

# N2Africa Podcaster no. 18

January and February 2013

## Introduction

I'm writing this introduction from Ethiopia where Esther Ronner and I have been discussing N2Africa activities for this year with many partners in Bahir Dar, Debre Zeit and Addis Ababa. We have a 'bridging grant' from the Bill & Melinda Gates Foundation to get N2Africa up and running in Ethiopia, Tanzania and Uganda. Endalkachew Wolde-Meskel will update you in the next Podcaster about our plans in Ethiopia, but to give a small taster – the Ministry of Agriculture and the Agricultural Transformation Agency have identified *Rhizobium* inoculant as one of it's main priority interventions in Integrated Soil Fertility Management and we will be supporting them to achieve their ambitious goals. Read on below to learn of the plans we have

developed for the coming season in northern Tanzania and Uganda.

We're currently discussing a concept note to continue N2Africa into a second phase that would start at the end of this year, and we hope to give you news on this in our next podcaster. We have lot's of news and updates in our current Podcaster. We repeat our earlier request for reports on any striking things you have seen, or stories you have heard that can help us learn about farmers' experiences through N2Africa. We'd love to hear more from you!

Ken Giller, Addis Ababa

## Obituary announcement

The N2Africa family has lost a colleague. Mr. G. Zargba Gaye, a beloved and humble colleague died unexpectedly after a brief illness. This sad event occurred on February 9, 2013 at the St. Joseph Catholic Hospital in Monrovia.



Mr. Gaye joined the N2 Africa Project – Liberia in April 1, 2012, and stayed until the

time of his death. He served as Farm Liaison Specialist from the IITA field office in Gbarnga. Before joining N2Africa and IITA, Mr. Gaye worked at the Ministry of Agriculture in Liberia where he served as Monitoring & Evaluation Officer as well as Director of Training. He acquired a BA in Agricultural Economics from the University of Nigeria – Nsukka, and was also trained by WARDA (AfricaRice) in Post Harvest Technology. Mr. Gaye is survived by his wife and four children. At this difficult moment we express our deep condolences to his spouse and children and pray to Almighty to rest his soul in peace.

Amare Tegbaru

## N2Africa plans for 2013

As Phase 1 of the N2Africa project comes to a close in October this year we have reviewed and agreed on work plans for the remaining period (and of course the finances). The planning of this year's activities has been guided by what needs to be done to achieve our objectives for delivery and dissemination (D&D). On the other hand we will conduct an 'early impact assessment' to evaluate the success and draw lessons on how D&D of legume and BNF technologies can be improved in future. Further, we want to implement a strategy to ensure that the gains we have made in the past years are sustained.

In Western Kenya and in Rwanda and DRC we are currently preparing D&D activities for the next cropping season, but will wind down the agronomic research. Focus is on data management, soil analysis and data analysis. Elite rhizobium strains are being tested in the greenhouse and in the field in Western Kenya. In DRC, bioprospecting for elite rhizobium strains is ongoing (see the report in this Podcaster). Students are testing strains in the greenhouse and field in Rwanda.

In Nigeria and Ghana surveys for the early impact assessment have been initiated, initiatives are taken to ensure that inputs will still be available to farmers for the next growing season. Whereas N2Africa was been largely responsible for input distribution in the past, we will make use of different mechanisms in the coming season and will monitor uptake of the technology. We are partnering with Advance (see report in this Podcaster) to stimulate further dissemination and outscaling. We will conduct training on rhizobium inoculant production and aspects of quality control of rhizobium inoculants as part of our strategy to establish sustainable inoculant supply.

In southern Africa (Zimbabwe, Malawi and Mozambique) we are currently in the middle of the season, after which we will concentrate on the 'early impact assessment' and putting mechanisms in place for continued and sustainable input supply. In many countries our partners have taken the dissemination of legume and BNF technologies to new areas beyond our original mandated areas and we will actively support these development wherever this is needed.

The early impact assessment (EIA) will use three instruments: a household survey, a partner survey to assess impacts on the way they work, and an agrodealer survey to assess stocking of inputs for legume crop production. The EIA will be complemented by specific case studies, on topics such as diffusion of technologies, mechanisms of adoption and adaptation by farmers, or on 'seed systems' to look into the critical issue of seed multiplication and access. Further, PESTEL analyses will investigate broader environment that may enable or constrain uptake of our technologies across the different countries. PESTEL stands for the Political, Economic, Social, Technological, Environmental and Legal macro factors for which, there is an established set of variables. For N2Africa, additional 'Development' and 'Agricultural Research' indices will be selected and applied by students from the Management School at Lancaster University.

### N2Africa Rhizobiology Activities at Kalambo, DR Congo

#### Introduction

The Eastern part of DR Congo, in the Sud Kivu province, is one of the target areas of N2Africa. In DR Congo, N2Africa's objectives 3 (rhizobiology studies) and 5 (capacity building) are led by Université Catholique de Bukavu (U.C.B.) through the faculty of agriculture, one of the project partners.

The team responsible for Rhizobiology activities at Kalambo (Objective 3) and Capacity building (Objective 5) in DRC, is led by Prof. Walangululu and consists of three trained core members to implement laboratory activities in the framework of objective 3 and one N2Africa core member to lead capacity building of farmers, while Prof. Walangululu leads the degree related training. Two of those three trained core members are engaged in MSc studies at University of Nairobi, Kenya.

Rhizobiology activities are not new in DRC; in the past, they were conducted at the National research center (INERA), Yangambi; one of the most prominent scientists well worldwide known is Bonnier, Belgian citizen, who left the country with the nationalization of the national research center. In the framework of the N2Africa project, rhizobiology activities are being carried out both in the soil analysis faculty laboratory of U.C.B. at Karhale and in the CIAT soil microbiology laboratory at Kalambo.

Activities carried out in 2011 were: collection of 10 soils samples and 39 rhizobium strains by a team of rhizobiologists of N2Africa, Nairobi, and sent to MIRCEN Nairobi, installation of 13 field trials in many locations (need to inoculate trials), collection from secured locations of North and South Kivu and isolation of 41 rhizobium strains characterized by DRC rhizobiology team in Bukavu; although planned, no MPNs and cultured isolates were initiated and no local inoculants produced; reference strains remained

Finally, in this podcast we report on a successful agrodealer training conducted in Western Kenya. Considerable time was devoted to the discussion on "What we can do to secure the availability of BNF technology products" and we agreed on concrete action points that involve improving the collaboration between our outreach partners, farmer associations and agrodealers, extending loans (from suppliers) to outreach partners to enable them to purchase inputs and providing loan guarantee to the suppliers. This exemplifies how we want to implement our 'exit' strategy to ensure sustainable supply of technologies. The full report is available on the project website ([www.n2africa.org](http://www.n2africa.org)).

