50% female participation in all farmer-related activities. This will be addressed in the next growing season by strongly encouraging technicians involved in farmer selection to include as many women farmers as possible, as well as making use of women's organizations, where they exist, to reach women through activities which more generally fall under their control (e.g. post-harvest handling, storage and value addition).

**Table 2.** Number of dissemination trials for the 2010/2011 season in Mozambique, broken down by location and gender of participating farmers.

| Province | District | Male | Female | Total |
|---|---|---|---|---|
| Manica | Sussundenga | 887 | 98 | 985 |
| Tete | Angonia | 1164 | 411 | 1575 |
| | Macanga | 1115 | 269 | 1384 |
| | Tsangano | 586 | 296 | 882 |
| Zambesia | Gurue | 3436 | 425 | 3861 |
| Total | | 7188 | 1499 | 8687 |

**Output 4.4.3:** By month 9 of each year, at least 3 extension events organized per season per country. **Accomplishments:** Four two-day training sessions were conducted for Lead Farmers, Technicians and Agribusiness-promotors; two were held in month 12 year 1, and two in month 3 year two. Topics covered, number of participants and breakdown of the latter by gender are in Table 3 below. As mentioned above, much stronger efforts will be made to include a significantly larger proportion of women during the next growing season's activities, including selection of more female Lead Farmers, and female participants for all project training activities.

**Table 3.** N2Africa trainings in Mozambique conducted over the 2010/11 growing season by project partners.

| Date | Location | Duration (days) | Subject | Participants | | |
|---|---|---|---|---|---|---|
| | | | | Male | Female | Total |
| 9-10/11/10 | Gurue | 2 | Field preparation, variety selection, weed control, seed treatment, demo plots and production cost | 44 | 6 | 50 |
| 17-18/11/10 | Chimoio | 2 | Field preparation, variety selection, weed control, seed treatment, demo plots and production cost | 40 | 5 | 45 |
| 10-11/2/11 | Gurue | 2 | Crop protection, scouting, crop management, harvesting and storage | 23 | 7 | 30 |
| 15-16/2/11 | Chimoio | 2 | Crop protection, scouting, crop management, harvesting and storage | 21 | 4 | 25 |
| **Total** | | | | **128** | **22** | **150** |

**Output 4.4.4:** By month 12 of each year, at least 3 mass media events organized per hub. **Accomplishments:** Two radio programs aired in Gurue district about better soybean crop management, 1 newspaper article on new soybean varieties (Noticias -8 April 2011); A 10-minute TV program on field day activities and soybean technologies broadcasted on 20 May 2011 by TV Mozambique.

**Activity 4.5:** Develop strategies for empowering women to benefit from project products.

**Output 4.5.2:** By month 9 of year 2, 3 & 4, a report documenting the involvement of women in at least 50% of all farmer-related activities, where relevant, produced. **Accomplishments and Challenges:** As may be noted in Tables 2 and3 above, N2Africa found it difficult to reach women in the dissemination trials as well as training in Mozambique (only 17 and 15% participation, respectively).

**Output 4.5.3:** By month 12 of each year, at least 2 special events on the role of legumes in household nutrition and value added processing conducted per country. **Accomplishments:** N2Africa is partnering with Platform Mozambique, TL II and CLUSA in soybean utilization and home processing. IITA Food Technologist trained Training of Trainers (ToTs) in Ruace and Lioma in Gurue district. The ToTs then trained more farmers in their communities on recipes aimed at enhancing protein and energy quality of commonly eaten foods. Recipes introduced in the target area include soy milk, soy fortified porridge, soy-wheat flour bread and soy-wheat flour cake.

**OBJECTIVE 5**

**Activity 5.1:** Provide short-term, high level technical training for project scientific and technical staff in essential microbiological skills and BNF technologies.

**Output 5.1.1:** By month 9 of year 1, at least 4 technical staff from the 3 hubs trained on inoculant production and quality control, lab-based PCR methods, $N_2$ fixation quantification, and associated laboratory, greenhouse, and field techniques. **Accomplishments and challenges:** Delayed until month 8 year 2.

**Activity 5.2:** Advanced training to MSc and PhD level of an elite young cadre of African scientists focused on topics filling identified knowledge gaps and identified through competitive calls.

**Output 5.2.1:** By month 6 of year 1, at least 14 MSc and 6 PhD candidates divided among three hubs selected for training. **Accomplishments and Challenges**: The Ph.D. candidate from Mozambique has been selected to study in Brazil under the Supervision of Dr. Mariangela Hungria but the selected candidate is delaying unnecessarily. Hence, it is recommended that the selection committee select another candidate who is prepared to start his/her studies as soon as possible. The selection process of the MSc candidates took a long time due to delays in receiving applications. However, two candidates have recently been selected to begin their studies.

**Activity 5.3:** Training-of-trainers workshops on legume and inoculant technologies for agricultural extension workers and NGO staff.

**Output 5.3.2:** By month 10 of years 2 and 3, at least 8 training-of-trainers workshops (2 workshops in each country), attended by at least 40 extension staff, conducted on inoculation technology (inoculant handling and storage, etc) and legume agronomy [resulting in 640 trainers by the end year 3]. (5.3.2) **Accomplishments:** See Output 4.4.3 above.

## II. Report on in country partner activities, accomplishments and challenges under objective and output headings

Partner Technoserve and their sub-partner CLUSA seem to be exceeding N2Africa targets in soybean D&D activities involving male farmers, and may even be of assistance with respect to setting up inoculant production facilities in Mozambique. Memorandum of Agreement with Technoserve was not finalized until month 7, year 2 due to oversight but partnering with them is not only logical (their soybean activities in Mozambique are funded by the Gates Foundation) but enables us to not just achieve but exceed project goals in soybean, with the exception of involvement of women.

Partner IIAM appears to be slow to take up and implement project activities; it is uncertain whether an agreement with them has been finalized and signed. Since Technoserve has indicated an interest in N2Africa groundnut trials in Mozambique, it might be prudent to include them in next season's groundnut D&D activities.

# 4 Zimbabwe Country Report (June 2011)

## I. Report specific in country activities, accomplishments and challenges under objective and output headings (including partner specific activities, accomplishments and challenges (II))

**OBJECTIVE 1: Establish a baseline of the current status of N2-fixation, identify niches for targeting N2-fixing legumes in the impact zones, M&E and impact assessment**

**Activity 1.1:** Establish project management structures

**Output 1.1.3:** By month 6 of year 1 project staff engaged and capital investments made in all impact zones.

**Accomplishments and Challenges:** In Zimbabwe all N2Africa staff members have been engaged by month 7, year 2. The M&E scientist commenced working in Harare, Zimbabwe early April 2010. To facilitate smooth operations of CIAT in Harare, the Finance and Admin Officer is partly funded from the N2Africa project. The agronomist already employed by CIAT shifted his attention to N2Africa from the start of the second project year (from about October 2010 onwards). The person is somewhat overqualified for the position and has a higher than budgeted salary. Due to this and his experience, he is also still involved in agronomy work for other projects implemented by CIAT in Zimbabwe and Mozambique. The position of Farm Liaison Officer was finally filled per April the 1st 2011. This will undoubtedly strongly enhance the D&D activities in Zimbabwe and iron out many of the challenges faced in the first season (Milestone 1.1.3 completed). The main reason for the late completion of Output 1.1.3 and several other outputs in Zimbabwe was because on August 4, 2010 a decision was taken by N2Africa Senior Managers that 1. CIAT-TSBF will do the N2Africa subcontracts in Zimbabwe, and will receive the funds directly from WU for this; and 2. CIAT-TSBF will take full responsibility for the activities, technical and financial reporting for Zimbabwe. Prior to August 4, 2010 IITA was responsible for all N2Africa activities in Zimbabwe. This major change during Year 1 Month 10 of the project was the cause of several delays in project implementation.

**Activity 1.3** Identify new opportunities for targeting legume and inoculant technologies to increase BNF and enlarge the production areas of prioritized grain legumes.

**Output 1.3.2:** By month 6 of years 2, 3&4, tested opportunities are identified prior to each following cropping season.

**Accomplishments and challenges:** In Zimbabwe the first growing season for N2Africa started in November 2011, i.e. month 2 year 2. Most crops were harvested in April 2011, month 7, year 2. The data of the agronomy trials have been collected, but are yet to be analysed to provide recommendations for dissemination. Currently the agronomist is assessing the results of the agronomy trials which will feed into the design of the D&D plots for the 2011-2012 season. These results are expected to be available before August. In May 2011 (month 8, year 2), a national review and planning meeting was held. Partner organisations are developing their work plans for the coming season. Close collaboration between the agronomist and farm liaison officer will ensure results from agronomy will feed into the dissemination activities of the coming cropping season.

The main partner for the agronomy work is the University of Zimbabwe and this has proven to be a challenging partnership. While UZ is interested in collaboration and active participation in the N2Africa project they were not able to implement planned activities.

**Output 1.3.4:** By month 10 of year 2, a document on market demand linking with TL-II and AGRA developed. **Accomplishments and challenges:** Value chain study on project legumes conducted in month 6 of year two; report (covering all three southern African

countries) is expected to map out the market opportunities, region-wide, for all four legumes being cultivated by farmers in Zimbabwe.

**Activity 1.4:** Quantify the current on-farm $N_2$-fixation in the target farming systems and its impact on livelihoods (income, nutrition).

**Output 1.4.2:** By month 12 of year 1 a baseline report quantifying the current level of BNF and its contributions to rural livelihoods is available for all impact zones.

**Accomplishments and challenges:** The baseline survey has been implemented by the University of Zimbabwe. The fieldwork was done in January/February. The data was entered at UZ, then first processed in Wageningen and a first draft with analysis has been produced in Zimbabwe in June. BNF measurements are to be organised by Wageningen.

**OBJECTIVE 2: Select multi-purpose legumes providing food, animal feed, structural materials and high quality crop residues for enhanced BNF and integrate improved varieties into farming systems**

**Activities 2.1, 2.2, 2.3:** Selection of best legume varieties.

**Activity 2.5:** Identification of best-fit agronomic practices

**Outputs 2.1, 2.2, 2.3, 2.5.1:** By month 12 of year 2 three new soybean and common bean breeding materials with high BNF traits identified and tested, (2.1.2 only soybean) and then by month 12 of year 3 forwarded to TLII and other breeding initiatives for inclusion in their respective programs. (2.1.3). By month 6 of year 1, at least 3 existing common bean varieties with proven higher BNF potential and sufficient seed availability identified for the respective impact zones. (2.2.1). By month 6 of year 1, at least 3 existing cowpea and groundnut varieties with proven high BNF potential, tolerant to biotic and abiotic stresses, and sufficient seed availability identified for the respective impact zones. (2.3.1). By month 6 of year 2, at least 9 adaptive [research campaigns focusing on major gain legume (soybean, common bean, cowpea, groundnut) implemented in the 3 impact zones. (2.5.1)

**Accomplishments and challenges:** Agronomy trials have been implemented by the CIAT agronomist in the first N2Africa season in Zimbabwe (2010-2011). The data from the trials has been collected, but these are yet to be analyzed. The University of Zimbabwe was not able to implement the agronomy trials as anticipated and stipulated in the MoU, and as a result, the CIAT agronomist took over the agronomy activities. The University of Zimbabwe was not able to implement the agronomy trials as anticipated and stipulated in the MoU, and as a result, the CIAT agronomist took over the agronomy activities. Variety and input trials were done on all four legume crops in Zimbabwe in 4 of the action sites (D&D works in 7 districts in Zimbabwe).

**Groundnuts** – *Evaluation of response of groundnuts varieties to P and Ca application under target areas in Zimbabwe.* Two trials were established in Murewa in early December. Varieties used in this experiment are Nyanda, Natal common, Valencia 3, Ilanda, Makulu red and Valencia 2. Nyanda, Natal common and Ilanda were purchased from Agriseeds while the remainder were sourced locally from the farmers in Murewa. Germination was almost 100%.

**Groundnuts** – *Determination of appropriate input requirements for the target grain legumes in Zimbabwe*

Two trials established in Murewa district, the Nyanda variety has been used for the trials. The seed was acquired from Seedco breeders, as it was unavailable on the market. Germination was about 100%.

**Cowpeas** – *Determination of appropriate input requirements for the target grain legumes in Zimbabwe*

Two trials were planted in Mhondoro in early December and the other two trials meant for Wedza where not planted due to delayed consent from the key partner in Wedza . IT18 /CBC1 variety was used. Germination was generally good except in some plots where Compound L was applied. This could have been caused by prolonged periods of low moisture after planting resulting in fertiliser burn.

**Soyabean** – *Determination of appropriate input requirements for the target grain legumes in Zimbabwe*

Four trials have been established in Mhondoro, Mudzi, Murewa and Hwedza. The soya bean variety used in this trial is SC Squire from Seedco. One trial in Mudzi had very poor germination due to prolonged low moisture conditions. The trial was replanted and germination was good.

**Soyabean** – *Evaluation of soybean varieties for their response to inoculation in target areas in Zimbabwe*

A total of 8 trials have been planted in 4 intervention districts in Zimbabwe: Mhondoro, Mudzi, Murewa and Hwedza. The varieties used in the trials are SC squire and SC saga from Seedco Zimbabwe; PAN 891 from PANNAR Zimbabwe; TG x 1740 – 2F, TG x 1987 –628 and TG x 1987 – 11E from IITA Malawi and Magoye a cultivar developed in Zambia. Germination in these trials was generally good except for Magoye which failed totally to germinate. This is most probably because the seed was stored for too long hence was no longer viable. In some areas PAN891 was used but its germination was also very poor at about 60%.

**Bush beans** – *Evaluation of bush bean varieties for their response to inoculation in target areas in Zimbabwe*
Two trials have been planted in Mudzi district. The following varieties have been used: Cardinal, PAN 148, PAN 159, Speckled ice and Bounty. 3 more trials were planted later in Murewa.

**Challenges:** The agronomist employed by CIAT under the N2Africa project has installed and managed all the trials without any involvement or assistance from the University of Zimbabwe. This has result in having to few staff for proper implementation of the agronomy trials in Zimbabwe which subsequently suffered in terms of timing of planting and management and data collection. An intended partner organisation in two of the districts informed us very late that they would not be actively collaborating in N2Africa and therefore it was only possible to plant one soybean trial. By then it was too late to find alternative sites for trials.

A major challenge related to inputs is the availability of the relevant varieties needed for both agronomy trials and dissemination. This included groundnut varieties, bush bean varieties and soya bean varieties. Only three certified groundnut varieties were available on the market and the other varieties had to be sourced from local farmers.

Time of availability of soya bean seed: varieties from Malawi were available for planting only at the end of December due to logistical reasons including challenges of importing new varieties with the local authorities. This meant that all 8 soya bean variety trials were planted late. Experimental fields: some of the fields meant for the experiments that had been sampled, referenced and the cropping history recorded were unfortunately planted by the farmers due to our late use of their fields. This meant that new fields had to be sourced, sampled again and referenced for use by the agronomist. Some of the newly assigned fields were found to be marginal fields.

Quality of seed: some of the seed purchased for the trials and dissemination had serious germination challenges. Soya bean seed from PANNAR variety PAN891 had serious germination problems in some of the agronomy trials but their were no reports of poor germination in farmers fields.

The IT18 cowpea variety bought from ARDA was a mixture of IT18 and CBC1.

Heavy downpours: excessive rainfall within short periods of time resulted in heavy wash away of some farmers' fields in some parts of Hwedza. Some parts of Mudzi were not be accessible after heavy downpours because small bridges, which easily overflow.

Makoni and Wedza: all trials intended for Makoni were not planted. Only soya bean was planted in Wedza. This was due to the fact that the intended partner organisation in these areas informed us very late that they would not be actively collaborating in N2Africa.

Table 1. List of trials planted across different districts

| District | Village | Trial | Legume | Varieties used | Inputs tested |
|---|---|---|---|---|---|
| Wedza, Chigondo Ward | Svinurai | variety | soyabean | TG x 1740 – 2F; TG x 1987 –628; TG x 1987 – 11E; SC Squire; SC Saga; PAN891 | SSP, Dolomitic lime, KCl |
| | Bhake | Input | soyabean | SC Squire | Compound L, SSP, Dolomitic Lime, |
| | Chiwenga | Input | soyabean | Sc Squire | Compound L, SSP, Dolomitic Lime |
| Chegutu, Mhondoro | Chakwenya | input | soyabean | Sc Squire | |
| | Mushayi | variety | soyabean | TG x 1740 – 2F; TG x 1987 –628; TG x 1987 – 11E; SC Squire; SC Saga; Magoye | SSP, Dolomitic lime, KCl |
| | Chikwanha | input | cowpea | CBC1 | Compound L, SSP, Dolomitic Lime, |
| | Mandebvu | input | cowpea | CBC1 | Compound L, SSP, Dolomitic Lime, |
| Murewa, Musami | Gwindi | variety | groundnuts | Nyanda, Natal common, Valencia 3, Ilanda, Makulu red and Valencia 2. | SSP, Dolomitic lime, calcium sulphate |
| | Kadadi | input | soyabeans | SC Squire | Compound L, SSP, Dolomitic Lime, |
| | Kadadi N | variety | sugarbeans | Cardinal, PAN 148; PAN 159; Speckled ice; Bounty | SSP, Dolomitic lime, KCl |
| | Ngundu | variety | soyabean | TG x 1740 – 2F; TG x 1987 –628; TG x 1987 – 11E; SC Squire; SC Saga; Magoye | SSP, Dolomitic lime, KCl |
| | Muchemwa | input | groundnuts | Nyanda | Compound L, SSP, Dolomitic Lime, |

| | | | | | |
|---|---|---|---|---|---|
| | Madekufamba | variety | sugarbeans | Cardinal, PAN 148; PAN 159; Speckled ice; Bounty | SSP, Dolomitic lime, KCl |
| | Bhunu | variety | groundnuts | Nyanda, Natal common, Valencia 3, Ilanda, Makulu red and Valencia 2. | SSP, Dolomitic lime, Calcium sulphate |
| Mudzi | Joromani | variety | soyabean | TG x 1740 – 2F; TG x 1987 –628; TG x 1987 – 11E; SC Squire; SC Saga; PAN891 | SSP, Dolomitic lime, Calcium sulphate |
| | Makanjera | variety | soyabean | TG x 1740 – 2F; TG x 1987 –628; TG x 1987 – 11E; SC Squire; SC Saga; PAN891 | SSP, Dolomitic lime, Calcium sulphate |
| | Masuko | input | soyabean | SC Squire | Compound L, SSP, Dolomitic Lime, |
| | Chanhasi C | input | sugarbean | Speckled ice | Compound L, SSP, Dolomitic Lime, |
| | Chanhasi A | variety | sugarbean | Cardinal, PAN 148; PAN 159; Speckled ice; Bounty | SSP, Dolomitic lime, Calcium sulphate |
| | Masuko A | variety | sugarbean | Cardinal; PAN 148; PAN 159; Speckled ice; Bounty | SSP, Dolomitic lime, Calcium sulphate |
| | Goromonzi | input | sugarbean | Speckled ice | Compound L, SSP, Dolomitic Lime, |

**Activity 2.4:** Explore the $N_2$-fixing potential of multi-purpose forage legumes for intensive meat and milk production and environmental services.

**Output 2.4.1, 2.4.2:** By month 12 of year 1 four forage legumes with high BNF capacity have been identified across the 3 impact zones (2.4.1) and by month 12 of year 2, sufficient planting materials is available for widespread farmer testing. (2.4.2)

**Accomplishments and challenges:** This milestone has been delayed. In the review and planning meeting held in May 2011, Prof Maasdorp (UZ) attended and has been involved in drawing up the agronomy work plan for Zimbabwe. Forage legumes are expected to be included in the agronomy work in the upcoming season.

**OBJECTIVE 3: Select superior rhizobia strains for enhanced BNF and develop inoculum production capacity in sub-Saharan Africa, including private sector partners**

**Activity 3.1:** Assess the need-to-inoculate for the target legumes and identify elite strains across the impact zones.

**Output 3.1.2:** By month 12 of year 1, at least 400 soil rhizobial counts (MPN) and accompanying need-to-inoculate trials conducted for soybean and beans, representing existing soil heterogeneity in 3 impact zones. (3.1.2)

**Accomplishments and challenges:** The rhizobiology work in Zimbabwe has been seriously delayed due to challenges in finalizing the agreement with the Department of Research and Specialist Services (DR&SS). It was signed in March 2011. SPRL is however determined and has already started on some of the work agreed.

**Activity 3.2:** Establish and characterize a rhizobium germplasm bank in the impact zones.

**Output 3.2.2:** By month 4 of year 2, at least 10 nodules of soybean and beans collected in at least 200 sites in 3 impact zones, for isolate characterization and inclusion in the germplasm bank.

**Accomplishments and challenges:** Little progress, but the strains from Brazil have been received,

**Activity 3.3:** Formulate improved inoculant products and develop cost-effective production methods, including quality assurance procedures.

**Output 3.3.2:** By month 12 of year 2, cost effective inoculant production methods including fermentation technologies, carrier selection, inoculant formulation, enhanced shelf life are developed. (3.3.2)

SPRL is expecting a visit from an inoculum production consultant, Bruce Knight and the leader of Rhizobology research in N2Africa, Adbullahi Bala in July 2011. It is expected that from their expertise, very useful recommendations will be made to improve the cost-effectiveness of the operations. With the delivery of equipment and renovation of glasshouse, this out put may still be achieved.

**Activity 3.4:** Expand and upgrade inoculant production capacity in sub-Saharan Africa.

**Output 3.4.2:** By month 12 of year 1, existing rhizobiology laboratories upgraded.

**Accomplishments and challenges:** Due to the complexity of some of the equipment, it proved to be challenging to find the best and most economic suppliers for the diverse equipment and inputs needed. It is expected that the order will be placed before the end of June 2011.

**Output 3.4.3:** By month 6 of year 2, at least 50,000 inoculant packets produced per year in at least 4 cooperating laboratories, increasing in years 3&4.

**Accomplishments and challenges:** Even with current facilities SPRL can produce sufficient packages as long as the order is given in time.

**OBJECTIVE 4: Deliver legume and inoculant technologies to farmers throughout sub-Saharan Africa**

**Activity 4.1:** Create strategic alliances for facilitating dissemination of legume and inoculant technologies in the impact zones.

**Output 4.1.1:** Memoranda of Understanding are formalized with key partners along the legume value chains in the impact zones.

**Accomplishments and challenges:** MoUs were finalized with 5 partners in Zimbabwe; CADS, Clusa, UZ & CTDT involved in dissemination activities. The funds for dissemination at the UZ were meant for collaboration with SOFECSA. This collaboration fell through and all activities were implemented by Agritex, unfortunately the funds for this work have been released too slow and the activities in the two districts concerned (Makoni and Hwedza) suffered. The fifth partner is DR&SS who is involved in the rhizobiology.

In general, the funding from N2Africa was/is considered to be rather low and in some cases this discouraged partners from finalizing the agreement with appropriate speed. Most agreements were signed in November/December 2010. Upon signing the funding was released quickly from HQ in Colombia.

For the coming season, one partner organization has unfortunately indicated to be no longer able to participate in the N2Africa project. Since the area they were working in is very promising for soya beans, we will explore the possibility to engage a local NGO to continue working with the farmers in this area. Moreover, this particular district has been selected by the IFAD funded project that is led by CIAT-TSBF " Increasing smallholder farm productivity, income, and health through widespread adoption Integrated Soil Fertility Management (ISFM) in the Great Lake Regions and Southern Africa" and this could assist N2Africa in ensure activities continue in this area with these farmers.

**Activity 4.2:** Produce specific dissemination tools.

**Output 4.2.1:** By month 6 of years 2, 3 &4, at least one new dissemination tool related to legume and inoculant use are produced per impact zone.

**Accomplishments:** In Zimbabwe we have made use of the Guidelines for Lead Farmers, developed by Paul Woomer (N2Africa scientist based in Kenya). This is now being translated into Shona and it is expected that a simplified version will be developed. Due to the very late engagement of the farm liaison officer for N2Africa in Zimbabwe, no country specific materials have been produced yet. Partner organisations and farmers have however expressed a need for that and efforts will be made to come up with country specific dissemination tools. In addition, appropriate available materials could be translated into the local vernacular, Shona, for easier access for a wider audience of farmers.

**Activity 4.3:** Engage with other legume seed production, marketing, input, processing and nutrition initiatives.

**Output 4.3.1:** By month 12 of year 1, sufficient legume seed is acquired for initial dissemination in the various impact zones.

**Accomplishments:** For the first season in Zimbabwe (2010-2011), the following legume seed and inputs were purchased and distributed (seed was bought from Pannar Seeds, Progene Seeds and SeedCo (TL-II not active in Zimbabwe), fertilizers were purchased from Windmill and ZFC).

| Partner Organisation | District | Soya bean | Cow pea | Sugar bean | Ground nuts | SSP | Lime | Inoculant |
|---|---|---|---|---|---|---|---|---|
| | | kg | kg | kg | kg | kg | kg | sachets |
| CADS | Mudzi | 41.5 | 78.45 | | 111.5 | 1450 | 2100 | 0 |
| CADS | Goromonzi | 182 | 5.25 | 159 | 44 | 1595 | 2310 | 20 |
| | *Subtotal* | *223.5* | *83.5* | *159* | *155.5* | *3045* | *4410* | *20* |
| | | | | | | | | |
| CLUSA | Guruve | 100 | 18 | 120 | 42 | 1377.5 | 1995 | 18 |
| | *Subtotal* | *100* | *18* | *120* | *42* | *1377.5* | *1995* | *18* |
| | | | | | | | | |
| CTDT | Murehwa | 100 | 10.5 | 105 | 42 | 1522.5 | 2383 | 50 |
| CTDT | Chegutu | 100 | 10.5 | 100 | 63 | 1710 | 1710 | 26 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *Subtotal* | *200* | *21* | *205* | *105* | *1882.5* | *4093* | *76* |
| | | | | | | | | |
| AGRITEX | Makoni | 100 | 10.5 | 80 | 84 | 1470 | 2130 | 50 |
| AGRITEX | Hwedza | 180 | 10.5 | 60 | 52.5 | 1378 | 1995 | 50 |
| | *Subtotal* | *205* | *21* | *120* | *132.5* | *2858* | *3225* | *50* |
| | | | | | | | | |
| **Total** | | **1252** | **266.2** | **1088** | **741.5** | **16808** | **25121** | **278** |

**Challenges:** The agronomist had to engage himself completely due to the non-fulfilment of the position of Farm Liaison Officer in Zimbabwe. Some seed was purchased late due to lack of availability of the variety from the different sources. Due to logistical challenges (no space nor human capacity to perform such a task at CIAT), repackaging was done by a partner without a MoU in place which caused financial and administrative hassle.Some of the cowpea seeds that were purchased was mixed and plants that were not true-to-type were observed in the field. And overall, the seed is expensive, on average at least usd 2 per kg. During the next season we plan to start the purchase seed earlier and to have a stronger program on community seed production.

**Output 4.3.2:** By month 6 of year 2, at least half of the farming communities engaged in the project are actively producing seed for local distribution.

**Accomplishments and challenges:** Community seed production has been insufficient in Zimbabwe in the past season. D&D efforts in Zimbabwe have suffered from the delay in clarification of roles and responsibilities between institutes and the delay in engaging a Farm Liaison Officer for the project. As a result, the expectations concerning community seed production have not been communicated well enough to and through partner organisations. In few areas like Murehwa, farmers did however conserve their seeds and returned it all to the Lead Farmer. This can be used to further encourage people to plant a larger area. The issue of seed production has been brought to the attention of partner organsations at the review and planning meeting in May 2011 and it will be an important component of the work plans of partner organsations. Moreover the recruitment of the Farm Liaison Officer in Zimbabwe will ensure that such issues will no longer be neglected.

