



N2Africa Podcaster no. 25

March and April 2014

Introduction

I'm delighted to report that Dr Fred Kanampiu will join N2Africa as Project Coordinator based in Nairobi from 1st June. Fred will be known to many of you already for the pioneering research he and his team have conducted on Striga control over the past years – including of course a strong legume component! Fred has been leading and managing a range of international projects – including the SIMLESA project that has a large legume component – and we look forward to benefiting from his rich experience. We have also hired for the Monitoring and Evaluation position and will introduce her to you in the next Podcaster. This means that all key staff are hired for the international positions.

In alignment with the revised strategy of the Bill & Melinda Gates Foundation, N2Africa will focus much of the activities in the coming years in Ghana, Nigeria, Ethiopia, Tanzania and Uganda – what we refer to as the “Core Countries”. Building on the important work already done in the six countries that are no longer within the priority list of the Foundation – namely DRC, Kenya, Rwanda, Malawi, Mozambique and Zimbabwe – we have substantial funding to continue and expand activities. We refer to these six countries as the “Tier 1” countries, and we held an exciting meeting in Nairobi in March together with the country leaders to plan activities for the coming year. Below you will

find a report of that meeting as well as introductions to the six Tier 1 Country Coordinators and ongoing activities in each of these countries.

In this Podcaster, we profile the ongoing research of the first cohort of PhD students within N2Africa who each provide an update on their work. You will also find reports of country planning workshops.

Ilse de Jager also provides a short start update on human nutrition work in collaboration with GAIN (Global Alliance for Improved Nutrition)

Dr Richard Jones of AGRA, and member of the N2Africa Advisory Committee provides an introduction to the Scaling Seeds and Technologies Project (SSTP) that he leads. The SSTP provides exciting opportunities for partnership with N2Africa that we will be exploring in the coming months.

Please remember to send in your contributions for the Podcaster and the N2Africa Facebook page. We strive to improve communication within and beyond N2Africa to share our learning across the countries. We rely on you to share your ideas and keep us up-to-date!

Ken Giller

Fred Kanampiu to join N2Africa as Project Coordinator

Fred Kanampiu holds a PhD Soil Science-Soil Fertility (Oklahoma State University, Stillwater, USA). He has 25 years of extensive experience in conducting agricultural research, technology development, and dissemination in cereal-legumes-livestock systems in East and Southern Africa, local and regional project implementation, coordination and management, including publishing, with public and international organizations. He has been involved in leading and monitoring the implementation of projects executed across countries, maintaining liaison with key partners and stakeholders in the public and private sectors, and ensuring implementation of project-related agreements. He has sound knowledge of international agriculture and development issues with first hand experience in areas of agriculture, food security, capacity strengthening, and donor relations.

Fred is leading the agronomy component in East Africa region of “Sustainable Intensification of Maize-Legume Based Farming Systems for Food Security in eastern and southern Africa Project”. This is an Australian supported program managed by CIMMYT in close collaboration with six partner country NARS and collaborating CGIAR centres (ICRISAT), sub-regional research organization



(ASARECA) and Australian partners (University of Queensland, Murdoch University). Partnerships involve a range of private, NGO and public sector mechanisms that support rapid dissemination of improved maize and legume seed and improved crop management approaches, supported by on-farm trials, demonstrations and farmer innovation

groups managed by farmers, extension agencies, NGOs and local fertiliser and seed input and marketing agents.

Fred has worked with CIMMYT for the last 17 years as an agronomist where he led, coordinated and managed several Parasitic Weed Striga-related projects, including integrating Striga, stem borer and soil fertility management practices for enhancing productivity in East Africa. This involves collaboration with National Agricultural Research Systems (NARS), seed and chemical companies, non-governmental organizations (NGOs), other Consultative Group of International Agricultural Research (CGIAR) Centers, Advanced Agricultural Institutes (ARIs), and our ultimate partners, the farmers of the region. Currently, he is leading 3 Striga projects, namely: (i) Integrated Striga Management for Africa (leading Kenyan component, sub-grantee of IITA and funded by BGMF); (ii) Commercialization of IR-Maize in East Africa (leading the CIMMYT component, sub-grantee of AATF and funded by USAID-FINTRAC); and (c) BASF-Support for Striga work (funded by BASF).

N2Africa planning meeting for Tier 1 countries in Nairobi

Short version was published on Facebook on April 18th

On April 14 and 15, a meeting was held at the ICIPE campus in Nairobi to plan for N2Africa phase II activities in the so called tier 1 countries, Kenya, Zimbabwe, Malawi, Mozambique, Rwanda and the Democratic republic of Congo. The meeting was attended by the six country coordinators, senior business development officer Edward Baars, coordinator research and data Joost van Heerwaarden and the N2Africa leadership team represented by Ken Giller, Bernard Vanlauwe and Bashir Jama (AGRA). They were joined by representatives of AGRA (Kiwia Abednego) and Export Trading Group (Wainaina Kung'u).

The main aim of the meeting was to prioritize activities stated in the phase II results framework for implementation by the tier 1 countries. Over the two days, the participants reached agreement on a number of issues and actions related to project strategy, dissemination activities, gender, legume technologies and rhizobiology and M&E.

On the evening of the first day the participants had a chance to socialize while indulging in a selection of exotic and not so exotic meats at a Brazilian steak-house. Neither the traffic, nor the occurrence of an unexpected pedestrian police chase on the highway could prevent this from being a success.

The second day saw two interesting presentations by Richard Jones (AGRA) on the Scaling Seeds and Technologies Partnership (SSTP), an initiative from AGRA and USAID to accelerate access of smallholder farmers to technology, and by Anne Marie D'Olier, series manager with the popular agricultural reality-TV show, Shamba Shape-Up.