Jeroen Huising  
N2Africa project coordinator

lacking. The causes for this shortcoming are complex, and responsibilities not easily assigned.

Activities planned in 2012 are bioprospection by collecting 213 rhizobium strains in 44 sites in Kalehe, Kabare, Walungu, Uvira and Idjwi locations, authentication and effectiveness of isolates collected strains, screening in greenhouse for BNF of collected isolates, conducting 50 MPNs in the greenhouse, 25 on soyabean and 25 on beans, quality control of reference commercial strains and production of inoculants for use in local trials.

#### Results

All 39 rhizobium strains collected by a team of rhizobiology of N2Africa Nairobi are now included in N2Africa Rhizobium database. Isolates were characterized and classified by Congo Red morphotype, BTB reaction and Gram Strain. Characteristics of rhizobium isolates collected by



Fig.1: Deficiency and/or toxicity: Symptoms on soyabean at Kalehe



Fig.2: Deficiency and/or toxicity: Symptoms on soyabean at Mushingua

Table 1: Characteristics of rhizobium isolates collected in DRC

DRC	Lab code	Host legume	Origin	BTB reaction	Gram reaction
1	BC01	<i>Indigofera arrecta</i>	Kirambi	N	Equivocal
2	BC02	<i>Mimosa</i> sp.	Buhimba 1	Ac	Negative
3	BC03	<i>Arachis hypogaea</i>	Inera 2	B	Negative
4	BC04	<i>Phaseolus vulgaris</i>	Mubambiro	B	Negative
5	BC05	<i>Cowpea</i>	Kanyaruhenga	B	Equivocal
6	BC06	<i>Unknown</i>	Tchadote	B	Negative
7	BC07	<i>Neonotonia wightii</i>	Lwiro 1	B	Negative
8	BC08	<i>Neonotonia wightii</i>	Lwiro 2	B	Negative
9	BC09	<i>Phaseolus vulgaris</i>	Kamululu 4	B	Negative
10	BC10	<i>Arachis hypogaea</i>	Kicheke	B	Negative
11	BC11	<i>Acacia</i> sp.	Ongero 2	Ac	Equivocal
12	BC12	<i>Mimosa pigra</i>	Bushushu	Ac	Negative
13	BC13	<i>Phaseolus vulgaris</i>	Kikunda	B	Negative
14	BC14	<i>Unknown</i>	Kirambi 4	Ac	Negative
15	BC15	<i>Vigna</i> sp.	Luberizi	N	Negative
16	BC16	<i>Desmodium adscendens</i>	Luberizi	B	Negative
17	BC17	<i>Indigofera spicata</i>	Kirambi 5	N	Negative
18	BC18	<i>Desmodium salicifolium</i>	Kalehe 1	B	Negative
19	BC19	<i>Mimosa</i> sp.	Nunigi 1	Ac	Negative
20	BC20	<i>Crotalaria cleomifolia</i>	Ongero 1	Ac	Negative
21	BC21	<i>Unknown</i>	Kitembo 1	B	Negative
22	BC22	<i>Mimosa pigra</i>	Luvungi 2	Ac	Negative
23	BC23	<i>Neonotonia wightii</i>	Luvungi 3	B	Negative
24	BC24	<i>Arachis hypogaea</i>	Luberizi 2	Ac	Negative
25	BC25	<i>Indigofera spicata</i>	Mutarule	B	Negative
26	BC26	<i>Unknown</i>	Buhimba 3	N	Negative
27	BC27	<i>Unknown</i>	Kirambi 3	N	Negative
28	BC28	<i>Unknown</i>	Kamanyola	N	Negative
29	BC29	<i>Indigofera atriceps</i>	Ongero 11	N	Negative
30	BC30	<i>Phaseolus vulgaris</i>	Kirambi/Minova	B	Equivocal
31	BC31	<i>Indigofera arrecta</i>	Kirambi 2	N	Negative
32	BC32	<i>Phaseolus vulgaris</i>	Kamanyola 2'	B	Negative
33	BC33	<i>Phaseolus vulgaris</i>	Kiliba ONDS 2	B	Negative
34	BC34	<i>Soyabean</i>	Kirambi 5/Minova	N	Negative
35	BC35	<i>Unknown</i>	Katale1	Ac	Negative
36	BC36	<i>Phaseolus vulgaris</i>	Kirambi 6	B	Equivocal
37	BC37	<i>Phaseolus vulgaris</i>	Ongero 6	B	Equivocal
38	BC38	<i>Tephrosia vogelii</i>	Kamululu	B	Equivocal
39	BC39	<i>Indigofera arrecta</i>	Kiliba ONDS 1	N	Negative
40	BC40	<i>Desmodium</i> sp.	Ntole / Buzi	B	Negative
41	BC41	<i>Crotalaria incana</i>	Kabulimbo 3	Ac	Negative

BTB reaction: Ac: acid forming (yellow); N: non reactive (green); B: basic (blue)

DRC rhizobiology team in Bukavu in 2011 are presented in Table 1.

Yield of soyabean of need to inoculate trials are given in Table 2.

Widespread complex nutrient deficiency and toxicity symptoms were observed on soyabean, as shown in figures 1 to 3. After harvesting, a high variability of yield was noticed among treatments (CV>15 %). Yield of PK 06 was in general higher either on plants inoculated or not inoculated, except on plants fertilized with urea, reaching almost the potential of the variety at Murhesa location. Ibona and Burhinyi locations were seriously affected by drought. Results have been analyzed for publication.

Table 2: mean yield of soyabean varieties (kg ha<sup>-1</sup>) in 11 locations of Sud Kivu province

Treatment Locations	Biofix		None		Urea	
	PK 06	SB 24	PK 06	SB 24	PK 06	SB 24
Birava	1177	975	1150	654	1050	1045
Mulamba	1224	935	1836	945	951	939
Burhinyi	865	908	694	731	616	810
Ibona	247	303	292	194	313	309
Bugorhe	809	952	832	966	644	1804
Kalehe	839	952	832	966	644	1804
Mumoshu	690	296	772	329	845	460
Murhesa	2002	1344	2503	1156	2122	1014
Mushinga	675	922	563	1088	758	1239
Nyangezi	887	633	964	558	988	709
Walungu	699	555	659	609	877	892



