

N2Africa Podcaster no. 36

March and April 2016

Introduction

Since the last Podcaster, N2Africa was show-cased at the Joint Pan-African Grain Legume and World Cowpea Conference in Livingstone, February 28 – March 4. N2Africa was well represented; we funded 53 participants, presented 15 posters and 3 talks and led a special session on Grain legume nitrogen fixation and contributions to sustainable intensification. It was a great opportunity to get up to date on all of the great research going on around the world with a special emphasis on Africa. Also a real opportunity for networking and forging new collaborations with a wider community of researchers. Many thanks to all staff and partners who presented and chaired sessions. Immediately afterwards we had the N2Africa Advisory Committee and Annual Planning Meeting in Victoria Falls and then went on to a field trip in Zimbabwe, including many interactions with partners and farmer groups and a visit to the Soil Productivity Research Laboratory Rhizobial Inoculant production plant.

Our Podcaster this week opens with some reflections on the conference from Dr Rebbie Harawa of AGRA, and a report on the N2Africa Advisory Committee (of which Rebbie is a member) together with some of the most important outputs of the N2Africa Advisory Committee, our Annual Report and the field trip. We have articles on a visit with partners in Tanzania, the use of grain legumes for livestock in Ghana, nutrition studies in Ghana and our superb interac-

tive data management system. We have announcements of new publications: (i) the practical manual “Working with Rhizobia” led by Professor John Howieson of Murdoch University to which N2Africa contributed. (ii) reports from a linked ESRC-DFID project which has been measuring the impact of N2Africa in DR Congo. This group is organizing a conference in Bukavu, DR Congo together with IITA in December 2016 on “Assessing the impact of agricultural extension and input subsidies in Eastern DRC”. We also announce the African Association of Biological Nitrogen Fixation 17th Biennial Conference on 17-21 October 2016 which is being organized by Dr Flora Pule-Meulenberg in Gaborone, Botswana and the 12th European Nitrogen Fixation Conference, 25-28 August 2016, Budapest, Hungary.

This week we also launch a new video made to profile the “Soya-ni-Pesa” (Soya is Money) project, which is a partnership led by the Catholic Relief Services, and some of the challenges faced. We made this video last year together in southern Tanzania. You can view the video by clicking on [this link](#).

We hope you enjoy reading this Podcaster and look forward to your contributions to the next edition which will focus on Sustainable Input Supply and Markets.

Ken Giller

Reflections after the Pan-African Grain Legume & World Cowpea Conference in Zambia

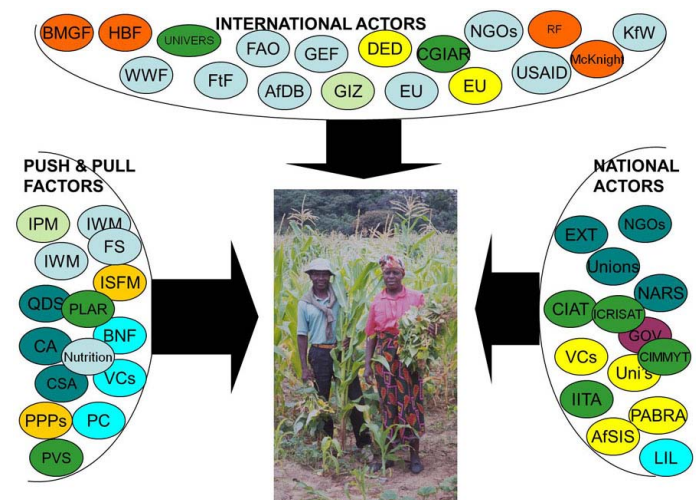
- A perspective on value chain partnerships from Rebbie Harawa (AGRA)

Pan-African Grain Legume & World Cowpea Conference



Listening to presentations for almost a week at the Joint Pan-African Grain Legume and World Cowpea Conference early this year, it was clear that there a lot of efforts that are going on the African continent that are geared towards intensifying legume production for smallholder farmers in a sustainable way. However, a big question was still lingering in mind as to why smallholder farmers were still not catching the ‘fire’ of all these efforts? In almost all the presentation, the picture of low productivity was crystal clear – smallholder grain legume productivity still remains very low – yields achieved of less than 1 ton/ha compared with potential yields of 2-3 ton/ha. And this was also true for cereal crops. On the final day of the presentations, a couple of slides by Prof. Ken Giller of Wageningen University in the Netherlands drew my attention, perhaps because they resonated with my own experience in trying to promote soil technologies among smallholder farmers to improve crop

productivity. His slides showed that the myriad of efforts by the practitioners are creating more confusion than the good they intended to achieve. The pictorial presentation of the efforts looked like a ‘spider web’ with a farmer in the middle as a ‘spider’.



Pictorial presentation of efforts by the diversity of actors and factors involved in improving farmers' crop production (Figure Giller, 2016)

It is therefore true that much soil and crop management knowledge relevant to agricultural production transformation has been generated through decades of research and investment, but the yield for most crops have remained stuck at less than 30% of the yield potential for most African countries (<http://www.yieldgap.org>). This scenario is mainly a function of poor adoption of good agronomic practices (AGRA, 2013), as a result of limited integration and flow of available information across formal and informal institutions and various levels of the agricultural value chain. Often this leads to duplication of research efforts, dissemination of conflicting messages and limited application of the right knowledge in making decisions (Toenniessen *et al.*, 2008). The resulting confusion leads to either limited uptake or inappropriate implementation of good agricultural practices. Further, the existing information is often poorly synthesized and interpreted for local application and remains dispersed across multiple locations, with scientists and institutions. For as development of good agronomic practices requires information integration relevant to soil types, inherent soil fertility status, fertilizer application (type and rates), crop varieties, agro-climatic zones, socio-economic implications, legal and regulatory structures and the input-output market environment.