**Output 4.3.3:** By month 12 of year 2, at least half of the farming communities engaged in the project are actively linked to legume market outlets

**Accomplishments and challenges:** In Zimbabwe strong linkages are established with the IFAD funded project project that is led by CIAT-TSBF “Increasing smallholder farm productivity, income, and health through widespread adoption Integrated Soil Fertility Management (ISFM) in the Great Lake Regions and Southern Africa” which will facilitate linking farmers to output markets. The IFAD project officer has begun organizing farmers and facilitating trainings in two districts. Moreover, there is great interest from a wide variety of organisations and companies in Zimbabwe which will hopefully result in stable reliable input and output markets in Zimbabwe. The partner organisations are also active in marketing activities – apart from the N2Africa project and we will build upon their efforts.

**Activity 4.4:** Conduct collaborative legume and inoculants technology dissemination campaigns and create awareness in rural communities in all impact zones.

**Output 4.4.2:** By month 6 of each year, large scale demonstration and dissemination campaigns launched in each impact zone.

**Accomplishments:** A total of 2215 beneficiaries have been reached by the project during the 2010-11 agricultural season. The beneficiaries were being led by lead farmers selected and trained in the N2Africa project on the new technologies that were being tested in the

production of legume crops. Each lead farmer supports another 15 to 20 farmers. See for details of dissemination campaign in Zimbabwe table below.

| | | Total numbers of farmers | | | *Lead Farmers* | | |
|---|---|---|---|---|---|---|---|
| **Partner Organisation** | **District** | **Male** | **Female** | **Total** | ***Male*** | ***Female*** | ***Total*** |
| CTDT | Murehwa | 102 | 238 | 340 | *10* | *11* | *21* |
| CTDT | Chegutu | 110 | 190 | 300 | *10* | *8* | *18* |
| AGRITEX | Makoni | 83 | 217 | 300 | *8* | *12* | *20* |
| AGRITEX | Hwedza | 114 | 169 | 283 | *9* | *11* | *20* |
| CADS | Mudzi | 139 | 181 | 320 | *11* | *9* | *20* |
| CADS | Goromonzi | 118 | 250 | 368 | *11* | *12* | *23* |
| CLUSA | Guruve | 121 | 183 | 304 | *8* | *8* | *16* |
| | Total numbers | 787 | 1428 | 2215 | *67* | *71* | *138* |
| | Total % | 35.53% | 64.47% | 100.00% | 48.55% | 51.45% | 100.00% |

| **Input** | **Beneficiary Type** | |
|---|---|---|
| | **Lead farmers** | **Ordinary farmers** |
| | **kg** | **kg** |
| SSP | 20 | 3.5 |
| Lime | 30 | 5 |
| Soya inoculants | 1 packet shared with group | |
| Soya beans | 5 | 1 |
| Cowpeas | 3.5 | 1 |
| Sugar beans | 5 | 1 |
| Groundnuts | 5 | 0.5 |

The strain of inoculant used in the inoculation of soya beans is *Bradyrhizobium japonicum*. The inoculant is being manufactured by SPRL and packed into 100g sachets. Each sachet can inoculate 100kg of soya bean which can be planted on one hectare.

The demonstration plots for the project are given as below. All demo plots were installed at the lead farmers' fields where other farmers could come and learn. The Table below shows the number of demonstration plots per crop and district.

| | | Layout m x m | No of demo plots per district | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Crop** | **Variety** | | **Mudzi** | **Makoni** | **Hwedza** | **Goromonzi** | **Murehwa** | **Guruve** | **Chegutu** | **Total** |
| Soya bean | SC Saga | 30 X 20 | | 4 | 5 | | 1 | 4 | 4 | **18** |
| | Serenade | 30 X 20 | 1 | 1 | 1 | 2 | | 1 | 1 | **7** |
| | Pan 891 | 30 X 20 | 1 | | | 8 | 4 | | | **13** |
| *Subtotal* | | | *2* | *5* | *6* | *10* | *5* | *5* | *5* | ***38*** |
| | | | | | | | | | | |
| Ground-nuts | Natal Common | 30 X 20 | 10 | 8 | 5 | 4 | 4 | 4 | 6 | **41** |
| *Subtotal* | | | *10* | *8* | *5* | *4* | *4* | *4* | *6* | ***41*** |
| | | | | | | | | | | |
| Sugar-bean | Cardinal | 30 X 20 | | 1 | 1 | 2 | 2 | 1 | 1 | **8** |
| | Sperkled ice | 30 x 20 | | 1 | 1 | 2 | 2 | 1 | 1 | **8** |
| | Pan 148 | 30 x 20 | | 1 | | 1 | | 2 | 2 | **6** |
| | Pan 159 | 30 x 20 | | 1 | | 2 | 2 | 2 | 1 | **8** |
| *Subtotal* | | | *0* | *4* | *2* | *7* | *6* | *6* | *5* | ***30*** |
| | | | | | | | | | | |
| Cow peas | CBC1 | 30 x 20 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | **10** |
| | CBC2 | 30 x 20 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | **9** |
| | IT18 | 30 X 20 | 4 | | | | | | | **4** |
| *subtotal* | | | *9* | *2* | *2* | *2* | *2* | *4* | *2* | ***23*** |
| | | | | | | | | | | |
| ***Total*** | | | ***21*** | ***19*** | ***15*** | ***23*** | ***17*** | ***19*** | ***18*** | ***132*** |

**Challenges:** The absence of Farm Liaison Officer has severely hindered the D&D operations in Zimbabwe. Partners have implemented project activities to the best of their abilities, but have not received sufficient back-up or support from the project. In addition, the rains came very early and hence the input distribution was considered to be late. With considerable efforts from everyone, most farmers could plant. But subsequently there was a mid-season drought, in itself not unusual, but this time it was much longer than usual.

**Activity 4.4.3:** By month 9 of each year, at least 3 extension events organized per season per country.

**Accomplishments and challenges:** In total at least 15 field days were organized by partner organisations, attended by 4161 people (1571 male, 2590 female) (see table for details on fields days held in Zimbabwe – note: additional field days have been held, but no data has been recorded of these days and therefore these are not reported here). The challenge is to ensure satisfactory dissemination of the N2Africa message during the very many field days. In addition, there is need to facilitate the diversity of field days, i.e. from very large to small-scale field days and capture these accordingly.

| | | | | | Attendance | | |
|---|---|---|---|---|---|---|---|
| | **Partner Organisation** | **District** | **Ward** | **Date** | **Male** | **Female** | **Total** |
| 1 | AGRITEX | Hwedza | 9 | 08-Mar-11 | 57 | 81 | 138 |
| 2 | AGRITEX | Hwedza | 9 | 09-Mar-11 | 48 | 78 | 126 |
| 3 | AGRITEX | Hwedza | 9 | 11-Mar-11 | 78 | 117 | 195 |
| | *Subtotal* | | | *3* | *183* | *276* | *459* |
| | | | | | | | |
| 4 | CADS | Goromonzi | 1 | 11-Mar-11 | 187 | 289 | 476 |
| 5 | CADS | Goromonzi | 5 | 17-Mar-11 | 167 | 283 | 450 |
| 6 | CADS | Goromonzi | 10 | 23-Feb-11 | 93 | 249 | 342 |
| 7 | CADS | Goromonzi | 11 | 18-Feb-11 | 168 | 204 | 372 |
| 8 | CADS | Goromonzi | 12 | 04-Mar-11 | 141 | 167 | 308 |
| 9 | CADS | Goromonzi | 15 | 02-Mar-11 | 119 | 235 | 354 |
| 10 | CADS | Goromonzi | 18 | 09-Mar-11 | 157 | 277 | 434 |
| 11 | CADS | Mudzi | 14 | 18-Mar-11 | 96 | 183 | 279 |
| | *Subtotal* | | | *8* | *1128* | *1887* | *3015* |
| | | | | | | | |
| 12 | CLUSA | Guruve | 7 | 07/04/2011 | 37 | 52 | 89 |
| 13 | CLUSA | Guruve | 18 | 12-Apr-11 | 20 | 50 | 70 |
| 14 | CLUSA | Guruve | 5 | 14-Apr-11 | 45 | 70 | 115 |
| 15 | CLUSA | Guruve | 16 | 16/04/2011 | 25 | 48 | 73 |
| 16 | CLUSA | Guruve | 23 | 18/04/2011 | 32 | 53 | 85 |
| | *Subtotal* | | | *5* | *159* | *273* | *432* |
| | | | | | | | |
| 14 | CTDT | Chegutu | 10 | 29-Mar-11 | 63 | 87 | 150 |
| 15 | CTDT | Chegutu | 29 | 27-May-11 | 38 | 67 | 105 |
| | *Subtotal* | | | *2* | *101* | *154* | *255* |
| | | | | | | | |
| | ***Total*** | | | ***18*** | ***1571*** | ***2590*** | ***4161*** |
| | | | | | | | |
| | | | | | 37.76% | 62.24% | 100.00% |

**Activity 4.4.4:** By month 12 of each year, at least 3 mass media events organized per hub.

**Accomplishments:** No media events have been organized in Zimbabwe.

**Activity 4.5:** Develop strategies for empowering women to benefit from project products.

**Output 4.5.2:** By month 9 of year 2, 3 & 4, a report documenting the involvement of women in at least 50% of all farmer-related activities, where relevant, produced.

**Accomplishments:** Lead Farmers: 51%, Beneficiary farmers: 64%, 62% female participation in field days, 57% in training. A separate report is not available.

In Makoni district women farmers are engaging in peanut butter making and they are selling the peanut butter to the towns of Rusape and Mutare. Women in Chigodora ward, Hwedza district, are processing peanut butter from groundnuts and selling it in the towns of Chitungwiza and Harare. Some people are processing of scones, coffee, soya milk and sausages from soya bean. There is a female farmer who was trained on processing of soya into different products in 2004. She is cascading the trainings to other farmers, and she is being assisted by AGRITEX officers in the area. Soya bean is being ground into flour and the flour is used for bread baking.

CADS is implementing a lot of activities with women who are in the N2Africa project. There are cooking demonstrations lined up in Mudzi and Goromonzi where women are trained to prepare meals using legume crops and then they can enter into cooking competitions. Two cooking demos have been conducted and on the 10th of June there will be a cooking expo to be conducted by Goromonzi women who are in the N2Africa project. Women are also trained on how to process soya beans and groundnuts to produce milk, cakes and other food products. There will be a food fair in Goromonzi at Bosha Primary school where women will showcase their different products processed from legume crops.

In Mhondoro, women are also processing peanut butter and selling the peanut butter in Harare.

CLUSA: Women had leadership roles on the program. Most of the demo plots were led by women-either as Lead or contact farmers. According to the ZAPAD extension structure, each demo plot was led by a lead farmer who was deputised by two contact farmers. More than 60% of these posts were occupied by women, in conformity with ZAPAD's gender strategy. Women also constitute the majority of the participants at the demo plots. On average, two thirds of the farmers at each demo plot were women. By and large, it can be said that this was a 'women project'-considering the number of women and the role the women played on the project.

**Challenges:** Need more specific activities and a strategy to ensure continued participation of women in the N2Africa project.

**Output 4.5.3:** By month 12 of each year, at least 2 special events on the role of legumes in household nutrition and value added processing conducted per country.

**Accomplishments:** Some partners have organized specific training on processing and value addition (see above and table on training by partners).

**<u>OBJECTIVE 5:</u> Develop and strengthen capacity for BNF research, technology development, and application**

**Activity 5.1:** Provide short-term, high level technical training for project scientific and technical staff in essential microbiological skills and BNF technologies.

**Output 5.1.1:** By month 9 of year 1, at least 4 technical staff from the 3 hubs trained on inoculant production and quality control, lab-based PCR methods, $N_2$ fixation quantification, and associated laboratory, greenhouse, and field techniques.

**Accomplishments and challenges:** Delayed until month 8 year 2.

**Activity 5.2:** Advanced training to MSc and PhD level of an elite young cadre of African scientists focused on topics filling identified knowledge gaps and identified through competitive calls.

**Output 5.2.1:** By month 6 of year 1, at least 14 MSc and 6 PhD candidates divided among three hubs selected for training.

**Accomplishments**: In Zimbabwe two excellent female MPhil candidates have been identified through a rigorous selection process led by UZ. The two students have developed the required short and long proposals. These have been assessed by several committees at UZ and we are awaiting official confirmation from UZ of their admission to be able to proceed with the disbursement of the funds for research, stipend and registration. PhD candidate has been selected. The defense of her Master thesis has taken place and she is supposed to make corrections to facilitate graduation in August/Sept 2011.

**Activity 5.3:** Training-of-trainers workshops on legume and inoculant technologies for agricultural extension workers and NGO staff.

**Output 5.3.2:** By month 10 of years 2 and 3, at least 8 training-of-trainers workshops (2 workshops in each country), attended by at least 40 extension staff, conducted on inoculation technology (inoculant handling and storage, etc) and legume agronomy [resulting in 640 trainers by the end year 3]. (5.3.2)

**Accomplishments:** Farmers were trained in different issues concerning the N2Africa project. It started of with a Training-of-Trainers conducted in each of the districts by two people trained in Kenya by the N2Africa project (September 2010). The participants consisted of Lead Farmers, Agritex extension officers and NGO staff. In total 50 staff were trained (27 male, 23 female) and a total of 190 farmers (112 male, 78 female) .

The people training in these trainings in turn trained their fellow farmers. In addition, the partner organisations organized additional trainings according to the priorities they had set. Some partners had both trainings that specifically targeted N2Africa farmers as well as trainings that were part of their broader programme activities (such as Clusa-ZAPAD). In the latter case, the training course would be relevant to the N2Africa farmers e.g. course on group marketing or post harvest handling of legumes. Not every partner has been able to provide the details of the trainings they organised. The table below summarizes the information we managed to collect on the types and number of trainings conducted.

| | **Staff** | | | **Farmers** | | | **Total** | | |
|---|---|---|---|---|---|---|---|---|---|
| | ***Male*** | ***Female*** | ***Total*** | ***Male*** | ***Female*** | ***Total*** | ***Male*** | ***Female*** | |
| **Whedza** | *3* | *1* | 4 | 10 | 12 | 22 | 13 | 13 | 26 |
| **%** | *75%* | *25%* | 100% | 45% | 55% | 100% | 50% | 50% | 100% |
| **Makoni** | *2* | *3* | 5 | 10 | 9 | 19 | 12 | 12 | 24 |
| **%** | *40%* | *60%* | 100% | 53% | 47% | 100% | 50% | 50% | 100% |
| **Mudzi** | *2* | *1* | 3 | 15 | 9 | 24 | 17 | 10 | 27 |
| **%** | *67%* | *33%* | 100% | 63% | 38% | 100% | 63% | 37% | 100% |
| **Murehwa** | *5* | *3* | 8 | 11 | 12 | 23 | 16 | 15 | 31 |
| **%** | *63%* | *38%* | 100% | 48% | 52% | 100% | 52% | 48% | 100% |
| **Goromonzi** | *4* | *3* | 7 | 11 | 6 | 17 | 15 | 9 | 24 |
| **%** | *57%* | *43%* | 100% | 65% | 35% | 100% | 63% | 38% | 100% |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Guruve** | *5* | *3* | 8 | 8 | 8 | 16 | 13 | 11 | 24 |
| **%** | *63%* | *38%* | 100% | 50% | 50% | 100% | 54% | 46% | 100% |
| **Makonde** | *3* | *5* | 8 | 37 | 13 | 50 | 40 | 18 | 58 |
| **%** | *38%* | *63%* | 100% | 74% | 26% | 100% | 69% | 31% | 100% |
| **Chegutu** | *3* | *4* | 7 | 10 | 9 | 19 | 13 | 13 | 26 |
| **%** | *43%* | *57%* | 100% | 53% | 47% | 100% | 50% | 50% | 100% |
| | | | | | | | | | |
| **Total** | *27* | *23* | 50 | 112 | 78 | 190 | 139 | 101 | 240 |
| **Average No.** | *3* | *3* | 6 | 14 | 10 | 24 | 17 | 13 | 30 |
| **Average %** | *56%* | *44%* | 100% | 56% | 44% | 100% | 56% | 44% | 100% |

**Challenges:** Having only two Lead Trainers proved to be rather few to train the large number of Lead farmers and extension staff necessary. More over there was a strong time pressure and tight budget that caused a rather hastily organization of the trainings and there has been no follow-up from the 'Master Trainers' due to issues with MoAs and the absence of the Farm Liaison Officer.

| **Partner Organisation (District)** | **District** | **Type of Training** | **Dates** | **Duration (Days)** | **Attendance** | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Male | Female | Unknown | Total |
| CADS | Goromonzi | TOT lead farmers | Nov-10 | 1 | 22 | 21 | | 43 |
| CADS | Goromonzi | Land preparation | Nov-10 | 1 | 257 | 431 | | 688 |
| CADS | Goromonzi | Identification of nodules and the benefits of legumes to soil fertility | Feb-11 | 1 | 184 | 265 | | 449 |
| CADS | Goromonzi | Weed, Pest and disease Management | Feb-11 | 1 | 160 | 200 | | 360 |
| CADS | Goromonzi | Pre-harvest Crop Management | Mar-11 | 1 | 162 | 241 | | 403 |
| CADS | Goromonzi | Post harvest handling training | Apr-11 | 1 | 176 | 193 | | 369 |
| | Goromonzi | Value addition (soy and groundnuts processing | May – June 2011 | 1 | | | | 0 |
| CADS | Mudzi | TOT Agronomy of Legumes | Nov-10 | 1 | 11 | 9 | | 20 |
| CADS | Mudzi | Agronomy of legumes to all beneficiaries (two sessions) | Dec-10 | 1 | 181 | 139 | | 320 |
| CADS | Mudzi | Pest Identification, Calibration, and Scouting | Jan-11 | 1 | 67 | 81 | | 148 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CADS | Mudzi | Identification of nodules, pod counting and inoculation | Mar-11 | 1 | 56 | 78 | | 134 |
| | | | | Subtotal | 1276 | 1658 | | 2934 |
| | | | | | | | | |
| AGRITEX | Makoni | TOT lead farmers (four trainings done) | Dec-10 | 1 | 9 | 11 | | 20 |
| AGRITEX | Makoni | Land Preparation and Planting Demos (8 demos done) | Dec-10 | 1 | 117 | 183 | | 300 |
| AGRITEX | Makoni | Pest management (2 sessions done) | Jan-11 | 1 | 105 | 155 | | 260 |
| AGRITEX | Makoni | Post harvest handling of legume crops | Apr-11 | 1 | 120 | 175 | | 295 |
| | | | | Subtotal | 351 | 524 | | 875 |
| | | | | | | | | |
| CTDT | Chegutu | TOT on legume Agronomy | 06/10/2010 | 1 | 20 | 26 | | 46 |
| CTDT | Chegutu | Farmer training on legumes | 26/10/2010 | 1 | 212 | 428 | | 640 |
| CTDT | Chegutu | Pest Identification | 03/02/2011 | 1 | 50 | 72 | | 122 |
| | | | | Subtotal | 282 | 526 | | 808 |
| | | | | | | | | |
| AGRITEX | Hwedza | ToT Lead farmer Training | Nov-11 | 1 | 14 | 11 | | 25 |
| AGRITEX | Hwedza | Agronomy training to beneficiary farmers in Ward 27 | Dec-10 | 1 | 114 | 169 | | 283 |
| AGRITEX | Hwedza | Biological N Fixation and identification of nodules | Mar-11 | 1 | 35 | 45 | | 80 |
| AGRITEX | Hwedza | Use of fertilizers in legume crop production | Feb-11 | 1 | 56 | 70 | | 126 |
| AGRITEX | Hwedza | Adoption of legume crops and value addition | Jan-11 | 1 | 38 | 85 | | 123 |
| | | | | Subtotal | 257 | 380 | | 637 |
| | | | | | | | | |
| Clusa-Zapad | Guruve | Sugar Bean Production | 29/09/2010 | 3 | 21 | 15 | | 36 |
| Clusa-Zapad | Guruve | Farming as a Business (FaaB) | Oct-10 | 3 | 14 | 21 | | 35 |
| Clusa-Zapad | Guruve | TOT Agronomy | Dec-10 | 1 | 10 | 14 | | 24 |
| Clusa-Zapad | Guruve | All beneficiaries Agronomy | Dec-10 | 1 | 121 | 183 | | 304 |
| Clusa-Zapad | Guruve | Lead farmer training in M and E | December, 2010 | | 8 | 8 | 7 | 23 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Clusa-Zapad | Guruve | Demo plot management ward 5 | Nov/Dec 2010 | | | | 55 | 55 |
| Clusa-Zapad | Guruve | Demo plot management ward 7 | Nov/Dec 2010 | | | | 48 | 48 |
| Clusa-Zapad | Guruve | Demo plot management wards 16 | Nov/Dec 2010 | | | | 62 | 62 |
| Clusa-Zapad | Guruve | Demo plot management ward 18 | Nov/Dec 2010 | | | | 38 | 38 |
| Clusa-Zapad | Guruve | Demo plot management ward 23 | Nov/Dec 2010 | | | | 35 | 35 |
| Clusa-Zapad | Guruve | Group Marketing | 12-14/04/2011 | 3 | 21 | 9 | | 30 |
| Clusa-Zapad | Guruve | Post harvest handling of legumes | May-11 | | | | 10 | 10 |
| | | | | Subtotal | 195 | 250 | 255 | 700 |
| | | | | | | | | |
| CTDT (& Agritex) | Murehwa | TOT Agronomy | 30/09 2010 | 1 | 10 | 13 | | 23 |
| CTDT (& Agritex) | Murehwa | All beneficiaries Agronomy | Dec 2010 | 1 | 101 | 234 | | 335 |
| CTDT (& Agritex) | Murehwa | Biological Nitrogen Fixation and identification of nodules | March 2011 | 1 | 67 | 81 | | 148 |
| CTDT (& Agritex) | Murehwa | Judging fields for Field days | March 2011 | 1 | 10 | 11 | | 21 |
| CTDT (& Agritex) | Murehwa | Pest management and spraying | Jan 2011 | 1 | 34 | 73 | | 107 |
| | | | | Subtotal | 222 | 412 | | 634 |
| | | | | | | | | |
| | | | | TOTAL | 2583 | 3750 | 255 | 6588 |
| | | | | | 39.21% | 56.92% | 3.87% | 100.00% |

**Activity 5.4:** Training workshops on legume and inoculant technologies for agro-dealers and officers of farmer associations and community-based organizations.

**Output 5.4.3:** By month 12 of years 2, 3&4, at least 30 agro-dealers in each hub are trained in accessing, managing and distributing information on inoculant use, resulting in 270 trained agro-dealers by the end of the fourth year. **Accomplishments:** N2Africa will further strengthen its collaboration with the IFAD funded project and possibly some new partner organisations that have indicated to be interested to participate in the N2Africa project.

# 5 DRC Report of N2Africa activities

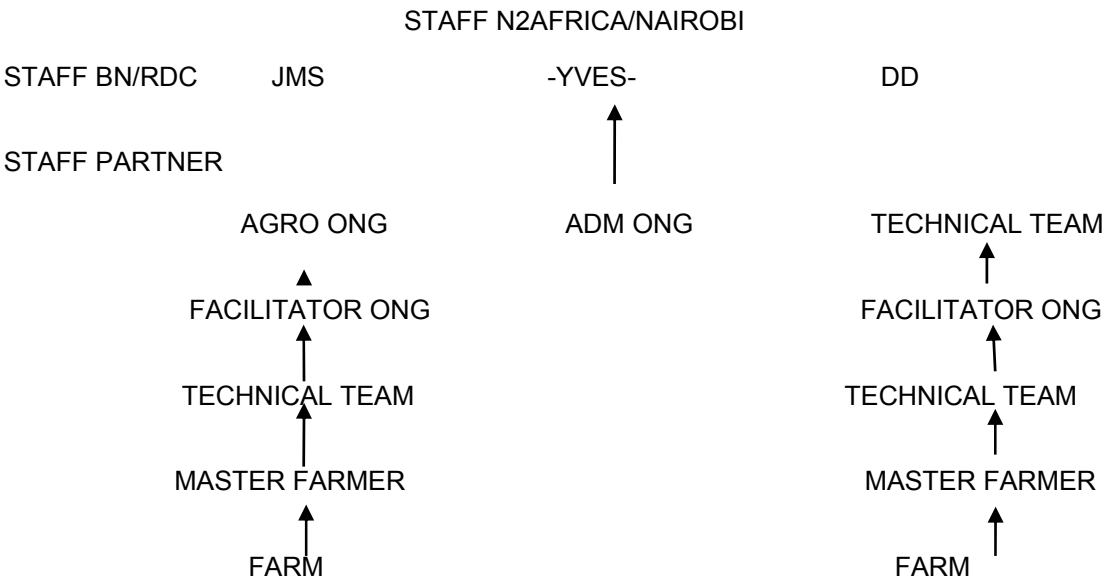
Summary of the activities/highlights of N2Africa project in DRC
This project started during a meeting held by the project supervisor on 2/18/2010. The meeting brought together the CIALCA and N2AFRICA staff members as well as the potential partners who would help the newly recruited staff to implement the N2AFRICA project.

STAFF

Staff on the ground is organized as below:
1. Jean-Marie Sanginga is responsible of the field activities;
2. Dieudonné is responsible of the dissemination;
3. Yves responsible of the administration
4. Isaac is the support person for the activities related to the Rhizobiology.

PARTNERS

Initially we had 3 partners: PAD, SARCAF and DIOBASS but since the beginning of the Rhizobiology, UCB was added as new partner and to be in charge of the 3rd N2AFRICA objective.
Interaction with the partners was materialized after signing the MOU following the reporting chain described below:




This figure illustrates how the information and reports reach to the hierarchy and vice-versa.

BUDGET

Since the disbursement of funds will be done in Nairobi, it is believed that Nairobi accounts office or finance has the accurate data to complete the figures all the times. The table below outlines the funds previously used:

| **Partner** | **Budget y1** | **Budget y2** | **Equipments** | **Other assets** |
|---|---|---|---|---|
| DIOBASS | 17997$ | 30000$ | Laptop, Camera, GPS | |
| PAD | 17997$ | 30000$ | Laptop, Camera, GPS | |
| SARCAF | 17997$ | 30000$ | Laptop, Camera, GPS | |
| **Staff** | **Budget Y1** | **Budget Y2** | **Equipments** | **Other assets** |
| JMS/AGRO | 7500$ | 44000$ | Laptop, Camera, GPS | |
| DD | | 7000$ | Laptop, Camera, GPS | 2 Small Cameras, guide books for farmers' trainers |
| YVES | 6251$ | 8782$ | Laptop | HILUX, scan, printer |
| ISAAC | | 7620$ | | Lab. Equipment |
| JMS/BASELINE | 10.069$ | | | |
| JMS/CARACTERIZATION | | | | |

MEETINGS

There are 2 types of meetings:

1. Regular meetings for the N2AFRICA staff: regularly held on 4th of each month. They are extended to staff working in the station of Bukavu as well as students and partners. In these meetings, each staff member presents the activities achieved, those to be carried out, the announced visits, travel programs, challenges or constraints encounted and the recommendations.

2. Non-ordinary meetings: these are meetings held for planning of activities or due to visits of certain personalities and/or due to the invitation of partners, institutions, ONGD, etc.

To date the N2AFRICA project in DRC is progressing well since all the objectives are already underway: the baseline is already done; the field activities are in full expansion; Rhizobiology has just started, both dissemination and capacity building are going well at staff, partner and student levels.

The outline below will give us the details on the activities following the five objectives of the project:

1. Baseline
2. Agronomy
3. Rhizobiology
4. Dissemination
5. Capacity building and others

The first two activities are described in other reports report.

