

N2Africa Podcaster no. 55

February and March 2019

Introduction

I've been experiencing some pretty extreme changes in temperature recently – in early March I was in southern Mali with temperatures around 35°C and then in the snow in Norway the next week with N2Africa colleagues for a RoundTable on Sustainable Soyabean. Samuel Adjei-Nsiah has kindly written a report on our visit below and we are hopeful that the roadmap that we are developing will lead to action soon.

In this Podcaster we bring you a summary of an important report on dissemination approaches deployed in Tanzania which has been finalised and published on our website. We are also delighted to bring you updates on follow up to N2Africa that is ongoing in the five Tier 1 countries where our direct activities ceased in 2017. We also have a report on some exciting research being done at the University of Oxford by Marcela Mendoza-Suarez in Phil Poole's lab – together with some beautiful photos of nodules! In addition you will find links to a number of new publications from N2Africa and other news items. Read on!

Ken Giller

The Sustainable Soyabean Roundtable in Oslo, Norway

The Minister of Food and Agriculture of Ghana has requested N2Africa and Yara to boost soyabean production in northern Ghana as part of the “Planting for Food and Jobs” initiative. Here we report on progress.

On 5 November 2018, an N2Africa team comprising of Ken, Bernard, Theresa and Samuel and a team from Yara, comprising of Derick Tuffour, Danquah Addo-Yobo and Øystein Botillen, met at the IITA office in Accra, Ghana to discuss the possibility of forming a partnership around soyabean to continue with N2Africa project with possible funding from Norwegian government. Present at the meeting were also two IITA scientists; Dr. Richard Asare, coordinator for CocoaSoils and Dr. Fred Kizito, IITA country rep for Ghana. We also met with Forster Boateng, Country Manager for AGRA who expressed enthusiasm to collaborate on this initiative.

On 6 November, the N2Africa and Yara team visited the Norwegian Embassy in Accra to present and discuss with them what we have called the Sustainable Soya Initiative. The team then went on to the Ministry of Agriculture and discussed with the Deputy Minister who confirmed the request to N2Africa and Yara. Further to these discussions, the team developed a concept note on how best to address the challenge and opportunity.



N2Africa team at the Norwegian University of life Sciences, Ås, Oslo, in the snow. From left to right: Victor Antwi (AGRA), Ken Giller, Theresa Ampadu-Boakye, Bernard Vanlauwe, Samuel Adjei-Nsiah.

Following this, Yara invited a small group of experts and leaders to a roundtable discussion in Oslo. The roundtable discussion was preceded by presentations by Ken and Bernard on the 14 March at Norad office in Oslo and at the Norwegian University of Life Sciences.

The Sustainable Soya Roundtable took place on 15 March 2019 at the Yara Headquarters in Oslo. A wide range of stakeholders joined the discussion, including representatives



A roundtable discussion among a small group of invited experts and leaders, hosted by Yara International in Oslo addressed a wide range of soya related issues. Photo: Camilla Nyhuus Christensen, Yara.



Theresa presenting at YARA HQ

from Norwegian Ministry of Foreign Affairs, Norfund, Norad, Yara International, a number of Norwegian feed companies, GIZ, AGRA and the N2Africa team of Ken, Bernard, Theresa and Samuel.

The Roundtable started with a series of short introductory presentations, a wide-ranging brainstorming and an in-depth discussion. There was general support in the room to establish a public-private partnership for a Sustainable Soya Initiative. The N2Africa team have been charged with preparing a roadmap and business case for the initiative and this work is already underway.

Samuel Adjei-Nsiah, N2Africa Country Coordinator for Ghana

A combination of dissemination approaches to scale-up legume technologies in Tanzania

In Tanzania, N2Africa and a number of related projects jointly developed and applied a range of innovative communication approaches to scale-up improved legume technologies. To assess the effectiveness of these communications approaches, N2Africa, the Centre for Agriculture and Bioscience International (CABI), Farm Radio International (FRI) and other partners designed a survey tool using Computer Aided Telephone Interviews (CATI). The survey consisted of two modules: the first module focused on farmer behaviour on beans and soya-bean, their intention to buy seeds and inputs, and the availability of inputs; the second module focused on farmer exposure and learning through dissemination campaigns. A report with the results of the second module has just been uploaded on the N2Africa website [\[LINK\]](#), and we share some highlights here.