In trying to bring a degree of normality to the prevailing atmosphere, AGRA in the last 3 years has been supporting Country Soil Healthy Consortia that bring together soil scientists, agronomists, plant breeders, seed scientists, policy experts, extension workers, communication experts, and other relevant stakeholders drawn from across regions of the country. Through the consortia they answered questions such as *who is doing what and where?, what is working?, what are the lessons learnt?*. This has led to harmonizing of agricultural messages going to the farmers and complementarity of the efforts has started showing positive fruits in a number of countries. Again, in an effort to scale up integrated soil fertility management practices using a value chain approach, AGRA recognized the need

for partnerships to help farmers' access knowledge, farm inputs and finance to purchase them, and output market incentives. It's very unlikely that one institution or project could provide all the services on the value chains and therefore coordinated multi-stakeholder partnerships within and between projects become critical.

The Legume Alliance supported by N2Africa in Tanzania (see [Podcaster 33](#)), which recognizes that, when efforts of various partners are joined and when partners can learn from each other, there are high chances to meet the ultimate goal of transforming smallholder agriculture is another good example of bringing normality to the prevailing atmosphere. Needless to say that the smallholder farmers' dream of achieving food security and increasing household income through agriculture will also come true when efforts are coordinated and harmonized. As the African Proverb say *'if you want to go fast, go alone; if you want to go far, go together'*. Intensifying legume production for smallholder farmers in a sustainable way will require joint and well-coordinated efforts.

Rebbie Harawa
Member of the N2Africa Advisory Committee, representing AGRA)

AGRA (2013). Africa Agriculture Status Report: Focus on Staple Crops. Nairobi, Kenya. Issue 1.

Toenniessen G., Adesina, A. and Devries, J. (2008). Building an Alliance for a Green Revolution in Africa. *Ann. N.Y. Acad. Sci.* 1136: 233–242.

Giller, K.E. (2016). Thematic plenary session: Grain legumes nitrogen fixation and contribution to sustainable intensification. Pan-African Grain Legume & World Cowpea Conference, Zambia.

All presentations delivered as keynote plenary, plenary, and topical oral sessions during the Pan-African Grain Legume & World Cowpea Conference can be downloaded from <http://gl2016conf.iita.org/index.php/presentations/>.



Impressions of the plenary session and panel discussion with Theresa Ampadu-Boakye speaking (Photo Edward Baars, 2016)

A flavour of the N2Africa Annual Planning Meeting and field trip in Zimbabwe



Professor Regis Chikowo (left) and Dr Endalkachew Wolde-meskel and Dr Peter Thorne (right) in Goromonzi, Zimbabwe (Photo Obrian Mudyiyenyama, 2016)

The N2Africa Annual Planning Meeting held in Victoria Falls on March 4th-6th focused at exchanging 2015 project wide experiences and country-specific learnings. Informed by annual country plans 2015, legume technologies studies and the M&E evaluation, the meeting gave country coordinators and staff the opportunity to review project progress and tailor this year's country plan. The subsequent field trip in Zimbabwe on March 7th – 9th showed farmers' legume knowledge and its use in the fields and the community.

The participants

The Annual Planning Meeting and field trip in Zimbabwe brought the Project Advisory Committee, country coordinators, project staff, farmers and Zimbabwean representatives of the inoculant factory and dissemination partners together. This mix ensured addressing project successes and field learnings from a multi-disciplinary point of view.



Participants and field practices and learnings in Wedza, Zimbabwe (Photo Obrian Mudyiyenyama, 2016)



Explanation legume production by Mrs Chawonza in Goromonzi, Zimbabwe, recorded by next generation (Obrian Mudyiwanyama, 2016)

The agenda

Discussions and presentations on the first day of the Planning meeting deepened learnings and scaling issues with regard to sustainable supply of inputs, women specific businesses, agronomy feedback loops and trials, nutrition research and usage of project M&E data.

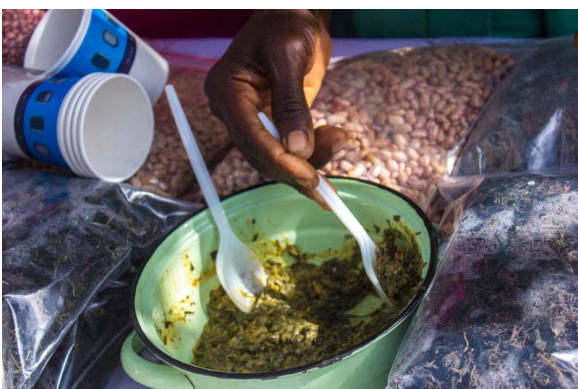
The second day of the meeting focused on emerging challenges and ideas that could be followed up at country-level. Ideas were further explored and discussed during an informal Zambezi Cruise.

Visiting the farmer communities and fields in three different districts in, Zimbabwe showed the extensive knowledge farmers had and the variety of treatments, practices and produce among participating farmers. During the seminar at the University of Zimbabwe students, staff and teachers were informed about the latest research results with regard to cultivating legumes in various agro-ecological settings.