Fig.3: Deficiency and/or toxicity: Symptoms on soyabean at Kavumu

Prof. Masamba Jean Walangululu

## Soya production: The Mozambique Experience

### Background

Mozambique is a large country with 10 major agro-ecological zones; from arid climate in Gaza province with less than 500 mm mean annual rainfall to tropical humid climate where mean annual rainfall is in excess of 1800 mm within parts of Zambezia, Lichinga, Nampula and Tete provinces. These high rainfall areas have the best potential for agriculture and are the regions where all kinds of crops grow well. Soyabean is among the crop with huge growth potential in the region and is becoming a major cash crop for smallholder farmers. Nationwide soyabean production in 2004 was estimated at 770-880 tons from an average yield of 450 kg/ha (Estrada, 2004\*). Production increased 10-fold to 8000 tons in 2010 with an average productivity of 850 kg/ha (CLUSA, 2010\*). Production in 2012 promoted by Soya value chain project being implemented by Technoserve alone is estimated at 31,000 tons from an average yield of 1100 tons/ha (Narciso Rodrigues, Technoserve, Pers. Comm.). Soyabean production is expected to increase over the coming years due to the high demand driven by the domestic poultry and livestock industries, available regional market and attractive prices. In 2006, the farm gate price for a kilogram of soyabean grain was 7-9 meticaís (US\$0.25-\$0.33); however, the price averaged 19 meticaís (US\$0.68 in August 2012). The strong interest from foreign investors in the soyabean production sector in Mozambique recently, is another dynamic that likely will help put Mozambique on the map as a major soyabean producing country in the future.

### Partnerships and major interventions

For many resource poor farmers, soyabean is a profitable smallholder crop that is easy to produce, does not take require much investment and improves soil health for the next crop. Thanks to the recent interventions by many collaborative projects implemented by both local and international organizations including IIAM, IITA, CLUSA, Technoserve and IKURU disseminated technology packages have been developed for smallholder farmers that have contributed to narrowing the yield gap: increasing yields from 450kg/ha to the current 1100kg/ha. Such yields are still well below soyabean yield potential in the region. The Platform Mozambique project funded by USAID and the Soya value chain project funded by the Bill & Melinda Gate Foundation and N2Africa are all helping smallholder farmers through diverse ways to make the soyabean story a great success. N2Africa focuses on  $N_2$ -fixation technologies for enhancing legume yields and has partnered with other programs and Farmers' Associations to develop, disseminate and promote appropriate  $N_2$ -fixation technologies for smallholder farmers. The project is focusing on major soyabean production areas to reach more soyabean growers in order to maximize impact. In collaboration with farmers' groups (e.g., Fig. 1), N2Africa has selected high-yielding soyabean varieties with high nitrogen fixing capac-



Fig. 1. Members of the Tirimbique Farmers' Associations on a demo plot at a Tirimbique village in Angonia district, Tete province, Mozambique

ity and has made seeds of preferred soyabean varieties available to farmers associations and community-based organization for multiplication and distribution. N2Africa demonstrated the use of inoculants, P fertilizer and other inputs through on-farm demonstrations to create awareness and have disseminated inoculants and P fertilizer to many smallholder farmers for testing on their farms. The majority of the smallholder farmers had no or limited information on inoculants three or four years ago; however, many of these farmers are now willing to buy inoculants for their soyabean crop. In light of this, N2Africa in partnership with Technoserve facilitated the import of inoculants by a private company, AgriFocus Lda for sale to smallholder farmers during the 2011/12 growing season. Two additional companies imported inoculants for sale during the 2012/13 planting season. Fig 2 is a collection of some of the inoculants imported and used in Mozambique during the 2012/13 growing season. These include MasterFix inoculant imported from Stoller do Brasil, Brazil;



Fig.2. Some of the Rhizobial inoculants imported and used in Mozambique during the 2012/13 growing season

Biagro inoculant, Laboratorios Biagro, Argentina; SoyCAP, Soygro (Pty) Ltd, South Africa, Biomax Premium, Bio Soja Industrias Químicas e Biológicas Lda, Brazil; BioFix, MEA, Kenya; Cell Tech, Novozymes, Canada and HiStick, Becker Underwood, USA.

### Personal encounter

For Joia Alberto Muchengete (Fig. 3), the timing for the intervention could not be better. He is one of the farmers in Gurue district who benefited from demonstration plots established on farmers' fields; the farmers prepared the land, participated in planting and also managed the day-day maintenance of the plots. He says he started producing soyabean in 2006 but it was not profitable at that time since yields were low and the price was not attractive; hence he produced tobacco and switched to soyabean the following season whenever tobacco price fell. Joia says soyabean production is now profitable because yields are higher now due to technologies made available to them by N2Africa and other projects and on top of this the farm gate price is very good for farmers compared with the prices for other competing crops like tobacco. Hence, he has been planting soyabean in the last 3 years. He planted 4 ha of soyabean last year and 7 ha this year.

Similarly, Bibiana Bernardo (Fig. 4) is a Lead farmer and has soyabean variety demonstration plots on her farm at Ndundu, a village in Angonia district, Tete province. She has 3.5 ha soyabean farm and expects to make more money this year than she made last year when she planted the field to maize. She says that the price of soyabean was high last season so those who grew soyabean made money. She is motivated by the fact that she would be able to identify the best yielding variety on her land and use the knowledge and skills she gained from the training to increase yield and income from the farm.

### Prospects

We expect the interventions to continue to boost soyabean productivity and expand production to encourage full participation of the private sector at all levels along the value chain. It is anticipated that more agro-dealers will be involved in the supply and distribution of inputs to enhance accessibility by smallholder farmers even in remote areas. Home utilization of soyabean is gradually increasing following training and demonstration campaigns to improve nutritional quality of traditional carbohydrate foods and to encourage womens' participation in project activities. The upward trend in home consumption of soyabean is stimulating intercropping soyabean with other food crops and it is anticipated that soyabean would be part of household diet in the near future.

The acquisition of large stretches of farm land by foreign investors is driving out smallholder farmers from their farmlands and this is likely to cause major conflicts if the acquisition continues. The challenge is: to what extent should



Fig. 3. Joia Alberto Muchengete in his soyabean field at Ruace, Gurue district in Zambezia province, Mozambique



Fig 4. Bibiana Bernardo Lead farmer and her children on her soybean demonstration plot at Ndundu in Angonia district, Tete province in Mozambique. Photo taken by Anne Turner

the government open up good agricultural land to investors without affecting the land usage rights of smallholder farmers? For now land is not scarce in Mozambique as long as the companies follow the rules and resettle farmers properly. If managed well it could be a win-win situation: the companies could procure excess inputs for sale to smallholder farmers, serve as source of employment for the local people and also the farmers could serve as out growers for the companies. It is hoped that farmers' training, demonstration and other forms of awareness creation will accelerate adoption and sustain high productivity, increase smallholder income and improve nutrition security.

