Milestone Report for the N2Africa Supplementary Grant

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N2Africa

Putting nitrogen fixation to work for smallholder farmers in Africa

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S2.1.2	Develop protocols for uniform soil sampling.
S2.1.3	Complete soil sampling.
S2.1.4	Soil samples from demonstration and adaptation trials analysed and results reported along with other agronomic data from the relevant trials.
Activity 2	**Investigate presence non-responsive soils and provide management recommendations**
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S2.2.2.	Trials on non-responsive soils in each hub established.
S2.2.3	Trial results analysed and management recommendations for legumes on non-responsive soils identified.
Activity 3	**Conduct impact assessment on nutrition and livelihoods of farmer's households**
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S2.3.2	Report on the impact of increased legume cultivation and marketing on the livelihoods of households and their individual members

1 Activity 1 on analysing soils from the demonstration and adaptation trials

1.1 S 2.1.1 Employ research assistants in the eight target countries and the Netherlands.

Additional technical support to collect data in demonstration and adaptation trials was recruited in each of the eight original African N2Africa countries. In most cases, a full-time research assistant was employed for the last 2 years of Phase I. In other countries, several temporary staff was recruited for the duration of the growing season. In the Netherlands, a junior researcher – Esther Ronner - was recruited to contribute to the analyses of field data collected in the demonstration and adaptation trials, and to support the development of plans and new activities in the new countries that are among the core N2Africa countries in Phase II of the project (Tanzania, Ethiopia and Uganda).

1.2 S 2.1.2 – 2.1.4 Develop protocols for uniform soil sampling, Complete soil sampling, Soil samples from demonstration and adaptation trials analysed and results reported along with other agronomic data from the relevant trials

Protocols for soil sampling were developed and extensive soil sampling in demonstration and adaptation trials conducted. Soil samples from all countries have been analysed. However, samples taken in the most recent seasons in the three hubs are currently in the process of being analysed and results are not available yet. The available results from soil analyses so far have been reported as part of the regular feedback to country teams on results from the monitoring of demonstration and dissemination trials. Soil data are also used for the development of scientific papers on the results of the adaptation trials currently under development.

Soil characteristics have been found to play a key role in explaining variability in yield and in yield responses to the use of inputs and how this related to farmers' socio-economic conditions. Clear relationships for instance have been found in Rwanda among farmers growing climbing beans between farmers' resource endowment and soil characteristics with wealthier farmers having more fertile soils. Also relationships between gender and soil characteristics were observed with women farming on poorer soils than men. These differences in soil characteristics were reflected by differences in climbing bean and maize yields. Thus, poorer farmers not only need to support their family with much smaller landholdings than their wealthier counterparts, poor soil fertility conditions also lead to considerably lower yields on farms of poorer farmer. These findings indicate a necessity to pay special attention to the needs of women farmers and the poorest of the poor, as proposed for Phase II of the N2Africa project, since responses to technological innovations are different on their fields compared to fields of wealthier, male farmers.

2 Activity 2. Investigate presence non-responsive soils and provide management recommendations

2.1 S2.2.1-2.2.3 Presence of non-responsive soils mapped in each of eight target countries, Trials on non-responsive soils in each hub established, Trial results analysed and management recommendations for legumes on non-responsive soils identified.

Monitoring of demonstration and adaptation trials provided information on the occurrence and spread of non-responsive soils in the target regions of N2Africa. The trials provided evidence that non-responsive soils are widespread, occurring in roughly 20-30% of the trial sites. A confounding factor however was poor management and climate limitations (e.g. drought) that also lead to non-responsiveness of crops to technological innovations but was not a result of poor soil conditions.

Trials using non-responsive soils have been conducted in each of the three hubs (Nigeria and Sierra Leone in W Africa, Zimbabwe in S Africa, Rwanda, DRC and Kenya in EC Africa). These nutrient omission trials in green houses followed the double-pot experiment design (Janssen, 1974). This experimental work in N2Africa has often been conducted within the framework of an MSc thesis. Soyabean has been chosen as a test crop, because of the relatively small seeds of soyabean containing few nutrient reserves, allowing a more rapid identification of nutrient deficiencies than with larger seeded grain legumes such as bean, groundnut or cowpea. The results of the experiments in Zimbabwe, Nigeria, Sierra Leone and Rwanda have been analysed and reports on the results from the trials are available on the N2Africa website (http://www.n2africa.org/all_msc_reports). The results from the other trials are being analysed.