The outcomes

Inspiration and new ideas, recommendations from the advisory committee, amongst others, and learnings resulted in prioritised activities at country level, and are used to tailor the country-specific action plans and partner work plans for 2016. The follow up is to put solutions into practice to strengthen further implementation in 2016, as discussed below.

Minke Stadler



Legume products produced by female farmers in Wedza, Zimbabwe (Photo Obrian Mudyiwanyama, 2016)

N2Africa key facts 2015 and learnings 2016

Today

- A total of 97 partnerships have been formed. Partners include private input suppliers, buyers, universities and research institutes and development partners, amongst others.
- A total of 7,961 professionals (36% female) in partner organizations have been trained across topics such as legume agronomy, handling and application of trials, post-harvest practices, data collection using tablets, legume processing and utilization, business plan development and marketing, and credit and savings.
- A total of 257,404 (42% female) farmers has been reached with N2Africa technologies through partnerships' implementation and capacity building activities.
- 64 media events (e.g., radio talk shows, agricultural shows, TV shows, among others) were organised in all countries.
- A total of 7.96 tons inoculants, 625.2 tons seed and 628.2 tons fertilizer were used on farmers' main fields.
- 2,000 farmers (56% female) in Ghana, Nigeria and Uganda validated labour-saving tools, such as hand-drawn planters, threshers and herbicides.
- Average yield of all target legumes cultivated on diagnostic and demonstration trials in Nigeria, Ghana and Uganda showed an increase after adding P-fertilizer (47%, 32%, 32%, respectively).
- Average yield of bush bean, climbing bean, cowpea and faba bean on diagnostics and demonstration trials increased after adding P-fertilizer (39%, 36%, 32%, 37% respectively).
- The completed Monitoring & Evaluation System collects data on partnerships, dissemination and research and supports the exchange of information and mutual learning. Data has been collected electronically through ODK and are immediately available for analyses.

See for more information: [N2Africa Annual Report 2015](#)



Zambezi cruise: The plume of smoke in the centre is Victoria Falls or the Mosi-oa-Tunya (The smoke that thunders) (Photo Charlotte Schilt, 2016)

Focus for 2016

- Identify and connect community based agro-dealers for last mile sales and delivery.
- Strengthen the input supply strategies of specific partnerships to enhance availability and access to inoculant, seed and fertilizer by new farmers and those already reached.
- Integrate market requirements in the partnership implementation plans and country-specific activities.
- Integrate validated labour-saving tools in commercial agro-services to ensure in actual use of the preferred tools.
- Improve quality control of marketed inoculants at the point of farmers' usage.
- Ensure quality of Monitoring and Evaluation Data, review and improve the M&E System.

Theresa Ampadu-Boakye and Minke Stadler

N2Africa visiting the inoculant factory in Zimbabwe

During the N2Africa Field Visits 2016 in Zimbabwe, we visited the inoculant factory in Marondera. The Soil Productivity Research Laboratory (SPRL) in Marondera, Zimbabwe hosts the government-owned inoculant factory of Zimbabwe. It is the sole facility in the country and was opened in 1962 (Corby, 2011)¹. In the early days, the inoculant factory produced inoculants for pasture legumes, mainly lucerne and clover species. Production of soyabean inoculants commenced in 1967. The factory is supported by a non-profit, government-owned microbiology laboratory which sets standards, performs inoculant quality-control duties and maintains the Grasslands Rhizobium Collection (Marufu *et al.*, 1995)², (Giller *et al.*, 2011)³.

In 2015, the factory produced about 50,000-60,000 packages (each pack weighs 50 g) of legume inoculants from September - November. The factory has an annual capacity of over 180,000 packs, which is directly related to the actual demand. About 90% of the produced inoculants are for the production of soyabean, although inoculants are also made for *Phaseolus vulgaris*, *Pisum sativum*, *Lens culinaris*, *Trifolium spp.*, *Medicago sativa*, *Desmodium spp.*, *Arachis hypogaea*, *Stylosanthes spp.*, *Crotalaria juncea* (Bala *et al.*, 2011)⁴. The *Medicago sativa* inoculants are only made on demand.

The recently published manual “Working with rhizobia” (Howieson and Dilworth, 2016)⁵ provides scientists and technicians modern guidelines for ensuring that the legume symbiosis with rhizobia is optimised. Chapter nine of this manual addresses the steps and procedures used in inoculant production and quality control.

The quality of the produced inoculants is ensured by the inoculant quality control (QC) system. Randomly selected samples are taken from each production step and tested

at the laboratory to control the quality. In the incubator, the produced inoculated packs are kept at 28°C for 14 days, after which they are graded for fungal contamination. The approved high quality inoculants are stored at 4°C, until they are distributed to the governmental headquarters in Harare and approved agro-dealers, where the packages are sold to smallholder farmers.

We will continue to support all countries to establish robust quality control procedures, also at other stages through the supply chain (storage, transport and delivery). N2Africa will also support the SPRL inoculant production facility in Zimbabwe to improve and guarantee that consistent quality inoculants are delivered to farmers. Possibilities to export inoculants to Mozambique and Malawi are further explored. We would like to thank Mrs. Mazvita Chiduwa for her clear clarification and guidance during our visit. Mazvita is back in charge of inoculant production at SPRL while completing her PhD thesis funded by N2Africa.