III Rhizobiology activities in DRC during 3 seasons

Summary of the various Rhizobiology activities already done:

| PERIOD | TYPE OF ACTIVITY | PERSONS INVOLVED |
|---|---|---|
| April 2010 | Collection of nodules in the field trials (+170 samples were sent to Nairobi) | Jean-Marie, Dieudonné, Isaac and UCB students |
| December 2010 | Collection of nodules in the wild forage legumes and some field trials in Kabare and Walungu areas. | Dr PAUL Woomer, Jorge Mwenda, Isaac and Bienvenue |
| April 2011 | Soil sampling in 10 sites of the $N_2$Africa project for the MPN | Dr Fred Baijukya, Isaac and UCB students |
| June 2011 | Discussion on the progress of objective 3, inventory of all equipment on the site and installation of a temporary laboratory in a room at Kalambo | Dr PAUL Woomer, Prof Walangululu, Isaac and Bienvenue |

January-June 2011

We started with the field installations in season B 2011 to see the response to the inoculum in the mandate area of N2AFRICA project (INNO2 trials).

| Site | Number of the field forseen | Number of installed fields |
|---|---|---|
| IKOMA | 1 | 1 |
| IBONA | 1 | 1 |
| CHAGOMBE | 1 | 1 |
| MULAMBA | 1 | 1 |
| MUSHINGA | 1 | 1 |
| BURHINYI | 1 | 1 |
| NYANGEZI | 1 | 1 |
| MUMOSHO | 1 | 1 |
| BUSHWIRA | 1 | 0 |
| MURHESA | 1 | 1 |
| BUGORE | 1 | 1 |
| KALEHE | 1 | 1 |
| BIRAVA | 1 | 1 |
| TOTAL | 13 | 12 |

After field installation, the following parameters were observed:

1. Germination at 8 days after planting;
2. Flowering dates;
3. Plant colour and vigour;
4. Fresh and dry weight of the biomass (pods and leaves);
5. Sampling and scoring of the nodules

June 2011

We just started with the extraction of the peat and in the coming week, the nodule exploration in 44 sites will follow: collection, characterization and screening must be done before the end of September.

Products and materials already received at Kalambo for N2Africa Rhizobiology account.

| Number | Product name | Quantity |
|---|---|---|
| 1box | BTB | 25g |
| 1box | CR (congo red) | 25g |
| 1box | Na AZIDE | |
| 1box | NaOH | 500g |
| 1box | CaCl | 500g |
| 1box | $KH_2PO_4$ | 1Kg |
| 2boxes | Silicagel | 500g |
| 1 | Manitol | |
| 1box | Agar | 500g |
| 1box | Yeast extract | 500g |
| 1box | MgSO4 | 500g |
| 1bottle | Na Hypocloride | 5L |
| 4box | Stainless steel sterilization | |
| 10 | Pipette | 25ml |
| 5 pieces | Alminium Foill | |
| 1 | Gram stain chemicals | 25gms |
| 1piece | Plastic Bottles for sterile distilled water | 10L |
| 2 | Bottles Brush | 10 |
| 1 | Cotton wool Non- Absorbent | |
| 5 | Cotton wool absorbent | 400gms |
| 1 | Needles | 18g |
| 1 | Wire loop holders | |
| 1 | Pair of Indistrials glovs | |
| 5 | Mc cartney Bottles(wide Mouth) | 10 |
| 1 | Wire basket holder(for .Mac courtney) | |
| 50 | Conical flasks | 500ml |
| 1 | Conical flasks | 5L |
| 3 | Conical flasks | 200ml |
| 5 | Conical flasks | Size citar |
| 5 | Conical flasks | 1000ml |
| 20 | Beaker low form | 600ml |
| 12 | Beaker | 100ml |
| 20 | Beaker | 250ml |
| 2 Brocken | Beaker | 1000ml |
| 2 | Beaker | 500ml |
| 2(1broken) | Beaker | 100ml |
| 10 | Pipette | 2Pces 10ml |
| 10 | Pipette | 2Pces 20ml |
| 1(100 pieces) | Test Tube | 12*100 medium wall |
| 1Piece | Of Wash bottle | 250ml,Oval/yellow |
| 1 | Aspirator | 25L |
| 1 | Vial Insert Support,Sleeve rubber,Chromacol | |
| 1 | Weighing Boat Square S white | 4pks |
| 8 | Syringes | 20ml et 50ml |
| 1 | Sieve | 200MM*212Um |
| 1 | Parafilm Tape | |
| 1 | Electric Balancing | 2000g |
| 1 | Wrist action Shaker | |
| 1 | Distillation apparantus | |
| 1 | Dispenser for bottles | |
| 1 | Incubator | 25c-35c |
| 1 | Laminar Flow houd | |
| 1 | Greenhouse | |

IV Dissemination

1 Number of households reached up to season B 2011

| Partner | Site | Number of new households reached | Number of old households | Total number reached |
|---|---|---|---|---|
| PAD | Mulamba | 70 | 120 | 190 |
| | Walungu | 70 | 120 | 190 |
| | Birava | 94 | 200 | 294 |
| | Murhesa | 70 | 110 | 180 |
| | Kalehe | 46 | 120 | 166 |
| | Sub-total | 350 | 670 | 1020 |
| SARCAF | Mumosho | 92 | 178 | 270 |
| | Ikoma | 104 | 105 | 209 |
| | Bwirembe | 54 | 110 | 164 |
| | Cagombe | 118 | 142 | 260 |
| | Sub-total | 368 | 535 | 903 |
| DIOBASS | Bugorhe | 150 | 270 | 420 |
| | Nyangezi | 40 | 150 | 190 |
| | Mushinga | 100 | 200 | 300 |
| | Burhinyi | 60 | 132 | 192 |
| | Sub-total | 350 | 752 | 1102 |
| Total | | | | 3025 |

2 Training

The training provided focused on the inoculation techniques, participatory evaluations, cultivation techniques and inoculum.

| Partner | Site | Number of trained master farms | | Number of trainings for master farmers organized | Training topic | Total number of trained Agronomists | |
|---|---|---|---|---|---|---|---|
| PAD | | M | F | | | M | F |
| | Mulamba | 22 | 26 | 3 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | | |
| | Walungu | 30 | 18 | 2 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | | |
| | Birava | 33 | 15 | 3 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | 9 | 2 |
| | Murhesa | 20 | 28 | 2 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | | |
| | Kalehe | 24 | 24 | 3 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | | |
| SARCAF | Mumosho | 0 | 15 | 3 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | 3 | 5 |
| | Ikoma | 0 | 16 | 3 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | | |
| | Bwirembe | 1 | 11 | 2 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | | |
| | Cagombe | 0 | 14 | 3 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | | |
| DIOBASS | Bugorhe | 55 | 30 | 3 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | 8 | 2 |
| | Nyangezi | 12 | 18 | 2 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | | |
| | Mushinga | 50 | 40 | 2 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Burhinyi | 41 | 36 | 3 | Inoculum techniques, participatory evaluation by the method of pair criteria, inoculum, cultivation techniques | | |
| Total | | 288 | 291 | 34 | | 20 | 9 |

The training of the master farmers was done in one day per site as well as the training of the agronomist per partner.

## 3 Demonstration trials installed up to season B 2011

For the demonstration trials, there are 2 types of intercropping systems (maize + soybean and cassava + soybean), 2 treatments (Inoculum application or not), 2 modes of planting (broadcast or on line) and 2 varieties (SB24 or PK6) or 16 demonstration units.

| Partner | Site | Number of demonstration trials |
|---|---|---|
| PAD | Mulamba | 2 |
| | Walungu | 2 |
| | Birava | 2 |
| | Murhesa | 2 |
| | Kalehe | 2 |
| | Sub-total | 10 |
| SARCAF | Mumosho | 2 |
| | Ikoma | 2 |
| | Bwirembe | 1 |
| | Cagombe | 2 |
| | Sub-total | 7 |
| DIOBASS | Bugorhe | 2 |
| | Nyangezi | 1 |
| | Mushinga | 2 |
| | Burhinyi | 2 |
| | Sub-total | 7 |
| Total | | 24 |

Seven demonstration trials were exclusively managed by women: these include Ikoma, Mumosho, Bwirembe and Cagombe trials.

## 4 Input distributed up to season B 2011

| Partner | Packages | Soybean (kg) | Bean (kg) | Maize (kg) | Number of cassava cuttings | Inoculum (g) |
|---|---|---|---|---|---|---|
| BIOBASS | 1102 | 219 | 221 | 110 | 66120 | 110 |
| PAD | 1020 | 217 | 219 | 108 | 53100 | 108 |
| SARCAF | 903 | 210 | 213 | 106 | 65280 | 106 |
| TOTAL | 3025 | 646 | 653 | 324 | 184500 | 324 |

5 Exchange visits organized until May 2011

| Partner | Between who | Number of organized exchange visits | Participants | |
|---|---|---|---|---|
| | | | Men | Women |
| DIOBASS | Bugorhe - Burhinyi | 2 | 59 | 71 |
| | Burhinyi - Mushinga | 1 | 15 | 7 |
| | Bugorhe - Nyangezi | 1 | 20 | 12 |
| | Total | 4 | 94 | 90 |
| PAD | Mulamba – Birava- Kalehe | 2 | 60 | 120 |
| | Murhesa-Birava- Kalehe | 1 | 57 | 70 |
| | Total | 3 | 117 | 190 |
| SARCAF | Interpartenaires | 1 | 24 | 41 |
| | Ikoma-Mumosho-Bwirembe | 2 | 6 | 52 |
| | Ikoma- Mumosho | 1 | 5 | 37 |
| | Total | 4 | 35 | 130 |
| **Total** | | **11** | **246** | **410** |

Exchange visit in Bugorhe

Exchange visits

The exchange visits were organized by all partners. These visits were an opportunity for mutual reinforcement between households of different agro-ecological zones of the project.

Summarized points of these visits are given in the table below.

Observations done during the exchange visits

| Site | Visited trials | Trial manager | Observations done | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Positive points | Negative points | Differences between treatments | Lessons learnt | Participants | |
| | | | | | | | Men | Women |
| Bugorhe / DIOBASS | Demonstration trials | Rhugwasanye association | Respect of the protocol | Poor management of the trial | Good response to the inoculum<br>Good yield with the planting in row compared to the broadcast | You have to respect the agricultural calendar | 20 | 12 |
| | Household fields | ADEA/ Alphonse | Respect of the protocol | Harvest of cassava leaves as a vegetable | Rapid plant growth in the inoculated plot | | | |
| | Input | ADEA association | Good germination, respect of the protocol, homogeneous soil | Shaded field | A lot of pods in the inoculated plot | The respect of the agricultural calendar is necessary<br>Regular maintenance of the field | | |
| Burhinyi/ DIOBASS | Input trial | | Respect of the protocol | Attack by weeds and rats. | Visible response to inoculum | High density of planting (maize and soybean) compromises the yields | 16 | 5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Demonstration trials | | The field is very accessible and homogeneous.<br>The protocol was respected | Density of planting was not respected and thinning was poorly done | | The high density of planting and non-thinning negatively affected vegetative growth and yields | | |
| | Household field | Nabintu | For 600 g planted, she harvested 7000 g ; Maize plants have good vigour | The protocol was modified | | | | |
| Mulamba/PAD | Demonstration trial | Rhuzusanye association | Planting in row and respect of the spacing and of the protocol | Poor management, presence of mosaic of cassava, late harvest | Good growth of maize in the plots planted in rows, poor growth of maize as well as soybean in the broadcasted plots<br>Visible response to the inoculum in plot sown in rows | Respect the planting density and agricultural calendar, regular maintenance<br>Apply the inoculum, planting on time and on line | | |
| | Household field | | Respect of the protocol | Late planting | Good vegetative growth in the inoculated plots | | | |
| Murhesa/PAD | Household field | Kujirabwinja Pascal | Respect of the protocol, good growth of soybean and maize . Field protected against erosion, Model field | Attack by pests | High biomass, average of 95 pods per inoculated plot and 50 for non-inoculated plot | Good management of the soil is very important to obtain good results | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Household trial | Charlotte | Excellent germination<br>Few attacks by rats | Non respect of protocol, delay of the second weeding | Inoculated plot gives good yield while non-inoculated gives low yield | Proposed spacing in the protocol does not promote production, especially when there is combination of crops | | |
| Chagombe/ SARCAF | Demonstration trial | | Proper plant development in cassava-legume intercropping but legume promoted by sowing in rows. | Poor plant development in plots planted in bulk (broadcasting system) | Plants in plots inoculated have high green biomass | Respect of the spacing in the intercropping cassava-legume allows to sow another legume the following season | | |
| | Household trial | | | Cobs size does not attract farmers<br>Maize planting density creates shade for legume | Good vegetative growth of soybean in the inoculated plot relative to non-inoculated plot | Review the planting density of maize in the combination maize-legume | | |
| Mumosho/ SARCAF | Demonstration trial | | Proper plant development in cassava-legume intercropping but legume promoted by sowing in rows. | Poor plant development in plot planted in bulk (broadcasting system) | Plants in plots inoculated have high green biomass | Respect of the spacing in the intercropping cassava-legume allows to sow another legume the following season | | |

FIELD DAY

Objectives of the field day:

- Share experiences between farmers and ensure a mass dissemination of the N2Africa technology
- Evaluate with farmers the effects of the inoculum on legumes

| Partner | Number of field day organized | Participants | |
|---|---|---|---|
| | | Men | Women |
| **DIOBASS** | **1** | **42** | **37** |
| **PAD** | **0** | **0** | **0** |
| **SARCAF** | **1** | **25** | **132** |
| **TOTAL** | **2** | **67** | **169** |

**Field day organized by SARCAF**

The participants came from several action sites: SARCAF, DIOBASS and PAD sites as well as guests coming from different state institutions (INERA, IPAPEL, Police, ANR, etc.) and Universities (UEA, ISDR, etc.).

***Field visits***

During the visit of the demonstration fields, the household trials were visited as well. The demonstrated technologies were combination of maize-legume, cassava-legume and the use of inoculum.

Observations and comments made by visitors on the technologies, treatments and visible differences were:

- The spacing of 2 m between 2 lines of cassava is very good for an efficient management and occupation of the land
- The plots sown in broadcasting system had a high number of plants but low yield compared to other plots
- The use of inoculum improved the performance of the legumes.

***Exhibition of improved varieties of legumes***

The head of the national program of legume at INERA/Mulungu gave his presentation with a special focus on bio-fortified varieties rich in Zinc, Iron and other necessary micro-nutrients to improve human health. He ended his speech by asking participants to disseminate these varieties in their families and especially their use by pregnant women. Several varieties were presented.

Some characteristics of bean varieties presented by INERA

| Variety | Some characteristics | | | | | |
|---|---|---|---|---|---|---|
| | 50% Flowering | Pods per plant | Grains per pod | Physiological maturity | Vegetative cycle | Average yield (kg/ha) |
| M'Nsole | 46 days | 25.2 | 6.2 | 77 days | 91 days | 1273.3 |
| Simama | 41 days | 8 | 4 | 74 days | 89 days | 832.1 |
| AFR 708 | 41 days | 10.3 | 5.1 | 74 days | 91 days | 1985.8 |
| CODMLB 001 | 41 days | 8.3 | 4.4 | 75 days | 85 days | 1502.5 |
| CODMLB OO2 | 41 days | 8.6 | 5.5 | 75 days | 90 days | 1091.9 |
| CODMLB 003 | 41 days | 18.1 | 4 | 75 days | 90 days | 1406.6 |
| AND 620 | 46 days | 5.8 | 4.2 | 77 days | 90 days | 724.2 |
| M'MAFUTALA | 46 days | 15.2 | 5.3 | 77 days | 91 days | 1690 |
| VCB81012 | 55 days | | 7.4 | 103 days | 111 days | 1327.3 |
| CVB 81013 | 55 days | | 6.6 | 103 days | 111 days | 1569.1 |
| AND 10 | 55 days | | 5.8 | 103 days | 111 days | 930 |
| KIANGARA | 51 days | | 7 | 108 days | 111 days | 1718.2 |

***Interventions of the authorities and key organizations***

- Ir. Cirhuza, representative of INERA expressed the wish to see SARCAF actively involved in the dissemination of these varieties in the different households that they supervise and to intensify the GIFS technologies coupled with the use of the inoculum.
- Kagayo Mukumiro, leader of the "groupement" of Mumosho asked IPAPEL together with SARCAF to strengthen the capacity of the field workers for the emergence of the agricultural activities. Thus, the contribution to the agricultural intensification will be successful.
- Michel Marhegane of IPAPEL, requested a strengthening collaboration between staff of ONGD and those of IPAPEL so that together we can fight against food insecurity and promote innovation technologies such as inoculum
- Capitaine Mulungulungu of PNC encouraged SARCAF for the results obtained and urges farmers to do better in the future
- Ayagirwe Basengere, representative of UEA, SARCAF to extend its activities in other villages and to continue to collaborate with competent institutions for the new technologies.

Women from other villages need organization like SARCAF for their promotion.

During the field day, Madam M'Nakaziba, a master farmer and producer from Chagombe/Ibona gave her testimony that she has multiplied a small quantity of seeds received and today she managed to buy a cow, thanks to the revenue generated.

The field day ended with the awards to the best farmers as selected by an ad hoc committee. The prizes mainly comprised of women's cloths, farming tools and boots (shoes).

**Field day organized by DIOBASS**

DIOBASS has organized the field day within the Bugorhe site.

**Field visits and observations done:**

| Trial | Demonstrated technologies | Observations and principal comments on the technologies, treatments and visible differences by visitors |
|---|---|---|
| Demonstration trial<br>intercroping-3, maize-soybean association | Maize-soybean intercropping using 2 varieties of soybean (SB24 and PK06), broadcasting method and planting on lines, application of inoculum and non-application | Very good trial, visible differences between inoculated and non-inoculated plots, Plots sown on row looked healthier than those with broadcasting method<br>Visitors appreciate the planting on lines and the use of chemical fertilizers |
| Inoculation trial | Use of 2 varieties of soybean (SB24 and PK06) with many treatments and inoculum. Some plots had NPK, others urea and others TSP+KCL. The response of soybean to the inoculum application was compared with the different fertilizer treatments. A control treatment without fertilizer and inoculum application was added | Visible differences between plots with fertilizer application and plots without fertilizer application were observed by visitors. These clear differences convinced visitors on the use of fertilizers.<br>The control treatment had poorly developed plants with chlorosis while plots with fertilizer application had very good plants and even more better in the inoculated plots. This made visitors to agreed on the use of inoculum |
| Adaptation trial | Cassava-soybean association | Visitors observed the number of soybean rows between two cassava rows.<br>During the field visit, visitors noticed that the technology allows the combination of two crops for two to three growing seasons without any inconvenience.<br>They were convinced that soybean may contribute to soil fertilization and increase cassava production.<br>They agreed that this production is possible, thanks to the planting in rows. |

79 people attended to the field day which ended with the awards to the best famers.

***Women's workshop***

A women's workshop was organized by SARCAF and the topic was "Gender, Role and Place of Women in Agriculture."

The workshop objectives were to identify specific activities for women (legume processing, cooking, etc.), make women aware of the contents of the N2Africa project, lead them to identify the roles of agriculture in general and of N2Africa project in particular, make them understand the gender concept and identify gender inequalities.

This workshop was attended by women partners to SARCAF, PAD and DIOBASS.

Number of participant: 17 women and 3 men.

### *Radio programs*

Three programs were produced on radio Maendeleo: the first two (one in French and the other one in Kiswahili) focused on presentation of CIALCA, its objectives and partners and the third focused on the presentation of N2Africa project (in French).

### *Dissemination tools*

The tools for data entry from household trials were made available by Linus, tools for M and E have been made available by Judith, a farmer guide book for biological nitrogen fixation was provided by Paul Woomer, signs visibility to trial site are produced by the DRC N2Africa team.

ANNEXES

Annex 1: Manuscript of the program produced.

Program 1 and 2 (one in French and another in Kiswahili)

Topic Presentation of CIALCA

Presenter Dieudonné Mongane

Producer Charles Bisimwa

Guest -

Time 30 minutes

Opening music

**Presenter:** Dear listeners, good evening;

Tonight we are honoured to come to you through this program, our program, your program: "UTAFUTI KWA MKULIMA" i.e. Research for farmer.

UTAFUTI KWA MKULIMA is a new program on radio Maendeleo produced by CIALCA. It is a program for dissemination of different agricultural technologies tested by CIALCA through different research programs and adopted by partners on the ground.

We are not alone in this studio, we are with a staff member of CIALCA to whom we wish welcome and ask to introduce himself to our listeners.

Welcome, would you like to introduce yourself?

**Producer:** Thank you; I am Mr. Charles Bisimwa, administrator of CIALCA in Bukavu.

**Presenter:** Yes, Mr. Charles Bisimwa, what exactly does CIALCA?

**Producer:** CIALCA (***Consortium for Improving Agriculture-Based Livelihoods in Central Africa***): is a consortium of three international partner members of the CGIAR in collaboration with national agricultural research institutes, Universities and national development organizations.

**Presenter:** We understand that CIALCA is a consortium of three international partners, who are they and what mission and goals (objectives) have they assigned CIALCA?

**Producer:** These three partners are IITA, CIAT and BIOVERSITY

Its mission and objectives are:

1) Improve the livelihood of farmers in Central Africa through sustainable systems of production that promote the improvement of income, health promotion (better nutrition) and protection of natural resources on-farm.

2) Make available and accessible the scientific knowledge to farm householders in Central Africa, consolidate and increase investments in technology developments, partnerships and capacity building and student trainings to lead at masters and PhD.

**Presenter:** What are the Universities that collaborate with CIALCA?

We work with UEA, UCB and ISDR and practically our doors are open almost to all academic institutions of the place. We also collaborate with universities in Kenya, Uganda, and Europe etc. for the training of students in MSC and PhD.

**Presenter:** Apart from the international partners and universities, what are other partners of CIALCA?

**Producer:** Thanks for the question. CIALCA partners are many: INERA, CIAT/TSBF, IITA, DIOBASS, UCB, SENASEM, CRSN/LUIRO, ACF, LOUVAIN DEVELOPMENT, PAD,

SARCAF, ACOSYF, FORAL, ASOP, BDD, CARITAS, CRS, FH, 8th CEPAC and associations supported/ accompanied by research organizations.

**Presenter:** Farmers, who are listening to us at this moment, have as you know many problems in managing their farms. What can they expect from the CIALCA staff?

**Producer:** The CIALCA members can make available to farmers their expertise and experience in applied agricultural research, integrated soil fertility management, integrated management of pests and diseases and fight against erosion.

**Presenter:** Could you tell our listeners what is the criterion for selection of CIALCA partners in Bukavu?

**Producer:** The criterion of selection is to be on the site.

**Presenter:** But is this enough? An organization such as human rights, for example, can it become CIALCA partner since it is on the site?

**Producer:** To be a partner, you must be working either in agricultural, nutritional or socio-economic areas in addition to being on the site.

Music break

**Producer:** What are the areas of collaboration with these different international partners?

**Presenter:**

- CIAT-TSBF deals with studies carried on legume grains (bean, soybean, groundnut and cowpea), on soils, socio-economic aspects, on legume transformations and on human nutrition;
- IITA: banana and plantain as well as legume grains;
- Bioversity

**Producer:** What about other partners (ONGD, Universities, etc.)?

- INERA: management of natural resources, development research, banana and legume grains. In station trials, production and multiplication of basic seeds;
- DIOBASS: identification, sensitization, mobilization and empowerment of associations/farmer groups;
- UCB/Faculty of agronomy: expertise, participation of students in surveys and other works. Training of Ir., MSC and PhD students;
- SENASEM: certification of produced seeds, supervision and inspection of seed fields;
- CRSN/LUIRO: nutrition and health components;
- Other partners (ACF, Louvain Developpement, PAD, SARCAF, ACOSYF, FORAL, ASOP, BDD, CARITAS, CRS, FH, 8EME CEPAC and farmer groups) ;
- Other project developed: BMZ or research project on forage, N2Africa (N2AFRICA or project on biological nitrogen fixation).

**Presenter:** We are coming to the end of our program, your program, the program UTAFUTI KWA MKULIMA. Today's program was mainly focused on the CIALCA presentation. The CIALCA staff has the expertise and experience ready for farmers so that they improve the production level and therefore their lives.

This program is produced every Thursday from 2.30 to 3 pm on your beloved radio Maendeleo.

We thank the disk jockey as well as our listeners.

For all contact, please go to CIALCA office sis Av. Fizi, N° 4, Commune d' Ibanda or call +243992038372/ +243853200348.

We had in the studio your humble servants Dieudonné Mongane and Charles Bisimwa

Program 3 (in French)

| **Topic** | **$N_2$ Africa project presentation** |
|---|---|
| **Presenter** | **Dieudonné Mongane** |
| **Producer** | **Yves Irenge** |
| **Guest** | **Jean Marie Sanginga** |
| **Time** | **30 minutes** |

Opening music

Dear listeners, good evening;

We thank you in advance to be many listening to the program UTAFUTI KAW MAULIMA, a CIALCA program on radio Maendeleo focusing on the dissemination of appropriate technologies for the promotion of agriculture.

Last week we followed the CIALCA administrator in Bukavu who presented the project and talked about their partners and the areas in which they operate. Today we will talk about one of the TSBF-CIAT projects: N2Africa project.

We are not alone in this studio; in front of the microphone, you have Dieudone Mongane your servant, Mr. Yves Irenge, administrator of the N2Africa project in DRC and Jean-Marie Sanginga, agronomist of the N2Africa in DRC.

**Presenter:** you talk about the project N2Africa; can you tell us what N2Africa is?

**Producer:** Yes, N2Africa is a project conceived by scientists and researchers from TSBF-CIAT and is funded by BILL and MELINDA GATE foundation in collaboration of the Wageningen University.

N2Africa literally means Nitrogen for Africa.

**Presenter:** What are the objectives of this project?

**Producer:** Before telling you the objectives of this project, you have to know that 8 African countries are involved in this project, namely Ghana, Nigeria, Democratic Republic of Congo (DRC), Rwanda, Mozambique, Malawi, Kenya and Zimbabwe. Referred to as the fight against hunger and poverty

**Presenter:** In DRC, what are the N2Africa partners?

**Producer:** Partners are the ONGD, SARCAF, DIOBASS and PAD. The project is operating in "territoire de Kabare" (Birava, Bugorhe, Murhesa, Bwirhembe and Mumosho), "territoire de Walungu" (Ikoma, Ibona, Mulamba, Mushinga and Nyangezi), "territoire de Kalehe" (Kasheke) and "territoire de Mwenga" (Burhinyi).

**Presenter:** One would think that the project will distribute food, why not money as it has been seen sometimes?

**Producer:** Thanks Dieudonne, our brothers and sisters who are engaged in agricultural activities should understand that, instead of giving them a fish, is better to teach them how to fish. N2Africa is a research and development project that wishes to bring farmers to the choice of technologies that could help them to increase their production. Thus, they will have to eat and to sell the surplus of their production and increase their income.

This project supports the use of Rhizobia on legume crops not only to achieve the nitrogen fixation but also to guarantee high fertility and productivity in order to increase peasant income since he will produce more and at lower costs.

**Presenter:** Mr. Jean-Marie Sanginga, you are the agronomist of N2Africa project, how will this project assist in increasing production, so that farmer may have to eat and sell the surplus?

**Guest:** To increase yield, you must provide good seeds, implement good agricultural practices and make effective use of fertilizers.

For N2Africa project, the new element which is practically the entry point is the use of the inoculum. A good legume seed coated with the inoculum in a favourable environment, with good farming techniques and well managed leads to increased production and consequently farmer income.