The results from all four trials analysed indicated that potassium (K), besides phosphorus (P) which is part of the standard recommended inputs to legumes, limits soyabean growth on the vast majority of non-responsive soils tested (see Figure 2.1 and 2.2 for examples from Zimbabwe and Nigeria respectively). In addition, magnesium, sulphur and micronutrients have been identified as limiting in soils from northern Nigeria. Besides nutrients, soil physical characteristics (a high fraction of stones) have been identified as a factor that contributes to non-responsiveness of soils in Rwanda. While nutrient deficiencies can be rectified by applying nutrients in the correct amounts, soil physical characteristics are much harder to rectify.

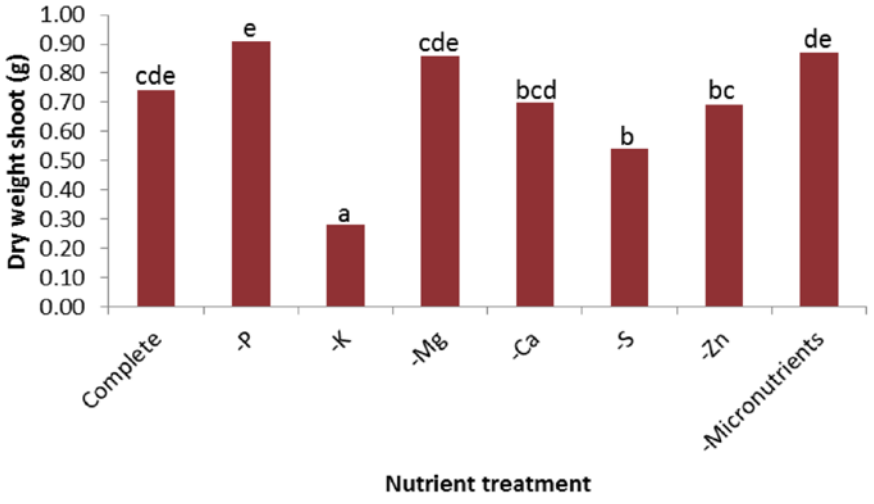

Figure 2.1: Results from a nutrient omission trial with soyabean, average from four non-responsive soils in Zimbabwe. The omission of potassium (K) had the strongest impact on biomass production, relative to the Complete treatment.

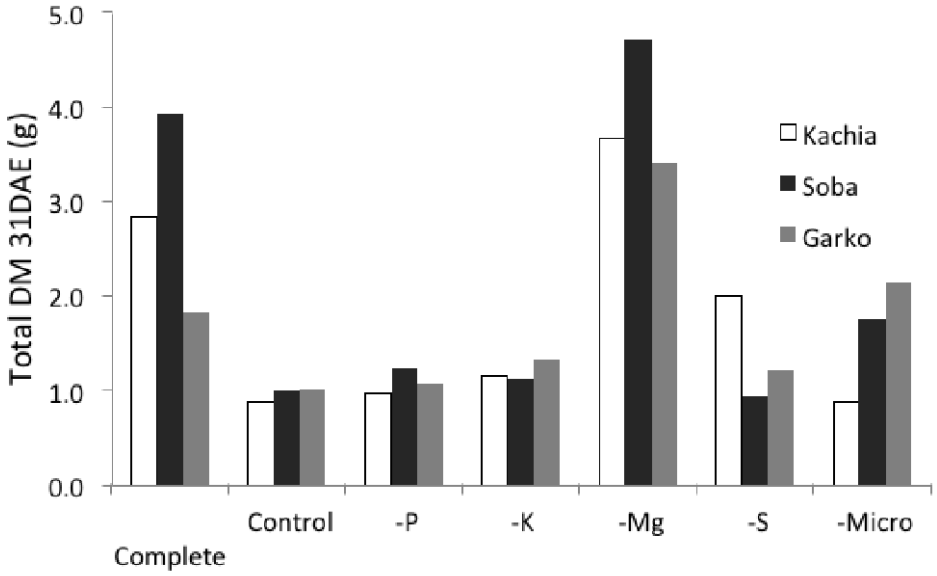

Figure 2.2: Results from a nutrient omission trial with soyabean for soils from three sites in northern Nigeria. The omission of P, K, S and micronutrient led to clear reduction in yield relative to the complete treatment.