Minke Stadler

⁴Bala, A., Karanja, N., Murwira, M., Lwimbi, L., Abaidoo, R. and Giller, K. (2011). Production and use of Rhizobial inoculants in Africa, *www.N2Africa.org*, 21 pp.

¹Corby, H.D.L. (2011). The Bagacillo legume-inoculant. Retrieved March 21th, 2016 from <http://www.hdcorby.com>.

³Giller, K.E., Murwira, M.S., Dhlwayo, D.K.C., Mafongoya, P.L. & Mpeperekwi, S. (2011) Soyabeans and sustainable agriculture in southern Africa. *International Journal of Agricultural Sustainability*, **9**, 50-58.

⁵Howieson J.G. and Dilworth M.J. (Eds.). (2016). Working with rhizobia. Australian Centre for International Agricultural Research: Canberra.

²Marufu, L. Karanja, N. and Ryder, M. (1995). Legume inoculant production and use in East and Southern Africa. *Soil Biology and Biochemistry*, **21**(415), 735-738.



Production of inoculant at the SPRL Inoculant factory in Marondera, Zimbabwe (Photo Minke Stadler, 2016)

N2Africa agronomy trials and farmers' recommendations in Tanzania

This article is based on an article in the *IITA Bulletin* of 28 March-1 April 2016

“Can the use of soyabean inoculants reduce the use of nitrogen fertilizers? How much fertilizer should soyabean farmers continue to apply in subsequent seasons? What are the

long term effects of fertilizers, inoculants and soyabean and maize intercropping? N2Africa tries to find out,” said Freddy Baijuyka, Country Coordinator for N2Africa in Tanzania.



A member of Umoja farmers group sharing feedback on the soyabean trials (left), long term trials on soyabean and maize (middle) and Joseph Mompesh showing the soyabean field trials (right)

The soyabean field trials result in recommendations on how to minimize the use of fertilizers by maximizing the fertilizers applied and inoculants. Therefore, lead farmers are using inoculants and fertilizers while growing their soyabean. Lead farmers are also rotating soyabean and other crops such as maize and they applying fertilizers on the maize.

A team of N2Africa researchers, staff and partners from Agricultural Research Institute at Uyole (ARI Uyole), International Institute of Tropical Agriculture (IITA), International Center for Tropical Agriculture (CIAT), the International Crops Research Institute for the Semi-arid Tropics (ICRISAT), One Acre Fund and Farm Inputs Promotion Services (FIPS), Jeff Ehlers, Senior Project Officer for N2Africa of the of the Bill & Melinda Gates Foundation visited N2Africa soyabean trials in the Southern Highlands of Tanzania.

The visited field trials in the Mbeya Region are being conducted by Agricultural Research Institute at Uyole (ARI

Uyole) and the International Institute of Tropical Agriculture (IITA). The visited farmer's demonstration fields at Iwanga village, Mbezi district are being conducted by Umoja farmers group in collaboration with ARI-Uyole and N2Africa. Farmers use these demonstration fields to select the most preferred soyabean variety for official release in the region.

"We are growing these three new varieties to select the one we prefer the most. As you can see some are already looking very promising. But we cannot tell for now until we harvest. Then we will see which will have the best yield and we will recommend this to the researchers," explained Joseph Mompesh, a lead farmer who acts as a link between farmer and researchers.

The results from the field trials and demonstration fields 2015 and 2016 help to promote the production of soyabean in Tanzania and tackle poverty and malnutrition.

Catherine Njuguna

Improving traditional storage systems of grain legume residues for livestock feeding in Ghana

Crop residues are an important livestock feed resource and as such they are linking crop and animal production in West Africa. They are the second largest feed source for livestock after grazing, especially in the dry season in the savannas.

Grain legume residues (GLRs) such as those of groundnut, cowpea and soyabean are considered more valuable feed resources than cereal crop residues, since they have higher nitrogen contents and digestibility. Moreover, inclusion of small quantities of GLRs in cereal-straw based rations of ruminants may improve intake and utilization of the low quality feeds by supplying the limiting nitrogen, and hence contribute to improved animal production.

Experiments are currently being conducted to investigate the traditional storage systems of grain legume residues for livestock feed in northern Ghana.

The objectives of trials are:

1. Study the feed quality degradation in traditional storage systems of GRLs for livestock feeding;
2. Study the effects of different storage systems and length of storage on quality and palatability of GRLs;
3. Determine the animal preference for stored GRLs over time;
4. Determine farmers' preference for the GRLs storage systems.

The experimental design used was a split-split plot design with 18 observations replicated four times in different communities (farms). The treatments included: whole plot - 3 types of storage locations (rooftop, tree fork and room), sub plot - 3 types of grain legume residues (cowpea, groundnut and soyabean) and sub-sub plot - 2 types of packing (sacks and tied with ropes). Figure 1 shows the three types of storage locations.



Figure 1: Three types of storage locations of the GLRs, A = Rooftop, B = Tree fork and C = Room (Photo Daniel Brain Akakpo, 2016)



Figure 2: Evaluation of stored GLRs after two months of storage by; A = Farmers and B = Animals (sheep) (Photo Daniel Brain Akakpo, 2016)

Data collected during storage are monthly weight loss and weekly temperature in the heaps and sacks. Stored GLRs are sampled monthly to evaluate fodder quality, using quality indicators such as crude protein (CP), neutral detergent fibre (NDF), Acid detergent fibre (ADF), in-vitro

digestibility and leaf-stem ratio. Physical quality of stored GLRs was also evaluated by farmers and through palatability tests with sheep (Figure 2).

