Putting nitrogen fixation to work for smallholder legume farmers in Africa (N2Africa) – An effort in international partnerships
Global Research Partnerships to Achieve “Feed the Future” Goals for Pulses

Sustainable Intensification of agriculture that leads to reducing poverty and improving nutrition.

Yes, N2Africa is addressing and will achieve Feed the Future Goals. Partnering with various CRSP projects would bring multiple benefits to our African farm families.

Putting nitrogen fixation to work for smallholder farmers in Africa
Charitable Purpose:

State-of-the-art legume and rhizobial inoculant technologies will be used by African smallholder farmers to triple the inputs of free atmospheric nitrogen by biological nitrogen fixation, thereby improving crop and livestock productivity, human nutrition and farm income, while enhancing soil health.
Vision of success for N2Africa

To raise average grain legumes yields by 954 kg/ha in four legumes (common bean, groundnut, cowpea and soybean), increase average biological nitrogen fixation (BNF) by 46 kg/ha, and increase average household income by $465, directly benefiting 225,000 households (1,800,000 individuals) in eight Countries.

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Bill & Melinda Gates Foundation

Wageningen University

IITA and CIAT

40 official partners with contracts including NARES, Universities and NGO’s

225,000 Farm Families in 8 Countries
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Need for inoculation with rhizobia

- Many legumes are “promiscuous” or naturally-nodulating – they can form nodules with rhizobia found in the soil
- Some legumes (e.g. soybean) are “specific” – they do not find compatible rhizobia in the soil and they need to be inoculated with specific strains of rhizobium
- The need for inoculation depends on the population of compatible rhizobia in soil and the promiscuosity of the legume
How to increase total $\text{N}_2$-fixation

- Increase the area of land cropped with legumes (targeting of technologies)
- Increase legume productivity – agronomy and P fertilizer (input dealers)
- Select better legume varieties
- Select better Rhizobium strains and inoculate (input dealers)
- Link to markets and create new enterprises to increase demand for legumes
Objectives

1. Establish a **baseline** of the current status of N$_2$-fixation and establish mechanisms for **monitoring and evaluation** (M&E) and impact assessment
2. **Identify and field-test multi-purpose legumes** with enhanced N$_2$-fixation and providing food, and high quality crop residues and integrate improved varieties into farming systems
3. **Collect and characterize superior rhizobia strains** for enhanced N$_2$-fixation and **develop inoculum production capacity** through collaboration with private sector partners
4. **Deliver** legumes, inoculant technologies and associated N$_2$-fixation technologies to farmers.
5. Develop and **strengthen capacity** for N$_2$-fixation research, technology development, and application
N$_2$Africa is a development to research project

- Delivery and Dissemination are the core
- M&E is provides the learning
- Research feeds back
N2Africa – target countries and legumes

West Africa
- Cowpea, groundnut, soybean

East & Central Africa
- Common bean, groundnut, soybean

Southern Africa
- Common bean, groundnut, soybean

Throughout all regions
- Legume forages

N.B. No work planned on pigeonpea and chickpea

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**Action Sites**

- 1a DR Congo
- 1b Rwanda
- 1c Kenya
- 2a Ghana
- 2b Nigeria
- 3a Mozambique
- 3b Malawi
- 3c Zimbabwe
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Genotype \times \text{Environment} \times \text{Management}

\[(G_L \times G_R) \times E \times M\]

Where:

\(G_L = \) legume genotype  
\(G_R = \) rhizobial strain  
\(E = \) environment  
- climate (temperature \times \text{rainfall} \times \text{daylength} \text{etc}) - to encompass length of growing season etc  
- soils (nutrient limitations, acidity and toxicities)  
\(M = \) management  
- agronomy – inoculation, seeding rates, plant density (row spacing etc), weeding,  
- (Diseases and pests are also a function of \(G \times E \times M\)....)
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Response to P and inoculation with soybean in DRC

N$_2$Africa demonstration trial results in Mushomo, Sud Kivu, DRC 2010
Response to P and inoculation with soybean in Kenya

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N₂Africa demonstration trial results in Western Kenya 2010
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- maize following maize
- maize following climbing beans
Climbing beans in DRC