3 Activity 3. Conduct impact assessment on nutrition and livelihoods of farmer's households

3.1 S2.3.1- 2.3.2 Collection of household, gender and nutrition data in at least two countries to identify the beneficiaries of legume technologies initiated, Report on the impact of increased legume cultivation and marketing on the livelihoods of households and their individual members

Nutritional studies at household level were carried out in northern Ghana and western Kenya in 2013 to explore whether and through which potential pathways increased agricultural productivity improves diet and nutritional status of children under 5. A quasi-experimental, cross-sectional study was conducted among smallholder farmers that did (n=126 in Ghana and n=190 in Kenya) and did not (n=203 in Ghana and n=157 in Kenya) receive N2Africa inputs between 2010 and 2012. Individual dietary diversity scores (IDDS) were measured by qualitative 24-hour dietary recall and the nutritional status by anthropometric measurements. Among N2Africa farmers, eight focus group discussions were held (four with male and four with female farmers).

On-farm trials in Ghana and Kenya showed that average legume yields increased with use of inoculants and/or TSP. Variability between farmers was large, however, and not all farmers benefitted to the same extent e.g. due to delays in agronomic activities. N2Africa farmers in Ghana and Kenya increased cultivation of legumes and use of inputs between 2010 and 2013.

Interview results indicated that the following N2Africa farmers groups used the legume yield mainly for home consumption: (i) farmers who received training on preparation methods; (ii) farmers having positive attributes towards legumes (tasty, healthy); (iii) female farmers; and (iv) farmers with low market accessibility. Male farmers indicated that legume yields were mainly sold. In Ghana, involvement in N2Africa is associated with an increase in percentage of children consuming legumes, and in dietary diversity of children older than 2 years but not of younger children. There was no association with nutritional status (Table 1). Results from Kenya are currently being analysed.

Table 3.1: Individual Dietary Diversity Score (IDDS) and nutritional status indicators of children 6-59 months of age from N2Africa participants and from non-N2Africa participants in northern Ghana.

		Non-N2Africa villages	N2Africa villages
Outcomes	Unit	(N=202)	(N=129)
IDDS, out of 14 food groups (incl. fats and oils)	Mean (SD)	5.1 (1.8)	5.5 (1.9)*
for children under 2 years	Mean (SD)	4.1	4.2
for children 2 to 5 years	Mean (SD)	5.6 (1.3)	6.1 (1.2)*
Consumption of 'legumes, nuts and seeds' group	% (N)	77.2 (156)	86.8 (112)**
for children under 2 years	% (N)	63.2 (48)	70.0 (28)
for children 2 to 5 years	% (N)	85.7 (108)	94.4 (84)**
Stunting, n (%)	% (N)	29.2 (59)	35.7 (46)
Underweight, n (%)	% (N)	23.3 (47)	24.0 (31)
Wasting, n (%)	% (N)	10.9 (22)	6.2 (8)

*P<0.05 (Mann-Whitney U test); **P<0.05 (Chi-square test)

More households cultivating legumes with increased yields theoretically lead to more legumes being available for consumption or for sale depending on characteristics of the farmer. Although causality is not studied, this may have led to an increased dietary diversity indicating an improved nutrient adequacy of the diet of children above 2 years. Results suggest that targeting female farmers, focusing on crops mainly used for home consumption, and providing training on preparation methods and nutrition, would better ensure improvement of nutrient adequacy of the diet of children.

Full report: I. de Jager, A. R. Abizari, G. Mbera, E. Ronner, I. D. Brouwer and K. E. Giller. Nutritional benefits of grain legume cultivation within the N2Africa project in Northern Ghana and in Western Kenya. Will be available at: www.n2africa.org

Film on case study in Ghana available at: http://www.n2africa.tv/.

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Janssen, B. H. (1974). A double pot technique for rapid soil testing. Tropical Agriculture (Trinidad) Vol. 51, No 2.