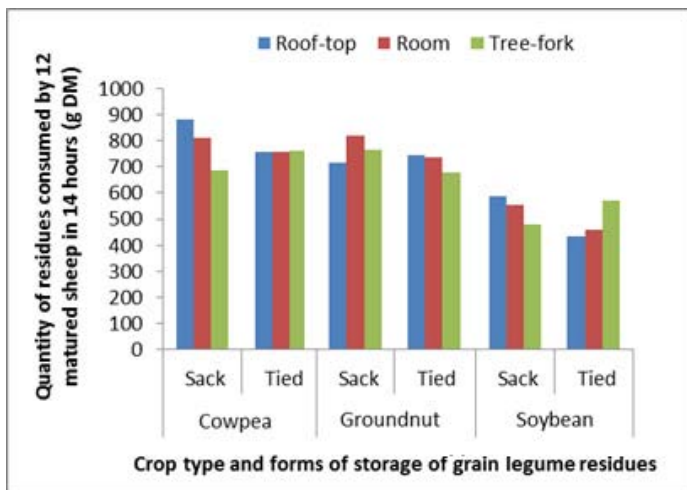


Figure 3: Effect of type of storage location, GLR type and type of storage on quantity of residue consumed by 12 matured sheep in 14 hours in a palatability test (Daniel Brain Akakpo, 2016)

Preliminary results indicate that farmers prefer cowpea residue as feed source for their animals to groundnut and soyabean residues. Palatability tests (1 kg GLR of each treatment was served in a cafeteria manner to 12 mature sheep during 14 hours and intake of each was recorded) indicated that there was significant difference ($P < 0.05$) in quantity of residues consumed by animals among GLR types (Figure 3). Animals prefer cowpea residues more to the rest of the residues. The fodder quality assessed by laboratory measures and leaf-stem ratio will be used to explain the ranking and the selection made by the farmers and animals, respectively.

The outcomes of the present study will be discussed with farmers and we hope that farmers will learn from it and adopt the best practice.

Daniel Brain Akakpo

School Feeding Program in Ghana

Caterers and cooks enriching school meals with soyabean recipes

This article was published before on [N2Africa Facebook](#)

Soyabean is one of the most promising grain legume crops for improving both human and livestock nutrition in northern Ghana due to its high protein content. Although the crop has been promoted during the past decade by the Ministry of Food and Agriculture, amongst others, it is rarely consumed by households. This is mainly due to inadequate skills and knowledge in its processing and utilization.

N2Africa project in collaboration with its partners and the Ghana School Feeding Program (GSFP) organized a Training of Trainers for 112 caterers and cooks from 100 schools. The caterers were trained in the preparation of about 15 recipes and on how to incorporate processed soyabean in the diets of the school children. N2Africa will monitor the inclusion of soyabean recipes in the school meals.



School children enjoying some of the recipes at one of the training venues



Soyabean recipes in the school meals in northern Ghana (Photo Eric Doe)

Using soyabean in the school feeding program facilitates market linkage between farmers and GSFP to create an organized market outlet for farmers' produce. The training and inclusion of soya recipes in the diets of the school children serves as a springboard for the achievement of the project milestones; increased incomes, improved nutri-

tional status of beneficiary women and children, assess business opportunities for women in legume marketing and value addition, and develop legume-product enriched food baskets for smallholder families.

Eric Doe and Samuel Adjei-Nsiah

Women's position, dietary nutrient adequacy and nutritional status of children in Ghana

The prevalence of malnutrition in terms of stunting and wasting is high in rural Northern Ghana. Agriculture plays an important role in access to food, as agriculture represents the population's main livelihood activity in the area. Hence, multiple programs (including N2Africa) aim to address malnutrition by increasing agricultural production.

The position of women is one of the pathways through which agriculture affects children's dietary nutrient adequacy and nutritional status, as women tend to prioritize the nutrition and health of their children. An empowered and healthy woman, is better able to control resources needed for good care, in turn stimulating the nutritional status of her children.



Froukje interviewing female key stakeholders in Ghana (Photo Sofia Argyropoulou, 2015)

Froukje studied how the position of mothers is related to dietary nutrient adequacy and nutritional status of children of 6-23 months old. The position of mothers included the health status and different domains of empowerment, like decision-making power, mobility, attitude towards and freedom from domestic violence, socio-economic status, marital characteristics etc. Together with another student Sofia, a translator, guide and driver a total of 51 households were visited. Mothers were interviewed to assess the degree of maternal empowerment regarding different domains. Interviews were held with key stakeholders in the area. Pre-existing data of the quantitative dietary intake study was used to establish child's dietary diversity, child and maternal nutritional status and maternal socio-economic characteristics. The report can be found [here](#).

Results of the research implicated that different aspects of the position of women seem to relate differently to child nutrition. Whereas some domains do not affect children nutritional outcomes, others seem to benefit or harm children's diet. First, findings revealed that stunted children (chronically undernourished) are more likely to have mothers who do not experience domestic violence, do not experience physical mobility constraints and are older. In other words, based on these indicators, results imply that empowered women have children with better nutritional status in terms of stunting. Second, findings showed that wasted children (acute undernourished) are more likely to have mothers with an impaired health status i.e. mothers with a better health status have children a better nutritional status in terms of wasting. Therefore it is concluded that policies and interventions need to consider the different impacts of domains of mother's position on children's nutritional outcomes and hence be sensitive to the context and culture.