Steve Boahen

#### References:

- \*CLUSA. 2010. Produção de Soja – Volumes Produzidos. Relatório do Workshop “Desenvolvimento da Cadeia de Valor da SojaHotel Zambeze, Tete 15 de Fev de 2010.
- \*Estrada, J. M. 2004. Regional overview of the soybean markets: Challenges and opportunities for smallholder farmers in Southern Africa. Study commissioned by IITA.

## N2Africa-ADVANCE partnership enhances soyabean-rhizobium inoculants technology dissemination – Part 2

In Part 1, published in the last Podcaster, we read how N2Africa established successful partnership with ADVANCE. This time, we report about this year's training of ADVANCE's Operational Communities in Tibali (Savelugu district) and Kpatribor (Karaga district), including in total 48 participants, of which 17% women.

On some occasions, ADVANCE engaged with the N2Africa team to train its farmers and/or its staff in application of the technologies and help them to understand the project concept. The training included legume agronomy, soil fertility and its improvement practises, BNF and soyabean Rhizobium inoculants technology, weed control, pest and disease management, post-harvest handling of legumes and value addition, linking farmers to markets, and involving women in community entrepreneurship. Another goal of the training was to get familiarized with the experiences of farmers concerning cultivation of legumes with N2Africa.

Some experiences shared by farmers:

- Fields cropped with legumes, especially groundnut, for about three years tend to produce a lot of biomass rather than grain yield.
- Having learned to practice legume-cereal based crop rotation system has helped to maintain the fertility of the soil over the years.
- Also testified by farmers who had purchased inoculants and used them in their own soyabean farms, inoculated plants seemed to have more biomass and pods. Even though farmers were not aware of beneficial effects of fertilizer on legumes before, they have now noticed the benefits of phosphorus fertilizers or YARAlegume.
- Training on value addition, and utilization of legume(s) in the household by WIAD (Women In Agricultural Development) has helped to reduce malnutrition, generate income and create employment for the women in their communities.
- Especially challenging and/or discouraging legume production were the prevalence of Rossette virus on groundnut fields, presence of pests like cowpea Maruca and Aphids, declining yields as a result of infestation by weeds, such as *Striga* spp., *Commelina* spp., *Euphorbia* spp. and sedge, poor market price for the farm produce and the inability to access credit from banks and other financial institution.

Farmers very much appreciated the timeliness of the training, and were convinced of the soyabean-rhizobium inoculants technology; such that they expressed their preparedness to purchase the inoculants at any time that it was available on the market. They also appreciated the education given them on the use of agro-inputs like YARAlegume, SSP and TSP fertilizers which could be used for the production of their legumes and were prepared to put



Farmers at the training at Tibali, Savelugu District



A section of participants at the Kpatribor training



Farm Liaison Officer explaining the importance of nodules to the farmers



Group photo of participants inside an inoculated soyabean demonstration plot at Tibali

in practice what they had learned from the training. The N2Africa team on the other hand was very happy with the opportunity to learn from the farmers.

Rev-Dr. Benjamin D. K. Ahiabor, Principal Investigator, N2Africa Project, SARI & Mr. Edwin K. Akley, Farm Liaison Officer, N2Africa Project, SARI

## MFAGRO Farmers: A Stronger Voice in Vihiga County, Kenya

The goal of MFAGRO is to bring new technology to its members and the farmers of Vihiga County, Western Kenya. We recognize the N2Africa Program and its partners CIAT, MEA Ltd. and Promasidor for assisting our group toward that end over the past year (2012) and we look forward to working with you during 2013. Much of MFAGRO's effectiveness and growth we owe to our collaboration. Over the past year, we conducted five farmer field days with N2Africa that were attended by 573 farmers (51% women). We also established an exhibit at the Provincial Agricultural Show in Kakamega and contributed to World Food Day celebrations in west Kenya.

Our BNF technologies were extended to 1320 new farmers exploring soyabean production on 200 m<sup>2</sup>, and 75 progressive farmers producing at least 0.5 acre contributing to the N2Africa tender with Promasidor Ltd. Using our own resources, we reached an additional 300 members that were attracted to soyabean as a result of local N2Africa outreach efforts. We also promoted climbing beans (cv Kenya Tamu) among 120 members. In this way, we reached 1815 farmers and spread our activities over five administrative districts during 2012. This work was conducted by seven Master Farmers and one Legume Processing Officer, all trained by N2Africa. Our group was visited by the N2Africa Project Leader, the new Program Coordinator, the Legume Agronomy Leader and the Kenya Country Mentor during 2012, offering appreciation, useful advice and encouragement to our members.

In several ways the activities of N2Africa and MFAGRO are closely aligned. We now produce over 2.5 tons of improved legume seed per season for sale to our members. We have established both a farm inputs supply shop and a grain legume market collection point. Our members engage in value addition to soyabean as a cottage industry, and our soymilk, soya beverage and mixed flour cakes are widely appreciated. N2Africa recognized these achievements by inviting a group officer on its recent farmer's tour through MEA Ltd, KARI-Muguga, Promasidor's soyabean processing factory and CIAT Headquarters in Nairobi. This tour helped us to better know the operations of our development partners, suppliers and buyers, and to better grade soyabean for specific markets.

We still face several challenges in promoting BNF technologies among Vihiga's smallholders. Farm inputs must reach our members on time, which requires greater planning skills among our officials and cooperators. Additional training of farmers is needed, and N2Africa now informs us that its training activities will soon end. We have experi-



MFAGRO's officials standing in one of their soyabean seed multiplication fields during the 2012-2013 Short Rains (Photo Dick Morgan Ongai)



Farm inputs and soyabean products on display during the Provincial Agricultural Show in Kakamega, Western Kenya (Photo Dick Morgan Ongai)

enced delays in farmer's payment for collectively marketed soyabean, putting our group in a difficult position. Vihiga is prone to hail, and this damages soyabeans more than most other crops. Most agro-dealers not working with N2Africa still do not stock Sympal fertilizer and BIOFIX inoculant. We need help in addressing these issues, but working together is strength as we move toward food security among poor households and our nation. And together we shall continue bringing improved BNF technologies to Vihiga's farmers during 2013 and beyond!

Dick Morgan Ongai, Activities Coordinator, Mwangaza Farmers Group Organization. Email: [mfagrofarmers@gmail.com](mailto:mfagrofarmers@gmail.com)

## Planting time: a crucial management decision for the cultivation of soyabean in the humid tropics

In many regions where N2Africa works, farmers need to plant soyabean at the beginning of the growing season in order to have a mature crop by the time the rains cease. The humid tropics covering most of Sierra Leone and Liberia however are blessed with a rainy season of at least 7 months and a total annual rainfall often well over 2000 mm. Results from a planting date trial conducted in Sierra Leone in 2012 however indicated that the long growing season does not mean that farmers have a long window to plant soyabean. In fact, soyabean planting time is a crucial management factor that determines both the quantity and quality of harvested grains.