**Presenter:** You talked about legumes, what are they and in DRC which species are involved in the project?

**Guest:** A legume is a plant capable of fixing atmospheric nitrogen like bean, soybean, groundnut, cowpea, calliandra, etc.

In DRC, especially in the Eastern part, the project is working with 2 legumes: soybean and bean.

**Presenter:** Thanks Mr. Yves and Jean-Marie for the precision you just provided. Our listeners/auditors who follow us around Bukavu, in the 'territoire de Kabare, Walungu, Kalehe, Idjwi, Uvira, Mwenga, etc. understood that N2Africa is a research and development project. It comes to introduce the technology based on the use of Rhizobia in legume crops.

But before you explain to our auditors what an inoculum is, can you tell us which approach you use to assist farmer increase their production?

**Guest:** The project uses the approach research study- demonstration trials, adoption trials. This means, we set up demonstration trials from which farmers learn technologies that were already tested and farmers adopt the technology that they consider important.

**Presenter:** What is the benefit of this project for the population of South Kivu?

**Producer:** This project is an innovation that the DRC in general and South Kivu in particular has to support for several reasons:

1. The project focuses on the improvement of the fertility of our soils that have become poor due to poor management and use of poor farming practices and techniques;
2. Selected legumes are staple food in South Kivu, therefore increase their production through the use of Rhizobia is to combat malnutrition, guarantee food security and contribute to the increase of household income.
3. In the final objectives of the project, the average income of the peasant (farmer), in exception of his/her diet, should be around 450$ and produce 900 kg ha-1.

**Presenter:** We are at the end of our program. As we heard, the N2Africa is a project focused on the use of inoculum on legume crops in order to increase the biological nitrogen fixation level for increasing legume production.

This program is produced every Thursday from 2.30 to 3 pm on your beloved radio Maendeleo.

We thank the disk jockey as well as our listeners.

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We had in this studio, your humble servant Dieudonné Mongane, Yves Irenge and JM Sanginga.

V. Capacity building

Capacity building through N2AFRICA was done at different levels. There has been training done, in all the objectives of the project that can be considered as capacity building. At the staff level, these are the different sessions, seminars, workshops to which at least one N2AFRICA staff member/DRC participated or facilitated.

| Name | Place | Topic | Speaker /Trainer | Goal | period |
|---|---|---|---|---|---|
| Irenge yves | Nairobi | Admin and financial meeting | Wanjiku + admin and finance team of TSBF | Upgrading and extension and policy manual | From 04 Sept 2010 to 10 Oct 2010 |
| Dieudonné | Nairobi | Dissemination tools | N2 AFRICA staff | Roles and responsibilities of flo, discussion on the monitoring tools, monitoring and evaluation | May 2011 |
| Dieudonné | Zimbabwe | N2AFRICA Annual meeting | N2AFRICA staff + N2Africa partners | Planning meeting per country and evaluation of activities of the first year | February 2011 |
| Jean-Marie Sanginga | Kisumu | Management and monitoring of trials, data entry | Fred and john mukalama | How to monitor and how to collect N2AFRICA data | December 2010 |
| Dieudonné | Kisumu | Inoculum | N2AFRICA staff | Train staff on the farm management at the household level | May 2010 |
| N2AFRICA/ CIALCA staff | CIALCA office | Evaluation tools | Pypers | To know how to evaluate the activities | May 2010 |
| N2AFRICA staff | CIALCA office | Sampling techniques of nodules | Fred | How to collect nodules | May 2010 |

Students are supervised by Jean-Marie Sanginga and Dieudonné. Students who are doing their last year have to produce a thesis at the end of their internship through the scholarship offered by N2AFRICA. Supervisors have given in the previous reports the name, topic of the thesis, year and institution of their students. The table below gives the details of the students who have received scholarship through N2AFRICA project. Only candidates who applied for a MSC scholarship were retained. There is no PhD. The committee worked on its own merits and the criteria were appreciated by the hierarchy. The deadline for the submission of the application form was fixed to 7/15/2010. The rating scale and minutes are available at the administration.

| **Nom** | **Structure** | **Gender** | **Study level** | **Training done** | **Current status** |
|---|---|---|---|---|---|
| Kijana Ruhebuza | INERA | F | L2 BIOLOGY | Training in Rhizobiology | Resigned |
| Sika Torroma | UCB | M | IR2 AGRO | Several training within the N2AFRICA project/ CIALCA | Already registered and is in Nairobi |
| Bintu Ndusha | UEA | F | IR2 AGRO | Training in Rhizobiology | |
| Barhebwa Fidele | PAD | M | IR2AGRO | Several training and more experiences | Already registered but not yet in Nairobi |
| Balume Kayani Isaac | UCB | M | IR2AGRO | Training in Rhizobiology | Not registered |

Once again our technical team (Jean-Marie and Dieudonné) was repeatedly solicited by partners, Universities and other Institutions to explain the basis of the N2AFRICA project. Their statistical interventions are delivered in their previous reports.

VI Challenges and propositions

The N2AFRICA project is in its second year (season B 2011) and the number of households already reached is around 3000 while the project has to reach more than 20,000 households at the end of the fourth year. In my opinion, the current rate of adoption should double or even triple so that we can hope to reach the targeted number. That is why we suggest the following points in order to see if their feasibility can help to achieve this goal:

- The access to the inoculum remains a big challenge for the households that adopted the N2AFRICA technology. What about the availability of the inoculum on the site?
- Bean being a staple crop in DRC, demand for bean inoculum is increasing every day while we do not have Rhizobia for this crop.
- The distance and number of households becoming high, intervention of partners in capacity building is required.
- Inputs should be supplied in time to avoid delays in planting.

These are few words that summarize the different activities undertaken by the N2AFRICA staff.

# 6 Rwanda Country Report: June 2011

**I. In-country activities, accomplishments and challenges under objective and output headings (include partners within their respective Objectives)**

***Objective 1: Establish a baseline of current BNF, targeting legumes, M&E and impact assessment***

In Rwanda, N2Africa is working in five mandate areas, two located in the north (Gakenke and Burea), one in the south (Kamonyi) and two in the east (Kayonza and Bugesera). In the first year research and dissemination activities were established at 12 action sites, but the number increased to 13 in the first season of 2011, to accommodate more farmers. Adjustments on the number of action sites will continue over time as the project continue to recruit more farmers.

A baseline document *"N2Africa Baseline Survey of Households in Rwanda"* characterizing farming, household and socio-economic conditions was released in March this year 2. A total of 380 households were interviewed in 16 villages found in the Northern, Eastern and Southern Provinces of Rwanda. The 8 villages targeted in the Northern Province are all situated in high altitude areas; the other villages in Eastern and Southern Province are all situated in mid altitude areas. Based on the N2Africa report on the characterisation of the impact zones and mandate areas (Franke et al., 2011), it is expected that the villages in the Northern Province receive slightly more rain, have a longer growing season and slightly cooler temperatures, compared to the villages in the Eastern and Southern Province. While the whole of Rwanda is relatively densely populated, the villages of Gakenyeri and Butimba 2 are situated in a slightly more sparsely populated area than the other villages. Interviews were conducted in the second half of October and the first half of November 2010.

The finding is summarized as follows: On average, 4.9 persons lived in a household. In 55% of the households, at least one person was member of an association. Overall education levels were in general low with a majority (70%) of adult household member (>35) without a completed primary education. Men were slightly better educated than women. Adult females generally spent more time (98%) on farm-activities than men, who were more frequently involved in off-farm activities. About 33.5% of the households hired labour for crop production and processing. Almost 60% of the interviewed households owned or took care of cattle goats, sheep, pigs, chickens and rabbits. It was fairly common for households to look after other people's cattle or goats. About 14% of all households took care of on average 1.3 heads of cattle that were not owned by them. 12% took care of other people's goats. In a few instances, households took care of other people's chicken, pigs, sheep or rabbits.

The majority of farmers in Rwanda had less than 0.5 ha available for farming (incl. land hired or borrowed from other people). As some farmers owned larger plots, the average land available for farming per household was 0.71 ha. A few households rented or borrowed land to others. 94% of the fields were used for cropping, 4% as woodlots and 2% as fallow or pasture. Given an average farm size of 0.71 ha, on average 38% of the farmland contains grain legumes. Many farmers used organic inputs (farmyard manure or compost) for the cultivation of grain legumes. Only few farmers used synthetic fertilizers such as DAP or NPK and only two farmers (0.5% of the total) used urea in climbing or common bean. None of the households indicated that inoculants were used in legume crops. Most of the legume grain harvest was used for home consumption. None of the grain legumes were primarily cultivated for commercial purposes. However, all types of legume grain were occasionally sold. Markets for all grain legumes thus existed. Beans made up very popular ingredients in main dishes (Table 1.). Much fewer households, primarily in the Southern and Eastern Province mentioned other legumes such as groundnut and soybean as important foods for household nutrition. Moreover, the legumes were usually eaten as a side dish.

**Table 1.** Utilization of legume grain in Rwanda: average percentage used for home consumption, seed and sale.

| | % used for home consumption | % used for seed | % used for sale |
|---|---|---|---|
| Climbing bean | 80 | 16 | 4 |
| Common bean | 69 | 15 | 16 |
| Groundnut | 71 | 15 | 15 |
| Soybean | 66 | 14 | 21 |
| Garden pea | 55 | 22 | 24 |
| All legumes | 68 | 15 | 17 |

A detailed follow-up study to quantify the currently levels of BNF was undertaken in all mandate areas of Rwanda. Field work has just been completed. Analysis of soil and plant samples to determine the $N_2$-fixation in farms of each of household class is ongoing and the report will be available by September this year.

***Objective 2: Identify best legumes and integrate them into farming systems***

2.1.2 At least 3 new soybean varieties with high BNF potential identified month 12, year 2

2.2.1 At least 3 existing bush and climbing bean varieties with proven high BNF potential, tolerant to biotic and abiotic stresses, and sufficient seed availability identified for the impact zones month 6, year 1

Initial soybean, bush bean and climbing varieties considered high yielding and well adapted to biotic stresses were identified from the grain legume germplasm collection at ISAR research stations Rubona, Nyagatare and Rwerere. In addition to the materials from ISAR some high yielding and rust tolerant soybean materials were introduced from the TL II project at IITA Malawi. Both soybean and bean varieties were selected to match their potential in operational mandate areas (Table 2). The varieties were field evaluated for their performance based upon nodulation with introduced and native rhizobial strains, biomass accumulation, $N_2$fixation, grain yield, tolerance to pests, diseases and other abiotic factors (drought tolerance, low soil fertility) and preference by farmers.

**Table 2.** Bean and soybean varieties included in adaptive research campaigns by mandate area

| **Mandate area** | Bush bean | Climbing bean | Soybean |
|---|---|---|---|
| Burera d Gakenke | - | Gasilida, CAB 2,<br>RWV1348,<br>MAMESA,<br>RWV2070 | - |
| Kamonyi, Kayonza and Bugesera | RWR 1668<br>RWR 1180<br>RWR 2245<br>RWR 2154<br>RWR2076 | - | PK6;<br>TGx1740-2F<br>Soprosoy<br>Yezumutima<br>TGx1987-11F*<br>TGx 1987-20F*<br>TGx 1987-62F*<br>TGx1987-64F* |

**Material obtained from IITA-Malawi*

Preliminary results indicate that climbing bean varieties perform equally well in the target mandate areas with yield range of 1400-4000 kg/ha). Varieties RWAV1348, Gasilida and RWAV2070 had outstanding performance at most sites as exemplified by Figure 1. Bush bean varieties yield between 250-850 kg/ha with the variety RWR 1668 and RWR 2745 being best performers in most sites (Figure 2).

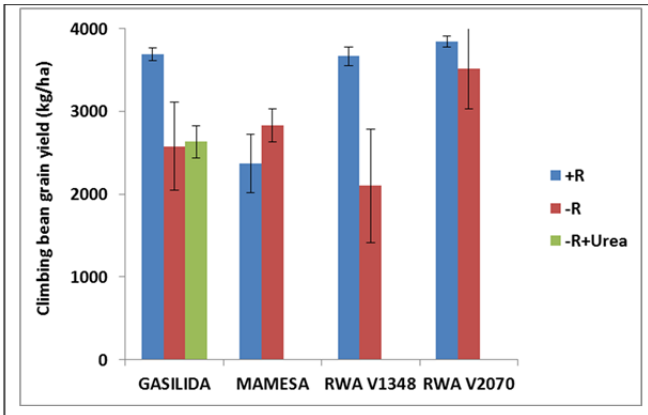


**Figure 1.** Yield performance of climbing bean varieties with and without rhizobial inoculation at Kinoni, Burera district

Inoculation of climbing bean increased bean grain yield at Kinoni site (Figure 1) but slightly reduced yield of bush bean at Mareba site, Bugesera district (Figure 2). Further analysis of soils properties and studies on MPN are being undertaken in order to understand the causal factors for this.

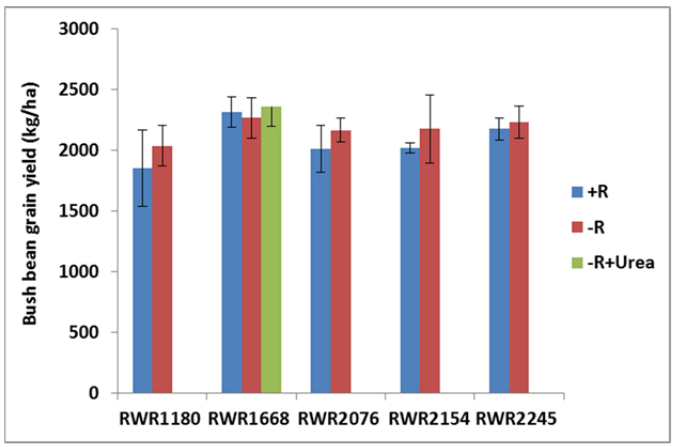


**Figure 2**. Yield performance of bush bean varieties with and without rhizobial inoculation at Mareba site, Bugesera district

Grain yield of soybean varied between varieties with yield range 0.6-1.3 t/ha without inoculation and 1.0-1.5 t/ha following inoculation (Figure 3). Overall, all varieties show positive response to inoculation with yield increase of between 5-50% depending on variety and site. So far soybean variety SB 24 had outstanding yield at all sites.

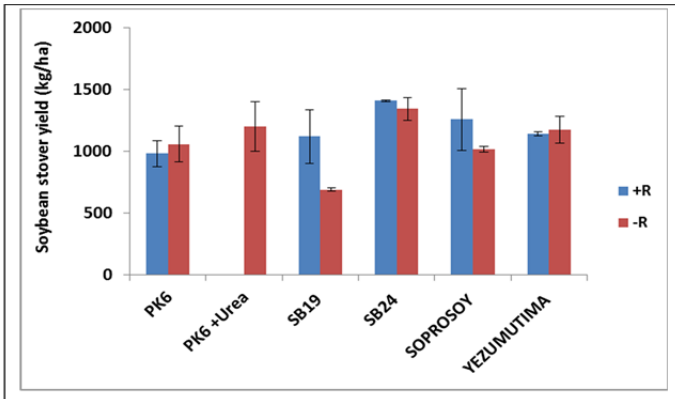


**Figure 3.** Yield performance of soybean varieties with and without rhizobial inoculation at Rwinkwavu site, Kayonza district

Despite yielding relatively little, soybean variety PK 6 is most preferred by farmer because of early maturity. Bush bean variety varieties RWV 1668 and RWV 2745 were highly preferred because of yield and early maturity. Farmers in different action sites preferred different climbing bean varieties but the varieties Gasirida, mamesa and RWV 1348 were preferred. To meet the objective of increasing grain legume production along with increasing BNF, we have taken initiatives to demonstrate to farmers other benefits to be accrued from adopting late maturing but high yielding varieties (which accumulate huge biomass, thus higher levels of BNF) such as SB 24, and this is reported under objective 4. Following the occurrence of high incidences of soybean rust, we have embarked on evaluating new materials acquired from TL II along with the local materials on resistance and tolerance to the diseases (**milestones 2.2.1 and 2.22 ongoing**).

2.4. **Identify and explore the $N_2$fixation potential of multipurpose tree and forage legumes for intensive meat and milk production and environmental services**:

Two tree forage legumes namely Calliandra (*Calliandra calothyrsus*) and Sesbania (*Sesbania sesban*) and 6 herbaceous forage legumes (*Macroptilium bracteatum* cv. Burgundy bean, *Desmodium uncinatum* cv. Silverleaf, *Desmodium intortum* cv. Greenleaf, *Desmanthus virgatus*, *Lupinus angustifolius*, *Vicia villosa-dasycarpa*, were identified for evaluation in highlands of Rwanda, seed procured now being multiplied at ISAR Nyagatare. This work is done in partnership with the CIAT tropical forage program and ISAR Nyagatare. Investigation of performance of materials under farmer condition will begin in 2010 long rains but activities will be limited to specific measurement of growth, $N_2$ fixation, and acceptability by livestock and feed value (**Milestone 2.4.1 ongoing**).

2.5. Identify best-fit agronomic practices

2.5.1 At least 9 adaptive [impact zone-specific] research campaigns focusing on major grain legume (soybean and beans) implemented in the impact zones.

A total of 61 adaptive research trials were implemented (Table 3) in different action sites and across different soil fertility gradients to evaluate response of soybean and bean to application of P fertilizers, rhizobia inoculants and their interaction. The research campaigns are led by ISAR- Rubona and implemented in collaboration with our cooperators and farmer associations. The work has been on-going for 3 seasons with refinement to address specific local challenges, e.g. addition of lime to neutralize soil pH in acidic soils in north district.

**Table 3.** Adaptive research campaigns conducted in different mandate area and action sites in different seasons

| Season | Mandate area | Action site | Name of trial | No. trials | participating farmers (No) | Partner |
|---|---|---|---|---|---|---|
| Long rains 2010 | Kayonza | Rukara | Soybean VAR, INP | 2 | 30 | Imbaraga |
| | | Nyamirama | Soybean variety trial | 1 | 31 | |
| | | Rwinkwavu | Soybean VAR, INP | 2 | 51 | |
| | Bugesera | Musenyi | Bush bean VAR,INP | 2 | 64 | Imbaraga |
| | | Mareba | Bush bean VAR,INR | 2 | 30 | |
| | Kamonyi | Musambira | Soybean VAR, INP | 2 | 29 | COCOF |
| | | Nyarubaka | Soybean VAR,INP | 2 | 47 | |
| | | Nyamiyaga | Soybean VAR, INP | 2 | 48 | |
| | Gakenke | Kivuruga | Climbing bean VAR, INP | 2 | 12 | DRD |
| | | Cyabingo | Climbing bean VAR, INP | 2 | 11 | |
| | Burera | Kinoni | Climbing bean VAR, INP | 2 | 28 | DRD |
| | | Nemba | Climbing bean VAR, INP | 2 | 17 | |
| Short rains 20110 | Bugesera | Nyamata | Soybean VAR,INP | 2 | 25 | CARITAS |
| | | Mareba | VAR 2, bush bean INP | 4 | 30 | |
| | | Musambira | Soybean INP, Bush bean Soybean VAR, Bush bean VAR | 4 | 30 | |
| | | Rwinkwavu | Input 2 Bush bean, Soybean VAR | 1 | 8 | |
| | Gakenke | Cyabingo | Climbing VAR and INP Input 2 climbing bean | 2 | 9 | DRD |
| | | Kivuruga | Climbing bean INP, VAR | 2 | 9 | |
| | Burera | Kinoni | Climbing bean VAR, INP | 2 | 16 | DRD |
| | | Nemba | climbing bean VAR, INP | 2 | 18 | |
| Long rains 2011 | Kamonyi | Nyarubaka | Soybean INO, INP, VAR | 3 | 19 | COCOF |
| | | Nyamiyaga | Soybean INO, VAR, | 2 | 11 | |
| | Bugesera | Nyamata | Bush bean INP | 1 | | CARITAS |
| | | Musenyi | 2-Soybean INO, | 2 | 64 | |
| | | Mareba | Soybean INO , VAR, | 2 | 31 | |
| | Kayonza | Rukara | Bush bean INP, Soybean VAR | 3 | 57 | EPR |
| | | Nyamirama | Soybean INO 2, Bush bean INP | 2 | 8 | |
| | Gakenke | Cyabingo | INP 3 Climbing bean | 3 | 25 | DRD |
| | Burera | Nemba | INP 3 Climbing bean | 1 | 10 | DRD |

Abbreviation of trials: VAR =Variety evaluation trial; INP = Input evaluation trials; INO, need to inoculate trial

Preliminary results obtained so far indicate that in relatively good soils, bean and soybean respond well to application of P fertilizers but not in poor soils. In poor soils we have observed insignificant yield increase with P fertilizers such as TSP and DAP. The lack of response to fertilizer application poses a challenge; as such soils occupy a significant part of agricultural land and indicate that other factors are limiting legume growth. In the next seasons we will embark on characterizing and identification of factors limiting legume production in non-responsive soils in order to find solutions to improve their productivity.

***Objective 3: Select rhizobia and develop inoculant production***

The ISAR Microbiology Laboratory leads N2Africa rhizobiology activities in Rwanda and liaises with related actions in DR Congo and Rwanda. The team at ISAR is responsible for both Agronomy (Objective 2) and Rhizobiology (Objective 3) activities in Rwanda, is led by Ms. Mathilde Uwizerwa and consists of three other trained core members. The Microbiology Laboratory has cultured 80 isolates from bean and soybean. Twenty-nine of these isolates were characterized and classified by Congo Red morphotype, BTB reaction and Gram Srain. To date, bio-prospecting has focused solely upon common bean (*Phaseolus vulgaris*) and soybean (*Glycine max*), but 11 other genera and related species in Rwanda were sampled by the University of Nairobi MIRCEN team, reducing this possible additional shortcoming. Seven hundred (700) packets of bean inoculant containing 80 gram each were recently prepared (56 kg total) for use by project research and dissemination activities in the next growing season. Strain authentication, MPNs and BNF effectiveness screening are delayed pending the rehabilitation of a nearby greenhouse allocated to the laboratory. This renovation requires less than US $1000 and should commence immediately considering that all necessary materials are readily available from stockists in nearby Butare town. The laboratory's rotary shaker and NIFTAL 30 l. batch fermenter are also in recent disrepair, preventing the team from preparing broth cultures. The ISAR team is performing well given a difficult setting, but laboratory facilities must be upgraded quickly if they are to meet project expectations for Years 2 and 3.

3.3.2 Cost effective inoculant production methods including fermentation technologies, carrier selection, inoculant formulation, and enhanced shelf life developed month 12, year 2

No achievements as no private investor in inoculants production had been identified yet.

***Objective 4: Deliver legume and inoculant technologies to farmers***

4.1. Create strategic alliances

4.1.1 Memoranda of Understanding are formalized with key partners along the legume value chains in the impact zones month 6, year 1

Towards the end of the first year, the pace of dissemination of legume technologies in the mandate area Kayonza and Bugesera was reduced. This followed poor performance of partner organization IMBARAGA, who was in charge of dissemination activities in these mandate areas. It was decided to drop IMBARAGA and recruited two new partners CARITAS-Rwanda (for Bugesera) and EPR Church (for Kayonza). With the new partners on board, five (5) new farmer associations were enlisted in Kayonza and seven (7) in Bugesera making the project more visible in these areas. So far the N2Africa in Rwanda is working with 56 farmer association with a total of 5,354 farmers. A MoU between CIAT and all partners has been formalized and funds provided for dissemination activities. The MoU's will be updated to accommodate the new project requirements as they develop **(Milestone 4.1.1 ongoing).**

The new partners CARITAS and EPR are already implementing (self funding) the project activities into 7 communities within our mandate areas, and these are regarded as "satellite sites". Three of such sites are managed by CARITAS and 4 by EPR. (**Milestone 4.1.2 started and ongoing**)

Activity 4.2: produce specific dissemination tools adapted to the needs of farmer groups. Output: by month 6 of year 2 at least a new dissemination tool related to legume and inoculant use are produced per impact zone.

In Rwanda, the guide for “Master Farmer” on legume technologies was translated into Kinyarwanda. Also the dissemination team has adapted three types of field book on soybean, bush bean, and climbing bean (developed by ISAR) for the dissemination packages and distributed them to 2500 households we are working with in all the 5 impact zones. New materials especially on value addition to soybean are being developed. In partnership with DRD we have been able to conduct one radio show and two 2 more are planned by CARITAS and EPR in July this year (**Milestone 4.2.1 ongoing**).

4.3.2 At least half of the farming communities engaged in the project are actively producing legume seed for local distribution: month 6, year 2.

Following land scarcity, which necessitated policy of land consolidation in Rwanda, seed multiplication is undertaken by farmer groups. At each of the 12 action sites, (Table 4) farmers groups are multiplying seeds of best varieties that were selected from last year’s agronomic trials. The varieties being multiplied are: Soybean variety SB24, bush bean varieties RWR 1668 and RWR 2245), and climbing bean varieties Gasilida, RWV1348, and Mamesa. Soybean is currently being multiplied on about 2.3 ha while bush and climbing bean are being multiplied on an area of 2 and 2.4 hectares respectively. A total of 15 tons of soybean seeds, 1.5 tones of bush bean and 1.6 tones of climbing beans will be available for distribution in September 2011 for the short rains season to old and new farmers to be recruited. All partners have already put a strategy in place on seed multiplication (see Table 4), which is subject to review during the planning meetings to prepare for the seasons (Milestone 4.2.2 ongoing).

4.3.3 At least half of the farming communities engaged in the project are actively linked to legume market outlets month 12, year 2.

Only farmers working with partner COCOF who is also involved in buying and processing soybean flour to fortify maize flour have a formal market. COCOF volunteered to buy all soybeans produced by farmers in Kamonyi, currently buying a kilo of soybean at RWF 300 (US$ 0.5). We do not anticipate shortage of soybean market outlets at least in Kamonyi because the current production is far below the demand of the market. A close working relationship was also forged with the USAID funded Postharvest Harvest Handling and Storage (PHHS) project. PHHS will train N2Africa master farmers in post harvest handling and storage of beans, and will link N2Africa bean growers with bean markets in Rwanda. N2Africa has essentially been promoting bean varieties with characters preferred by local farmers. However, new markets especially with WFP, Rwanda prisons and other Government institutions (schools, hospitals) are currently looking for other types of beans, e.g. white colored beans which are produced in small quantities in Rwanda. Strategies are being put in place to enable farmers to tap from this new opportunity by inclusion of white seeded beans in dissemination packages, and ensuring markets of produce through contract farming with buyers **(Milestone 4.3.2 ongoing)**.

Market analysis for inoculant in Rwanda has not been done due to a lack of local producers. Inoculants used in Rwanda were supplied from Kenya by MEA Ltd., the only commercial supplier of inoculant (BIOFIX) in East Africa. Inoculants were received in the packets of 10 (200 packets), 50g (60 packets) and 100 g (50 packets) at a price of approximately $45 per kg (including transport). However the soil microbiology laboratory at ISAR Rubona has been strengthened and can now produce inoculants. The project donated rhizobiology equipment as well as training of technicians on basic rhizobiology technologies. Recently seven hundred (700) packets of bean inoculant containing 80 gram each have been produced for use by project research and dissemination activities in the next growing season. However, a consultant has been hired by the project to look at the market issues of legumes and inoculants and he is expected to start his work in Rwanda end June. His report will shed more light on the way forward on legume and inoculants production and marketing in Rwanda (**Milestone 4.3.3 delayed but ongoing)**.

4.4. Conduct collaborative legume and inoculant technology dissemination campaigns

Activity 4.4.1 Conduct collaborative legume and inoculant technology dissemination campaigns and create awareness in rural communities in all impact zones. Output: By month 6 of each year, large scale demonstration and dissemination campaign launched in each impact zone.