Froukje Takens

Froukje Takens completed her BSc in human nutrition and just received her MSc diploma in Health and Society, with a focus on sociology of consumption and households, at Wageningen University. For her master's thesis she did fieldwork in Karaga district in Northern Ghana. She re-visited households who have participated in an earlier quantitative dietary intake study conducted by Ilse de Jager and others (see [Podcaster 31](#)).

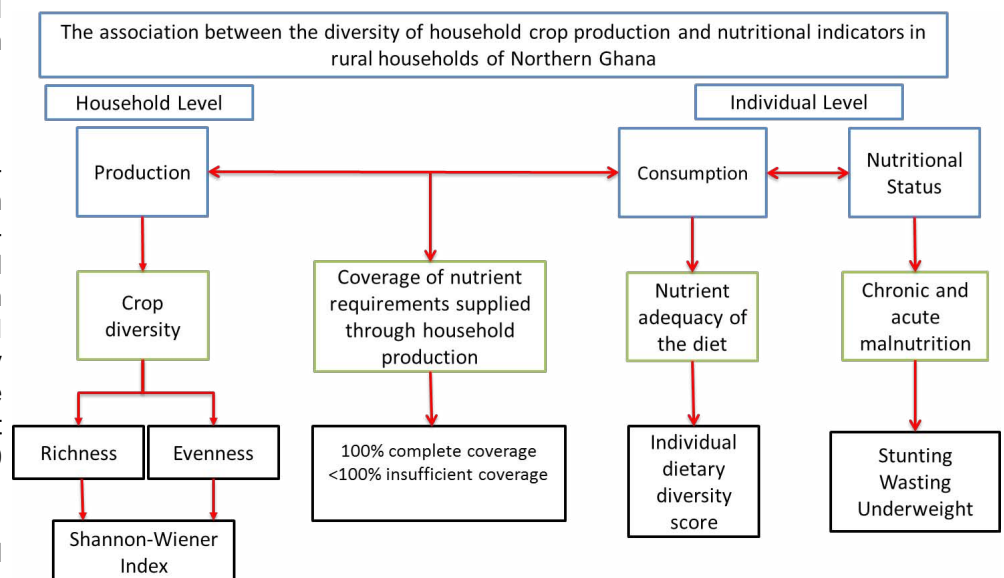
The association between the diversity of crop production and nutritional indicators of rural households in Ghana

We investigated how household production diversity is correlated with dietary diversity and nutrition of infants and young children living in rural farming communities in northern Ghana.

The nutrition indicators included: (i) coverage of household nutrient requirements supplied through household production (ii) the individual dietary diversity score and (iii) the nutritional status of children 6 to 23 months old. Data was used from an earlier quantitative dietary intake study conducted by Ilse de Jager and others in Karaga district in Northern Ghana among 400 households (see [Podcaster 31](#)).

We found that higher household crop production diversity is associated with higher coverage of nutri-

ent needs of household members by household production. Looking at the coverage of nutrient requirement supplied



The study design shows how indicators are linked to production and consumption (Argyropoulou, 2015)

through household production, only 43.4 percent of micro-nutrients supplied covered the daily requirements of all members of a household. Vitamin A, vitamin C, vitamin B2, vitamin B12, calcium and folate were not covered in the household production. The study did not show associations between diversity of household production and dietary diversity of children 6 to 23 months or nutrition status of these children. This suggests that household production diversity does not necessarily translate into improved diets of infants and young children. However, markets may play an important role in this relation. Future research could include further insight on markets influence on food consumption, income expenditure and intra-household

distribution of food to determine the potential of household production diversity to affect the dietary quality of infants and young children 6-23 months in rural areas of sub-Saharan Africa. Sofia's internship report can be found [here](#).

Sofia Argyropoulou and Ilse de Jager

Sofia Argyropoulou just completed her MSc in Human Nutrition at Wageningen University. She did her internship for the Netherlands Environmental Assessment Agency (PBL) in collaboration with the Slow Food organization, conducting a literature review on agriculture and nutrition.

An erratum of sorts

In [Podcaster 34](#) of last year, we reported on progress on our data flows. As an example of how fast data turnover enables timely learning, we presented results of a 2015 climbing bean diagnostic trial in Uganda. Two figures showed the average effects of different inputs and the variation in those effects across different districts.

After seeing the results, the Uganda team kindly pointed out that the data used for the analysis contained an error. One of the soyabean trials from Pallisa, turned out to have been erroneously documented as a climbing bean trial. Based on this new insight we could correct the data and present the adjusted figures (Figure 1 and Figure 2).

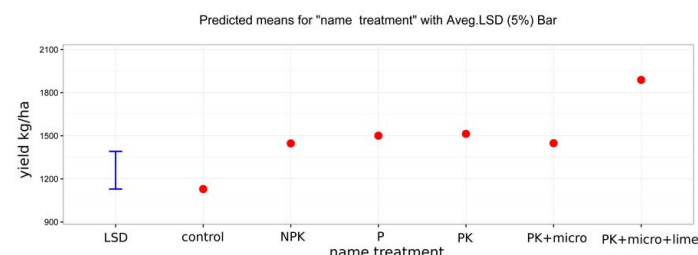


Figure 1. Graph showing average yields for different treatments in a climbing bean diagnostic trial (with the 5% least significant difference shown in blue) in Uganda

The detection and removal of this minor error shows the strength of our data management system. By generating early feedback on data analysis, country teams and data analysts can quickly draw lessons from the most recent

N2Africa in the news

The [IITA Bulletin 2319](#) published articles how N2Africa helps farmers in Nigeria and Borno State gain access to markets and agro inputs, and get women and youth agripreneurs into business. Next to the article on the agronomy trials and farmers' recommendations in Tanzania that we included in this Podcaster, there are more articles showing pictures and giving information on the background and aims of N2Africa.