The soyabean trials in Sierra Leone showed that in all three agro-ecological zones, the rain forest, the forest transition and the savannah, highest grain yields were achieved with planting before August (Fig. 1). Planting in August or September gave an increased risk of drought

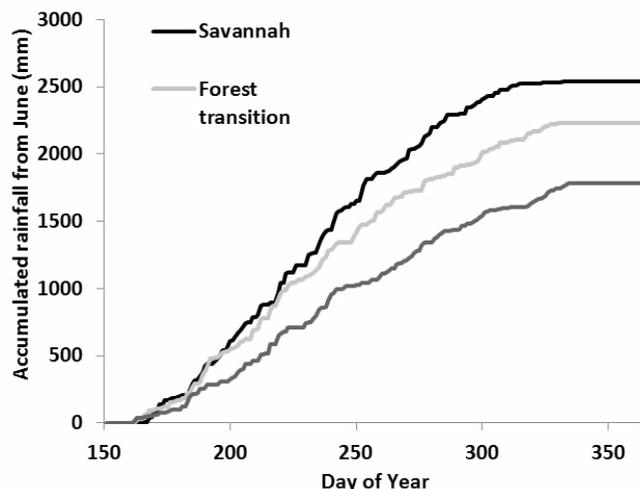


Fig. 2. Accumulated rainfall from June 1 in three agro-ecological zones of Sierra Leone

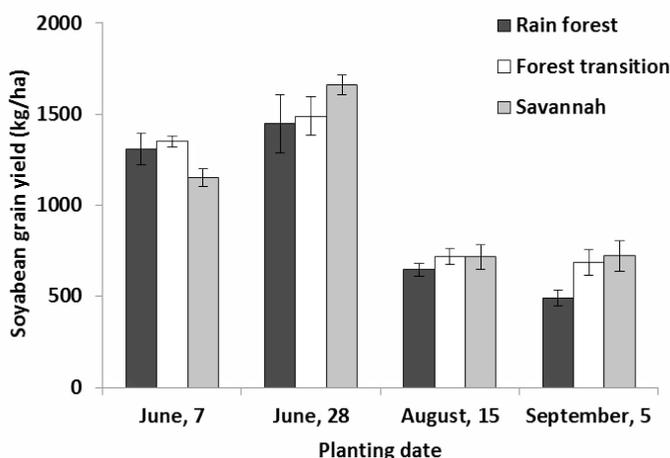


Fig. 1. Soyabean grain yield as affected by planting time in three agro-ecological zones in Sierra Leone. Average of two varieties (TGx 1448-2E and TGx 1904-6F); error bars indicate standard errors of means



Fig. 3. Pictures of grain from soyabean planted at different times in three agro-ecological zones in Sierra Leone

stress towards the end of the growing period (November – December) (Fig. 2). Because of the photosensitivity of soyabean, late planting led to early flowering and a long grain-filling period, which further reduced yields. Early planting however was associated with increased fungal attacks on grains before and after harvest, which were worsened by poor post-harvest drying conditions. This led to a poor grain quality from soyabean planted in June (Fig. 3). Soyabean farmers are likely to face similar challenges with the drying of soyabean grain in the middle of the rainy season.

Given the trade-off between early planting providing high grain yields and late planting giving grains of a higher quality, the optimum planting period for soyabean is likely to be around mid July. This planting date will be an additional treatment when the trial is repeated coming season. The trial provided an important lesson about planting time that can be extended to groundnut. Groundnut farmers in Sierra Leone indicated that planting in May gives the highest yields, but the grain needs to be consumed or sold straight away and cannot be stored over a prolonged period. Groundnut planting in July gives a lower yield but the best grain quality, allowing farmers to use the grains as seed in the following season. Planting date is also likely to have an impact on the severity of aflatoxin infections, especially in groundnut. Late planting of groundnut could greatly reduce infestations, which are common in this environment and can cause severe health problems to humans and livestock.

Linus Franke, Keiwoma Mark Yila



## N2 Africa starts activities in Uganda

A follow-up workshop was conducted at Makerere University on 4<sup>th</sup> February 2013 to identify partners and to agree on start up activities for the N2Africa Project in Uganda. Participants at the workshop were research and development organizations including the Namulonge Crops Resources Research Institute (NaCCRI) and National Semiarid Agricultural and Animal Research Institute (NaSAARI) of National Agriculture Research Organisation (NARO), International Institute of Tropical Agriculture (IITA), International Centre for Tropical Agriculture (CIAT), International Fertilizer Development Centre (IFDC), Africa 2000 Network Uganda (A2N), VECO East Africa, Soyabean Products International, World Vision Uganda and the Department of Agricultural Production and Soyabean breeding and Seed Systems Project of Makerere University.

The strategy for the N2Africa project in Uganda is to work in partnership with various development and research and training institutions in the dissemination of legume technologies for improved productivity and livelihoods of smallholder farmers. Dissemination will follow the various approaches used by the different partners, set up as 'randomized control trials'. Wageningen University will play a support role of linking and providing knowledge to the partners, priority human resource capacity development and infrastructure refurbishment so as to strengthen the national capacity in research and dissemination of legumes. Makerere University will take the lead in the coordination of the project and will be supported by the IITA Uganda Office.

In starting up the project in Uganda, priority is on dissemination of the best available legume technologies in the areas where the key identified partners operate. However other relevant partners will be brought on board with time. Critical in the partnerships are the synergies amongst the partners. The research Institutes have high yielding and disease tolerant varieties: Climbing and bush beans with the National Bean Research Programme (NaCRRI) and CIAT, rosette tolerant groundnut varieties (NaSAARI); rust tolerant soyabean varieties (Makerere University); fertilizer packages and linkages to markets (IFDC), and Rhizobium inoculants production (Makerere University). For the development partners, Africa 2000 Network Uganda is an extension organization that uses a group approach to disseminate

technologies through on-farm demonstrations at village level led by community based facilitators. Soyabean Products International multiplies soyabean seed in collaboration with farmers and with the SRSS project of Makerere University for quality assurance. They are also delving into processing soyabean into various value added products. VECO East Africa works with farmers to empower them to increase production and productivity and organized marketing. World Vision Uganda uses participatory technology development approaches, largely the farmer field schools approach and collaborates with research institutions for technical knowledge to empower communities to address food security issues. IITA has vast experience in farming systems characterization and will support the project in the randomized control experimentation as well as graduate student supervision.

Implementation of the activities during the first season of 2013 will be in the southwestern region (highlands of Kabale and Kisoro) for climbing bean, northern region (Apac, Oyam, Kole and Lira) for soyabean and eastern region (Serere, Pallisa Bukedea and Tororo districts) for groundnut.