The target group for the survey were farmers from N2Africa and related projects (SILT, GALA and UPTAKE) in the main bean and soyabean growing regions in Tanzania (Figure 1). About 2900 farmers had been contacted for the first survey module, and over 1600 of these farmers could be reached a second time to complete the second module. From the farmers participating in the second module, 86% recently grew beans or soyabean, while 91% intended to do so in the next suitable season. The most important sources of information on beans or soyabean that respondents mentioned were their own experience (almost 50%) and demonstration or adaptation trial plots (30%) (Figure 2).

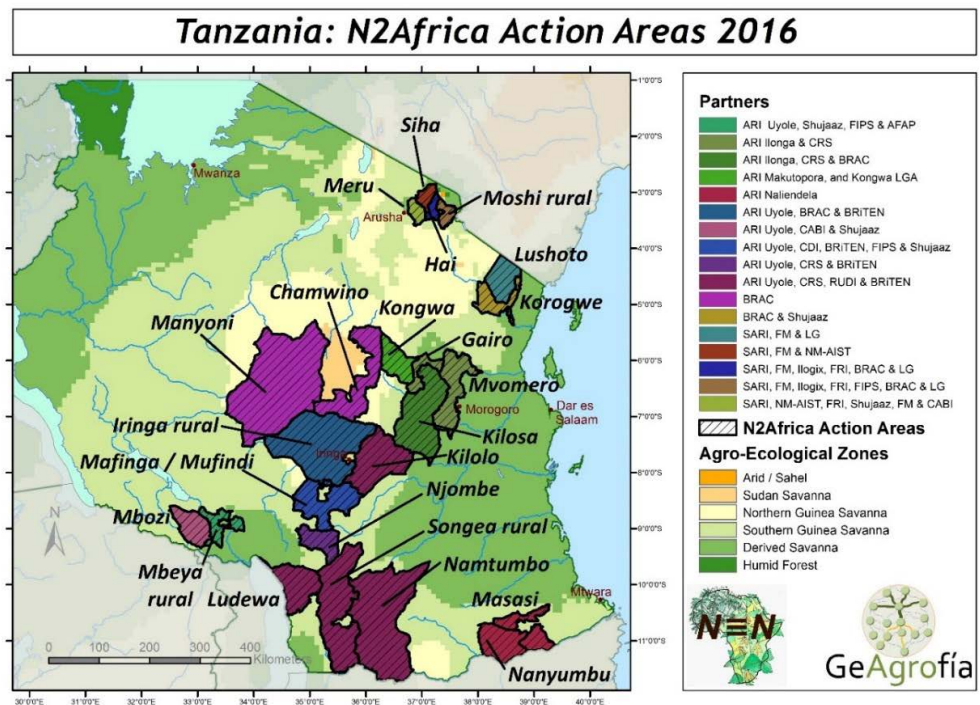


Figure 1. N2Africa Action areas - Districts in 2015-2018

Radio programs, another dissemination tool applied, were mentioned by 4.2% of the respondents. As part of the survey tool, these respondents subsequently listened to the introduction jingles of the five radio programs broadcast by Farm Radio International, and of these respondents 46% mentioned to have listened to one or more of the survey target radio campaigns (2% of the total of 1,646 respondents). Despite near equal exposure to the radio campaigns, women listened to fewer episodes than men: 80% of women listened to three or less episodes, against 37% of men, while half or more episodes of the target campaigns applied to 45% of the men and 8% of the women.

Respondents were also asked what they learned from the N2Africa and partners' dissemination campaigns.