He has advised several six graduate students, and contributed to the advancement of more than 1,360 trainees and visiting scientists.

Over time, Fred developed a strong network of partnership with NARES, seed companies, other IARCs, ARIs and NGOs. I have developed proposals that have been funded by Rockefeller Foundation, the Department for International Development (DFID), the African Agricultural Technology Foundation (AATF), the Syngenta Foundation for Sustainable Agriculture (SFSA), the Swiss Agency for Development and Cooperation (SDC), EC-IFAD, Australian Centre for International Agricultural Research (ACIAR), BASF-The Chemical Company and USAID-FINTRAC. These supported programs/projects included research and capacity building in areas of sustainable intensification for increased crop production and addressing the food security agenda in Africa.

Fred will start his N2Africa coordination work on June 1st.



Country coordinators left to right: Lloyd, Regis, Speciose, Wilson, Paul, Jean Marie. Photo taken during the Tier 1 country meeting. Further introduction in the article below

Both generated useful and lively discussion on the potential for collaboration and the use of television for disseminating the use of legume technologies. The last day ended with an open discussion to solve the issues raised the previous day. All in all, the meeting was a success, providing the basis for successful activities in phase II as well as an opportunity for several new project members to get to know each other.

Joost van Heerwaarden



Introducing the Country Coordinators of the Tier 1 countries

As indicated above, the Tier 1 countries are the six countries other than Ghana and Nigeria, that participated in the N2Africa project from the start. The country coordinators for these countries are:

Lloyd Phiphira (Malawi)

Lloyd Burton Phiphira is a holder of an MSc (1998) degree in Pest Management from the University of London, Imperial College of Science, Medicine & Technology, UK. He obtained his BSc degree (1993) in Agriculture (Crop Science) from Bunda College of the University of Malawi. For the past 20 years, he has worked as a Crop (Coffee) Protection Officer at Tea Research Foundation (Central Africa) - Coffee Research Unit; at Agricultural Research Trust (ARET) as an Entomologist and as a Land Acquisition and Farm Development Manager with a World Bank funded project in Malawi. He was instrumental in assisting more than 15,000 landless/land-poor families relocate and acquire land for farming purposes. He is currently serving as a Country Coordinator for N2Africa Project in Malawi. Contact: L.Phiphira@cgiar.org, Mob: +265 888 892 261.

Regis Chikowo (Zimbabwe)

Regis is a soil scientist by training, with BSc and MPhil Degrees from the University of Zimbabwe and a PhD from Wageningen University. Over the past several years, he has carried out basic and applied research on nutrient management on smallholder farms, largely in southern African countries of Mozambique, Malawi, Zambia and Zimbabwe. Approaches that integrate legumes to tap into the benefits of biological N₂-fixation to sustain production on low-input smallholder farms have been core his investigations. He also integrates crop production systems modeling to study complex farming systems. Through Michigan State University, where he is a Research Associate, Regis is also the Malawi Country Coordinator for the AfricaRISING project, a research initiative under the USAID Feed the Future Program. AfricaRISING has a strong emphasis on grain legumes for maize-based cropping systems, and there is a natural synergy with the N2Africa project. Regis enjoys teaching - from the basics of soil chemistry to the principles of crop production!

Contact: regisChikowo@yahoo.co.uk.

Speciose Kantengwa (Rwanda)

Speciose is a sociologist, with specialization in Environment & Sustainable Development, and Gender. She has a strong background in agriculture, a long experience in seed systems, technology transfer, situation analysis, project management, development of extension messages, and capacity building for farmers' organizations. She joined N2Africa Rwanda in 2010, as a Farm Liaison Officer.

Contact: S.Kantengwa@cgiar.org.

Wilson Leonardo (Mozambique)

Wilson's PhD research at Wageningen University focused

on exploring the possibilities and limitations to improve land and labour productivities of smallholder farming systems in Central Mozambique. In 2007 he obtained his Master's Degree in Plant Science from Wageningen University. In 2001 he was graduated as a Bachelor of Plant Production and Protection at the Eduardo Mondlane University, Mozambique. He worked for International Crop Research Institute for the Semi-Arid Tropics from 2001 to 2008 as scientific officer, before he joined Wageningen University for his PhD in 2009. From February 2014 Wilson was hired by IFDC Mozambique as senior agronomist in a joint position with N2Africa as the Mozambique Country Coordinator.

Contact: wleonardo@ifdc.org.

Paul Woomeer (Kenya)

Paul Lester Woomeer holds a PhD in Agronomy and Soil Science awarded by the University of Hawaii in 1990 for his work on the introduction of rhizobia to tropical soils. For the past 24 years, he has lived and worked in Africa on projects designed to deliver improved land management technologies to smallholder farmers. He led the development of the MPNES computer program for estimating rhizobial populations in soils, was co-founder of the UNESCO Rhizobium Ecology Network of East and Southern Africa, designed the MBILI maize-legume intercropping technology and examined the role of grain legumes in integrated striga management technologies. Currently he serves as the Kenya Country Coordinator in the N2Africa Program. Paul also serves as the Tier 1 Rhizobiologist and assists in the development of the Nodumax inoculant factory in Nigeria. Contact: plwoomeer@gmail.com.

Jean Marie Sanginga (DR Congo)

Jean Marie Sanginga Matabaro has a MSc in Agricultural and Environment from the Université Evangélique en Afrique (UEA), DRC, Gestion durable de sol. He worked in agricultural research in an international environment and with the African rural communities and has experience with employers of private and national and international research institutions like FHI (Food for Hungry International) and CEE (Communauté Économique Européenne) in the implementation of agricultural programs, monitoring and evaluation of agricultural programs in rural community, with UN agencies for WFP (World Food Program) in the development of agricultural programs, monitoring food distributions to vulnerable populations. Further he worked in various projects for CIAT TSBF in the CIALCA project (2005 – 2009) and in N2Africa as Agronomist research assistant and Focal point N2Africa DRC. He also worked with other national research institutions in the sub regions like Inera in DRC, Usabu in Burundi, Isar in Rwanda and did international research in the sub-region of the Great Lakes. He is coauthor of scientific papers and author of posters and abstracts for international conferences.