4.4.2 Large-scale demonstration and dissemination campaigns held in each impact zone month 6, all years.

4.4.3 At least 3 extension events (e.g., field days, exchange visits) organized per season per country month 9, all years.

In Rwanda a total of 13 demo plots were installed in 2010 long rain season ( 4 on climbing bean in rotation with maize, 9 on bush bean inter cropped with cassava, 9 on Soybean in rotation/inter cropped with Maize). This was followed by and 13 field days that were organized around the demo plots to create awareness of these technologies among the local communities from which 2 were covered by journalists and broadcasted on local radios (FM Musanze and FM Huguka). These events were organized in February 2011 and 3 more are planned in July during harvesting of demonstration plots (**Milestones 4.4.1, 4.4.2 and 4.4.3 ongoing**). All dissemination activities conducted in Rwanda are summarized in Table 5.

**Table 5.** Summary of N2Africa dissemination activities in Rwanda from 2010 to date, 2011 Long rains season

| Outreach action | 2010 Long rains | 2010-2011 Short rains | 2011 Long Rains |
|---|---|---|---|
| Number of demonstrations | 0 | 10 | 13 |
| Number of new households reached | 150 | 1500 | 1000 |
| Inoculants deployed (kg) | 2 | 5 | 10 |
| Inoculants packets distributed (BIOFIX) | 40 | 100 | 200 |
| Soybean seed distributed (kg) | 2500 | 3000 | 3500 |
| Climbing bean seed distributed (kg) | 700 | 950 | 1200 |
| Bush bean seed distributed (kg) | 1600 | 2500 | 3000 |
| Fertilizer distributed (kg) | 600 | 1000 | 1600 |
| Cassava cuttings distributed | 0 | 81,000 | 8,000 |
| Maize seed distributed | 0 | 200 | 250 |
| Seed multiplication sites | 0 | 20 | 20 |
| Master farmers trained | 45 | 0 | 45 |
| Master farmer manuals distributed (188 pp) | 45 | 0 | 50 |
| Extension manuals distributed (20 pp) | 0 | 450 | 600 |
| Radio shows conducted | 0 | 1 | 2 |

4.5. Develop strategies for empowering women.

4.5.2 A report documenting the involvement of women in at least 50% of all farmer-related activities produced month 9, years 2, 3&4

This activity has not started in Rwanda, still waiting for recommendation from gender study. However, a partner COCOF conducted training on land rights to sensitize the community on

empowering women towards making them access and participating in decision making on land use.

4.5.3 At least 2 special events on the role of legumes in household nutrition and value-added processing conducted per country month 12, all years

No activity conducted.

***Objective 5 Develop and strengthen capacity for BNF***

5.3 T Organize training-of-trainers workshops

5.3.2 At least one training-of-trainers workshops (1 workshop in each country), attended by at least 40 farm liaison staff, conducted on inoculation technology and legume agronomy month 10, years 2&3.

So far, 165 master farmers were trained on legume technology which is 35 per mandate area; other topics were also included (e.g., the use of fertilizer and pesticides). Training was also done for the facilitators and 'master farmers' or representatives of the associations/cooperatives and these people then trained the participating households. For the new partners, the NGO coordinators were informed about N2Africa before engaging with the staff that directly supervise field activities. The training sequence (Table 6.) and training plan (Table 7.) have been developed and topics for 2011 has been determined.

**Table 6.** Training sequence for facilitators, etc, for Rwanda

| **Time of joining** | **Sept 2010** | **Feb 2011** | **Sept 2011** | **Feb 2012** |
|---|---|---|---|---|
| Facilitators joined in Sept 2010 | Training on agronomy, inoculants, etc | Training on seed multiplication, etc [based on needs assessment and logic of the project] | Training on commercialisation and processing, etc *[based on needs assessment and logic of the project]* | Training on other issues *[based on needs assessment and logic of the project]* |
| Facilitators joined in Feb 2011 | -- | Training on agronomy, inoculants, etc | Training on seed multiplication, etc *[based on needs assessment and logic of the project]* | Training on commercialization and processing, etc *[based on needs assessment and logic of the project]* |
| Facilitators joined in Sept 2010 | -- | -- | Training on agronomy, inoculants, etc | Training on seed multiplication, etc *[based on needs assessment and logic of the project]* |
| Facilitators joined in Feb 2012 | -- | -- | -- | Training on agronomy, inoculants, etc |

It is important that the number of trainees at upper level is sufficient to train those at lower levels to ensure that trainings are done effectively.

**Table 7.** Logical training plan for Rwanda

| Trainee group | **Year** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2010** | | **2011** | | **2012** | | 2013 |
| | Number trained | Number need to be trained | Number trained | Number need to be trained | Number trained | Number need to be trained | |
| Technical Agronomist | 3 | 2 | 5 | 0 | 5 | 0 | 5 |
| Facilitators | 14 | 6 | 20 | 8 | 28 | 100 | 128 |
| Master-famer | 42 | 40 | 85 | 90 | 175 | 180 | 350 |
| Households | 700 | 1000 | 1750 | 1750 | 3500 | 3500 | 7000 |

5.4 Organize training workshops for agro-dealers and farmer associations

5.4.1 At least 2 grass-root training events organized by each of 320 trainers across all impact zones, with an expected attendance of 66 farmers per event [resulting in 42,000 farmers trained by the end of year 2] month 12, year 2.

- Covered under 5.3

5.4.3 At least 30 agro-dealers in each hub are trained in accessing, managing and distributing information on inoculant use each year [270 trained agro-dealers by year 4] month 10, years 2, 3&4.

- Not yet done

## II. Work stream accomplishments and challenges (any others not covered above)

### Research work stream

Agronomy work on going as planned. Detailed analysis of data collected so far on going. Rhizobiology is moving slower. However, with the provision of supplies and equipment requested and rehabilitation of greenhouse the pace will improve.

### M&E work stream

Monitoring tools were provided to all partners and they continue to gather the information. We need a budget to train and also to motivate partners to assist the agronomy team to collected detailed information from 300 farmers that we are going to monitor.

### D&D work stream

Going on as planned, specific area of improvement mentioned under specific milestone.

### Communication work stream

**III. Revised work plan (include re-planned time, team and task).**

As uploaded in N2Africa intranet

**IV. Risks and mitigations**

Much risks are on changing climate, leading to mid-season drought which is not giving much of the expected results from our trials, demo plots as well as adaptation packaged implemented by individual farmers. Short term mitigation strategy is to adapt technologies to different agro-ecological zones, including selection of varieties, and other soil-water management practices.

**V. Updated administrative information**

Ms Alice Umugwaneza, previously recruited as admin assistant to the project has been replaced by Ms Teddy Mukankusi. Alice is now working as assistant accountant for Rwanda office. This is an internal re-shuffle within CIAT- office, which has not affected implementation of our activities.

# 7 Kenya Country Report: June 2011

**I. In-country activities**

***Objective 1: Baseline, targeting legumes, M&E and impact assessment***

Kenyan country activities are closely linked to project management structures owing to its close proximity to TSBF Headquarters and ready access to the Project Leader in Nairobi. This close working relationship led to the procurement of needed capital equipment early in Year 2 **(Milestone 1.1.2 completed)**. Adjustments were made among country cooperators. Four additional farmer groups were enlisted from the Lake Victoria Basin as dissemination partners early in Year 2, bringing Objective 2 activities into better geographic balance. Private sector partnership was also forged. An MOU was completed between the project and MEA Ltd., suppliers of BIOFIX inoculant and Sympal Fertilizer. A close working relationship was also forged with Promasidor, a major soybean buyer in Kenya **(Milestone 1.2.1 completed and refined).**

New opportunities for targeting legume technologies continue to be identified. Focus in west Kenya remains upon semi-determinate, promiscuously nodulating soybean varieties and high yielding, disease resistant climbing beans. Two soybean varieties, SB 19 and Namsoy, excel in the Lake Basin and Midlands and have become the varieties of choice for a major soybean buyer in Kenya. This buyer (Promasidor) has expressed interest in purchasing 4000 t of soybean from project cooperators next season (February 2012) and plans are underway to mobilize necessary inputs and commodity inspection and collection points. Climbing bean variety Tamu is preferred by cooperators owing to its heavy pod set and disease resistance. Promotion of a similar variety, Kenya Mavuno, was discontinued because of its greater susceptibility to aphids **(Milestone 1.3.2 ongoing)**.

Market analysis for inoculant in Kenya was readily achieved through collaboration with MEA Ltd., the only commercial supplier of inoculant (BIOFIX) in East Africa. MEA markets BIOFIX in 10, 20, 50 and 100 g packets for approximately $39 per kg. Over the past 18 months, MEA has marketed 44,000 packets of various sizes. To date, the project has accounted for about 16% of this sales, with MEA offering the project a 50% discount on purchased inoculants. Project cooperators are assisting MEA to improve the quality assurance of BIOFIX in terms of both live rhizobia and reduced contamination. **(Milestone 1.3.3 achieved)**. N2Africa is linked with AGRA to secure loans for farmers adopting soybean enterprise from Equity Bank under its Kilimo Biashara (Farmer Business) Program, and activity that is expected to begin in September 2011 to address the Promasidor tender of 4000 tons **(Milestone 1.3.4 ongoing).**

A baseline document *"N2Africa Baseline Survey of Households in Western Kenya"* characterizing farming, household and socio-economic conditions was released early in Year 2. **(Milestone 1.4.1 delayed but completed)**. A summary of that document follows. Four hundred households were interviewed in N2Africa's mandate areas of Nyanza and Western Provinces in western Kenya between October 25 and November 5, 2010. Households were stratified based on the agro-ecological potential of the area (high or low) and market access (high or low) with 100 households were interviewed in each stratum. On average, 4.7 persons lived in a household. Most adult household's members had primary level education (56-67%) and a substantial part also attended secondary school (20-36%). Farming was the most important source of income for most households, with slight income from off-farm activities (9%) and remittances (1%). Women were more frequently involved full time in farm activities. A majority of households (57%) was belonged to a community association dealing with farming and livelihood improvement. Many households (56%) relied upon hired labour, mostly for field preparation.

Cattle were an important component of the farming system (67% owned at least one head). Most households also owned chickens and small ruminants but other types of livestock were rare. Households had on average 1.6 ha available for farming activities, according to the estimated field areas given by the interviewed household members. Only 1% of the households had access to more than 5 ha of land. Most fields (89%) were cropped with more than one crop. Maize was grown on 91.6% of all fields, usually as a main crop. Common

bean was the second most important crop, although it is rarely grown as a monocrop. Other important crops included groundnut, sugarcane, cassava, bananas and cowpea.

**Table 1.** Frequency and coverage of legume cultivation in west Kenya.

| Legume | Household | Field area |
|---|---|---|
| | % | ha |
| Common bean | 82 | 0.27 |
| Cowpea | 50 | 0.10 |
| Groundnut | 35 | 0.20 |
| Soybean | 19 | 0.10 |
| Climbing bean | 12 | 0.19 |
| Green gram | 6 | 0.12 |
| Fodder legume | 3 | 0.20 |
| All legumes | 98 | 0.43 |

Almost all households (98%) cultivated at least one legume type in the previous growing season (Table 1). Common bean is the most popular legume (82%), followed by cowpea (50%), groundnut (32%) and soybean (19%). Fodder legumes were grown by few households. The average area cultivated with legumes (usually intercropped with cereals) was 0.43 ha per household. Many farmers applied farmyard manure to the major grain legumes (32-51%). Few farmers (<20%) applied synthetic fertiliser, mostly DAP, to grain legumes. Most of the legume grain harvest was used for home consumption (68%) but 15% retained for seed and 17% was marketed. Additional information was collected on market access and household assets. Most households possessed a cell phone (79%) and a radio (78%).

These baseline results suggest that households in west Kenya are familiar with several grain legumes (Table 1), but do not presently rely upon them as cash crops. Furthermore, grain legumes are not currently a target for external farm inputs but do receive manure. Efforts to stimulate grain legume enterprise and BNF should be directed through farm associations and via the radio and SMS. A weakness in this survey was the lack of attention to farmers' knowledge of nodulation and inoculants and that the sample was drawn close to Kisumu town rather than across the entire Action Site. For example, a sample drawn from 1182 households participating in Year 1 dissemination activities suggests an average 6.2 members per household and average farm size of 1.3 ha, deviating by 25% and 19% from the baseline values, respectively.

A baseline report quantifying the current level of BNF and its contributions to rural livelihoods has not yet been completed **(Milestone 1.4.2 ongoing but delayed**). Kenya has hosted 24 field trials contributing to this milestone and the results of those studies are presented later in this report.

The monitoring of impacts relating to legume and inoculant technologies is ongoing. A series of forms relating to development and use of dissemination tools, publication and distribution of non-technical publications, participation and impacts of extension events and additional media coverage from the M&E Specialist were recently distributed to cooperators for completion as dissemination activities are conducted. To date, two of these forms were completed and returned. This monitoring and evaluation framework allows for grassroots cooperators to complete hard copies during field days and for project staff to file electronic copies in a flexible manner. **(Milestone 1.5.2 ongoing)**

***Objective 2: Identify best legumes and integrate them into farming systems***

Activities 2.1 and 2.2 involve identifying the best varieties of common bean (*Phaseolus vulgaris* L.) and soybean (*Glycine max* L. Merrill). A list of candidate varieties was drawn from several breeding programs. Seed sources available in sufficient amounts include varieties include KARI-Katumani (bush beans), University of Nairobi (Climbing bean) and TSBF-CIAT (Soybean) and others (Table 2). The varieties were assessed for two seasons in terms of nodulation with introduced and native rhizobial strains, biomass accumulation, N-fixation, grain yield, tolerance to pests, diseases and other abiotic factors (drought, low soil fertility).

**Table 2.** Bean and soybean varieties identified and included in adaptive research campaigns in different growing seasons.

| Season | Bean | | Soybean |
|---|---|---|---|
| | Bush bean | Climbing bean | |
| 2010 short and long rains seasons | Kenya Umoja<br>New Rosecoco<br>KAT B1, KAT B9<br>KAT X56, Kenya | Tamu<br>Kenya Mavuno<br>Umubano | TGx 1740-2F (SB19)<br>TGx1895-33F (SB8)<br>NAMSOY (SB25)<br>TGx1835-10E (SB3)<br>EAI3600 |
| 2011 short rains | KK8,<br>KK15<br>KK071<br>KK072 | Gasirida, Mamesa, MAC 9, MAC 44, MAC 49, RWV 1129, RWV 2070 | Sc-Squire*<br>Sc- Saga*<br>Sc- Squile*<br>SC S823-6-16*<br>TGx 1987-62F**<br>TGx1987-6f** |

Soybean varieties denoted by * were obtained from Seed-Co Zimbabwe while those denoted by ** were obtained from IITA Malawi

Both specific (e.g. EIA 3600) and promiscuously nodulating soybean varieties demonstrated no increased biomass when inoculated with BIOFIX in the lake basin area and in the upper midlands there was also no positive response except for TGx 1835-10E. There was high variability across the entire mandate area (Figure 1). There was also no increase in grain yield (data not presented) presumably due to mid-season drought and the onset of soybean rust, which occurred after nodulation and biomass assessment. Soybean varieties NAMSOY and TGx895-33F performed best across the action site and are recommended for promotion by the dissemination team pending further evaluation.

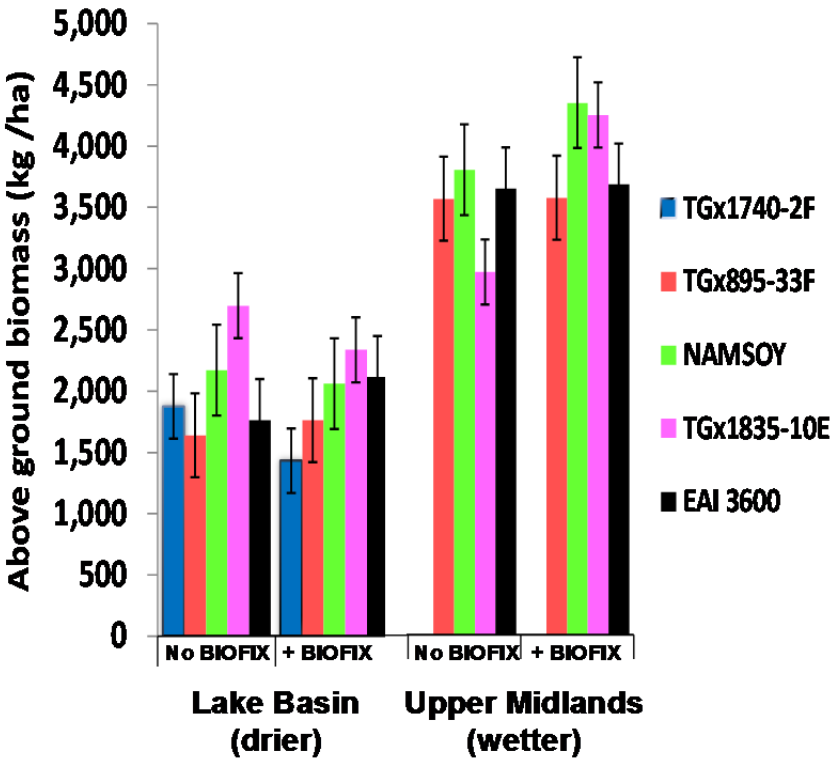


Figure 1.Response of five soybean varieties to inoculation with BIOFIX in two contrasting gro-ecological zones in west Kenya; Lake Basin (Kisumu west, Rarieda and Bondo sites) and Upper Midlands (Mirori, Teso and Bungoma sites). Data are from season 2, 2010.

Inoculation response by bean was less pronounced in season 1 and season 2, 2010 and was inconsistent. This finding is may be attributed to the prevalence of root rot, aphids and root knot nematodes as well as the promiscuous nature of beans. Nonetheless, climbing beans performed quite well in many areas of west Kenya, particularly in Migori, South Nyanza where pests and disease are less intense (Figure 2). Kenya Tamu is particularly promising as it appears less prone to root rot and aphid attack and is recommended for promotion by the

dissemination team. The agronomy team continues to analyze these data to better match specific bean varieties to areas across the Action Site **(Milestones 2.2.1 and 2.2.2 ongoing**).

Three tree legumes, Calliandra (*Calliandra collothyrsus*), Lucaena (*Lucaena diversifolia*) and Sesbania (*Sesbania sesban*) and 11 herbaceous forage legumes (*Macroptilium bracteatum* cv. Burgundy bean, *Desmodium uncinatum* cv. Silverleaf, *Desmodium intortum* cv. Greenleaf , *Desmanthus virgatus*, *Lupinus angustifolius*, *Vicia villosa-dasycarpa*, *Canavalia brasiliensis*, *Lablab purpureus*, *Cratylia argentea*, *Clitoria ternatea*, *Brachiaria* sp) were identified for evaluation in west Kenya. Many of these species were obtained in small quantities from Australia, Colombia and Nicaragua and are undergoing seed bulking at KARI-Kakamega prior to multi-site evaluation in Year 3 (**Milestone 2.4.1 ongoing**).

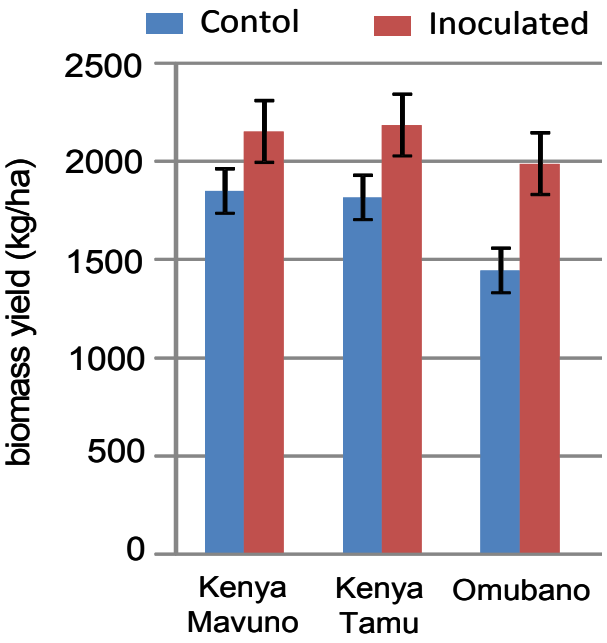


Figure 2. Performance of three inoculated climbing bean varieties in season 2, 2010 at Migori, South Nyanza.

Identification of best fit technologies agronomic practices for maximizing benefits of legume and inoculant technologies continues. To date, 11 different adaptive campaigns were during three growing seasons resulting in 81 field trials. These initial trials included evaluation of legume variety, fertilizer inputs and climbing bean staking method. Later trials examine crop rotation, residual effect of fertilizer and evaluation of soybean rust. Trials conducted in the first and second seasons (2010) focused on the phosphorus (P) and potassium (K) fertilizer requirements of soybean and beans and interactions with rhizobial inoculants. Combining inoculation and fertilizers resulted in yield increases ranging between 51% to 114% **depending upon agro-ecological zone (Table 3). Analysis and interpretation of these results** continues, with several recommendations forwarded to the

**Table 3**. Grain yields (kg/ha) of soybean following application of different P, K and N fertilizers in two agro-ecological zones of west Kenya (estimates of error not included).

| AEZ | Inoculation | Fertilizer treatment | | | | | |
|---|---|---|---|---|---|---|---|
| | | Control | TSP | DAP | TSP/KCl | MPR | TSP/KCl/Urea |
| Upper midlands (site Migori, Teso) | w/ BIOFIX | 2493 | 3507 | 3363 | 3645 | 2763 | |
| | w/o BIOFIX | 1698 | 2815 | 3135 | 2542 | 2469 | 2675 |
| Midlands (site Kisumu West, Bondo) | w/ BIOFIX | 576 | 1027 | 1119 | 948 | 937 | |
| | w/o BIOFIX | 741 | 812 | 944 | 844 | 727 | 538 |

dissemination team for action.

Bush bean and climbing bean also responded to fertilizer application but with no clear interaction between applied P and inoculations. Field observations suggested need of sulfur and magnesium to optimize legume yield in many soils, leading to the formulation of SYMPAL PKS+ that appears to perform very well at many sites during the current growing season. SYMPAL consists of 7 parts TSP, 7 parts SSP, 5 parts KCl and 1 part $MgSO_4$ and is already being blended and marketed by MEA Fertilizers in Kenya.

New adaptive research trials were included in the third season to address pertinent issues raised by farmers engaged in dissemination campaigns. A challenge posed by farmers is lack of staking materials for climbing beans, which prompted an assessment of different staking materials. Another challenge is the emergence of soybean rust disease which necessitated the introduction of new rust resistant soybean materials from Zimbabwe and Malawi, and the evaluation of Amistar-Extra fungicide. Results of these new experiments will be available by August 2011. A further activity under this objective is to assess the benefit of legumes in increasing farm productivity. Two trials, the first one geared at understanding the rotation benefits of soybean and bean with maize, and the second one to assess the residual effect of P fertilizers applied to soybean or bean to subsequent maize were established in the March, 2011 with results and interpretation available in August this year **(Milestone 2.5.1 ongoing).**

***Objective 3: Select rhizobia and develop inoculant production***

Efforts to assess the need-to-inoculate and identify elite strains continue in Kenya. Fifty MPN counts and need-to-inoculate trials were planned for soybean and beans at a range of sites representing heterogeneity across the impact zones. Most Probable Number (MPN) assays are being conducted in the MIRCEN greenhouse using 10-fold dilutions of bean and soybean in sterile growth pouches. Twenty-five soils from west Kenya were sampled from three AEZs, diluted and inoculated onto bean. One soil provided improbable results and the results were discarded. Four soils were entirely negative, suggesting that bean rhizobia were absent. Strong trends were observed for different AEZs suggesting that response to inoculation with bean is more likely in the semi-arid Lake Victoria Basin and adjacent sub-humid Midlands than in the humid Upper Midlands (Table 4). These results will next be compared to inoculation response observed in these same sites to correlate population size and inoculation response. MPN

**Table 4.** MPN of rhizobia in soils from three Agroecological Zones (AEZ) of west Kenya

| AEZ | sites | MPN | range |
|---|---|---|---|
| Lake Basin | 7 | 38 | 8 - 179 |
| Midlands | 12 | 98 | 21 - 456 |
| Upper Midlands | 5 | 819 | 89 - 1953 |

**Table 5:** Colony characteristics of rhizobia on YMA-CR developed by the MIRCEN laboratory

| Morphological group | Characteristics |
|---|---|
| I | Milky-translucent, very tiny, shiny |
| II | Very tiny, white, dry, firm |
| III | Small, domed, white, dry |
| IV | Pink-red, translucent margins |
| V | Very tiny, red |
| VI | Red suspension, clear margins, runny |
| VII | Milky-translucent, raised, firm, whitish |
| VIII | Reddish, domed, glistening |
| IX | Medium to large, watery, turns CR purplish |
| X | Small, red, dry |
| XI | Watery-translucent, flat, runny |
| XII | Domed, gummy, watery translucent |
| XIII | Medium, milky-translucent, semi-runny |
| XIV | Reddish, runny, curdled with red spots in clear zones |
| XV | Translucent with clear margins, shiny, gummy, raised |
| XVI | Runny, clear zones and white margins |
| XVII | Pink, raised, shiny |
| XVIII | Reddish, small, runny, shiny |

determination will be performed using soybean later in Year 2 **(Milestone 3.1.2 delayed but ongoing).**

The project requires that at least 2,000 strains screened for effectiveness under greenhouse conditions to select the top 5% for field testing. This corresponds to 250 isolates in each of eight countries leading to the recognition of 12 candidate elite strains. The University of Nairobi leads N2Africa rhizobiology activities in Kenya and assists related actions in DR Congo and Rwanda. To date, the MIRCEN laboratory has cultured 200 isolates from 17 legume host genera and characterized 160 of them. Eighty-eight (88) of these isolates were characterized and classified into 18 morphotypes (Table 5), suggesting large genetic diversity among strains. Preliminary strain testing using Leonard Jars suggests that further evaluation of isolates KE10, KE25, KT8, KL3 and KL11 is warranted as candidate elite strains for bean (Figure 1). To date, bio-prospecting has focused upon legume hosts belonging to the Tribe *Phaseoleae*, particularly Glycine, Phaseolus and Vigna spp., an assumption that requires testing against a wider selection of legume hosts at a later stage of investigation. This collection, characterization, and screening effort (Table 6), combined across all countries serves to establish and characterize a rhizobium germplasm bank once a standardized cataloging system is in place **(Milestones 3.1.3 and 3.2.2 ongoing)**.

The project seeks to improve inoculant products, and in the case of Kenya this involves working closely with MEA Ltd., makers of BIOFIX inoculants, and the University of Nairobi Microbial Resource Center that provides quality control services. Since joining this effort, N2Africa has assisted in the establishment of quality control standards (> $10^8$ rhizobia and < $10^6$ contaminants per gram), suggested guidelines for quality assessment (MPN and strain purity check by serology in addition to plating on YMA CR) and identified incomplete carrier sterilization as a constraint. MEA Ltd. has reacted positively to these suggestions and has ordered a gamma irradiator to improve its carrier and lengthened its curing period to achieve a finer, drier product **(Milestone 3.3.2 ongoing, report due in October 2011)**.