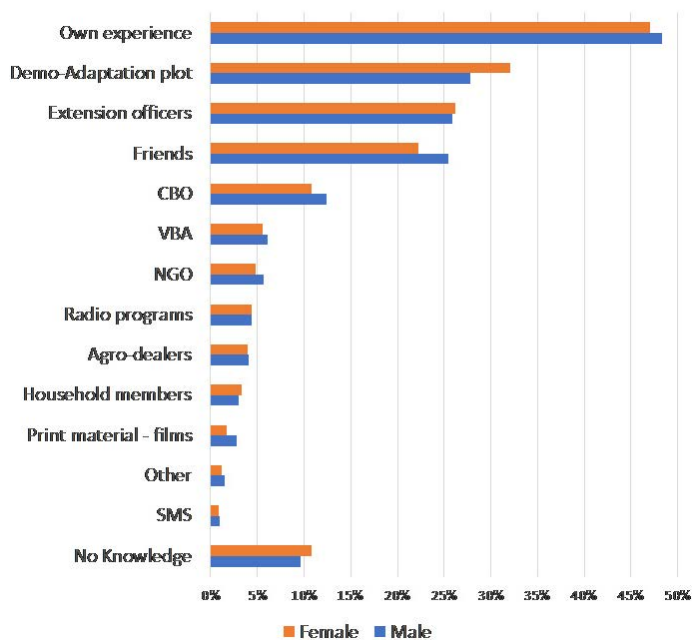


Figure 2. Knowledge sources on beans and/or soyabean (n=1,646). CBO = Community Based Organization, VBA = Village Based Advisor.

Row cropping and earlier land preparation were the most frequently mentioned topics (37% of respondents), followed by the use of chemical fertilizer (31%), the use of quality seeds (22%), manure (21%), pesticide (19%), herbicide (4%), inoculants (3%) and PICs bags for storage (2%). The learning topics were in line with the topics mentioned in the first survey module about the uptake of practices, although the percentages of uptake were often much higher as not all topics would have been new to the respondents. For instance, the first survey module showed that PICS bags were used by 29% of the respondents, and chemical fertilizers by 44%. For seed, only 9% of the farmers had bought certified-quality seeds. However, on the question about farmers' intention to 'purchase certified seeds of the most preferred variety', 68% confirmed this intention. This means that uptake of quality seed was mainly hampered by lack of availability/ inaccessibility, and not by awareness on the use of quality seeds. For 'use of inoculants', mentioned by only 3% as major learning topic, 8% of the farmers used, and about 20% of the farmers were aware of inoculants, of

which 83% intended to buy inoculant. Of this 83%, three quarters did not have a source to buy inoculants. Like for seeds, uptake is therefore constrained by non-availability, but in contrast, low awareness is also an important limiting factor for the uptake of inoculants.

About two-thirds of the respondents mentioned that an 'intervention' had also influenced their learning. From these respondents, 85% mentioned demonstration plots, 10% radio programs and 7% information leaflets and posters. The importance of demonstration plots can be explained by the sampling strategy: 90% of the respondents were involved in N2Africa. 'Interactions' that led to learning were own experience, extension officers, and neighbours, friends and family. On private sector chain actors, 15% of the respondents mentioned community based organizations, 8% village-based advisors, 7% agro-dealers and 0.3% a private company. Almost all respondents were interested in receiving additional information, with the most popular topics being 'quality seeds', 'markets', 'marketing', 'pesticide use', 'use of the right variety' and 'use of chemical fertilizer'. Markets and marketing were more frequently mentioned by men than women, and if these two topics are combined were mentioned by nearly half (42%) of the respondents.

Concluding, 85% of the respondents learned something on bean or soyabean, largely through demonstration plots. However, different types of dissemination approaches are useful for different types of messages: mass media like radio can be used for simple messages, e.g. to raise awareness on a new variety or the presence of a pest, but are less suitable for more complex information like the proper use or benefits of inoculants. Demonstration plots played an important role for such more complex messages. The investment required to achieve this level of effectiveness in learning was made possible through the N2Africa Public Private Partnership (PPP) approach, which is therefore a recommended mode for the implementation of value chain projects to contribute to increased awareness.

Edward Baars, IITA, Abuja, Nigeria and Esther Ronner Wageningen University & Research

N2Africa legacy in DRC / The three questions below are asked to the Country Coordinators of all Tier 1 countries

To what extent is there still a (knowledge) network around legumes and nitrogen fixation active in your country?

Farmers are responding to a high demand for soyabeans in the region, especially as there are large soya processing plants located in neighbouring countries Rwanda (Plant Mont Meru) and Uganda (Mukwano) who come to buy soyabeans from farmers in the territory of the DRC. There are also some initiatives with the small processing units (soyafLOUR; biscuits; cake); feed for livestock; fish ponds with the soya constitutes a large part.

To what extent are private sector and/or NGOs still selling/ using / promoting "N2Africa technologies"? Can farmers readily access seeds, inoculants, legume-specific fertilizers?