Contact: sangingajeanmarie@yahoo.fr, Tel. +2439998666101.

N2Africa/phase II DR Congo activities have already begun

Opportunities for sustainable intensification of climbing bean on smallholder farming systems in the eastern highlands of DR Congo

South Kivu is located in the eastern part of DRC. This is a productive area, but agricultural productivity has been held back by years of war, overpopulation and land degradation. The majority of the population is engaged in subsistence agriculture. However, food security is a critical issue, because most farmers do not use fertilizers, resulting in nutrient depletion and decreasing harvests.

Climbing bean is grown in mid to high altitude areas. In the eastern highlands of DRC, farm sizes are small and the huge biomass of climbing bean allows to capture a greater proportion of the solar radiation to provide more yield; three times more than bush bean. Because of the high biomass, climbing bean also has high N-fixing potential. In Northern Katana (South Kivu) Isaac met a farmer who introduced *Pennisetum purpureum* to support his climbing bean crop and also used it as forage for livestock that give him manure to replenish soil nutrients.

N2Africa/Phase II indirect dissemination activities have started in DR Congo since the launch of the second phase in February. After identification of new partners, new households were identified, trainers were trained and technology packages were distributed to households. Sange village in Ruzizi was honored by the presence of Dr. Vanlauwe, who interacted with local farmers. In his speech he said *“Thank you for this special occasion you have given us to visit again. We encourage farmers to do better and to raise their standard of living through agriculture”*

N2Africa Malawi

Positive developments! despite the absence of N2Africa in the first three months of the 2013/2014 season: (a) huge interest by farmers to use soybean inoculants despite facing hurdles to access the product; (b) the pass-on program of legumes seed from farmer to farmer continued with facilitation by DAES, WVI, CRS, NASFAM and Clinton-Hunter Development Initiatives, among others.

Rhizobiology work: (a) about 13,000 (50g sachets) of a local Chitedze inoculants were produced and sold to mainly farmer organizations during the 2013/2014 season, demand for inoculants was quite high; (b) research findings by an MSc student, Joseph Mhango identified three local rhizobia strains for soybean and are potential candidates for further evaluation. (c) Six technicians and three Research Attendants from Chitedze, Bvumbwe and Lunyangwa Research Stations were locally trained on inoculant production and quality control; (d) Installation of a heavy duty autoclave is expected to be completed by mid-May 2014.



Dr Bernard Vanlauwe talking to farmers of Ruzizi

At the same time, rhizobiology work is on-going with refreshment of rhizobia isolate cultures. About 105 NAC strains will be re-isolated and cultured in Congo red petri-dishes and then kept in slant. However, the rhizobium research laboratory has challenges with the running funds. This year it was assigned 10,000 USD for maintaining its activities: bio-prospecting, isolation and characterization, testing the best isolates strains, inoculant testing and quality assessment, and providing technical support. Nice to know is that the NAC strains have crossed Africa to IITA Ibadan, where MSc student Liliane Shukuru will compare them to the NAN strains from N2Africa Nigeria.

Jean Marie Sanginga, Despines Bamuleke, Isaac Balume. N2Africa/ IITA, Bukavu South Kivu DR Congo

All documents, reports and data have been compiled by a consultant until mid-March. The Country Coordinator visited all seven N2Africa impact districts of Lilongwe, Dedza, Ntcheu, Salima, Dowa, Kasungu and Mchinji. Met the following partners: Department of Agricultural Extension Services (DAES) district offices; World Vision International (WVI); Catholic Relief Services (CRS); National Smallholder Farmers Association of Malawi (NASFAM) and Agri- Input Suppliers Limited (AISL), the Tier 1 country planning meeting was attended.

Demand driven training-of-trainers: a workshop on harvesting and post-harvest management of legumes was conducted in April 2014 in collaboration with the Department of Agricultural Research Services (Crop Storage). 28 Extension Workers were trained.

Lloyd Phiphira

N2Africa in Zimbabwe

From January 2014, the University of Zimbabwe, Crop Science Department, assumed coordination of the project, taking over from CIAT. There has been a seamless change-over, with support from both Judith de Wolf, the previous N2Africa coordinator for Zimbabwe, and Dr Nelson Mango, the CIAT Country Representative in Zimbabwe. During early April, both Judith and Nelson visited the University for an official handover of the project, including two project vehicles (see photos).



Activities for the 2013/14 cropping season were initiated from CIAT during Oct/Nov 2013. Activities during Phase II are now concentrated in five districts (Goromonzi, Murehwa, Mutoko, Wedza and Makoni), with limited activities in three other districts (Chegutu, Guruve and Mudzi).



On-farm demonstrations remain core to our technology dissemination strategy

We continue to closely work with the CADS (Cluster Agricultural Development Services) and AGRITEX as our main dissemination partners. The Soil Productivity Research Laboratory (SPRL) remains the cornerstone for inoculants production and rhizobiology training for our partners.

Regis Chikowo

N2Africa in Mozambique

N2Africa is being implemented in close collaboration with many partners. The key partners include Technoserve, CLUSA, IIAM, IFDC, IKURU and many Farmers Associations. The project is conducting dissemination campaigns, demonstration plots, training and awareness creation through these partners, with support from the project.