The project also seeks to expand and upgrade inoculant production capacity. In Kenya, this activity is realized through collaboration with MEA Ltd., producers of BIOFIX inoculant. Milestone 3.4.3 requires that 50,000 inoculant packets be produced per year 3 cooperating facilities. Based on production over the past 18 months (44,000 packets) BIOFIX alone is

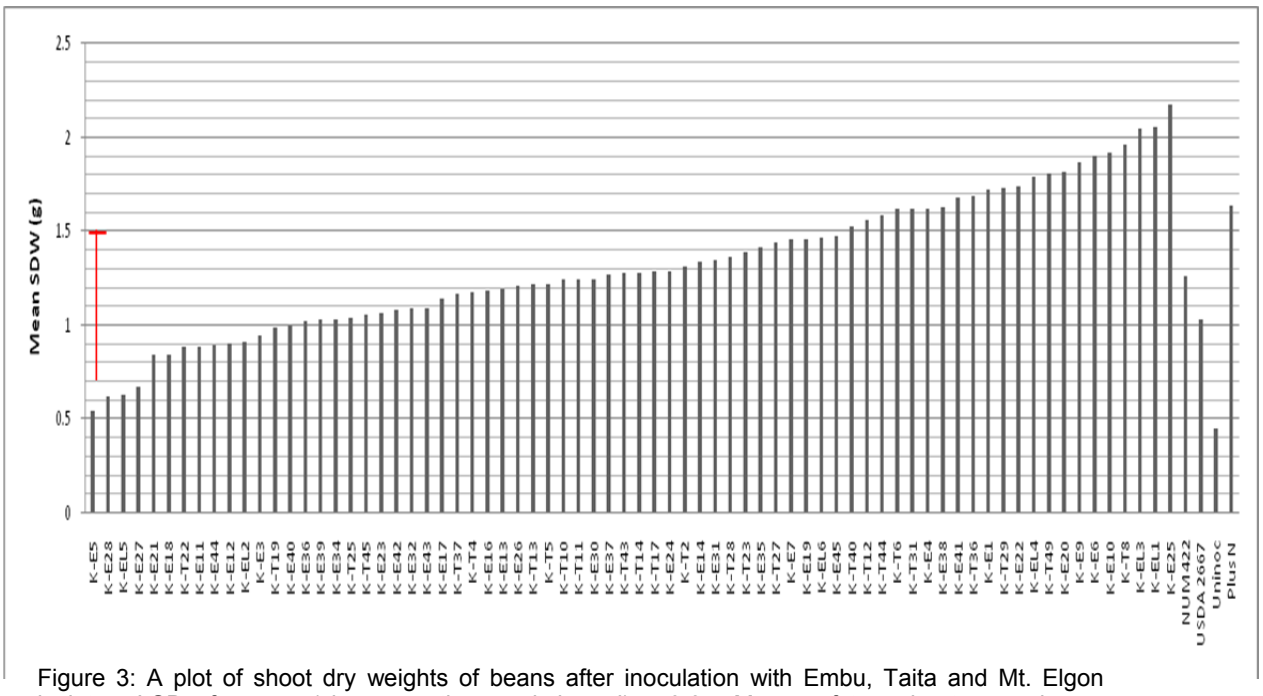


Figure 3: A plot of shoot dry weights of beans after inoculation with Embu, Taita and Mt. Elgon isolates. LSD of means (shown on the graph in red) = 0.87. Means of two shoots are shown. Isolates starting with K-E are from Embu, K-T from Taita and K-EL from Mt. Elgon

**Table 6:** Characteristics of selected rhizobial isolates from Rwanda, DRC and Kenya performed by MIRCEN

| N2R | Morphological group | Host | Geographical origin | BTB | #Diameter | *Gram reaction |
|---|---|---|---|---|---|---|
| **1** | I | Phaseolus sp. | Kigali, Rw | B | <.5 | Equivocal |
| **4** | I | Crotalaria incana | Inera, DRC | Ac | 0.7 | Negative |
| **5** | II | Soybean | Kamonyi, Rw | B | 0.63 | Negative |
| **10** | III | Glycine sp. | Kisheki, DRC | B | 1.17 | Negative |
| **11** | III | Indigofera sp. | Runda, KE | N | <.5 | Negative |
| **14** | IV | Calliandra sp. | Inera, DRC | Ac | 4.33 | Negative |
| **17** | IV | Climbing bean | Runda, KE | Ac | 8.2 | Negative |
| **20** | V | Rhyncosia sp. | Tshinjo, DRC | B | <.5 | Negative |
| **21** | V | Soybean | Walungu, DRC | B | <.5 | Equivocal |
| **24** | VI | Indigofera sp. | Runda, KE | N | 4.67 | Negative |
| **25** | VII | Arachis hypogaea | Kamonyi, Rw | B | 1.73 | Negative |
| **28** | VII | Soybean | Walungu, DRC | N | 0.73 | Negative |
| **29** | VII | Erythrina abyssinica | Kayonza, Rw | B | 0.7 | Negative |
| **34** | VIII | Vigna sp. | Kisheki, DRC | B | <.05 | Negative |
| **35** | VIII | Vigna sp. | Kisheki, DRC | N | 0.63 | Negative |
| **37** | IX | Vigna vexillata | Kayonza, Rw | Ac | 5.6 | Negative |
| **41** | IX | Aeschynomene schimperi | Kamonyi, Rw | Ac | 10.3 | Negative |
| **44** | IX | Sesbania sesban | Inera, DRC | N | 4.7 | Negative |
| **47** | X | Tephrosia sp. | Kalehe, DRC | B | 1.07 | Equivocal |
| **48** | XI | Vigna sp. | Kigali, Rw | Ac | <.5 | Negative |
| **49** | XI | Vigna sp. | Kigali, Rw | Ac | 3.8 | Equivocal |
| **51** | XII | Bush bean | Kalehe, DRC | Ac | 7.3 | Negative |
| **52** | XII | Calliandra | Inera, DRC | Ac | 6.47 | Negative |
| **53** | XIII | Desmodium intortum | Kayonza, Rw | Ac | 3.43 | Negative |
| **58** | XIII | Climbing bean | Runda, KE | Ac | 8.6 | Negative |
| **59** | XIII | Sesbania sesban | Runda, KE | Ac | 10.8 | Equivocal |
| **61** | XIV | Indigofera sp. | Kayonza, DRC | B | 1.23 | Negative |
| **64** | XIV | Soybean | Walungu, DRC | N | <.5 | Equivocal |
| **65** | XV | Sesbania sesban | Kayonza, Rw | Ac | 5.43 | Negative |
| **67** | XV | Climbing bean | Walungu, DRC | Ac | 8.17 | Negative |
| **68** | XVI | Vigna vexillata | Kayonza, Rw | B | <.5 | Negative |
| **74** | XVI | Soybean | Walungu, DRC | N | <.5 | Negative |
| **75** | XVII | Bush bean | Kayonza, Rw | Ac | 3.6 | Negative |
| **80** | XVII | Climbing bean | Runda, KE | Ac | 7.9 | Negative |
| **81** | XVIII | Tephrosia sp. | Kamonyi, Rw | B | 1.03 | Equivocal |
| **84** | XVIII | Soybean | Murhesa, DRC | N | 0.77 | Negative |
| **88** | XVIII | Desmodium sp. | Walungu, DRC | N | 1.37 | Negative |

currently operating at 59% of that targeted capacity and the combined N2Africa-Promasidor order for the 2011 short rains (September) is expected to exceed 40,000 fifty-gram packets **(Milestone 3.4.3 ongoing)**. Several mechanisms to improve the cost effectiveness of BIOFIX production is underway including gamma irradiation rather than autoclaving carrier materials and installing additional purity checks along the production line **(Milestone 3.3.2 ongoing)**. This alliance forms the core of the Kenyan effort to strengthen sustainable private sector and research center collaboration for inoculant production and use expected in Year 4 **(Milestone 3.4.4 ongoing)**.

The project requires policy review on inoculants. N2Africa staffs are currently involved in setting of policies and guidelines in importation and exportation of biofertilizers and microbial cultures and organisms in Kenya through the revision of the Biofertilizer Act. Other members on the Technical Committee includes the Kenya Bureau of Standards, the Ministry of Agriculture, The University of Nairobi and several private sector parties interested in inoculants and organic agriculture. Appendix A Section 2.1 of the Biofertilizer Technical Committee Draft describes procedures relating specifically to Rhizobium with quality checks on inoculants applied to mother cultures, production broth and peat-based inoculants. Outputs from Objective 3 are assisting in shaping the industry standards for rhizobium inoculant produced in Kenya and compliance procedures **(Milestone 3.5.1. ongoing)**.

***Objective 4: Deliver legume and inoculant technologies to farmers***

The ambitious deployment of BNF technologies for the 2011 Long Rains in west Kenya is now complete. The Kenyan outreach team provided 42 demonstration kits to 23 cooperators, distributed 4084 packets of inoculant, 3875 kg of soybean and climbing bean seed, 8200 kg of fertilizer and 3750 copies of extension materials (Table 7). A majority of these extension materials were translated into Kiswahili as suggested by the cooperators at the planning meeting **(Milestone 4.2.1 achieved for Year 2, Milestone 4.4.2 ongoing)**. This mass of material was deployed to 4100 farmers during March 2011 through four Node Leaders and used to plant about 850 ha of improved legumes in ten counties of west Kenya. Once again, MEA Fertilizer provided inoculants and fertilizers to our packaging specifications in a timely manner. The primary focus of grassroots dissemination is farmer field days built around BNF technology demonstrations and other community activities that are led by N2Africa Master Farmers. During Year 2, 33 such field days were conducted, with eleven more scheduled for latter June and early July **(Milestone 4.4.3 exceeded)**. Some of these field days are covered by local media, particularly West FM radio, where project partners are either invited to their studio in Kakamega, or station staff attend field days and record short interviews with organizers and participants **(Milestone 4.4.4 ongoing)**.

Because the number of targeted cooperating farmers increased over four-fold this season, we were requited to adjust some of our logistical strategies. Ten of the cooperators were entirely self-sufficient in seed production (2000 kg), and received only inoculant and labeled seed bags (**Milestone 4.3.2 achieved)**. Three of these cooperators sold 500 kg or more of seed back to the project (1930 kg). Some of the cooperators from last year traded their insufficiently bulked seed for bagged-and-labeled seed from the project (about 300 kg) but much of the project's purchased seed was distributed to new partners in the Southern, Central and Northern Nodes.

Two types of fertilizer were distributed for testing in 2011, SSP and SYMPAL PKS+. SYMPAL is a blend specially formulated for symbiotic legumes (0-23-16 + S and Mg) and most cooperating groups were provided with both types of fertilizer so that they may compare them. Formal comparison of the two formulations is being done in the demonstrations and by the Objective 2 agronomy field experiments. Initial results are extremely promising and nodulation scores and grain yield data are being collected. MEA Ltd. has since announced that SYMPAL will become a commercially available fertilizer for legumes offered in 10, 25 and 50 kg bags alongside its widely marketed blends for coffee and tea. The development of a

**Table 7.** Summary of N2Africa outreach activities in west Kenya during the first 18 months of the project.

| Outreach action | 2010 Long rains | 2010-2011 Short rains | 2011 Long Rains |
|---|---|---|---|
| Number of demonstrations | 52 | 35 | 43 |
| Number of satellite technology tests | 1500 | 1910 | 4500 |
| Number of new households reached | 1500 | 815 | 4100 |
| Inoculant deployed (kg) | 12 | 28 | 122 |
| Inoculants packets distributed (BIOFIX) | 120 | 1168 | 4084 |
| Soybean seed distributed (kg) | 920 | 565 | 3790 |
| Climbing bean seed distributed (kg) | 58 | 98 | 85 |
| Fertilizer distributed (t) | 3.0 | 3.8 | 8.2 |
| Seed multiplication sites | 10 | 13 | 1 (+2 for 1) |
| Master farmers trained | 32 | 0 | 31 |
| Master farmer manuals distributed (188 pp) | 45 | 0 | 50 |
| Extension manuals distributed (20 pp) | 0 | 2100 | 3750 |
| Radio shows conducted (West FM) | 0 | 3 | 0 (to date) |

Note: Seed multiplication sites, shift to 2 for 1 payback system where recipients return 2 kg seed at the end of the season for every 1 kg received at the season's start. Master farmer and grain processing training workshops scheduled for May 2011. Master farmer training manual and grain legume procession handbooks were recently printed and distributed across the network. Twenty farmer field days were conducted during the first half of Year 2.

commercialized fertilizer blend for symbiotic legumes occurs well in advance of **Milestone 4.4.4** (Public-Private Alliances).

A big change is our strategy for producing legume seed for future project activities. We no longer commissioned a few cooperators to grow seed in larger fields, rather we have switched to the two-for-one arrangement where every new farmer provided seed this season is expected to return twice that amount to their organizations next season **(Milestone 4.3.2 decentralized and achieved)**. This strategy should return 7750 kg of seed at no additional cost to the project. This allows us to purchase more fertilizer and inoculant, and to print additional extension literature. The dangers of the 2-for-1 strategy are that groups unable to collect seed from their farmers may be dropped from the project or that the quality of seed may decline due to inexperienced post-harvest handling.

Two training activities were planned for this year. ARDAP will host the next Master Farmer Training of 33 participants. Every participating farmer organization is sending at least one new representative, and the project is selecting 10 additional participants. Kleen Homes and Gardens recently hosted a Legume Processing Workshop from 16 to 18 May that was attended by 18 participants. A 40 page extension manual supporting this workshop was printed and over 1000 copies distributed across our network. Each of four network nodes is organizing a grain legume cooking contest later in the season and copies of this manual will be distributed to cooperators **(Milestone 4.5.3 ongoing)**. A simple method of pressing soymilk was developed for that meeting that requires only $60 investment **(Milestone 4.3.4 ongoing)**. The Master Farmer training was conducted at ARDAP (14-15 June 2011), attended by 29 new candidates and facilitated by three Master Farmers from last year and representatives from Smart Logistics and TL-2. Special attention was paid to describing Master Farmer responsibilities in the upcoming soybean production and marketing venture **(Milestone 5.3.2 ongoing)**. Women's involvement in dissemination activities is ensured through several mechanisms. Half of all N2Africa trainers and workshop participants are required to be women, although this ratio may decline slightly when other projects that are less gender sensitive are invited to send additional participants. Half of the Kenyan dissemination node leaders are women. Forty-four percent (44%) of recently trained Master Farmers were women. Two-thirds of the trainers and 84% of the participants at the Grain Legume Processing Workshop were women. A survey of 1182 households participating in Year 1 dissemination activities revealed that 62% of those receiving BNF technology field packages were women **(Milestone 4.5.2 achieved)**.

Actions are underway to direct farmers toward soybean markets. The manufacturers of SOSSI textured vegetable protein, Promasidor Ltd of Nairobi, announced two tenders for Kenyan soybeans. Part of the first tender, 3000 tons in July 2011, will be met by outreach members Kleen Homes and Gardens and KESOFA. The remainder of our network members is targeting the second tender, 4000 tons in February 2012. It is possible for project partners to produce 3000 tons of soy worth $1.4 million during the 2011-2012 Short Rains. To do this, we require that 6000 farmers first bulk 20 kg of seed on 200 $m^2$ during the current long rains, and then plant that seed on one acre the following season, producing 500 kg each **(Milestone 4.3.3 ongoing)**. Smart Logistics, a local company contracted by Promasidor to provide quality inspection and transportation services, is offering KSh 1 per kg to the local organizations that arrange collection points, potentially resulting in KSh 2 million ($25,000) for use in expanding network services to farmers. The transition from developmental to commercial focus within the network poses a real challenge that will stretch our available funds and logistic capacity, but if the N2Africa Project is to really come through for the farmers we must connect them to strong markets!

### *Objective 5 Develop and strengthen capacity for BNF*

Short course training in inoculant production troubleshooting, quality control procedures and improved rhizobiology is currently being offered in Kenya. This effort is led by Dr. Anabel Marfusi (Murdock University, Perth, Australia), assisted by MIRCEN and MEA and will host 10 trainees and graduate students from eight countries in various capacities between 4 and

22 July 2011. The training intends to introduce new procedures and techniques including conducting efficient batch-level purity checks and broth counts, adjusted methods of carrier sterilization and improving inoculant curing and serves as a mechanism toward achieving the cost effective industrial practices described in **Milestone 3.3.2 (ongoing)**. The impacts of this training will be provided in the next Kenyan country report **(Milestone 5.1.2 on-going)**.

The project has selected "at least 14 MSc and 7 PhD candidates … for training from the impact zones" Three of these M.Sc. students are Kenyans and were placed within three different universities, the University of Nairobi, Egerton University and Moi University. These students are currently engaged in coursework but one, Macdonald Wasonga has not yet enrolled in Moi University. The logic for this academic disbursement is unclear as it reduces interactions between students and places some of them with supervisors not working closely with the project. This disadvantage is partly offset by enrollment of two M.Sc. Students from DR Congo and Rwanda with interests in rhizobiology supervised by Prof. Nancy Karanja at the University of Nairobi. The Kenyan Ph.D. candidate was identified (George Mwenda) but not enrolled in Murdock University (Australia). In the meanwhile, he remains very productive in the MIRCEN laboratory **(Milestone 5.2.1 achieved but requires follow up).**

A Master Farmer training workshop was organized by the Objective 4 team, conducted at ARDAP (13-14 June 2011) and attended by 29 participants (44% women) with three Node Leaders (Year 1 Master Farmer trainees) serving as facilitators. This action is related to Milestone 5.3.2 calling for "training-of-trainers workshops (1 workshop in each country), attended by at least 40 farm liaison staff (later lowered to 33), conducted on inoculation technology and legume agronomy" by month 10, Years 2&3 **(Milestone 5.3.2 achieved)**. Again there was no direct involvement by the Objective 5 team and clarification is needed on their future role as farmer training increases into Years 3&4.

**Milestone 5.4.1** requires that "at least 2 grass-root training events organized by each of 320 trainers across all impact zones (40 from Kenya), with an expected attendance of 66 farmers per event resulting in 42,000 farmers (6000 in Kenya) trained by the end of Year 2". It is uncertain how this is to be achieved as there has been neither communication with nor funds received from the Objective 5 team in this regard. If we assume, however, that two Kenyan Master Farmers (trainers) lead two farmer field days, or 44 field days per year (as has taken place), and that only 136 farmers attend each field day (a number greatly exceeded in most field days) then the target of 6000 farmers is reached **(Milestone 5.4.1 achieved through Milestone 4.4.3)**. This estimate does not consider the day-to-day use of BNF and grain legume training materials by the Master Farmers. The M&E team has recently formalized reporting on farmer field days and a more precise estimate will be available in the future. This process is being led by Objective 4 staff and partners and the actual role of the Objective 5 team needs to be clarified, particularly as it leads to the much more ambitious **Milestone 5.4.2** where 51,000 will farmers will be trained during Year 3 and 132,000 during Year 4.

**Milestone 5.4.3** states that "at least 30 agro-dealers in each hub (10 in Kenya) are trained in accessing, managing and distributing information on inoculant use each year". Again, it is uncertain how this is to be achieved as there has been neither communication with nor funds received by national cooperators from the Objective 5 team toward this end. This Milestone is, however, being significantly addressed indirectly through partnership with MEA Ltd., makers of BIOFIX inoculant. To date, over 100 stockists in west Kenya were trained in BNF technology by MEA in collaboration with three area coordinators of AGMARK (an AGRA grantee) relying upon Master Farmer training materials developed by the project **(Milestone 5.4.3 achieved by proxy)**. The Objective 5 budget holds substantial funds for agro-dealer training in BNF ($94,575 for Years 2,3&4) and it is important that these funds reach the individuals involved in the actual training so that this effort can be better supported and monitored.

The Kenyan team has developed seven training publications over the past 12 months (Table 8), printing 16,150 copies for use across the project (2 publications, 150 copies), the Southern African hub (1 publication, 2000 copies), the East and Central hub (2 publications 4000 copies) and Kenya (3 publications 10,000 copies). Production was performed by offset press in Nairobi by two printers receiving photo-ready materials provided by the project at

**Table 8.** Training publications developed in Kenya and their audience, number of copies and description (based upon M&E form 09).

| Title | Audience | Copies printed | Description | Remarks |
|---|---|---|---|---|
| Biological Nitrogen Fixation and Grain Legume Enterprise: Guidelines for N2Africa Lead Farmers (2010) | Lead Farmers N2Africa (Southern Africa) | 2000 | 21 pp b&w text, full color cover, B5 | Sent to Malawi in November 2010 |
| Biological Nitrogen Fixation and Grain Legume Enterprise: Guidelines for N2Africa Master Farmers (2010) | Master Farmer Trainers | 6000 | 17 pp b&w text, full color cover, B5 | Intended for Years 1&2 farmers in Kenya |
| Uongezaji Naitrojeni Kibailogia na Biashara ya Mazao ya Legumi: Maelezo ya Wakulima Wakuu wa N2Afrika (2011) | Swahili speakers in Kenya and DRC | 4000 | 18 pp b&w text, full color cover, B5 | Intended for Year 2 farmers in Kenya & DRC |
| Fixation Biologique de L'Azote et Entreprise de Le`gumineuse `a Graine: Guide du Paysan Pilote pour N2Africa (2011) | French speakers in Rwanda | 2000 | 20 pp b&w text, full color cover, B5 | Intended for Year 2 farmers in Rwanda |
| Grain Legume Processing Handbook: Addition to Bean, Cowpea, Groundnut and Soybean by Small-Scale African Farmers (2011) | Obj 4 Activity 5 | 2000 | 41 pp b&w text, full color cover, A5 | Intended to launch Obj 4 Act 5 activities in Kenya and elsewhere |
| aster Farmer Training in Biological Nitrogen Fixation and Grain Legume Entreprise (2010, updated & reprinted 2011) | Master Farmer Trainers | 125 | 26 pp b&w text, full color cover, A4 | Intended for N2Africa D&D Trainers and Kenya Master Farmers |
| Advancing Technical Skills in Rhizobiology (2010) | Obj 3 trainees | 25 | 27 pp b&w text, full color cover, A4, with CD | Included within a larger looseleaf notebook |

very reasonable prices. For example, 6000 copies of "Guidelines for N2Africa Master Farmers" (17 pp) were printed for only $0.34 each **(Milestone 5.5.2 part 1 greatly exceeded)**.

Kenya contributed to Milestone 5.5.1 by conducting the pilot Technician Training in Rhizobiology course (September 2010) and producing the manual "Advancing Technical Skills in Rhizobiology" shortly afterwards **(Milestone 5.5.1 achieved)**. Training materials and technology packages developed by the Kenyan team are regularly offered to AGRA grantees. AGRA sponsored six participants to the Grain Legume Preparation workshop (May 2011). The electronic copy of "Master Farmer Training in Biological Nitrogen Fixation and Grain Legume Entreprise" served as the basis for training 24 participants in the Grain Legume Project (GLP) conducted by ARDAP (16-17 June 2011, Butula). Plans are underway to combine soybean marketing activities of N2Africa and GLP farmers in Busia, Siaya and Teso Counties **(Milestone 5.5.2, part 2 ongoing).**

Milestone 5.5.3 requires that "support for undergraduate and postgraduate education will be provided through access to long distance education programs, visiting professorships or adjunct appointments in the area of N2 fixation at selected African Universities, and the

provision of resource materials to assist in course planning and evaluation" by month 12, year 2. Kenyan universities have not yet benefited from this activity **(Milestone 5.5.3 uncertain)**, but project materials developed by the Objective 4 team have been used in lectures at Nairobi University.

### II. Workstream accomplishments and challenges

The concept of workstream was introduced within the project over the past six months and is intended to link teams working in similar and complementary areas. Some comments on these workstreams as they relate to Kenya follow:

***Research workstream.*** The legume agronomy efforts operating from the TSBF Maseno Station are in transition, initially conducting several large, standardized field experiments (examining varieties and inoculation and fertilizer interactions) to more tightly focused, problem solving trials (climbing bean staking, rust resistance in soybean, advanced fertilizer blends) as the project transitions from **Milestone 2.5.1 to 2.6.1.** This development is timely as it provides needed, agro-ecological zone specific information to the dissemination team. On the other hand, the agronomy team appears uncertain how far downstream its work should extend and sometimes conducts participatory appraisals that are better left to the dissemination team. The rhizobiology team operates from the University of Nairobi MIRCEN laboratory. It is closely adhering to the work plan within the project document and its outputs are expected to increase as the M.Sc. students from three countries assembled within the lab enter into the research phase of their studies. It is important, however, that the strain evaluation efforts progress from smaller, sterilized Leonard Jars to larger greenhouse pot studies in low N, rhizobium-free (more or less) media such as vermiculite or sub-soil cinders. Larger rooting vessels will permit greater differentiation of strain differences. The legume agronomy and rhizobiology objectives are expected to better intersect into a workstream during Year 3 as the rhizobiology team completes identification of its 5% candidate elite rhizobium strains and passes them for field testing by the agronomists and field technicians **(Milestone 3.1.3)**.

***M&E workstream.*** M&E made very little progress in Kenya during Year 1 as those responsible for it sent a series of mixed messages to different country team members, in contrast to the participatory sense of **Milestone 1.5.1**. More recently, the M&E leaders sent a series of forms concerning technology packages, publications and media events that can be usefully incorporated into dissemination activities, suggesting that **Milestone 1.5.2** is now in place. Problems remain with monitoring at the individual farm level as the forms are excessively large and query too much peripheral information. Furthermore, M&E requests may be related to the downstream extension by the agronomy team as it embarks on participatory evaluation of technologies that may be better performed by the dissemination team. ), In addition, the important dissemination transition toward market activities of grain legumes suggests that monitoring trends of input supply (inoculants and specialized fertilizers) and commodity bulking and sales among partner organization may contain more useful information than tracking changes within individual farms and attempting to aggregate upwards. As of yet, no funds were made available to the dissemination team for conducting requested M&E activities in Kenya, and this reduces the ability to comply with some of the more detailed information requests.

***D&D workstream***. The dissemination team in Kenya continues to adhere to, and slightly exceed the milestones as presented in the project document. The team is growing in preparation for the reuirement in Year 3 that 50% of all participating households be directly linked with legume markets **(Milestone 4.3.3)**. Farmer groups are being readied for participation in soybean production and marketing ventures as the area of soybean production on members' farms increases from 200 $m^2$ to greater than 2000 $m^2$ (1/2 acre). A market for soybeans has been secured for February 2012 (Promasidor) and a company with expertise in quality compliance and commodity transport identified (Smart Logistics). Syngentia is assisting in the design of a soybean rust control program by providing training, 24 backpack sprayers and 120 litres of Amstar fungicide. Credit opportunities are also being

pursued from Equity Bank through AGRA's Kilimo Biashara program. Two contrasting market development approaches will be offered to farmers and their groups; one based upon micro-finance of individual farmers (possibly through Kilimo Biashara) and another that promotes collective marketing within farmer associations (through revolving funds managed by group leaders). These models will differ in terms of how needed farm inputs are mobilized and acquired, how farmers qualify for participation, the responsibilities and returns to farmer groups, how loans are repaid by farmers and the mechanism of payment to farmers. Some contrasts exist between the preference of the buyer, who prefers the micro-finance model, and many farmer representatives who seek to expand their member services to include collective marketing. The next six months shall prove very interesting in terms of addressing **Milestone 4.3.3** at the conclusion of Year 2.

**III. Revised work plan.** Some milestones are behind schedule, or should be considered recurrent rather than time-bound. **Milestone 1.4.2** required a baseline report quantifying the current level of BNF was due by Month 12, Year 1 should be completed by the Research and M&E workstreams by Month 12 Year 2. **Milestone 1.5.2** required that a monitoring and evaluation framework be in place by Month 3 Year 2. Indeed a sizable package of report forms were developed and about 25% of them completed and returned. Funds to form a country M&E team, however, must be provided by Month 10 Year 2 for the remainder of these forms to be completed by Month 12 Year 2. **Milestone 2.1.2** requires at least 3 new soybean varieties with high BNF potential identified be finalized by Month 12, Year 2 but this is premature owing to the superseding need for rust resistance as a soybean varietal trait. These varieties will likely not be confirmed by the agronomy team until Month 6 Year 3. **Milestone 3.1.2** required that at least 50 MPN counts and need-to-inoculate trials conducted for soybean and beans be completed by Month 12 Year 1 but this task is only 50% complete owing to delays in identifying MPN techniques suitable for greenhouse conditions. This milestone is rescheduled for Month 12 Year 2. **Milestone 5.2.1** selected four MSc and one PhD candidates from Kenya, but one student M.Sc. student is yet to enroll in a Kenyan university, and the Ph.D. candidate has still not departed for Murdock University. Actions concerning these students must be completed by Month 12 Year 2.