Some USAID-funded organizations are working on the soyabean value chain in the region of East of DRC, which some farmers organizations have worked and collaborated with N2Africa and who have applied the technologies. The problem has always been the access to seed of good quality as there are no functional seed companies. There is also no company that produces or sells inoculum, nor

are public services involved in the production of seeds or inoculum. Access to fertilizer remains a problem – the price is high due to the cost of importing.

Are there any interesting new developments taking place around legumes and nitrogen fixation?



Carrying the bean harvest home

Several initiatives want to continue with the achievements of N2Africa in DRC. The Consultative Committee on Nitrogen Biological Fixation is working with an NGO – the Association for the Promotion of Development (APD). They are working on a project of continuity of N2Africa with the National Ministry of Agriculture through its specialized service SENAFIC (Service National des Fertilisants et Intrants Connexes) with the objectives of producing and disseminating organic fertilizers through the outputs of the N2Africa project. In fact, this organization made contact with companies that have shown interest. SENAFIC want to build on the scientific advances of N2Africa in the field of organic fertilizers and to be able to duplicate the results of N2Africa in west of DR Congo because the project had operated only east of the DRC.

Jeanmarie Sanginga, Country Coordinator DRC

N2Africa legacy in Kenya

To what extent is there still a (knowledge) network around legumes and nitrogen fixation active in your country?

During Phase II of N2Africa, the Kenyan team focused upon commercial knowledge pathways with regard to the promotion of BNF technologies. This approach was built upon the availability of legume seeds, inoculants and specially blended fertilizer as input products offered by agro-dealers. Also, the approach of shifting from farmer field days, that requires project support, to customer open houses hosted by local agro-dealers proved successful in terms of more lasting impact. During the N2Africa project, responsibility for agricultural extension services shifted from the national Ministry of Agriculture to the individual counties, and this resulted in disorganization with regard to their effective participation in N2Africa and other projects. This trend is changing to the better as the farmer associations and agro-dealer networks are now receiving better extension support. Similarly, the processing of legumes has continued at both the cottage industry and agro-industrial scales through the production and distribution of soya milk and flavoured yogurt, instant beverages, blended flours and textured vegetable proteins. Customers recognize these a healthy food products and farmers and marketing mechanisms organized through N2Africa continue to supply raw soyabeans.

To what extent are private sector and/or NGOs still selling/ using / promoting “N2Africa technologies”? Can farmers readily access seeds, inoculants, legume-specific fertilizers?

Agro-dealers across the former N2Africa West Kenya Action Site continue to market improved soyabean seed (mostly cv Saga from AgriSeed-SeedCo), BIOFIX legume inoculants, and the Sympal fertilizer blend. Most seed, however, tends to be produced through community-based mechanisms relying upon improved varieties (mostly cv Saga) distributed to farmer groups by N2Africa. The distribution of soyabeans tolerant to Asian Rust disease by N2Africa has resulted in lasting impacts. BIOFIX inoculants continue to be produced at the factory built by MEA Fertilizers in Nakuru, and distributed to agro-dealers through product representatives. A new, larger 150 g package was added to the BIOFIX product line. Also a liquid formulation inoculant for soyabean is under development. Inoculant quality control testing continues by the nationally-sanctioned MIRCEN and its laboratory that the N2Africa project helped modernize. In many cases, inoculants continue to be displayed by agro-dealers in small glass-fronted refrigerators that were provided as incentives through N2Africa. Unfortunately the innovative product return policy for unsold BIOFIX crafted by N2Africa was discontinued, so local agro-dealers now assume full risk for marketing these products. MEA Fertilizers continues to produce the Sympal fertilizer blend in 40 ton batches at its blending facility in Nakuru. This blend has achieved an identity alongside other specialized blends for rice, tea, coffee and other commodities, but MEA as a relatively small Kenyan company is finding it increasingly difficult to compete with multi-national fertilizer importers. One positive spin off is that MEA readily agreed to produce and test market a new fertilizer blend intended for root crops designed by IITA scientists based upon the earlier success of the legume blend formulated by N2Africa.

Are there any interesting new developments taking place around legumes and nitrogen fixation?