Ninety soyabean and cowpea demonstration plots were established in December 2013 and January 2014. The crops are currently being harvested. The plots were established to demonstrate the effects of inoculation, SSP application, a combination of SSP and Inoculant, and early and late planting on soyabean and groundnut yields. In total, 48% of the farmers involved in the demonstration plots are female. In addition, three hectares each of soyabean and groundnuts seed multiplication fields were established to produce seeds for project activities during the 2014/2015 growing season.

The project and its partners also distributed small quantities of inputs to farmers and farmers associations across the project areas. In this way farmers can test these inputs

on their own farms and under their own management. This will allow them to compare with their current practices and facilitate adoption and demand for the inputs. In addition, several training events were conducted across project sites to enhance the knowledge and skills of farmers in legume technologies and crop management in general. The training focused on inoculation procedure, handling and storage of inoculant, variety selection, best time to plant, row spacing, plant population, scouting, disease prevention and control and record keeping.

In terms of Rhizobiology research, the N2Africa PhD student (Amaral Chibeba) completed his work isolation of rhizobium strains collected from 15 project sites in Mozambique. He obtained about 256 isolates and tested seven isolates from each site in the greenhouse (See also the article below on Amaral's PhD research). Elite strains will then be tested in the field in both Mozambique and Brazil.

From 6 month country report by Wilson Leonardo (compiled by Greta van den Brand).

Kenya

At the start of Phase II, a model for indirect dissemination is being formulated. Established Action Site partners are maintained and six new development partners willing to disseminate recommended N2Africa technologies have been identified.

To achieve a sustainable input supply, input suppliers (MEA, SeedCo) are linked to agrodealer associations (KENADA) and the seasonal orders of large farmer associations including the KESOPA. Commercialization of BNF technologies is led by MEA Ltd, producers of BIOFIX inoculants and Sympal fertilizer. Marketing and legume product development is conducted in conjunction with UNIDO and its three recently developed legume processing factories, and with Promasidor, a top-end buyer of soyabean. Other key partners include the Kenya Soybean Farmers Association, SeedCo, the Western Chapter of the Kenya Agrodealer Association (KENADA) and the recently founded Soybean Stakeholder Working Group.

BNF technology testing and N2Africa led dissemination led technology continued during the 2013-2014 short rains growing season. In this season, 3476 households received a BNF technology package, bringing the number of on-farm technology tests since project inception to 37,464 households (99.9% of the initial outreach target). In addition, trials were established to refine field management using improved legume varieties of soyabean (SB19 and SC Squire) and climbing bean (Kenya Tamu and Rwanda Red) grown in conjunction with Sympal fertilizer and BIOFIX inoculant following current best practice (Figure 1). For soyabean, Squire outperformed SB19 when both fertilizer and inoculants were applied, producing 2399 (± 348) kg grain ha⁻¹. Similar trends were noted for common bean with Tamu outperforming Rwanda Red (2165 kg ha⁻¹ ± 664). Soyabean performed well in the Lake Basin and Midlands, but less so in the Upper Midlands (>1500 masl).

From 6 month country report by Paul Woomer (compiled by Greta van den Brand).

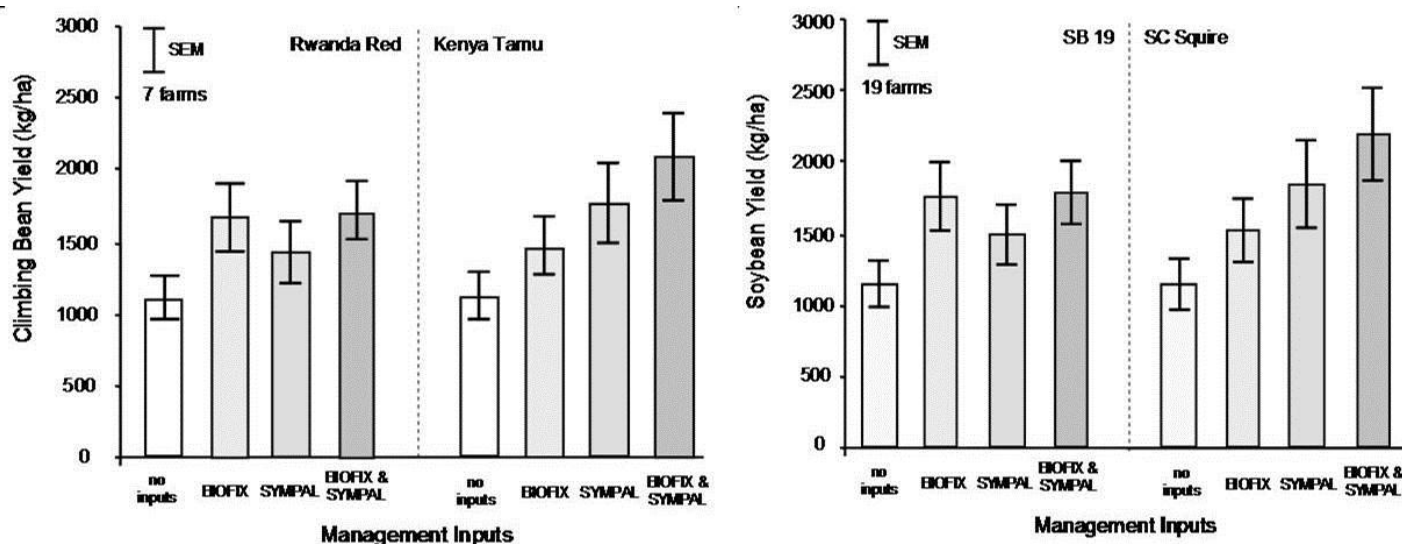


Figure 1: Yield of two climbing bean (left) and soyabean (right) varieties in response to inoculant and fertilizer during the 2013-2014 short rain growing season in west Kenya.