**Milestone 5.4.3** requires that at least 10 agro-dealers in Kenya be trained in accessing, managing and distributing information on inoculant use each year but the private sector partner already engaged in this activity (MEA Ltd) receives no support from the project. An agreement must be made between the Objective 5 team and MEA Ltd will be reached by Month 12 Year 2.

**IV. Risks and mitigations**

1. **The standardized M&E framework implemented across the project cannot capture rapidly unfolding developments in soybean production and marketing by farmer associations in west Kenya.** Rapid adoption of soybean by large numbers of farmers, strong private sector partnership and previously untapped demand by soybean processors and shifted focus of project dissemination toward commercial input supply and commodity marketing has accelerated project activities in ways not captured by an M&E framework focused upon individual farmers rather than their collective actions. For example, 6000 N2Africa farmers are expected to produce 4000 MT of soybean worth $2 million by February 2012 but the M&E framework does not consider marketing. ***Mitigation: Kenya will continue to report on collective marketing actions and report these separately to the M&E team until appropriate report forms are developed.***
2. **The soybean most in demand by commodity buyers appears to have a reduced capacity for BNF.** SB19 contains the ratio of protein to oil that buyers demand, but field observations suggest that it does not nodulate as well as varieties with unacceptably higher oil contents. This variety is also quite susceptible to rust disease. ***Mitigation: The agronomy team will continue to search for varieties with acceptable protein:oil***

***ratios, higher BNF capacity and rust resistance beyond the Month 12 Year 2 timeframe of Milestone 2.1.2.***

3. **Delays in rhizobial bio-prospecting and strain characterization may not permit sufficient time to identify the candidate elite strains in sufficient time for them to be comprehensively tested in the field** (Milestone 3.1.3 interface with Milestone 3.1.4**).** Currently, only two rhizobiologists in Kenya serve as bio-prospectors and all wild rhizobium isolates cultured in Kenya are authenticated, cultured and screened in a detailed manner. An alternative approach is under development that would require additional agronomy team members to explore for elite rhizobia during their other routine field tasks and then to take test cultures directly to larger, rhizobium-free greenhouse pots better able to differentiate strain performance, allowing only the most promising isolates to be "back-characterized". ***Mitigation: Assign graduate students to refine this alternative approach and as the Milestone 3.1.3 deadline nears, adopt this more rapid screening procedure.***
4. **Rapidly unfolding developments in soybean production and marketing overshadow the progress of climbing bean enterprise.** A very promising climbing bean variety (Kenya Tamu) is being promoted in west Kenya but its staking requirements and local market opportunities suggest that it occupy a less prominent place in smallholder farms than soybean. On the other hand, it is likely that the rush soybean enterprise may bypass the poorest farm households. Seed of Tamu was not readily available at the project onset and only now (after three growing seasons) is it widely available. Climbing bean offers a more productive alternative to bush bean and can offer special marketing and household nutritional advantages to the poorest households. ***Mitigation: Clearly distinguish dissemination partners with special interest in climbing bean and offer then additional incentive to promote this crop among the most vulnerable stakeholders***.

**V. Updated administrative information.** The position of Training Officer remains vacant for several months following the untimely death of Patrick Ngokho and this absence is felt in coordinating project dissemination and capacity building activities in Kenya. Furthermore, inflexible CIAT-TSBF administrative and financial policies continue to frustrate scientists engaged in unfolding innovation and iterative problem-solving required to meet project milestones. Kenya should establish an ***Innovation Workstream*** that is driven by readily available petty cash disbursement.

# 8 Ghana Country report

**Introduction**
This report details the progress made in the last eighteen months in N2Africa's project activities in Ghana. During this period, project staff were employed, national planning meetings held, partnerships formed, and adaptive research trials and dissemination activities carried out.

***Objective 1: Establish a baseline of the current status of N2-fixation, identify niches for targeting N2-fixing legumes in the impact zones, M&E and impact assessment***

***Activity 1.1.*** *Establish project management structures*
The Farm Liaison Officer was engaged in November 2010, while adverts for the positions of Administrative Assistant and Research Technician have been made and the positions due to be filled in July 2011. Three motorbikes have been purchased for extension activities and have been distributed to the 3 main partners – ACDEP, UrbaNet and SARI. A project vehicle was purchased and for activities in May 2010. Two GPS devices have also been procured.

***Activity 1.2.*** *Develop detailed documents for planning and management of N2Africa*
National planning meetings were held on 26-27 April 2010 for the first year and on 28-29 March 2011 for the second year. During the 2010 meetings, the mandate areas (See Table 1) were selected and implementation plans for extension, P access, seed increase and market as well as TLII and AGRA interaction plans were developed and incorporated into the project's respective implementation plan documents.

Table 1 Selected mandate zones and action sites in Ghana

| Country | Mandate zones | Action sites |
|---|---|---|
| Ghana | Northern Region | Chereponi, Karaga |
| | Upper East Region | Kassena-Nankana East, Bawku West |
| | Upper West Region | Nadowli, Wa East |

***Activity 1.3.*** *Identify new opportunities for targeting legume technologies [niches] to increase BNF and enlarge the area under the priority legume*
Cowpea, groundnut and soybean were identified as the priority legumes for Ghana. Twelve adaptive research trials were conducted in the Northern and Upper East Regions (Table 2). Four soybean, 6 cowpea and 1 groundnut varieties were used for the trial in 2010. Late onset of rains and flooding events at trial sites in the Upper West Region meant we could not record a successful trial in that region. The same trials will be repeated in 2011 but with additional legume varieties.

Table 1 Legume varieties selected for niche assessment trials in the various mandate zones in Ghana during the 2010 season

| Region | Location of trial (Districts) | Legume | Varieties |
|---|---|---|---|
| Northern Region | Chereponi, Karaga | Cowpea | Songotura, Marfo-tuya, Padi-tuya, Zayura, Omondao and IT98K-573-1-1 |
| | | Groundnut | SAMNUT 21, SAMNUT 22, Chinese |
| | | Soybean | Anidaso, TGX1448-2E, Jenguma, TGX 1835-10E, |
| Upper East Region | Kassena-Nankana East, Bawku West, | Cowpea | Songotura, Marfo-tuya, Padi-tuya, Zayura, Omondao and IT98K-573-1-1 |
| | | Groundnut | SAMNUT 21, SAMNUT 22, Chinese |
| | | Soybean | Anidaso, TGX1448-2E, Jenguma, TGX 1835-10E |

***Activity 1.4.*** *Quantify the current on-farm N2-fixation in the target farming systems and its impact on livelihoods*

Secondary data bio-physical and socio-economic characteristics for the selected impact zones and mandate areas in Ghana were collated and used by the Farming Systems Specialist for the initial characterisation of the action sites. The Kwame Nkrumah University of Science and Technology (KNUST) was contracted to conduct the baseline survey of communities within the mandate zone. The survey has been completed and the data sent to Wageningen University for data processing and analysis. The communities sampled for the baseline enumeration are as shown in Table 3.

Table 3 Communities sampled for baseline enumeration in the three northern regions of Ghana

| Table 3a: Communities selected in Northern Region | | |
|---|---|---|
| **Tolon-Kunbungu** | **Savelugu-Nanton** | **Chereponi** |
| •Tonjing<br>•Koshibo<br>•Dalan Kukuo<br>•Gbubli | •Moglaa<br>•Langa<br>•Naprisi<br>•Janjori Kukuo<br>•Tarikpaa | •Wugando<br>•Achuma<br>•Andonyamanu<br>•Nabojoku |

| Table 3b: Communities selected in Upper East Region | |
|---|---|
| **Bawku West District** | **Kasena-Nankana East District** |
| •Tilli<br>•Bulinga<br>•Palsako<br>•Azupupunga | •Manyoro<br>•Naga<br>•Pungu<br>•Nayagnia |

| Table 3c: Communities selected in Upper West Region | |
|---|---|
| **Wa West District** | **Nadowli District** |
| •Goohi<br>•Kpalnyi<br>•Kpaglahi<br>•Tanina | •Deffiama<br>•Zambogu<br>•Zeng<br>•Tibani |

***Objective 2: Select multi-purpose legumes (food, fodder, stakes, and soil fertility management) for enhanced BNF and integrate these into farming system***

***Activity 2.1.*** *Identify and field test best varieties of soybean for high $N_2$-fixation capacity and adaptation to abiotic and biotic stresses*

Four soybean varieties (Jenguma, Anidaso, TGX 1448-2E and TGX 1835-10E) were identified and used for varietal trials (Table 4). The amounts of seeds purchased from TL2 seed systems partners and other local seed dealers are as given in Table 4. These varieties of soybean will be used for the 2011 season.

Table 2 Amounts of seeds of soybean varieties purchased for the 2010 varietal trials in Ghana

| Country | Varieties | Qty of seed (kg) | Seed source |
|---|---|---|---|
| Ghana | TGX1835-10E | 7.00 | Savanna Seed Services Company (SSSC) |
| | Anidaso | 4.05 | SSSC |
| | Jenguma | 4.05 | SSSC |
| | TGX1448-2E | 4.05 | TL II Seed systems |

Preliminary results of the 2010 varietal trials show that soybean grain yield ranged from about 1000 to 2000 kg $ha^{-1}$ with the early maturity variety TGx 1835-10E yielding less than the medium maturity varieties Jenguma and Anidaso (Figure 1). Inoculation did not affect soybean grain or stover yield.

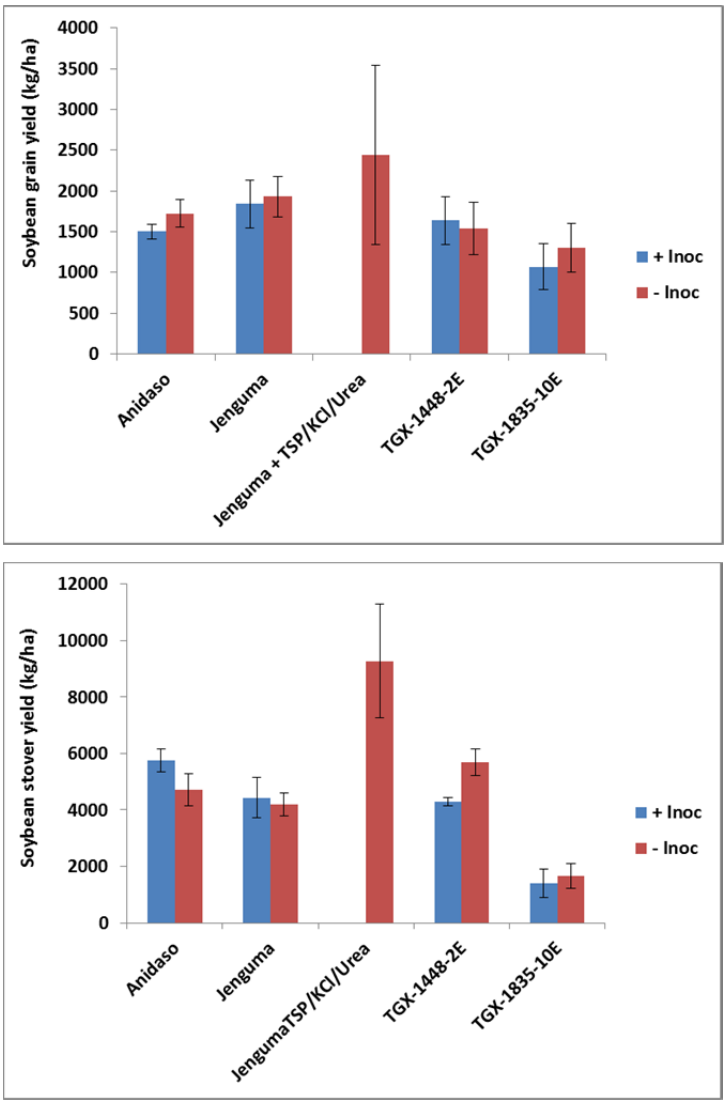


Figure 1 Grain and stover yield response of different soybean varieties to inoculation at Nyakpala, Ghana

***Activity 2.3.*** *Select cowpea and groundnut for high BNF potential and less variable capacity to respond to inoculation*

Six cowpea materials (Songotura, Marfo-tuya, Padi-tuya, Zayura, Omondao and IT98K-573-1-1) were tested in the 2010 varietal trial of which only the first four have been released. In the 2011 trials, three dual purpose varieties from Nigeria are going to be added to the trials. The dual purpose varieties are IT90K-277-2, IT98K-205-8 and IT99K-273-1-1. Three groundnut varieties, two of which were sourced from Nigeria (Samnut 23 and Samnut 21), were used in the 2010 trials. The quantities of seeds used for the trials are presented in Table 5. Trials for the 2011 season will be done using these 3 varieties.

Table 3 Amounts of seeds of cowpea and groundnut varieties purchased for the 2010 varietal trials in Ghana

| Crop | Varieties | Qty of seed (kg) | Seed source |
|---|---|---|---|
| Cowpea | Songotura | 4.00 | SSSC |
| | Marfo-tuya | 2.03 | SSSC |
| | Padi-tuya | 2.03 | SSSC |
| | Zayura | 2.03 | SARI |
| | Omondoo | 2.03 | SSSC |
| Groundnut | | | |
| | Chinese | 12.5 | SSSC |
| | SAMNUT 21 | 4.05 | TL II Seed system |
| | SAMNUT 23 | 4.05 | TL II Seed system |

Results of the 2010 trials show that on-farm cowpea yield Ugando ranged from less than 500 kg/ha in the variety Omondao to about 2000 kg/ha produced by Songotura (Figure 2). Basal application of N, P and K led to yield of about 2.5 tons per hectare. Yields from other sites were generally less than 1000 kg/ha (Figures 3 and 4).

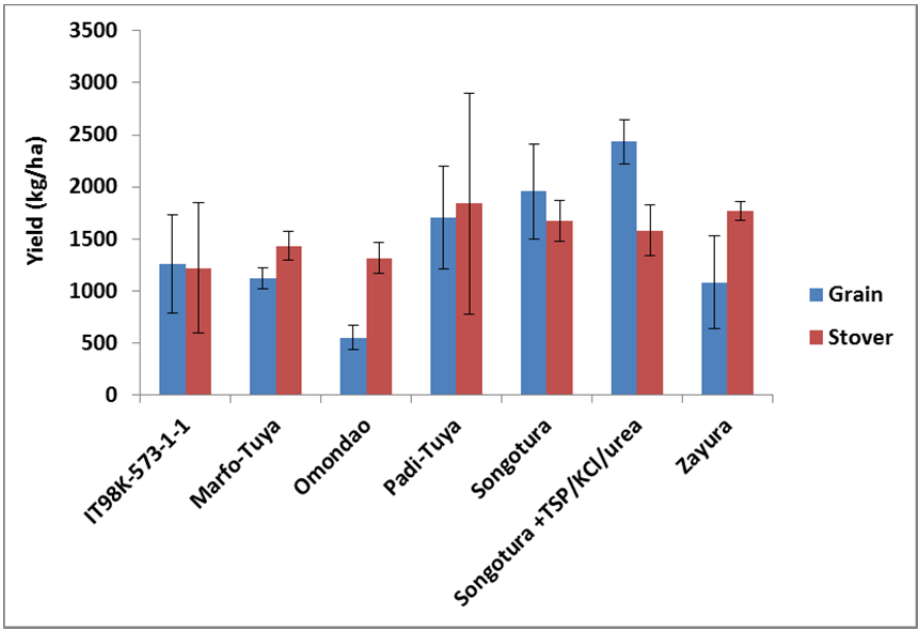


Figure 1. Grain and haulm yields of different cowpea varieties grown at Ugando.

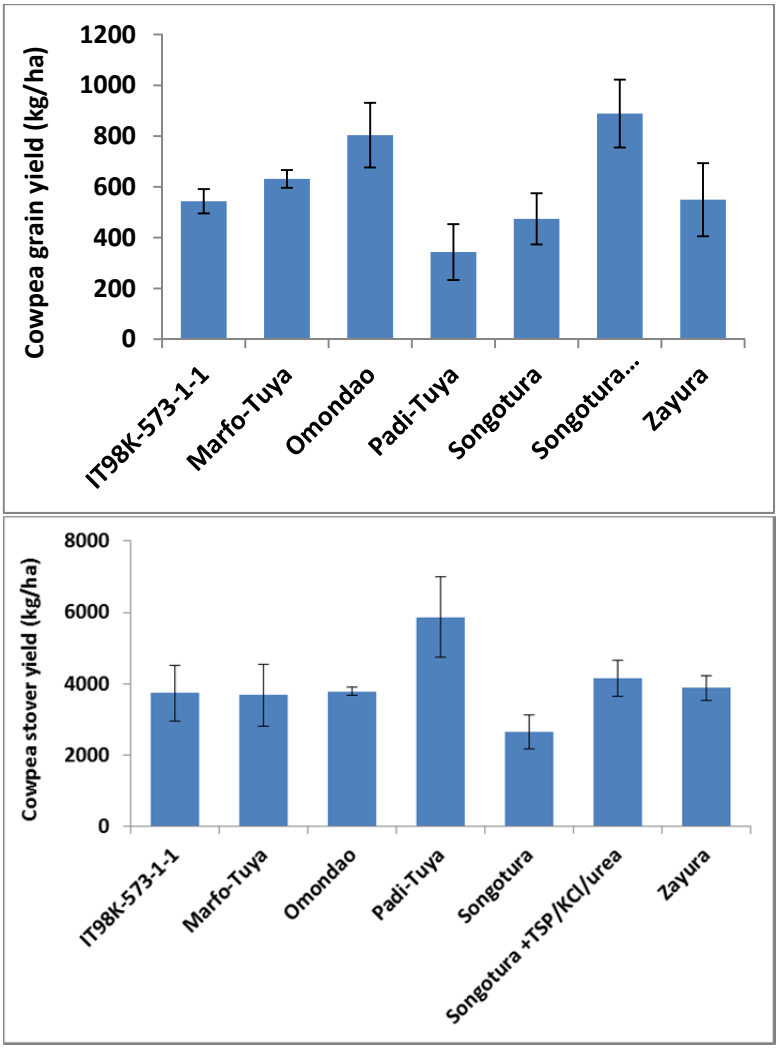


Figure 2. Grain and stover yields of cowpea varieties at Nyebsobga.

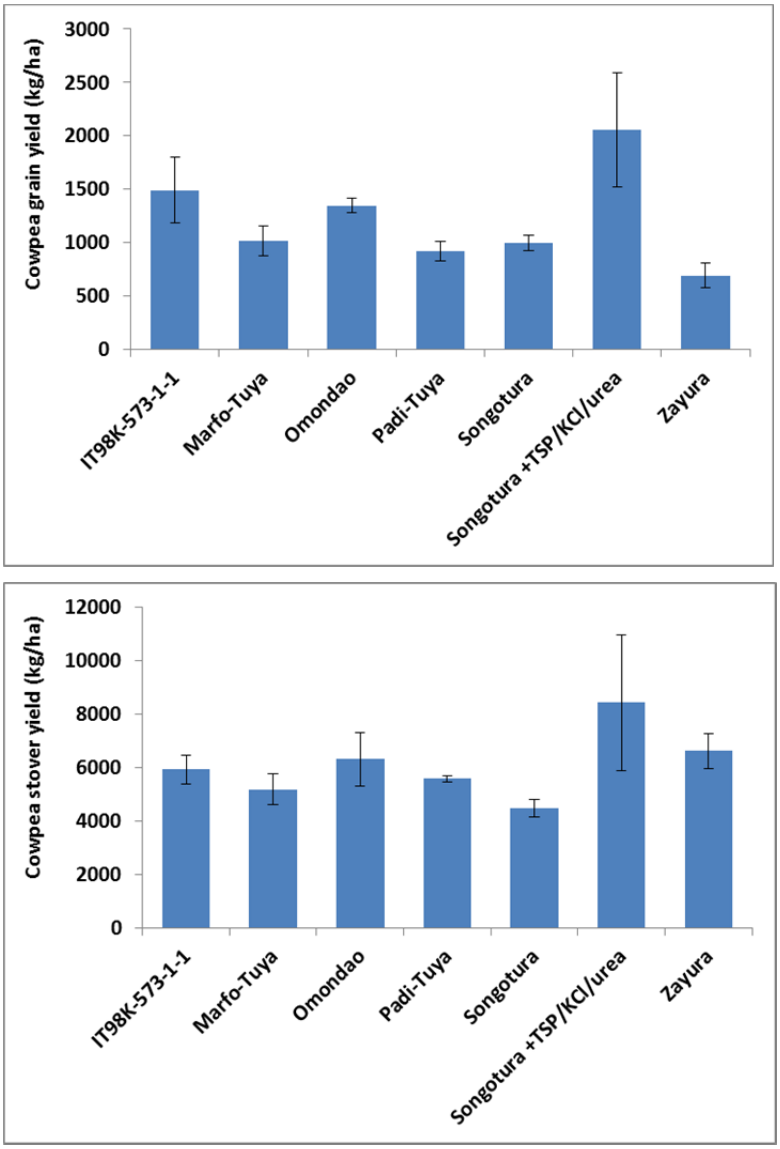


Figure 3. Grain and stover yields of cowpea varieties at Nyankpala.

***Activity 2.5.*** *Identify best-fit agronomic practices for maximizing potential benefits of legume and inoculant technologies on increasing and stabilizing productivity*

Two input trials were each established in 2 northern regions (Northern, and Upper regions), taking into consideration the relevant biophysical gradients (Table 6). The inputs used for the trials were (i) Triple superphosphate (TSP), a readily available P fertiliser, (ii) Muriate of potash (KCl), which is a readily available K carrier to be used to address issues of K deficiency currently observed in many soils in northern Ghana, and (iii) DAP, which contains small doses of N so that starter N issues could be explored.

Table 4 Location of input trials in the various mandate zones in Ghana

| Region | Mandate area | Action site | Type of trial | Crop type | Remark |
|---|---|---|---|---|---|
| Northern | Chereponi District | Ugando | Varietal | Soybean, Groundnut, Cowpea | Germination of soybean was extremely poor due to water-logging. Groundnut plants were eaten by animals from nearby community |
| | | Andonyamanu | Input | Cowpea, Groundnut, Soybean | All the crops established very well |
| | Karaga District | Nyebsobga | Varietal; Input | Cowpea, Soybean | Farmer's care of the soybean trials was lackadaisical leading to failure of the trials. Cowpea trials were excellent. |
| | | Sung | Varietal; Input | Groundnut | The time of planting was too late for groundnut but germination was relatively good. |
| | Tolon-Kumbungu District | Nyankpala | Varietal; Input | Soybean, Groundnut, Cowpea | All crops were planted and establishment was excellent. |
| Upper East | Kassena-Nankana East District | Manyoro | Varietal | Groundnut, Soybean, Cowpea | Cowpea variety trial was submerged in water. Soybean was completely destroyed by animals |
| | | Naaga | Input | Soybean, Groundnut, Cowpea | Soybean was completely destroyed by animals |
| | Bawku West District | Tanga | Varietal | Soybean, Groundnut, Cowpea | |
| | | Sakom | Input | Groundnut, Cowpea | Soybean was not planted due to lack of land. |

Preliminary results of the 2010 trials at Andonyamanu show grain yield of 1.6 to 2.1 t/ha (Figure 5). However, the application of TSP alone or in combination with KCl or urea did not gave higher yields than the control treatment. On-station grain yields at Nyankpala were 1000-2000 kg/ha with plots treated with N, P and K producing the largest grain yields (Figure 6). Stover yields were however not affected by fertilizer treatments.

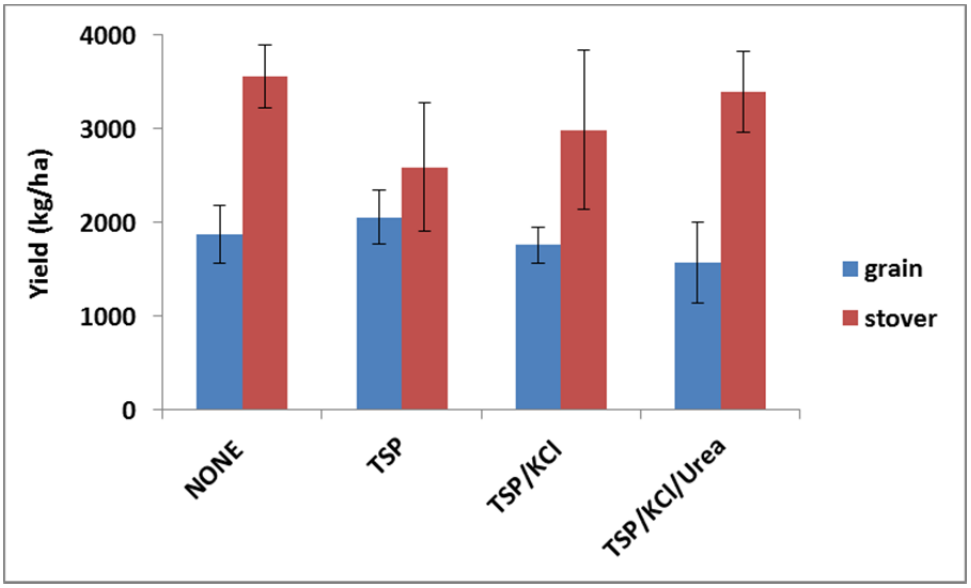


Figure 4 Effect of fertilizer application on grain and stover (vine) yields (kg/ha) of cowpea (Variety: Songotura) grown at Andonyamanu (Chereponi District)

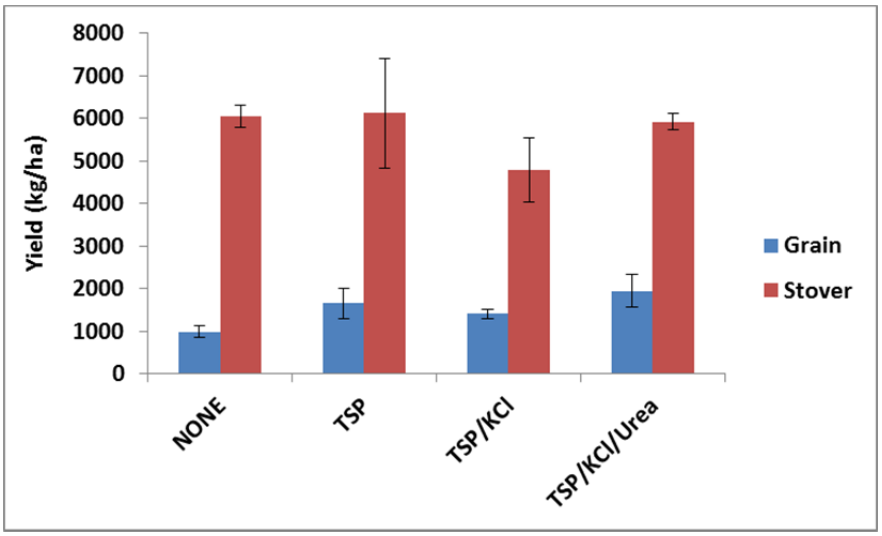


Figure 6 Effect of fertilizer application on grain and stover (vine) yields (kg/ha) of cowpea (Variety Songotura) grown at Nyankpala (T-Kumbungu District)

***Objective 3: Select superior rhizobia strains for enhanced BNF and develop inoculum production capacity in sub-Saharan Africa, including private sector partner***

***Activity 3.1.*** *Assess the need-to-inoculate for the target legumes and identify elite strains across the impact zones*

Need to inoculate campaigns were nested within agronomic trials and dissemination campaigns of the 2010 season. Results, especially from the dissemination campaigns, show substantial response of soybean to inoculation. Currently, the Soil Research Institute (SRI) have sampled soils across the action sites and are conducting additional need-to-inoculate trials and MPNs for soybean in the greenhouse (Activity 3.1.2. on-going). Nodule sampling from the greenhouse work is expected in the next 6 weeks (Activity 3.2.2 on-going).