Two new developments are worthy of note. 1) TechnoServe has initiated a working group devoted to improving soybean marketing in Kenya. Their consultants visited several former N2Africa cooperators, including farmer groups, agro-dealers and small-scale processors, in the formulation of their recommendations. Two events were held in 2018 that brought together soybean producers, input manufacturers, buyers and processors, and N2Africa technologies and partners featured prominently in these discus-

sions. 2) In addition, Technologies for African Agricultural Transformation (TAAT), a Pan-African Program devoted to modernizing agriculture, has included legume inoculants and specialized fertilizer blends within its technology “tool-kits”. These toolkits assume many forms and the Kenya Quick Win working group leads in translating proven TAAT technologies as combined product offerings through agro-dealer networks. This approach is now being applied as a means to modernize farmer’s traditional maize-bean intercropping systems.

Paul Woome, Country Coordinator Kenya

Hi Paul, We really value the efforts of N2Africa in line with soybean production, processing and marketing. It's through N2Africa that we are where we are today. we as an organization are working towards ensuring availability of right inputs for soybeans such as Biofix (inoculant), Sympal fertilizer through our well established links with MEALTD, I would like to sincerely inform you that we are working on a system of ensuring commercial soybean production through contracting farmers and having a well organized marketing system. we have already put 30 acres under soybeans and we are expected to put at least 20 more acres. We are also working towards commercializing high iron beans with the farmers. As a result we have procured 50 kgs of high iron beans (Nyota) and we are organizing to establish a demo plots in collaboration with the Ministry of Agriculture. We have also registered Bungoma county youth agribusiness organization which is engaged in several agribusiness activities. To strengthen our small businesses we have planned to have monthly meetings where we can be able to review our progress and plan.

Regards,
Paul Wabomba- Visionary Farmers Association Secretary.

N2Africa legacy in Malawi

To what extent is there still a (knowledge) network around legumes and nitrogen fixation active in your country?

There is huge networking around legumes and nitrogen fixation in Malawi. Apart from the well-established projects funded by multinational donors (such USAID, GIZ among others), the tobacco industry (being the biggest farming industry in Malawi) started diversifying into legumes and have helped their farmers to access improved legume seed and locally produced inoculant, Nitrofix by AISL.

To what extent are private sector and/or NGOs still selling/ using / promoting “N2Africa technologies”? Can farmers readily access seeds, inoculants, legume-specific fertilizers?

The private sector led by Agro-Input Suppliers Limited (AISL) is actively involved in production and selling large volumes of soybean and groundnut seed inoculant. One notable initiative by Feed the Future (The U.S Government’s Global Hunger and Food Security Initiative) has been floating adverts in the local newspapers with the caption ‘Use INOCULANT! For increased Legume Production’ (See also N2Africa Podcaster 54). Farmers can readily access legume seeds through various seed companies and agro-dealer networks spread across the country. The only challenge which some farmers cite is the cost of the seed. One major local fertilizer company – Malawi Fertilizer Company started blending and distributing legume-specific fertilizers.



Entrance of the new AISL laboratory near completion

Are there any interesting new developments taking place around legumes and nitrogen fixation?

Large tobacco buying companies in Malawi are supporting their outgrower farmers to grow legumes (mostly soybean and groundnuts) as a way of diversifying their agro-enterprise.

Lloyd Phiphira, Country Coordinator Malawi



N2Africa legacy in Mozambique

To what extent is there still a (knowledge) network around legumes and nitrogen fixation active in your country?

Former N2Africa partners remain engaged in disseminating the N2Africa technologies to farmers mainly through development projects.

To what extent are private sector and/or NGOs still selling/ using / promoting “N2Africa technologies”? Can farmers readily access seeds, inoculants, legume-specific fertilizers?

The N2Africa technologies that have been promoted by the private sector in Mozambique are improved seed of cowpeas and soybean. Yet, other legume crops such as beans are also being sold by the private sector. The main bottleneck still remains the seed quality especially with respect to poor germination. This area still needs more attention if the country wants to see farmers investing in improved seeds.

The use of fertilizers is very limited due to the high costs. Despite having a good harbour and several blending companies, fertilizers prices in Mozambique remain higher than in neighbouring countries such as Zimbabwe, Malawi and Zambia. This combined with the large amount of available land also leads to extensification rather than intensifi-

N2Africa legacy in Rwanda

To what extent is there still a (knowledge) network around legumes and nitrogen fixation active in your country?