List of project reports

1. N2Africa Steering Committee Terms of Reference
2. Policy on advanced training grants
3. Rhizobia Strain Isolation and Characterisation Protocol
4. Detailed country-by-country access plan for P and other agro-minerals
5. Workshop Report: Training of Master Trainers on Legume and Inoculant Technologies (Kisumu Hotel, Kisumu, Kenya-24-28 May 2010)
6. Plans for interaction with the Tropical Legumes II project (TLII) and for seed increase on a country-by-country basis
7. Implementation Plan for collaboration between N2Africa and the Soil Health and Market Access Programs of the Alliance for a Green Revolution in Africa (AGRA) plan
8. General approaches and country specific dissemination plans
9. Selected soyabeans, common beans, cowpeas and groundnuts varieties with proven high BNF potential and sufficient seed availability in target impact zones of N2Africa Project
10. Project launch and workshop report
11. Advancing technical skills in rhizobiology: training report
12. Characterisation of the impact zones and mandate areas in the N2Africa project
13. Production and use of rhizobial inoculants in Africa
18. Adaptive research in N2Africa impact zones: Principles, guidelines and implemented research campaigns
19. Quality assurance (QA) protocols based on African capacities and international existing standards developed
20. Collection and maintenance of elite rhizobial strains
21. MSc and PhD status report
22. Production of seed for local distribution by farming communities engaged in the project
23. A report documenting the involvement of women in at least 50% of all farmer-related activities
24. Participatory development of indicators for monitoring and evaluating progress with project activities and their impact
25. Suitable multi-purpose forage and tree legumes for intensive smallholder meat and dairy industries in East and Central Africa N2Africa mandate areas
26. A revised manual for rhizobium methods and standard protocols available on the project website
27. Update on Inoculant production by cooperating laboratories
28. Legume Seed Acquired for Dissemination in the Project Impact Zones
29. Advanced technical skills in rhizobiology: East and Central African, West African and South African Hub
30. Memoranda of Understanding are formalized with key partners along the legume value chains in the impact zones
31. Existing rhizobiology laboratories upgraded
32. N2Africa Baseline report
33. N2Africa Annual country reports 2011
34. Facilitating large-scale dissemination of Biological Nitrogen Fixation

35. Dissemination tools produced
36. Linking legume farmers to markets
37. The role of AGRA and other partners in the project defined and co-funding/financing options for scale-up of inoculum (banks, AGRA, industry) identified
38. Progress Towards Achieving the Vision of Success of N2Africa
39. Quantifying the impact of the N2Africa project on Biological Nitrogen Fixation
40. Training agro-dealers in accessing, managing and distributing information on inoculant use
41. Opportunities for N2Africa in Ethiopia
42. N2Africa Project Progress Report Month 30
43. Review & Planning meeting Zimbabwe
44. Howard G. Buffett Foundation – N2Africa June 2012 Interim Report
45. Number of Extension Events Organized per Season per Country
46. N2Africa narrative reports Month 30
47. Background information on agronomy, farming systems and ongoing projects on grain legumes in Uganda
48. Opportunities for N2Africa in Tanzania
49. Background information on agronomy, farming systems and ongoing projects on grain legumes in Ethiopia
50. Special Events on the Role of Legumes in Household Nutrition and Value-Added Processing
51. Value chain analyses of grain legumes in N2Africa: Kenya, Rwanda, eastern DRC, Ghana, Nigeria, Mozambique, Malawi and Zimbabwe
52. Background information on agronomy, farming systems and ongoing projects on grain legumes in Tanzania
53. Nutritional benefits of legume consumption at household level in rural sub-Saharan Africa: Literature study
54. N2Africa Project Progress Report Month 42
55. Market Analysis of Inoculant Production and Use
56. Identified soyabean, common bean, cowpea and groundnut varieties with high Biological Nitrogen Fixation potential identified in N2Africa impact zones
57. A N2Africa universal logo representing inoculant quality assurance
58. M&E Workstream report
59. Improving legume inoculants and developing strategic alliances for their advancement
60. Rhizobium collection, testing and the identification of candidate elite strains
61. Evaluation of the progress made towards achieving the Vision of Success in N2Africa
62. Policy recommendation related to inoculant regulation and cross border trade
63. Satellite sites and activities in the impact zones of the N2Africa project
64. Linking communities to legume processing initiatives
65. Special events on the role of legumes in household nutrition and value-added processing
66. Media Events in the N2Africa project
67. Launch N2Africa Phase II – Report Uganda

68. Review of conditioning factors and constraints to legume adoption and their management in Phase II of N2Africa
69. Report on the milestones in the Supplementary N2Africa grant

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