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Long rains season 2010 in Sud Kivu, DRC
Non- or Poorly-responsive soils
Number of farmers reached – April 2011

<table>
<thead>
<tr>
<th>Country</th>
<th>Soybean</th>
<th>Common bean</th>
<th>Groundnut</th>
<th>Cowpea</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigeria</td>
<td>752</td>
<td>-</td>
<td>432</td>
<td>928</td>
<td>2,112</td>
</tr>
<tr>
<td>Ghana</td>
<td>685</td>
<td>-</td>
<td>342</td>
<td>343</td>
<td>1,370</td>
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<tr>
<td>Kenya</td>
<td>5,275</td>
<td>1,040</td>
<td>-</td>
<td>-</td>
<td>6,315</td>
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<tr>
<td>DR Congo</td>
<td>1,020</td>
<td>1,920</td>
<td>-</td>
<td>-</td>
<td>2,940</td>
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<tr>
<td>Rwanda</td>
<td>690</td>
<td>1640</td>
<td>-</td>
<td>-</td>
<td>2,330</td>
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<tr>
<td>Zimbabwe</td>
<td>755</td>
<td>562</td>
<td>614</td>
<td>332</td>
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<tr>
<td>Malawi</td>
<td>1,505</td>
<td>568</td>
<td>978</td>
<td>178</td>
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<tr>
<td>Mozambique</td>
<td>4,417</td>
<td>-</td>
<td>250</td>
<td>-</td>
<td>4,667</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15,099</td>
<td>5,730</td>
<td>2,616</td>
<td>1,781</td>
<td>25,226</td>
</tr>
</tbody>
</table>

- Project cycle adjusted as effectively three years rather than four
- On track to meet targets and with all major milestones

Based on N₂Africa M&E for each country and crop updated 18 April 14, 2011
Private sector partnerships

1. Input suppliers (all countries)
2. MEA Kenya producing inoculants in Kenya
3. Inoculants supplied Legume Technology UK Ltd
4. Inoculant companies expressing interest in marketing in Africa
5. Kenya – Promasidor (Kenya) contracts for 4000 tonnes of smallholder soybean by 2012
Public sector partnerships

1. TLII
2. AGRA – Markets and supply chains/ ago dealers including seed companies
3. AGRA Soil Health
4. CIALCA – DRC and Rwanda
5. SIMLESA (ACIAR funded) in Kenya, Malawi and Mozambique
6. Dry Grain Pulses CRSP????? Yes
Problems encountered/ being addressed

1. Accessing high quality inoculants in Africa
2. Lack of useful quality control regulations in Africa
   – Problems of cross-border trade in inoculants
3. Shortage of soil microbiologists and laboratories
4. Non-responsive soils (unknown and/or multiple constraints)
5. The market paradox (an institutional problem)
   – National deficit for soybean in all countries
   – But farmers lack markets for legume grain at local level
   – And they lack input suppliers for P fertilizer, inoculant etc
Making adjustments during the life of a project is normal

• We have used a lessons learned process
• What went well
• What did not go well
• What will we do different
• Define activities required to ensure this year is better than last year.
• Must be in a “safe place”
Some lessons learned

• Planning activities at the country or location level is best
• Collaboration with AGRA SHP projects is given top priority.
• Developing agreements with partners can often take longer than expected
• The logistics of purchasing and transporting requires detailed plans
• Capacity building at all levels is required
Suggestions on the way forward

- Include all partners at country planning meetings
- Identify areas where our strengths complement each other
- Make a plan that includes activity (not milestone) details on who, what where and when and then establish and finalize the agreement with a contract.
Conclusions

1. Good \((G_L \times G_R)\) key, but \(E \times M\) overriding
2. Success depends on good technology and market linkages
3. Need to invest much more in M&E to ensure maximum learning
4. Need attention to non/poorly-responsive soils
5. Nitrogen fixation by legumes has a great role to play in African agriculture
6. Give high priority to improving nutrition of women and children
• N2Africa is addressing and will achieve Feed the Future Goals. Partnering with various CRSP projects would bring multiple benefits to our African farm families.
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For updates see

www.N2Africa.org

Lots of video resource materials
N₂Africa Podcaster - Monthly Newsletter