A legume platform is active country-wide, promoting common bean and soyabean crops which are among the priority crops promoted by the Ministry of Agriculture and Animal Resources. Post-harvest initiatives increased around precooked beans, and/or using soyabean as raw material to feed factories (oil pressing, animal feed, blended flours for infants and pregnant/breastfeeding mothers). Small business around soyabean products initiated by N2Africa continue, the case of Mukakayonde Gashirabake Claudine in Bugesera is very encouraging, her business continues to grow. For nitrogen fixation, RAB continues to produce inoculants for beans and soyabean, though the lack of a clear distribution channel to farmers is still a threat in the value chain.

To what extent are private sector and/or NGOs still selling/ using / promoting “N2Africa technologies”? Can farmers readily access seeds, inoculants, legume-specific fertilizers?

cation. The use of inoculants is limited and farmers access them through development projects rather than through the private sector.

Are there any interesting new developments taking place around legumes and nitrogen fixation?

The SEMEAR project (USAID funded) is being implemented by a consortium of four organizations (IITA, ICRISAT, CIAT and IIAM) to fill the gaps and missing links in the legume value chains. Their focus is on increasing the production and supply of breeder, pre-basic, basic, and certified seeds of common beans, cowpea, groundnut, pigeonpea, sesame, and soyabean and to strengthen the national seed systems. Strengthening the links between the initiatives such as SEMEAR and private sector is vital for long-term sustainability of these interventions.

Action Points

The real demand for inoculants in Mozambique needs to be assessed, particularly for other legumes apart from soyabean, as beans and groundnuts are more profitable. Further feasibility of intensification using fertilizers at prevailing market prices needs to be evaluated and there remains a need to reinforce the private sector.

Wilson Leonardo, Country coordinator Mozambique

More private companies have invested in the importation and distribution of agriculture inputs in the country, like YARA which has warehouses in Kigali where local agro dealers buy directly fertilizers sold in their small shops at sector level (e.g. the one owned by Celestin in Musenyi, documented earlier). New initiatives to blend specific fertilizers are also taking place (e.g. ENAS). Farmers still have difficulties to access inoculants.

Are there any interesting new developments taking place around legumes and nitrogen fixation?

AGRA is providing grants around early generation seeds of four selected crops in Rwanda, soyabean and beans are part of this initiative. IITA in consortium with CIAT and RAB have submitted a proposal on soyabean and beans under this opportunity, feedback from AGRA is still awaited. Feed the Future with Cultivating New Frontiers in Agriculture (CNFA) has a new project in Rwanda-Hinga Weze working on selected crops, beans being one of them.

Speciose Kantengwa, Country coordinator, Rwanda

N2Africa legacy in Zimbabwe

The N2Africa project was implemented in Zimbabwe between 2009-2017. The project engaged smallholder farming communities on intensified grain legume integration in their farming systems across eight districts.

To what extent is there still a (knowledge) network around legumes and nitrogen fixation active in your country?

This is addressed under the other questions below.

To what extent are private sector and/or NGOs still selling/ using / promoting “N2Africa technologies”? Can farmers readily access seeds, inoculants, legume-specific fertilizers?

SeedCo seed company has continued to produce soyabean and groundnut seed for Zimbabwe and neighbouring countries markets. For soyabean, the model where farmers access seed and rhizobia under ‘one roof’ has reduced transactional costs. Cowpea has been mostly supported by NGOs in marginal rainfall regions as a climate smart intervention to provide a grain legume crop in drought-prone regions. We worked with the Cluster Agricultural Develop-

ment Services (CADS) for several years. This NGO has continued to mainstream grain legume production with communities on its HIV/AIDS alleviation and rural nutrition programs.

Are there any interesting new developments taking place around legumes and nitrogen fixation?

The government of Zimbabwe’s ‘Command Agriculture’ program, that had over the past 3 years exclusively supported farmers for maize production, has now extended seed and fertilizer inputs support for soyabean production. This has increased demand for soyabean inoculants, thus tapping into N2Africa investments in Zimbabwe. N2Africa made investments on improving inoculants quality and production capacity at the Soil Productivity Research Lab in Marondera. The equipment included refrigeration facilities, microbiological incubator, an autoclave and a modern laminar flow chamber for aseptic transfer of sterilized materials inoculation of microbes. Technicians that received N2Africa expert training have also contributed to the continued production of high quality inoculants at the factory.