***Activity 3.4.2*** *Three existing rhizobiology laboratories upgraded*
The Soil Research Institute (SRI), Kumasi, has refurbished a laboratory to be dedicated for N2Africa activities at the institute. They also have received delivery of assorted laboratory equipment (Table 7) in April 2011; thus putting them in standing to fully commence activities.

Table 5 List of equipment delivered to SRI, Kumasi, Ghana

| Item | Code | Description | Unit | Qty | Unit Price (GH¢) | Amount (GH¢) |
|---|---|---|---|---|---|---|
| 1 | T702-701 | Tubes, screw neck vials, tall form,<br>neutral glass with polypropylene screw cap, capacity 3.50ml, 46 x 12.<br>5mm. Pack of 666<br>**Lab Cat Page No 331** | Pack | 1 | 416.44 | 416.44 |
| 2 | S442-281 | Rack, test tube, kit form,<br>polypropylene, white , 21 places, max tube dia.<br>**Lab Cat Page No 294** | Pack | 1 | 82.34 | 82.34 |
| 3a | P367-231 | Micropipettors Tips<br>Disposable, Plain, 200µl, yellow, for uni micropipettor; pack of 1,000<br>**Lab Cat Page No 221** | Pack | 1 | 96.43 | 96.43 |
| 3b | P367-243 | Micropipettor Tips<br>Disposable, Blue, Maximum volume:<br>1000µl, Pkt. 1000.<br>**Lab Cat Page No 221** | Pack | 1 | 120.06 | 120.06 |
| 4 | P362-140 | Pipettes, One Mark, Class B<br>• Capacity: 10ml | Pack | 2 | 25.13 | 50.26 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | • Tolerance: +/-0.040ml<br>• Delivery time: 8-40sec<br>• Pack of 5<br>**Lab Cat Page No 208** | | | | |
| 5 | A2146-N | Ethanol rectified 96% GRG 1L<br>UN 1170/3, Pkg II | Each | 1 | 16.53 | 16.53 |
| 6 | P276-981 | Petri Dish Sterilising Box<br>Stainless Steel, Dimensions: 254 x<br>115mm, Capacity: 10 dishes.<br>**Lab Cat Page No 198** | Each | 4 | 251.56 | 1,006.24 |
| 7 | B757-160 | Bunsen burner, universal, push<br>ignition, lock/on mechanism, battery powered, butane gas fill.<br>**Lab Cat Page No 58** | Each | 1 | 444.65 | 444.65 |
| 8 | W085-414 | Water purification, Aquatron® water<br>still, 8 litres/hr, single distilled, 240V,<br>50-60Hz, single phase<br>pH 5.0 - 6.5, conductivity 1.0 - 2.0<br>µScm-1, resistivity 0.5 - 1.0 Ohm-cm,<br>25 - 35ºC, Pyrogen free, water supply<br>1 litre/hour 3-100psi (20-700kPa).<br>**Lab Cat Page No 348** | Each | 1 | 10,925.64 | 10,925.64 |
| 9 | A1519-M | Cotton wool, white, non-absorbent<br>1kg<br>Un-restricted | Each | 5 | 60.88 | 304.39 |
| 10a | M735-214 | Vortex Mixer ZX3<br>Variable speed control with continuous and manual modes. These mixers are devised for mixing substances in test tubes or small flasks. Sturdy cast aluminium construction. Strongsucker feet to prevent movement.<br>**Lab Cat Page No 193** | Each | 1 | 491.80 | 491.80 |
| 11 | S519-541 | Large Stirrer Hotplate with Ceramic<br>Top | Each | 1 | 2,152.46 | 2,152.46 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Analogue; Max plate temp: 450ºc, chemically resistant ceramic top plate; flashing HOT warning light to warn when top plate is too hot to touch (over 70ºC); independent safety circuit to protect against<br>overheating; powerful stirring action;<br>supplied with magnetic followers; goes to speeds of 1500rpm with volumes of up to 15 litres. 220-240V<br>50Hz.<br>**Lab Cat Page No 299** | | | | |
| 12 | P756-162 | Hand-Operated Vacuum Pump<br>to attain and hold vacuum of 25in (<br>635mm) Hg. Pumping Rate of 15cc/ stroke and 3 psig (.21 bar) postive pressure. Supplied with 600mm plastic tubing.<br>**Lab Cat Page No 224** | Each | 1 | 111.50 | 111.50 |
| | | **Inoculant Preparation** | | | | |
| 1a | F510-831 | Flasks, Erlenmeyer, Narrow Neck<br>- Borosilicate glass.<br>- Complies to ISO 1773.<br>- 250ml Capacity<br>- Pack of 10<br>**Lab Cat Page No 127** | Pack | 1 | 41.82 | 41.82 |
| 1b | F510-835 | Flasks, Erlenmeyer, narrow neck,<br>500ml. Pack of 10<br>**Lab Cat Page No 127** | Pack | 1 | 55.00 | 55.00 |
| 1c | F510-839 | Flasks, Erlenmeyer, narrow neck,<br>1000ml. Pack of 10.<br>**Lab Cat Page No 127** | Pack | 1 | 148.90 | 148.90 |
| 1d | F510-877 | Flask, Conical,Pyrex narrow neck,<br>graduated, capacity: 2000ml, White enamel graduations. Pack of 10<br>**Lab Cat Page No 127** | Pack | 1 | 459.17 | 459.17 |
| 2 | S952-380 | Needles, microlance, sterile, 25<br>gauge, 16mm. Pack of 100<br>**Lab Cat Page No 310** | Pack | 1 | 17.28 | 17.28 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **Lot 2** | | | | |
| 1 | I520-100 | Incubators, General Purpose<br>Suits most biological analysis and routine general laboratory applications. Includes the following features:<br>• Aluminium coated steel interior.<br>• Interior is fitted with fixed shelf runners with removable chrome plated steel wire grid shelves.<br>• Natural convection; incoloy sheathed elements are located below the chamber floor.<br>• Solid door.<br>• Direct reading hydraulic controls with safety thermostat and over-heat indicators.<br><br>Technical information:<br>• Temperature range 5ºC above ambient (natural convection) to 100ºC<br>• Fluctuation (hydraulic control) ± 0. 25ºC at 38ºC<br>• Volume: 30L<br>• Shelf positions: 3<br>• Shelves: 2<br>• Shelf size: 280x280mm<br>• Power: 500W<br>**Lab Cat Page No 160** | Each | 1 | 2,160.71 | 2,160.71 |
| 2a | S308-352 | Orbital Shaker<br>Available with orbital or reciprocating action; Digital speed selection to<br>300rpm with soft start; Built-in digital timer; Reliable quiet drive mechanism | Each | 1 | 3,883.87 | 3,883.87 |
| 2b | S308-356 | Fully adjustable cradle system accommodating a wide variety of vessels, dishes, flasks including 8 x<br>500ml, or 6 x 1L or 2 x 2Litres. Platform size 355 x 355mm; **Lab Cat Page No 283** | Each | 1 | 1,054.45 | 1,054.45 |
| 1 | P756-322 | Accessory Platform<br>Pumps, Diaphragm, ME2<br>**Lab Cat Page No 224** | Each | 1 | 2,406.31 | 2,406.31 |

***Objective 4: Deliver legume and inoculant technologies to farmers throughout sub-Saharan Africa***

***Activity 4.1.1.*** *Memoranda of Understanding are formalized with key partners along the legume value chains in the impact zones*

Dissemination platforms have been formed involving key partners in governmental, non-governmental and community-based organisations as well as the private sector. At the launch of the project in 2010, a functional collaboration was established between N2Africa and a number of organisations. The key partners were Ministry of Food and Agriculture (MoFA), Savanna Agricultural Research Institute (SARI), Soil Research Institute (SRI), KNUST, UrbaNet and ACDEP (Association of Church Development Programmes).

Since the beginning of 2011, additional partnerships have been formed. Two projects, (ADVANCE and GOAL), which are involved in the development of soybean value chain, are actively collaborating with the project in the dissemination of inoculant technology among major soybean producers and their out-growers and also facilitating the development of inoculant agro-dealer network in the 3 northern regions. ADVANCE in Ghana supports lasting improvements in the competitive performance of all actors in the soy bean value chain. ADVANCE is working with select supply chains of businesses in the soy value chain, which include processors, aggregators, nucleus/commercial farmers, input providers, equipment service providers and financial institutions. ADVANCE does not directly work with farmers but builds the capacity of other actors to provide commercially sustainable products, services and support to farmers in their supply chains.

In April 2011, Kenton Dashiell, director of N2Africa, met with Eric Derks of ACDI/VOCA in Ghana and agreed to undertake the following: To target soy bean farmers who are working in dedicated supply chains linked to an aggregator and/or nucleus farmer and a processor as end-market buyer. Other suggested parameters for targeting include

  - Supply chain actors supported by ADVANCE
  - Supply chains within the 3 northern regions and Brong Ahafo region
  - Where supply chains involve an inputs dealer who is a willing and able supplier of inoculants and triple super phosphate (TSP) fertilizer—a condition for inoculants to have demonstrable effect

- Determine, with targeted actors, how best to introduce and develop a market and clientele for inoculants (e.g., input retailer provides and trains farmers, aggregator through lead farmers provides inoculants and trains farmers in collaboration with input dealers, etc.)
- (N2Africa) Import and distribute between 1000 to 2,500 packets of inoculants (est. 1 packet for an acre's worth of seed) for this collaboration with ADVANCE
- Determine, with targeted actors, a cost-sharing scheme for acquiring inoculants from N2Africa
- (N2Africa) Train targeted actors (e.g., input retailers, aggregators, Nucleus Farmers, Lead farmers) on storage and use of inoculants and soy bean production practices
- (ADVANCE ) Support and build capacity of targeted actors to strengthen cooperative relations and competitive commercial performance
- Identify and act on opportunities to ensure the commercially sustainable importation and distribution of inoculants to this year's recipients under this collaboration (e.g., introduce input importers to market opportunity, invite U.K. supplier to visit Ghana and visit existing and potential buyers, etc.)

The training of targeted actors was conducted by N2Africa staff in Tamale on 10 May 2011, and was considered to be successful. N2Africa, through SARI, has already started the delivery of inoculant which will ultimately be sold to agro-input dealers working with ADVANCE. SARI has, of today, delivered 200 packs of the 100-g inoculants to ADVANCE for and on behalf of some of its nucleus farmers, out-growers and input dealers. Some of these are going to be used in trials and a few packs for display in the shops of the input dealers. The beneficiaries include Big Ajar, Simple Prince, Antika, Heritage Seed, Savanna Seed Services Company, Wumpini, Golden Stork, Bogu Seed, Kharma, Behisung, Petasco, etc. A memorandum of understanding between N2Africa and ADVANCE has been developed.

Ghana Nuts Ltd, located in Techiman, processes soybean and has set up a production farm and an out-growers scheme. These farmers have an automatic market to Ghana Nuts Ltd. N2Africa's contact is the Out grower Operations Manager for the GOAL soya project. Their staff were recently trained by N2Africa on the use and handling of inoculants and they will be provided with 1000 packets of 100 g inoculum.

N2Africa is also partnering with a number of AGRA-funded activities in Ghana. One of such projects is the AGRA-funded 'Farmers to Markets' coordinated by the International Fertilizer Development Center (IFDC). This project works towards the inclusion of N2Africa's farmers on its 'MFarm' platform, which is a network for linking farmers to market through the use of mobile telephone. The leader of the project, Dr. Kofi Debrah was invited to the Ghana Planning meeting in Tamale and he came for a part of the meeting with some of his Tamale staff. On April 8 Dashiell met with Kofi Debrah and Victor Clottey at their IFDC Accra office. Subsequent meetings have been held between project Assistants and Robert Abaidoo and also with representatives from UrbaNet, ACDEP and N2Africa Farm Liaison Officer. For N2Africa to become part of their system and thus receive all the communication benefits of being able to send messages to all of our farmers, we need to have our farmers' names, cell phone number and GPS location given to their project. IFDC trained N2Africa staff and partners on 15th June 2011 on the operations of the MFarm network.

The AGRA Soil Health Project (SHP), being implemented in the three regions of northern Ghana (i.e. Northern, Upper East, and Upper West Regions), has Dr. Mathias Fosu (a Soil Scientist) as the Project Manager and Dr Ben Ahiabor as the Northern Regional Coordinator. Dr. Ben Ahibor is also the Leader of N2Africa based at SARI. Last year AGRA used some few packets of the inoculants supplied by N2Africa Project after Ben had trained some of the AGRA Project's technical people on inoculant use and inoculation, and they in turn trained a few of the Agricultural Extension Agents of MoFA who were responsible for the demonstrations AGRA set up on Integrated Soil Fertility Management (ISFM). This year, N2Africa will be supplying some packets of the inoculants for the SHP work. SHP will also be organizing some training on inoculant technology to some members of Farmer-Based Organizations (FBOs) who have been registered, geo-referenced and uploaded onto the IFDC's Farmer-to-Market Platform.
Sub-contract agreements with leading partners in dissemination (SARI, UrbaNet, KNUST, and ACDEP) have been signed and funds released for activities.

***Activity 4.1.3.*** *At least 10 additional satellite sites have been identified per impact zone*
Collaborating with other partners has widened our reach outside our action sites. Our collaboration with ADVANCE allows us to reach farmers in the Brong Ahafo region, which is outside the project's action site. Similarly, we are going to reach farmers working with GOAL in the Techiman area. Our partnership with SHP increases the number of districts in northern Ghana where farmers will be exposed to inoculant technology.

***Activity 4.2.1.*** *At least 1 dissemination tool for each action site related to legume and inoculant use is produced per impact zone, resulting in about 24 different tools by the middle of year 3*
Three soybean technologies, 4 each of cowpea and groundnut were developed during the 2010 season. In 2011, one additional tool for cowpea has been produced. Each farmer will be supplied with seed, P fertiliser and, for soybean demonstrations, inoculants. These will be accompanied with dissemination protocols.

***Activity 4.3.1.*** *Sufficient [several tons] legume seed is acquired through cooperation with TL-II and the private sector, for initial dissemination in the various impact zones*
Seeds for dissemination and adaptive research were procured from TL II seeds systems and private sector organisations. So far, twenty-six mini-bags each of Jenguma have been delivered to UrbaNet, ACDEP and Bawku West District (Upper East). These were bought from Savanna Seed Services Company (SASSEC). Appropriate amounts of the two Nigerian varieties of groundnut (SAMNUT 22, SAMNUT 23) brought from Nigeria have also been delivered to UrbaNet (for Karaga District), Bawku West, Wa East and Nadowli districts. We have also mobilized 860 kg of Chinese in Navrongo for the Wa East and Nadowli districts. The two districts require a total of 960 kg of Chinese for their demonstrations. We'll continue

to mobilize more of this groundnut variety for the remaining districts, namely Karaga, Chereponi, Bawku West and Kassena-Nankana East. The two cowpea varieties to be used for the dissemination work (Songotura and Apaagbala) will be purchased through SASSEC from an AGRA-sponsored seed-producing company in the Volta Region of Ghana.

***Activity 4.3.2.*** *At least half of the farming communities engaged in the project are actively producing legume seed for local distribution*
The transition farmers (first year farmers) are expected to cultivate 0.2 ha with legume. Some of these farmers will be organised to act as community seed producers.

***Activity 4.3.3.*** *At least half of the farming communities engaged in the project are actively linked to legume market outlets.*
Our collaboration with IFDC and ADVANCE is geared towards a functional linkage of farmers to market.

***Activity 4.3.4.*** *At least half of the farming communities engaged in the project are linked to legume processing initiatives*
Arrangements are being made to organise trainings on post-harvest technologies during the 2011 season. Efforts are already underway to identify resource persons for training of trainers.

***Activity 4.4.2.*** *Large-scale demonstration and dissemination campaigns held in each impact zone*
About 1500 farmers from 16 communities in Ghana were mobilised for dissemination during the 2010 season. Two soybean technologies, 3 each of cowpea and groundnut were developed and deployed during the season. Each farmer was supplied with 1 kg of seed and 3 kg of P fertiliser, in addition to inoculants and adhesive for soybean response to inoculation demonstrations.

In 2011, we will be working with about 1860 farmers in each of the six districts of the project's operation (Table 27), thus resulting in a total of 11,160 farmers across the 3 northern regions.

Table 6 Total number of demonstrations per crop per district for the 2011 season in Ghana

| Crop type | Variety | No. of Demonstrations | No. of Lead Farmers | No. of Other Farmers/Lead Farmer | Total No. of Farmers/district |
|---|---|---|---|---|---|
| Soybean | Jenguma | 35 | 35 | ≥30 | 1050+35=1085 |
| Cowpea | Songotura | 10 | 10 | ≥30 | 300+10=310 |
| Groundnut | Chinese & SAMNUT 22 | 5 | 5 | ≥30 | 150+5=155 |
| | Chinese & SAMNUT 23 | 10 | 10 | ≥30 | 300+10=310 |
| TOTAL | | 60 | 60 | | ≥1860 |

Hence, for six districts, the total number of farmers is 1860 x 6 = 11,160

The dissemination strategy will be to increase the number of farmers per demonstration from 10 (in 2010) to 50 in soybean, 30 in cowpea and 20 in groundnut demonstrations. Additional communities (in existing districts) and new districts are also to be included in the project. The new communities in the existing districts are given in Table 9.

Table 9 Communities in the existing districts where N2Africa activities are operational or about to be operational

| Region | District | Old communities | New communities |
|---|---|---|---|
| Northern | Cheroponi | *Achuma, Andoyamanu, Ugando* | **Jakpa** and **Aderi** |
| | Karaga | *Nyong, Sung, Pishegu* | **Nyong** |
| | **Savelugu** | | **Moglaa** and **Yong** |
| Upper East | Kassena-Nankana East | *Manyoro, Naaga, Pungu Wusungu* | **Pungu** and **Doba** |
| | Bawku West | *Apotdabogo, Tilli* | **Kobore**, **Tanga** and **Sapelliga** |
| Upper West | Nadowli | *Goriyiri, Daffiama, Zambogu* | **Kojokpere** and **Serekpere** |
| | Wa East | *Kpalworgu, Kpalinye* | **Bulenga**, **Goripie** and **Loggu** |

Districts and communities in bold letters are new. The Savelugu District will be handled by UrbaNet that are also in charge of Karaga District.

Results of the 2010 trials show grain yield response of soybean to inoculation to occur in 90% of all cases, with average yield increase of 36% and yield range of 300-4,000 kg/ha (Figure 8). Average grain yield of inoculated plots was about 2000 kg/ha as against 1,300 kg/ha in the uninoculated plots.

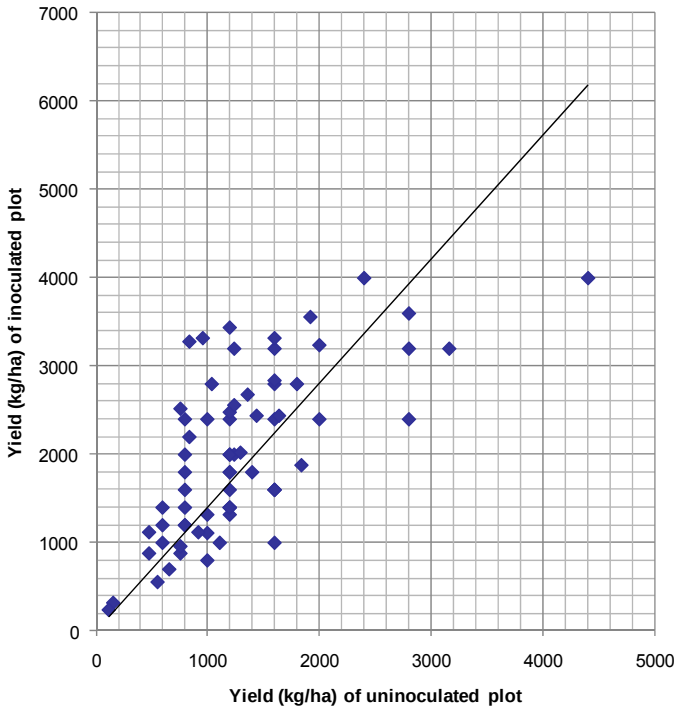


Figure 5. Soybean response to inoculation on farmers' fields in Ghana

On-farm groundnut yields ranged 800-2400 kg/ha in communities of Bawku West District and 480-1200 kg/ha in Kassena-Nankana District (Figure 9). Yield increase in improved technology over traditional technology in Kassena-Nankana was 20-150%, with average yield of 1100 kg/ha and 690 kg/ha, respectively.

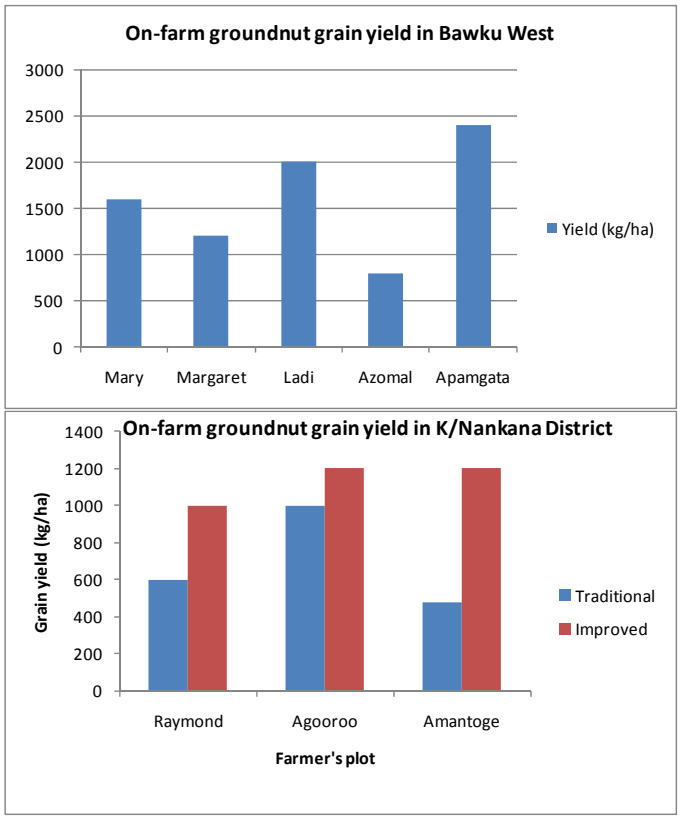


Figure 6 On-farm groundnut grain yield in Bawku West and Kassena- Nankana Districts

On-farm cowpea yields in Nadowli district were generally less than 1000 kg/ha although the improved technology was better than farmer practice (Figure 10).

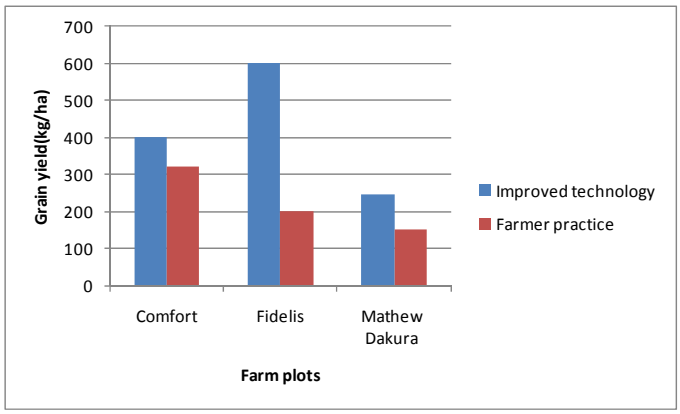


Figure 10. Cowpea yield in at Moyiri in Nadowli District

***Activity 4.4.3.*** *At least 3 extension events (e.g., field days, exchange visits) organized per season per country*

A field visit was made by N2Africa project team to 8 communities in Ghana during which mini field days were held. One additional field day each was organized in the Naaga and Manyoro operational areas of the Kassena-Nankana East district to share ideas with farmers. At least one field day will be held in each of the districts in 2011.

***Objective 5: Develop and strengthen capacity for BNF research, technology development, and application***

***Activity 5.1.1.*** *At least 4 technical staff from the 3 hubs trained on inoculant production and quality control, lab-based PCR methods, N2 fixation quantification, and laboratory, greenhouse, and field techniques*
Two trainees (one male, one female) from Ghana attended a 2-week technician training at IITA Ibadan, which took place 29th November to 10th December 2010. The trainees were drawn from SRI and SARI, respectively.

***Activity 5.3.*** *Training-of-trainers workshops on legume and inoculant technologies for agricultural extension workers, NGO staff*
Two Training of trainers for lead farmers and extension agents were held for 41 lead farmers and extension agents (6 females and 35 males) in June 2010. In 2011, three trainings have been held. The first training was given to the staff of ACDI/VOCA ADVANCE together with their nucleus farmers, out-growers and agro-input dealers on inoculants, inoculants technology and legume enterprise. This training was held at the Modern City hotel at Tamale on 10th May, 2011. The principal resource person was Dr. Benjamin D. K. Ahiabor, the Principal Investigator of the N2Africa project in northern Ghana and he was supported by the project's Farm Liaison Officer (FLO), Mr. Edwin K, Akley and Mr. Jebreel Basit and Mr. John Lambon, the respective representatives of UrbaNet (Urban Agricultural Network) and ACDEP (Association of Church Development Projects) which are the two implementing partners in the Northern Region. Twenty-six males and four females participated in the training.

The second training was organised for Agricultural Extension Agents (AEAs) of MoFA (Ministry of Food and Agriculture) and farmers involved in the implementation of the project in northern Ghana. These people were drawn from the six target districts of the project, namely Karaga, Chereponi, Bawku West, Kassena-Nankana East, Nadowli and Wa East. The one-day training was held at the Catholic Guest House on 19th May, 2011. The training was on inoculants, inoculants technology and legume enterprise. Forty-nine people participated and all of them were males

A third training was organized by IFDC (International Fertilizer Development Center) for the project's FLO and the representatives of $N_2$Africa dissemination partners (Mr. Jibreel Basit and Mr. Abdul Rahim of UrbaNet and Mr. John Lambon of ACDEP) on 15th June, 2011 on accessing "MFarm Platform". The facilitator was Mr. Paul Anani, the Value Chain Specialist at IFDC. The topics treated at the training which was held at the premises of IFDC at Nyankpala

were using the mobile phone for

- Linking farmers to markets on MFarm Platform
- Geo referencing of all farm sites with the out use of G.P.S equipment
- Generating a common data base for all farmers / Generating a common MFarms Platform for farmers
- Communication using SMS

***Activity 5.2.1.*** *At least 16 MSc and 6 PhD candidates selected for training from the impact zones*
Two MSc nominees have been selected for sponsorship at the KNUST. The admission process is completed and the students are awaiting their admission letters. Two PhD candidates under AGRA sponsorship at KNUST will be selected for sponsorship by N2Africa to undertake short-term visits to laboratories overseas.

# 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 soybeans, 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

# Partners involved in the N2Africa project

Caritas Rwanda

Diobass

Eglise Presbyterienne Rwanda

Resource Projects-Kenya

Université Catholique de Bukavu

University of Zimbabwe