Rwanda

In Rwanda the national project staff has been reduced to the country coordinator only. However, there are several partners involved in dissemination activities, including DRD in the districts of Burera, and Gakenke, CARITAS Rwanda in Bugesera district, COCOF in Kamonyi district, and EPR in Kayonza. There are also informal partners such as Clinton Hunter Foundation and One Acre Fund (Tubura) who also have been actively disseminating N2Africa technologies outside the mandate zones of the project. In addition there are linkages with the Post-Harvest and Agribusiness Support project of MINAGRI/ IFAD, to promote the use of PICS bags on grain storage (Bean and Maize). Current dissemination activities include the production of

extension materials, establishment of demonstration plots and seed multiplication of newly released soybean varieties. Soyabean demonstration trials show five soybean varieties (four new and one local), both with and without inoculants. Additionally, six demonstration plots on different methods of staking climbing bean and use of inoculants in climbing bean are installed in six sites in Burera and Gakenke districts.

Research activities in Rwanda continue with rotational trials with maize in fields where soyabean and bush bean trials were established in the last season (2014 A). In addition, new field trials are ongoing in Northern Rwanda with the aim

to explore the possible mechanisms behind the response of climbing bean to low rates of manure application.

N2Africa works with several partners to maintain a sustainable input supply, which is important for the continuation of legume dissemination and adoption of legume technologies. Partner RAB (Rwanda Agricultural Board) multiplies foundation seeds of soyabean variety SB24 on station, and at the same time maintains all varieties released. Also COCOF multiplies certified seeds of SB24. Farmer cooperatives multiply certified seeds of SC Squire, SC Saga, and SC Sequel in collaboration with Seed Co. In addition, the

PhD students and their progress

Exploring the genetic diversity of groundnut-nodulating rhizobia in moist and dry savannas of Nigeria for increased symbiotic nitrogen fixation and productivity

My PhD study aims at exploring the genetic diversity of groundnut-nodulating rhizobia and identifying promising strains for inoculant production to benefit the farmers and all stakeholders in groundnut production and utilization. I enrolled for the programme in the Centre for Rhizobium Studies (CRS), Murdoch University, Perth, Western Australia in February, 2013. Thereafter I prepared my programme of study on the above topic and sampled groundnut root nodules and soils from Nigerian groundnut farmers' fields in July/August, 2013. I have conducted glasshouse experiments to establish successful growth of SAMNUT 24 and SAMNUT 22; groundnut varieties bred at the Institute for Agricultural research (IAR), Ahmadu Bello University, Zaria, Nigeria. I have also conducted experiments to screen the effectiveness of five reference groundnut - nodulating rhizobia strains, four *Bradyrhizobium* spp.; NC92 (The Australian commercial strain), 32H1 and

Rhizobiology Laboratory established a pilot legume inoculant plant, producing 44,500 (80 gram) packets of inoculant for soyabean and common bean in 2013. RAB now continues to produce inoculants for both soybean and common bean. N2Africa also aligned with existing opportunities to scale up activities, such as Government policy on importation and distribution of mineral fertilizers in the country, and agro-dealer networks operating at grassroot level selling agriculture inputs.

From 6 month country report by Speciose Kantengwa (compiled by Greta van den Brand).

AM01 from Brazil, CB756 from Zimbabwe and NGR234 (*Sinorhizobium fredii*) from New Guinea on the two varieties. Twenty two strains of Nigerian groundnut-nodulating rhizobia have been isolated so far, and more are in the pipeline. The next glasshouse experiments are aimed at testing the effectiveness of selected Nigerian groundnut-nodulating rhizobia strains on the same groundnut varieties with a view to identifying highly effective isolates for use in field experiments at the IAR field stations at Samaru (moist) and Minjibir (dry) Savannas in Nigeria during the next rainy season (2014/2015). Figures 1 and 2 shows the compatibility of SAMNUT 22 and SAMNUT 24 with NC92; which will be used as basis to determine the effectiveness of the Nigerian isolates in the experiments.

Aliyu Anchau, Abdullahi



Figure 1. Compatibility of SAMNUT 24 Nigerian groundnut variety with NC92 (Australian commercial strain of *Bradyrhizobium*) at 6 weeks after sowing. Treatments from left to right; -N, +N (10 g L⁻¹) and inoculation with NC92.



Figure 2. Compatibility of SAMNUT 22 Nigerian groundnut variety with NC92 (Australian commercial strain of *Bradyrhizobium*) at 6 weeks after sowing. Treatments from left to right; -N, +N (10 g L⁻¹) and inoculation with NC92.

Symbiotic effectiveness of indigenous *Bradyrhizobium* strains and strategies to maximize the contribution of Biological Nitrogen Fixation on soyabean in Mozambique

The major accomplishment by April 2014 include meeting the University credit requirements and harvesting the screening trial from which promising isolates will be selected and tested in the field both in Brazil and Mozambique in 2014/15 and 2015/16 cropping seasons. Soyabean nodules from 15 locations in Mozambique were



Figure 1: Amaral Chibeba before (left) and during (right) trial harvesting



Figure 2: From left to right, Jackson Gundi, Edenize Orzini, Maria Jacobino, Eduara Ferreira and Amaral Chibeba during nodules' count



Figure 3: Amaral Chibeba determining total N content

brought to Brazil in April 2013. From the nodules, a total of 105 isolates were obtained, 7 from each location, and screened for symbiotic efficiency in the greenhouse at Embrapa in December 2013. The trial was harvested in January 2014, nodule counts were completed in February 2014, plant dry weight was measured in March 2014 and total N content was determined in April 2014. Data analysis has just commenced.

Amaral Chibeba, who started his studies at Londrina State University, in Brazil, in August 2012.