Regis Chikowo, Country Coordinator Zimbabwe

A molecular toolkit for high-throughput identification of competitive and effective rhizobial strains

Despite decades of intensive research on *Rhizobium*-legume symbioses, we are still only beginning to understand the factors that influence the survival, persistence, efficiency and competition of rhizobial strains in various environmental conditions.

Research focused on the identification of both competitive and highly effective nitrogen-fixing strains has been limited because, so far, the only way to test competitive rhizobial strains has been to isolate individual strains and compare them one at a time in large-scale plant growth assays.

Four years ago, I began my PhD in Professor Philip Poole’s lab (<https://rhizosphere.org/>) with the aim of engineering a molecular toolkit for high-throughput identification of competitive and effective rhizobial strains.

We have developed a library of novel reporter plasmids (Plasmid IDs) based on the broad host range vector pOGG026 that is suitable for rhizobial screening in the rhizosphere (Geddes et al., 2019). The Plasmid IDs contain the maker gene sfGFP under the control of a synthetic consensus promoter (*PsnifH*), which drives nodule-specific expression in biovars and strains of *Rhizobium leguminosarum* and which can be used to assess competitiveness of strains without reducing their fitness and as a proxy for

nitrogenase activity assays. The Plasmid IDs also contain specific nucleotide sequences so that, in a single experi-

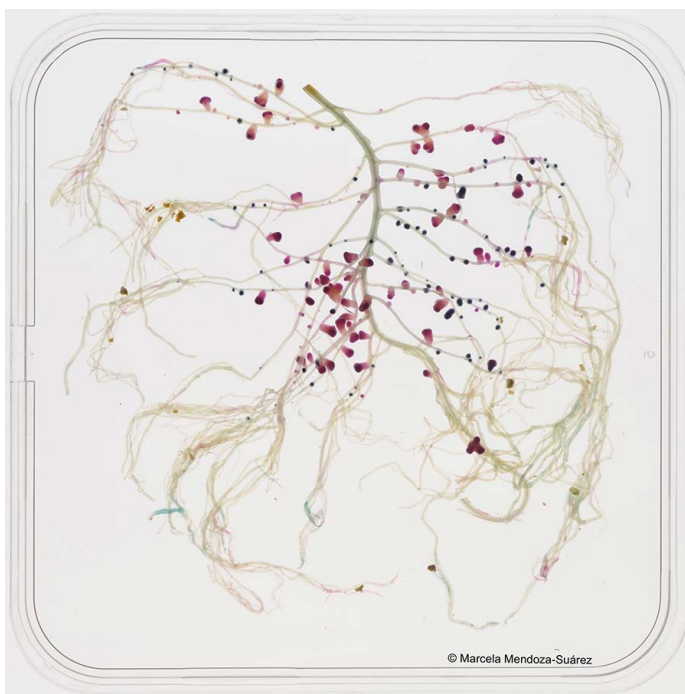


Figure 1. Competition assays for nodule formation between UPM791-*gusA* under the control of *PsnifH* (pink nodules) and Rlv3841-*ceIB* under the control of *PsnifH* (blue nodules) in pea roots.



Figure 2. (Left) Photograph obtained using a mobile phone camera; (Right) Roots were exposed to a Safe blue-light transilluminator and the mobile phone camera was accompanied by an orange filter. Nodules expressing green fluorescence occupied by Tagged-strains with Plasmid-IDs and non-fluorescent nodules occupied by indigenous rhizobia.

ment, multiple rhizobial strains can be marked and scored for nodule occupancy through the use of next generation sequencing (NGS).

Additionally, we developed reporter plasmids that express the biomarkers *gusA* and *celB*, allowing us to develop a new plasmid-based system to mark *Rhizobium* strains and evaluate their competitiveness (Fig. 1).

The application of this tool in a competition assay among eighty-four Tagged-strains, in non-sterilised agricultural soil containing indigenous rhizobia (Fig. 2), allowed us to identify an effective and super competitive strain. These results demonstrated the proof of concept of Plasmid IDs as a tool for high-throughput identification of competitive and effective rhizobial strains.

This tool has the potential to revolutionise the search for elite indigenous rhizobia, by reducing the costs involved in identifying competitive and effective rhizobial strains.