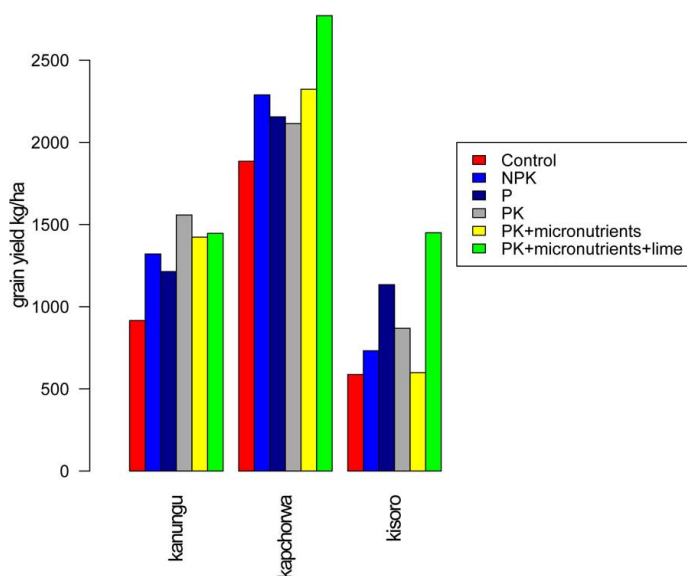


Figure 2. Graph showing mean yields for different treatments per district in the same diagnostic trial in Uganda

trials and can immediately spot inconsistencies in the data. The system has now advanced further by the addition of an on-line analysis tool that offers the ability to perform exploratory statistical analysis within a day after uploading the data.

We hope that this new tool will help country teams to quickly summarise, explore and check their most recent data.

Joost van Heerwaarden

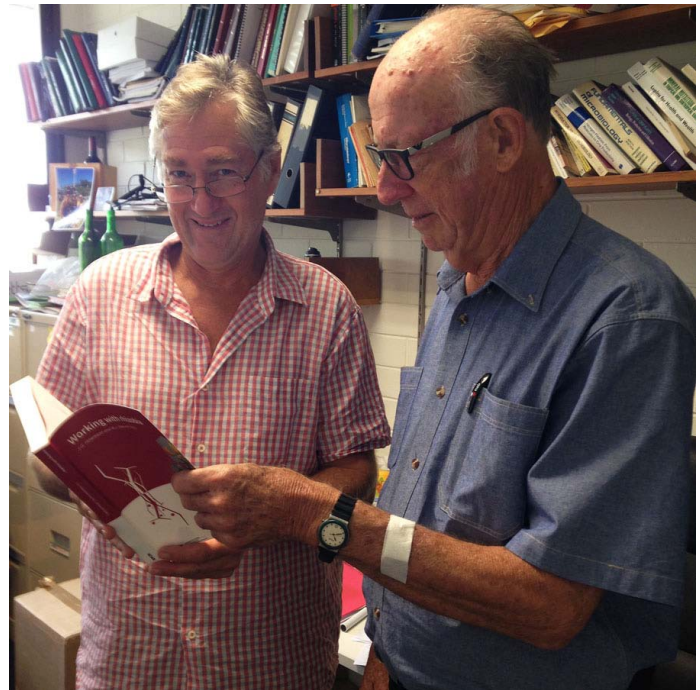
Ken Giller of Wageningen University gave a presentation at the American Association for the Advancement of Science meeting in Washington in February. He was interviewed by a journalist, Alison Takemura and the interview was posted on the blog ["The Plate"](#) of [National Geographic](#). The article describes how the project gives farmers hands-on training to expand their cultivation of legumes and experiment with different techniques to make their crops more productive.

Related publications

Centre for Rhizobium Studies published manual “Working with Rhizobia”.

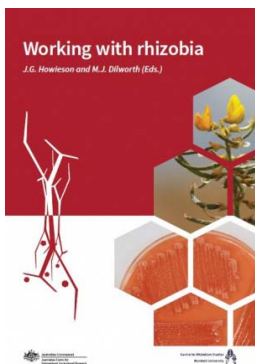
The nitrogen-fixing symbiosis between legumes and soil bacteria (known as rhizobia) is fundamental to sustainable agriculture. While synthetic nitrogen fertilisers have boosted agricultural outputs, they require large amounts of fossil fuels, whose burning increases production of greenhouse gases. In contrast, rhizobia in legume nodules are able to fix atmospheric nitrogen and supply it to their legume partners, and so can provide food and fibre to a growing world population while maintaining soil fertility and the natural environment. This process is called symbiotic nitrogen fixation.