Does the interaction of the indigenous and exotic rhizobia in contrasting Zimbabwean soil conditions result in superior individuals worthy of selection as inoculant strains

Soyabean has been grown since the early 20th century in Zimbabwe with inoculation beginning during the 1960's. Developments in crop and inoculation technology have progressively increased coverage to present day where inoculant and improved seed are available in every rural province in the country. While the seed industry has benefited from rigorous breeding programmes, inoculation has continued with a narrow range of exotic strains that display superior nitrogen fixation but may be challenged by the local agro-ecologies across the country.

In contrast, indigenous strains may display superior resilience to the Zimbabwean conditions that include soil acidity and high soil temperatures. Previous studies have identified indigenous strains that are compatible with soyabean. Horizontal gene transfer (HGT) is one example of the interactions that occur when populations of rhizobia are mixed, as happens when elite nitrogen fixing inoculant strains are introduced to soils containing environmentally adapted local strains. In the present study, one of the main

objectives is to describe population dynamics with respect to HGT, five years after the last introduction of rhizobial inoculants into contrasting environments represented by smallholder farms and soyabean breeding facilities.



Figure 1: A comparison of different nutrients levels supplied in a nitrogen fixation optimization experiment.



Two hundred and eighteen soyabean nodulating strains were isolated by host trapping from soils collected from three soyabean breeding facilities; and from nodules collected from soyabean plants in three smallholder communities. Capturing diversity of source, colony morphology and molecular fingerprinting, 140 strains had combinations of six genes amplified, namely *16s rRNA*, *recA*, *glnII*, *rpoB*, *nodC* and *nifH*. Preliminary findings have identified strains from the *Bradyrhizobium elkanii* and *Bradyrhizobium japonicum* lineages in significant numbers and yet only the *Bradyrhizobium diazoefficiens* lineage was introduced by inoculation. The 140 strains will be assessed for nitrogen

fixation efficiency in the glasshouse.

In further work, the top 5% in nitrogen fixation efficiency will be assessed for competition against each other in co-inoculation experiments and also individual performance across soyabean cultivars easily accessible in Zimbabwe. Strains that display competitiveness and superior nitrogen fixation will be recommended for use as inoculant strains in Zimbabwe.

Mazvita Chiduwa, PhD student at Murdoch University, Perth, Australia

Investigating Suboptimal Nitrogen Fixation in *Phaseolus vulgaris*

Phaseolus vulgaris (common bean) is an important food crop in many parts of Africa. Its yield is often hampered by nitrogen deficiency in soils despite its ability to nodulate and fix nitrogen with a wide range of rhizobia. Bean inoculation programs in Africa have repeatedly been plagued by a lack of, or erratic, inoculation responses in the field and my study aims to understand this phenomenon by 1) collecting, identifying and screening indigenous/naturalized rhizobial populations in Kenyan soils for effectiveness on commercially important bean cultivars alongside elite inoculant strains, 2) exploring possible causes of differences in strain effectiveness, mainly the role of poly-3-hydroxybutyrate, 3) evaluating the competitiveness of these stains in multi-strain environments with the aid of reporter genes and 4) evaluating the effect of soil nutrients on nodule occupancies and nitrogen fixation outcomes.

Over 300 isolates were obtained from both cultivated and wild legumes growing in different agro ecological zones in Kenya. The isolates were authenticated and screened for effectiveness on commercially important Kenyan bean cultivars in sterile pot systems revealing a wide range of effectiveness. Effectiveness Index was calculated based on strain performance in comparison to the inoculant strain used in Kenya CIAT 899. Figure 1 shows the effectiveness index for some of the Kenyan isolates.

The data shows that there are a number of strains in Kenyan soils of comparable effectiveness to CIAT 899. Focus is now on the competitiveness of these isolates. The hypothesis is that the native strains will be more competitive than the commercial strains on Kenyan bean cultivars

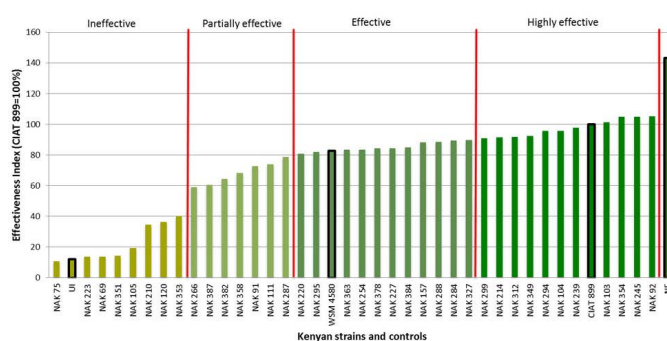


Figure 1: Effectiveness Index of Kenyan strains on *P. vulgaris* 'KK08' in sterile pot system. Bars of control treatments bolded

either by, the Kenyan bean cultivars having a higher affinity for the native strains and or, the native strains being more adaptable to Kenyan soil conditions. Competition studies are being undertaken with the aid of *gusA* and *celB* marker genes.

The role of poly-3-hydroxybutyrate (PHB) in bean bacterioids is also being investigated. PHB is thought to be accumulated by N2 fixing bacterioids as a means of hoarding carbon that is supplied by the plant leading to suboptimal N2 fixation. The wide range of strains with different N2 fixing abilities is being used to explore this area.

George Mwenda 2nd Year PhD student at Murdoch University, supervised by Graham O'Hara, Jason Terpolilli, John Howieson and Nancy Karanja

*George also made his [research poster](#) available that was presented in a poster contest at Murdoch University.

Options to enhance biological nitrogen fixation by soyabean and common bean in smallholder farming systems of Rwanda

Legumes are inoculated with expectation that it will increase nitrogen fixation and grain yield. However, this is not always the case. Among the possible factors affecting the response of legumes to inoculation are competition between indigenous soil strains with introduced ones, sufficient population of soil rhizobia and environmental stresses.