Future 50 Foods from Knorr

Among other duties, I serve as a member of the Sustainable Sourcing Advisory Board of Unilever and through this I was asked to review this report. I was delighted to do so, as I find it an important initiative to broaden the range of crops commonly used in foods. Of course I was not surprised to see that several legumes were selected by the Knorr team and the scientists who advised them. The final report can be downloaded [here](#) and the section on Beans and Pulses starts on page 11.

Ken Giller

It provides a fantastic opportunity to identify indigenous rhizobial strains with both competitive and effective traits, and then use them in similar soil types where ineffective rhizobial strains are found.

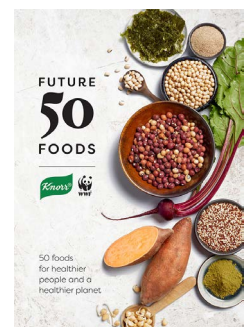
Marcela Mendoza-Suárez, Post-doctoral Researcher, Department of Plant Sciences, University of Oxford, UK

Reference:

Geddes, B. A., Mendoza-Suárez, M. A., and Poole, P. S. (2019). A Bacterial Expression Vector Archive (BEVA) for Flexible Modular Assembly of Golden Gate-Compatible Vectors. *Front. Microbiol.* 9, 3345. doi:10.3389/fmicb.2018.03345.

Funding:

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N2Africa publications

- Influence of P sources and rhizobium inoculation on growth and yield of soybean genotypes on Ferric Lixisols of Northern Guinea savanna zone of Ghana by Adjei-Nsiah, S., Kumah, J.F., Owusu-Bennoah, E., Kanampiu, F.;
- Response of Grain Legumes to Phosphorus Application in the Guinea Savanna Agro-Ecological Zones of Ghana by Adjei-Nsiah, S., Alabi, B.U., Ahiakpa, J.K., Kanampiu, F.;
- Current and potential role of grain legumes on protein and micronutrient adequacy of the diet of rural Ghanaian infants and young children: Using linear programming by De Jager, I., Borgonjen-Van Den Berg, K.J., Giller, K.E., Brouwer, I.D.
- Response of common bean (*Phaseolus vulgaris* L.) to nitrogen, phosphorus and rhizobia inoculation across variable soils in Zimbabwe, by Chekanai, V., Chikowo, R., Vanlauwe, B.

Related newsletters

- ASHC news report: How data visualization helps to plan and evaluate the campaign approach;
- ASHC blogs: Nigeria soybean campaign reaches 170,000 farmers... and shares key lessons on impacts of the uptake of campaign messages and
- Gala blogs: CABI and IFDC join forces to get soybean film out to farmers in Northern Ghana and Soybean Innovation Lab and CABI explore a stepwise investment approach using technology bundles and Village-based film screenings prove a popular way to reach and inform farming families in Northern Ghana;
- Soybean Innovation Lab: Newsletter December 2018;
- SeedSystems blogs: Experience of farmers in adopting production and use of quality declared seed (QDS) in Uganda and How do we scale last mile bean service? Trucks versus AgroVet shops in Tanzania;
- IITA News: Youth Agripreneur insists beans can be preserved naturally without using Sniper.

Reports and other output uploaded on the N2Africa website

- Climbing bean x highland banana intercropping in the Ugandan highland.

Announcements

The 21st International Conference on Nitrogen Fixation (ICNF 2019) will be held on October 10-15, 2019, on the campus of Huazhong Agricultural University, Wuhan, China. This conference series has been ongoing for over 40 years and is a preeminent international forum for scientific discussion of nitrogen fixation. Find [HERE](#) the 1st round announcement of the ICNF 2019 in attachment. Conference information and updates can be found on the website: <http://2019icnf.csp.escience.cn>.

Feed the Future Innovation Lab for Legume Systems Research Announces Request for Concept Notes: Area of Inquiry 1

The Legume Systems Innovation Lab will be funding projects in the following three Areas of Inquiry (AOI):

- AOI-1 Integration of legumes into sustainable smallholder farming systems and agricultural landscapes
- AOI-2 Integration of legumes within local and regional market systems
- AOI-3 Analysis of sociocultural and/or economic motivators or barriers to legume utilization at various stages and scales within production and market systems
- Some more information can be found [HERE](#).

(Calls for concept notes for AOI2 and AOI3 will be forthcoming)

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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