

## **N2Africa: Delivering BNF Technologies to African Small-Scale Farmers**

Paul L. Wooper, Nancy K. Karanja and Ken E. Giller  
N2Africa Program, email: plwooper@gmail.com

N2Africa is "Putting Nitrogen Fixation to Work for Smallholder Farmers in Africa". It is a large-scale program focused upon increasing grain legume production and its symbiotic N<sub>2</sub>-fixation in smallholder farming systems of sub-Saharan Africa, directed toward four major grain legumes (bean, cowpea, groundnut and soybean) in eight countries (D.R. Congo, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda and Zimbabwe). The program conducts strategic research in legume agronomy and rhizobiology that backstops BNF technology dissemination activities targeting 225,000 poor households over four years. Its partners include international research centers, universities, international NGOs, national research and extension organizations, farmer associations and private sector input producers and grain legume buyers. As this effort is quite diverse, this abstract focuses upon rhizobiology activities in Kenya as an example of its mechanisms and achievements. Rhizobiology studies are conducted at the University of Nairobi MIRCEN Laboratory and through the field activities of 26 grassroot groups in west Kenya. These actions include bio-prospecting native rhizobia, greenhouse and field evaluation of these isolates, working with the MEA Fertilizer Company the producers of BIOFIX<sup>®</sup> inoculants to assure product quality and assisting the Ministry of Agriculture to frame bio-fertilizer legislation. To date, 387 isolates were collected from 20 genera in 14 different ecological zones, 85% belonging to the tribe Phaseoleae. Isolates were tested against inoculant industry standard for bean (CIAT 899) and soybean (USDA 110) and six consistently outperform them. Collaborative efforts with inoculant production include testing the effects of carrier material selection, storage condition and different quality assessment approaches. Peat and sugar cane factory filter mud carriers perform well while vermiculite, coconut coir and charcoal do not. Refrigeration extends soybean inoculant shelf life by 30%. Recent tests of BIOFIX<sup>®</sup> ranged between 1.1 and 6.2 x 10<sup>9</sup> rhizobia g<sup>-1</sup> using the YMA drop plate technique. Evaluation using MPN procedures in the greenhouse yield lower, and more variable results. Soybean response to inoculation with BIOFIX<sup>®</sup> under farmer conditions increases yield by +260 kg ha<sup>-1</sup> worth \$129, nodulation by +11 plant<sup>-1</sup>, crown nodulation by +44% and red interior pigmentation by +58%. The partial return ratio to inoculant adoption is 9.2. To date, improved grain legume and inoculation technologies were introduced to 50,127 Kenyan households with an adoption ratio of approximately 70%. On another front, inoculant standards of >10<sup>9</sup> rhizobia and <10<sup>6</sup> contaminants were included within Kenya's draft Biofertilizer Act, will likely be adopted into law and N2Africa plans to assist producers to meet and monitor these thresholds. The activities in Kenya are representative of the program's larger impact on BNF technologies across Africa, with additional attention directed toward laboratory and skills development, and pilot inoculant production in many other countries. For more information on our approaches and achievements, visit the program's website at [www.n2africa.org](http://www.n2africa.org).