The survival of rhizobia population in soil in the other hand is affected by soil properties and management activities. To understand how management and soil properties affect the population of soil rhizobia, hence the nitrogen fixation and grain yield, 18 field trials of both soyabean and bean were established in three different agroecological zones

of Rwanda during the agricultural season 2014 A and will run for three consecutive seasons, with the second season (2014B) a rotational trial with maize to evaluate how different manure rates and soil characteristics affect the survival of rhizobia in soil and the need to re-inoculate in previously inoculated plots. The results so far showed variability in rhizobia population following soil origin. Both soyabean and bean nodulated well in some fields but not in others. The grain yield in all sites increased with increasing manure rates. Grain yield of uninoculated plots also increased with increasing manure rates. The pictures below show well nodulated soyabean in one site (Plate 1) and two plots of soyabean showing differences: one with manure addition (Plate 2) and the other one without (Plate 3).



Plate 3: no P, no manure, not inoculated

In the last week of March, 2014, 14 field trials have been established in Northern Province of Rwanda. This area is one of the major climbing bean growing areas in Rwanda. Fields were selected based on soil fertility differences. These trials aimed at exploring the possible mechanisms behind the response of climbing bean to manure application even at lower rates. Different farm yard manure rates were used with or without N, P, K or NPK application.

The pictures below show farmers weighing manure to be used and a field on preparation for planting. Farmers were curious as weighing prior to application is not a common practice.



Plate 1: Well nodulated soyabean in field



Plate 4: Farmers weighing farm yard manure



Plate 2: +P+10t manure, not inoculated



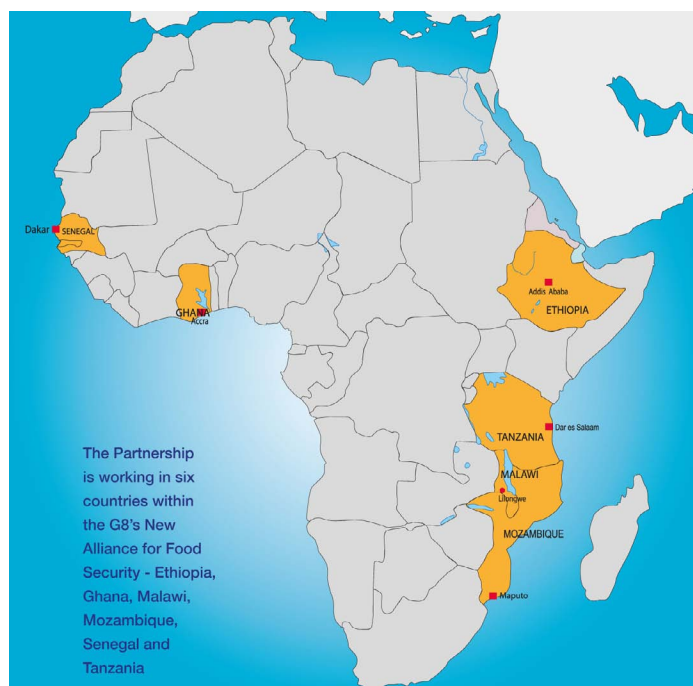
Plate 5: Field preparation prior to planting

Edouard Rurangwa, PhD student at Wageningen University

The Scaling Seeds and Technologies Partnership: Opportunities for collaboration with N2Africa

On July 1, 2013 USAID and the Alliance for a Green Revolution in Africa (AGRA) announced the Scaling Seeds and Technologies Partnership (SSTP) in Africa, a \$47 million, four-year partnership intended to accelerate smallholder farmer access to transformative agricultural technologies.

SSTP is accelerating the adoption of high-yield crop varieties and complementary technologies by smallholder farmers in Africa in support of the New Alliance for Food Security and Nutrition, a shared commitment of African leaders, private sector partners, and donor governments to lift millions out of poverty over the next decade.



SSTP is working in six countries - Ethiopia, Ghana, Malawi, Mozambique, Senegal and Tanzania - that have joined the New Alliance for Food Security and Nutrition where we will help governments strengthen their seed sectors and promote the commercialization, distribution and adoption of quality seeds of superior varieties and complementary technologies including blended fertilizers and rhizobium inoculation. SSTP aims to increase production of quality seeds by 45 percent in four years and ensure that 40 percent more farmers gain access to innovative agricultural technologies.

SSTP investments will be guided by Roadmaps developed after widespread in-country consultations that outline the specific technologies and areas where SSTP intends to support scaling. These Roadmaps will be the basis for soliciting proposals from interested parties and awarding grants for innovative ideas that will contribute towards achieving our targets and that will catalyze further investments beyond the life of the project. SSTP is particularly interested to scale up the adoption of legumes and complementary technologies developed by N2Africa and its partners. Further information can be obtained from our Country Coordinators:

Ethiopia	Yonas Sahlu: YSahlu@agra.org
Ghana	Isaac Asare: IAsare@agra.org
Malawi	Geoffrey Kananji: GKananji@agra.org
Mozambique	Anabela Manhica: AManhica@agra.org
Senegal	Abdou Ndiaye: ANdiaye@agra.org
Tanzania	Vianey Rweyendela: VRweyendela@agra.org

Richard Jones

N2Africa-Ethiopia Annual Planning Workshop, 15- 16 April

N2Africa-Ethiopia annual planning workshop was successfully held on 15-16 April, 2014 at ILRI Addis campus. The conference was made in ILRI's conference hall with well-furnished display technology which excited the participants. A total of 41 participants from national and regional research institutes, Universities, Ministry of Agriculture, ILRI, CAFS, National Soil, Private sectors, and invited guest from ICRISAT and NGOs have attended the conference. Dr. Amare Tegbaru, N2Africa's Gender Specialist, Dar es Salam IITA, also attended the planning meeting and made presentations.