Research issues for dissemination support identified in Uganda included strengthening research - dissemination linkages and particularly establishing systems for quality seed provision; assessing effectiveness of different materials for improved storage of soyabean, and developing ways to enhance availability of stakes for climbing beans and getting seed companies interested in promoting climbing beans. Agronomic and economic research issues include establishing limiting nutrients to legume production in the various farming systems and zone specific fertilizer application recommendations (in cooperation with IFDC); input levels and management practices to maximize productivity of legume intercrops; processing and value addition for beans; nitrogen fixation capacities of the legume varieties under the various production systems; isolation of native rhizobium strains and improvement of inoculant quality. The research will be prioritized according to constraints urgently felt by partners and taken into account in the implementation plans that will be jointly developed.

Peter Ebanyat

## N2Africa Planning Workshop - Tanzania, 11-12 February 2011

A two days' sensitization workshop was conducted from 11-12/2/2013 at The Nelson Mandela African Institute of science and Technology in – Arusha – Tanzania, to plan for the N2Africa project activities in Northern Tanzania. The workshop was attended by more than 30 participants. Representatives from N2 Africa project in the Netherlands, CIAT - TSBF, PABRA, government agencies from Tanzania (Extension, Research and Foundation Seed Farm), NGO

operating in the Northern zone (World Vision Tanzania, RUDI, Catholic Relief Services, FAIDA MaLi, Tanzania Horticultural Association, Alpha Seed Company and Crop Bioscience Solutions LTD); Community Based Organizations in the northern zone (Usambara Lishe Trust and Ubwiri Women Group) and The Nelson Mandela African Institute of Science and Technology were invited. In total, representatives were drawn from three regions from



Northern Zone and were represented by four districts as follows: Arusha – (Arumeru – district), Kilimanjaro – (Moshi Rural and Hai districts) and Tanga – (Lushoto district). The initiative involved a mix of different institutions operating in Northern Tanzania. It was anticipated that by bringing together highly qualified researchers supported by extension, NGOs and CBOs' will form a strong alliances, where the resulting synergies from the expertise of each partner will significantly add value to the planned project.

In Northern Tanzania, the common bean (*Phaseolus vulgaris* L.) is a major food grain legume grown mostly by resource-poor farmers without fertiliser inputs. Despite the attractive local price of beans, the yields of this grain legume have remained very low under farmer conditions. This low yield is, in part, associated with abiotic and biotic constraints such as low soil fertility and reduced N<sub>2</sub> fixation and the occurrence of various diseases and insect pests. To alleviate some of these problems, N<sub>2</sub> Africa project has stepped in to initiate collaborative activities with a variety of stakeholders in northern Tanzania to scale up and disseminate the appropriate technology to improve the plant nutrition of bean plants and increase the final yield.

The planning workshop was very successful and participative. One of the extension officer confessed that it was her first time to be involved in planning of research activities in her carrier. After exchanging ideas and experience, participants in the workshop decided to promote the dissemination of released climbing common bean varieties in the northern highlands which can yield four times more than the conventional bush types. This will be accompanied by staking, small addition of Triple Super Phosphate (TSP), Farm Yard Manure (FYM) and rhizobial inoculants. The planned demonstrations will be conducted in farmers' fields starting from March 2013. A possibility of involving private companies to produce rhizobial inoculants in northern Tanzania was discussed.

This project is expected to produce meaningful results by improving the livelihood of the small scale farmers in northern Tanzania.

Patrick Ndakidemi

### Learning from Farmer Managed Soyabean Trials in Kenya

Outreach activities continue to test new soyabean varieties, input combinations and cropping arrangements that promote BNF. During the 2012 long rains in west Kenya (March to July), two new soyabean varieties from SeedCo were compared to SB 19 (the current industry standard). SB 19 was also evaluated with and without addition of zinc in an effort to further improve the Sympal fertilizer blend as well as in combination with two new cereal crops, dwarf white sorghum (SC Sila) and IR maize (WS303). The 41 trials were farmer installed and managed, and data collected by N<sub>2</sub>Africa Master Farmers trained in previous seasons. Each

management was established on 45 m<sup>2</sup> (444,444 plants per ha) and received Sympal fertilizer (0-23-16 w/S, Mg and Ca) at 125 kg<sup>-1</sup>. Inoculated treatments received BIOFIX inoculant containing *Bradyrhizobium japonicum* USDA 110. Cereals received 33 kg N per ha as urea topdressing in split application. Nodule observations were recorded at mid-bloom based on a 0-5 ranking system. Root nodulation responded strongly to inoculation with 55% more nodules, 111% greater frequency of crown nodulation, and 30% increased red interior pigmentation. There was a massive variation in yield between sites ranging from 0.13 to 2.80 t

per ha in soyabean monoculture. Average inoculated SB19 yields were 1.12 t per ha, but lower than the past long rains growing season (-12%), probably due to a three week delay in the onset of the rains and a short late-season drought. SC Saga yield responded significantly to inoculation with BIOFIX (+16%). The mean yield of SB19 was greater with the addition of Zn in the Sympal fertilizer blend (+5%), but the response was not statistically significant due to the variability in response.

An economic analysis was conducted based upon production costs, yield and commodity prices, Costs included seed, inoculant, Sympal and urea fertilizers, labor requirement and wages, cleaning and bagging. Production costs ranged between \$288 and \$382 per ha for non-inoculated Saga soyabean monocrop and the MBILI intercrop, respectively. Net returns ranged between \$326 per ha for non-inoculated Saga and \$549 for MBILI, although large differences in yield between sites implies that also net returns greatly varied between sites. These returns do not include return on household labor (about \$113 to \$128 per ha). The favourable return to MBILI intercropping is largely due to the very high price of maize caused by the emergence of Maize Lethal Necrosis Virus (\$0.46 per kg). Benefit to cost ratios varied between 1.5 for soyabean-sorghum intercropping (where sorghum was often consumed by birds) and 2.5 for inoculated Squire soyabean (offering a net return \$467 per ha).

These results point to several important findings. Even during a season with unreliable rainfall, soyabean production was profitable when net benefits were averaged across sites. Clearly, inoculation of soyabean with BIOFIX containing USDA 110 is a crucial practice and offers the greatest partial return on investment. This improvement was realized among 71% of the fields. Fortification of

Sympal fertilizer blend with 0.1% Zn bears no additional cost to farmers and results in yield improvement at 71% of the sites, though further research is needed to better understand on which type of soils Zn additions are most likely to results in a yield response. Our search for cropping options for soyabean continues. The past several seasons, intercropping management has focused upon better performance of soyabeans as an understorey intercrop of maize. Simply substituting soyabeans for beans in farmer's traditional practice is a poor option as insufficient light results in low yield and poor quality soyabeans. Alternative row arrangements, such as strip cropping or MBILI offer some improvement, but after three years there is little evidence of adoption by farmers. Finally, these findings illustrate the value of engaging N2Africa Master Farmers in the process of refining the use of BNF technologies among small-scale farmers in west Kenya (see photo).