Now, Murdoch University’s Professor John Howieson and Emeritus Professor Mike Dilworth have edited the first legume-rhizobia techniques manual in over 30 years for all those working in the field of symbiotic nitrogen fixation. The idea for the book came about at a workshop held on Rottnest Island, off the coast of Perth, in 2011. At the workshop, which was sponsored by N2Africa, it was decided that an updated manual would be very timely, given the launch of N2Africa and the new focus on N-fixation. This manual brings together state-of-the-art methods for the study of root-nodule bacteria, both in the free-living state and in symbiosis with legumes.



The editors admiring the new publication

*N2Africa is purchasing 100 copies for distribution to partners. Please write to N2Africa.office@wur.nl if you want one.



In each chapter, the manual introduces a topic and provides guidance on how study of the symbiosis might best be tackled. Detailed descriptions are provided of the protocols that need to be followed; potential problems and pitfalls are identified. Topics covered include acquiring, recognising, growing and storing rhizobia, experimenting with strains in the laboratory, glasshouse and field, and applying contemporary

molecular and genetic methodologies to assist in the study of rhizobia.

The manual “[Working with rhizobia](#)” is especially relevant for researchers in agricultural systems that are constrained by nitrogen infertility, but where farmers cannot afford the high cost of manufactured fertiliser.

Research support for this manual was provided by Murdoch University, ACIAR, the Crawford Fund and the Bill & Melinda Gates Foundation (through N2Africa), and Australian Wool Innovation and the Grains Research and Development Council (through the National Rhizobium Program).

Professor John Howieson, Murdoch University and former N2Africa Advisory Committee member.

ESRC - DFID Project: Assessing the impact of agricultural extension and input subsidies in Eastern DRC

Researchers from the Development Economics Group at Wageningen University teamed up with the N2Africa program to assess the impact of their program in Eastern DRC. The key research objectives are to (1) create an assessment of household characteristics and needs for improving agricultural yields in Eastern DRC (2) Assess the impact of the N2Africa agricultural extension services and access to subsidized inputs on knowledge, attitudes and adoption of new inputs for grain legumes.

The research project is a joint effort between Wageningen University and the International Institute for Tropical Agriculture (IITA), International Center for Tropical Agriculture (CIAT), Consortium for Improving Agriculture-based Livelihoods in Central Africa (CIALCA), Catholic University of Bukavu, and UNU-MERIT as well as the DRC based implementing organisations PAD, DIOBASS, WOMEN for WOMEN, SARCAF, IPLCI & CDC/Kiringye. Funding is provided by the Growth Research Program of ESRC - DFID.

The first main descriptive and qualitative research findings are now online via www.n2africa.org, [N2 Links](#) and in near future more will be uploaded. Results of the impact assessment are available soon.

Contact: For more information please contact Maarten Voors via maarten.voors@wur.nl



Reports and other output uploaded on the N2Africa website

Annual reports 2015 for [DR Congo](#), [Rwanda](#) and [Malawi](#).

The report written by CropLife for N2Africa about the [assessment of contract sprayers in Borno State, Nigeria](#). See also the [article in the previous Podcaster](#).

Related newsletters

Tropical Legumes III aims to improve the livelihoods of smallholder farmers in drought-prone areas of the two regions through enhanced productivity and production of grain legumes. [This bulletin](#) highlights critical lessons and achievements from the Seed Systems Project.

The [March 2016 ADVANCE Newsletter](#), with articles on ADVANCE bringing together maize and soyabean value chain actors to network and develop business relationships; Anti-bushfire campaign records successes; The youngest ADVANCE beneficiary farmer paves the way for the youth to enter agriculture; ADVANCE celebrating Women Farmers to mark International Women's Day; Diare Women's Group benefitting from Numeracy Training.

Announcements

The 17th African Association of Biological Nitrogen Fixation (AABNF) conference

The Botswana University of Agriculture and Natural Resources (BUAN) organizes the 17th African Association of Biological Nitrogen Fixation (AABNF) conference to be held in Gaborone, Botswana from 17 – 21 October 2016.

This conference will focus on strategies to increased food production in Africa through sustainable means. Chief amongst those is the use of biologically fixed N because of its green nature. Nitrogen together with phosphorus and soil moisture are the most important constraints to arable production in many African countries.

Update on the 12th European Nitrogen Fixation Conference

We already announced the 12th European Nitrogen Fixation Conference August 25-28, 2016 in Budapest and have two updates:

- The extended deadline for submitting abstracts is April 25th 2016!
- Parallel with this the new deadline for submitting application for FEMS Young Scientists Meeting Grant is also April 25th, 2016!
- 20 renowned speakers have already contributed to building an exciting program (see <http://enfc2016.hu/speakers/>).
- two satellite meetings will also be held; one is on the Genomics of Nitrogen-Fixing Organisms: <http://enfc2016.hu/genomics-of-nitrogen-fixing-organisms/>; the other is on the BNF-Non Legumes: <http://enfc2016.hu/bnf-non-legume-satellite-symposium/>.

Information about the conference agenda, registration process, abstract submission, travel and accommodation etc. can be found at <http://enfc2016.hu/>.

Conference “Transition and Local Development in Eastern DRC”

Wageningen University and IITA are involved in organising a conference during 8-10 December 2016 in Bukavu, DRC, at the Kalambo campus of the Catholic University of Bukavu.

The conference will provide an overview of the current social science research on transitions and local developments in eastern DRC; it will bridge the policy-academic divide; and bring together a host of research institutions.

See for more information and how to apply: <http://cegemi.com/index.php/bukavu-conference-2016/>. Maarten Voors (ESRC - DFID Project) is looking forward to seeing you 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

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