Brief overview of the conference was made during the first day by Dr Endalkachew Welde-Meskel, Country coordinator for N2Africa-Ethiopia. The welcoming address was then made by Dr Alan Duncan, Senior Livestock Scientist. Deputy Director General of Oromia Agricultural Research Institute, Dr Asefa Ta'a officially opened the planning workshop.

The conference was stimulated by presentations from the bridging period activity reports and synthesis of studies on rhizobiology, priority legume crops value chains, feed value of legume crop residues and methods and tools for gender mainstreaming in Agricultural Research and Development. A detailed presentation on the Agronomy Master Plan and specifically the Development-to-Research Model followed by planning template by Dr Endalkachew, has tailored the planning by partners.

During the afternoon and first half of day two, participants were subdivided into their respective regions and disciplines to work out the planning around the four activity clusters: Diagnostic, Researcher Managed Agronomy, Demonstration and Adaptation with due consideration of Value Chain and Market Development, Gender Mainstreaming, Nutrition and the Feed Value of Legume Crop Residues. Backstopping from the National Project Team and a consultant has further fine-tuned the planning process. Finally, a compre-



Workshop participants. Photo credit ILRI/Apollo Habtamu

hensive planning was made by regions and complemented by participants of the conference.

On the closing session, Mrs. Mekdes Alemu, Gender Specialist for CAFS, has remarked the crucial role of N2Africa in realizing Productivity and Food Security of poor smallholder farmers in Africa.

More detailed information is available via [wikispaces](#).

Endalkachew Wolde-meskel

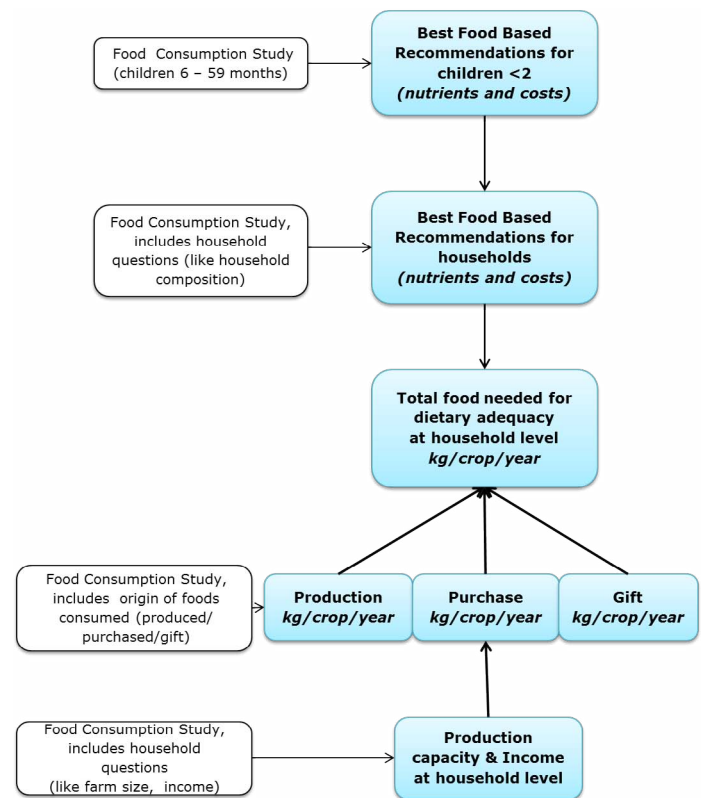
A quantitative food consumption survey of infants and young children in rural Ghana: a first step in linking agriculture and nutrition

Published before on Facebook on April 28th

Agricultural models used to analyse and re-design farming systems using multi-objective optimisation do not take into account household nutrition needs, while the development of dietary guidelines do not take into account the local food systems and agricultural productivity. Combination of agricultural productivity and nutritional needs may result in farm designs that optimize nutrition. One of the first steps in linking agriculture productivity and nutritional needs is to identify strategies to improve the nutritional quality of the diet based on locally available foods.

USAID/Ghana requested GAIN to conduct dietary analysis using Optifood software (linear programming) to identify a set of evidence-based, population-specific, food-based recommendations that can be promoted to improve the nutritional status of young children in farming communities of Northern and Southern Ghana. The food consumption study will be a cross-sectional survey to collect quantitative dietary data and food cost, and preparation of a local food composition table (FCT) necessary as inputs to use Optifood software.

I will use the study results from Northern Ghana (Karag district) to develop food based recommendations at household level and translate these into total food needed for dietary adequacy at household level which can be used to identify strategies to design farm systems for optimised nutrition (see figure). The study received ethical clearance by the Scientific and Technical Committee (STC) in Ghana and we will start data collection in July. I am very much



looking forward to take up this new challenge!

Ilse de Jager

Launch meetings in the Core Countries

In the previous Podcaster we already informed you about the Phase II launch meetings for the Core Countries Tanzania, Ethiopia, Ghana, Nigeria. The [workshop report of the launch meeting held in Tanzania](#) is now available via the N2Africa website. Also a report from the [Uganda launch meeting](#) can be accessed there.

The Podcaster is published six to 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

Please feel free to forward this email to colleagues you believe would be interested. This email has been sent to you by N2Africa, funded by The Bill & Melinda Gates Foundation and The Howard. G. Buffett Foundation.

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Briefs on Innovation Platforms

Several briefs on innovation platforms have been developed by ILRI as part of their contribution to the Humid Tropics CRP. The briefs can be downloaded from the [ILRI website](#).