This former tobacco grower in Migori, west Kenya, has shifted to soyabean production using the production package offered by N2Africa (photo credit Moses Chamwada)

Article prepared by Paul L. Woome, Kenya Country Mentor

### Limitations in the Production of Legume crops in Zimbabwe

Legumes, such as groundnuts, sugar beans, soyabeans, cowpeas and bambara nuts, are important in the cropping systems of smallholder farmers in the communal areas in Zimbabwe. These legumes are often referred to as women's crops and they are not given as much attention as other crops like maize, tobacco and cotton. Despite the fact that legumes enhance soil fertility through biological nitrogen fixation (BNF), their role in human nutrition and their contribution to household cash income are still not highly appreciated. This article seeks to bring out some challenges that limit the production of the legumes by smallholder farmers in Zimbabwe.

One of the main challenges in the production of legumes is their low yield, which is caused by several factors, such as the use of retained seed, limited availability of proper inputs through agro-dealers, hesitancy of farmers to use phosphorus-based fertilizer, and – particularly for soyabean – the challenges with the availability and use of inoculants.

Farmers are reluctant to buy fertilizer and certified seed. The recycled seed of these legumes has exhausted the production potential and the yields will keep getting lower and lower. As certified legume seeds are in very low demand, many agro-dealers in the country have stopped stocking the legume seeds. Consequently, several seed producing companies have stopped breeding and multiplication of seed of legumes. Furthermore, the seed that is available through seed houses is often of inferior quality which in turn discourages farmers from purchasing seed.

Farmers also lack adequate market information (on desired varieties, prices, etc.) and are not organised to market their crops as groups to enhance their negotiating power for better marketing deals. According to market preferences, some of the varieties grown by farmers are not good enough for processing. For example, groundnuts processors would require small-seeded groundnuts like Natal Common for better quality peanut butter, but most farmers have large

seeded groundnuts varieties like Ilanda, Nyanda, Plover, Valencia, Makulu Red which have been circulating among farmers for decades and as a result yield little – on top being not in demand by processors.

Legumes like soyabeans are best grown with inoculants so that their BNF capacity can be enhanced to obtain higher yields. From observations by the N2Africa staff in the areas where the project is being implemented, indications are that most farmers do not know where to get the inoculants. This could be attributed to the way the inoculants are being distributed and sold by the Soil Productivity Research Laboratory (SPRL, a division in the Chemistry and Soils Research Institute (CSRI) under the Ministry of Agriculture, Mechanisation and Irrigation Development (MOAMID)). SPRL is the sole manufacturer of inoculants in Zimbabwe. The inoculants are manufactured and transported for sale to different districts in the country where there is potential for soyabean production. Thereafter, AGRITEX at district level is supposed to sell the inoculants to farmers, making a small profit of USD 0.50 per sachet. However, the district staff is not given any direct incentive as the profit goes to AGRITEX Head Quarters in Harare. In addition, farmers are mostly not aware that the inoculants are to be found at AGRITEX offices. If inoculants were advertised through the national radio, TV programs and in the written press, farmers would know where to get the inoculants. Because of the way in which the inoculants are distributed and marketed, some unscrupulous dealers are now buying the inoculants from SPRL or CSRI and selling them to farmers at inflated prices ranging from USD 10 to USD 15 per sachet, while the gazetted price is USD 5.

The Soyabean Promotion Taskforce was successful in increasing soyabean production by smallholder farmers during the late 1990s (Giller et al 2011). While the importance of inoculants was part of the awareness raising during N2Africa Training-of-Trainers (ToT), some knowledge gaps were noticed among the farmers. In general, most farmers had little knowledge on the functions of inoculants and how they are used. Moreover, some farmers



Isaac Chabata doing the mid-season Training-of-Trainers in Makoni district

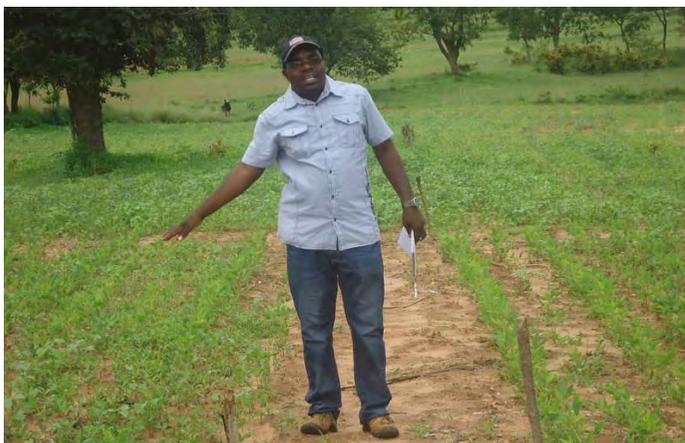
who seemed to have gained knowledge from the work of the taskforce in the 1990s, had erroneous knowledge. For example, a comment from one farmer in Chegutu, when he saw an inoculant sachet being held by N2Africa personnel, was that one could substitute inoculants with brown sugar. Another farmer argued that the inoculants are used to control pests and diseases in the early crop stages of the soyabean crop.

Most smallholder farmers in Zimbabwe do not use fertilizers in the production of legumes, despite the positive results obtained from research. Fertilizer companies in Zimbabwe do not advertise the Phosphorus-based fertilizers for legume production and farmers view the use of legume fertilisers as expensive compared to maize and cash crops.

While most agro-processing companies in Zimbabwe use legumes for processed food and animal feeds, some legume crops still have no lucrative markets in the country. For example, cowpeas are a common legume crop grown in Zimbabwe but there are relatively few output markets for the crop. This may be because cowpea is not a preferred crop in town markets and the crop is usually used for vulnerable feed during times of famines among the poorly endowed families. In addition, cowpea is relatively vulnerable to storage pests after harvest and storage facilities are not accommodative for cowpea.

For all legumes, the main challenge is that processors are interested in buying large quantities. In the case of cowpeas, farmers plant small areas – only to cater for home consumption. As for groundnuts, output markets for the crop exist in the country, but most often smallholder farmers are not yet strongly organized in collective marketing groups and the quantities from individual farmers are too small for lucrative sales.

Lack of credit facilities is also limiting the production of legumes in the country. Some crops are produced under an input-credit facility, for example, cotton, sorghum and



Isaac Chabata pointing out the different treatments in the soyabean D&D trial of Ambrose Mapire, Makoni district

tobacco. For legume crops, there is need to find financiers who will bankroll the production of these crops. The processing companies which require the legumes in large quantities could come in and engage in credit schemes with smallholder farmers. This will ease the marketing problem of the legume crops and at the same time promote the production of the desirable varieties for the process-

ing industry. However, it will require farmers to be strongly organized in groups or associations.

Isaac Chabata and Caroline Chipomho

\* Giller, K. E., M. S. Murwira, D. K. C. Dhlwayo, P. L. Mafongoya, and S. Mpeperekwi. 2011. "Soyabeans and sustainable agriculture in southern Africa." *International Journal of Agricultural Sustainability* 9(1):50-58.

### The Crawford Fund Master Class on Rhizobiology

The Crawford Fund Master Class was a two-week training course, held from the 1<sup>st</sup> -13<sup>th</sup> of December 2012 in the city of Kandy, Sri Lanka on all the skills and techniques of rhizobiology. Participants were from nine countries namely Zimbabwe, Zambia, Malawi, South Africa, Kenya, India, Thailand, Vietnam and the host Sri Lanka. The facilitators were from Murdoch University, Australia and the coordinators were from Australia and Sri Lanka.

The theme of the master class was "The isolation, identification and utilization of root nodule bacteria (rhizobia) in promoting sustainable agricultural productivity", divided into four modules:

- Isolation
- Characterization
- Authentication
- Inoculants technology

In the first module we learnt about the types of media (minimal and rich) and which type was appropriate for the different bacteria. We also learnt of the benefits of using some media like ½ LA media and Yeast Mannitol Agar and the different genera of rhizobia as well as phenotyping legumes and rhizobia. This module was interesting because we went into the mountains looking for different legumes using phenotypic features.

In the second module we learnt about the different types of characterization namely:

1. Characterisation based on morphology of the colonies on the media plates i.e. the shape, size, colour of the colony and the number of days the colony takes to form;
2. Biochemical process i.e. gram staining of gram negative and gram positive bacteria. Different bacteria absorb different dyes and produce different end products either acids or alkalines on different media;

3. Characterization based on DNA (*which was the most interesting because we do not use this method in Zimbabwe due to inadequate facilities*). This is done by a process called PCR for Polymerase Chain Reaction. Here the DNA sequences with the desired genes is fragmented under a series of reactions under specific heat and pressure and the characteristics matched to a database. This was interesting because the magnitude of the impact of the results did not match with the micro-micro quantities of everything we used and also that unlike other techniques in microbiology where we worried about foreign substances on our skin as contaminants in PCR our skin was also a DNA contaminant and we had to wear gloves at all times and not touch our skin.

In the third module we learnt on methods of making sure what we had isolated and characterized was really rhizobia a process known as authentication. In this module we learnt to test how effective our isolates were and if they were rhizobia through a series of glasshouse tests and through trap hosting i.e. growing the desired host plant of desired rhizobia in a collected soil suspected to have rhizobia. We also did plating on different media and did colony counts of viable rhizobia using different media and calculation techniques and formulas for total viable colony counts. This was a bit strenuous but very interesting too.

Module four was about inoculant technology. This was about how you make broths for inoculants, how you inoculate these broths, setting up fermentation units, types of carriers for inoculants, how to introduce rhizobia to carrier packets and quality control of inoculants. This was also another interesting module because it reminded me of our achievement in southern Africa of having the biggest inoculants production plant in Marondera. It was also strenuous at times but very interesting. Also the facilitator was



Some impressions of the Crawford Fund Master Class on Rhizobiology



very patient because it took all the groups a lot of trials to achieve a broth that had minimal contamination.

In the second week of the training we had an excursion. We went to an elephant orphanage. Despite the elephant being one of the largest animals we learnt that it was also susceptible to abuse. There were some elephants that had been hurt by landmines and had part of their legs blown off. It was fun as we got the opportunity to feed some of the elephants and see some of the naughty elephants playing and chasing each other.

Kandy was interesting because it is mountainous and everywhere we went we would be winding and always had a lovely view. Also despite the course being intense, we had a lot of fun. We were from nine different countries, had nine different cultures, nine different languages and nine different beliefs but somehow all that didn't even seem

### Links to video on women in extension

From Agro-Insight we received a link to a video on women in extension. The link is available in several languages. To watch the video online or download the video for later use click the language of your choice: [English](#), [French](#), [Kiswahili](#) or [Portuguese](#).

### January 2013 episode of the Bill & Melinda Gates Foundation podcast "Inside the Gates"

[This podcast](#) is designed to provide a glimpse into the Bill & Melinda Gates strategies and the people who work at the foundation, and is part of their ongoing effort to share information with you on a regular basis.

In January's episode (Episode 5):

- A conversation with Aliko Dangote. James Whittington reports from Nigeria and sits down with Africa's wealthiest individual to learn about the part he's playing to help eradicate polio.
- The evolution of a partnership. We met with grantee Asia Society and our College Ready education team to hear what they're learning about working together to help all students succeed in school and life.
- Around the foundation. Bill's Annual Letter is coming up and Melinda paid a trip to the BBC as a guest editor. Our roving reporter brings you the highlights.
- New Year's Resolutions. Irvin tells listeners what he's looking forward to in 2013

The Podcaster is published eight times per year – we look forward to receiving news and contributions – particularly from partners. Please send in contributions well in time. Contact address for this newsletter is: [N2Africa.office@wur.nl](mailto:N2Africa.office@wur.nl)

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to exist because over the two weeks we became one big family. We ate together every evening, we went shopping and site seeing together, we literary did almost everything together.

This was the most fulfilling training courses I have had. The closing ceremony was a very emotional one because we had become a close family, but it was time to say goodbye. This training strengthened my willpower to make nitrogen fixation known to more people and benefit a lot more.

VIVA SRI LANKA!!!!!!!!!!!!!!!!!!!!!! AYUBOWAN *May we live long* so we might attend even much better and exciting training courses

Tatenda Kainga (MPhil student N2Africa)

### MSc, BSc, Internship, reports freely available on the N2Africa internet

The MSc, BSc, internship reports of our Wageningen University students are made freely available on our website. You will find the reports under the tab "outputs". All our work done in Wageningen is done via global access and we are aiming to make it available to everybody.

We have many students still studying at partner universities in Africa and we hope very much that their thesis reports will be made available very soon.

### Conference announcement

IFDC offers a training program "Linking Farmers to Markets in Africa" in East Africa. It will be held in Nairobi, Kenya, July 1-5, 2013.

The program is meant for development professionals from both public and private sector with specific interest in farmer-to-market linkages, such as agro-input dealers, importers, traders and trader organizations; producer organizations; and development projects, donors, NGOs and other agricultural development practitioners. For more information see [this link](#).