

Delivering rhizobia inoculant technology to small-scale farmers for enhancing grain legume production and soil fertility in Tanzania

Baijukya, F.P.¹, Kijoji, A.², Magelanga, A.³, Mwantumu, O.¹, Mzanda, A.¹.

¹International Institute of Tropical Agriculture (IITA), P.O. Box 34441, Dar Es Salaam, Tanzania

²Catholic Relief Services (CRS) in Tanzania, P.O. Box 34701, Dar Es Salaam, Tanzania

³Highland Agricultural Research and Development Institute, P.O. Box 400, Mbeya, Tanzania.

The problem

Resource poor-farmers in sub-Saharan Africa experience low cereal and grain legumes yields resulting from subsistence farming practices, poor soil fertility and unfavorable biotic environment. Grain legumes are a major component of smallholder farming systems as they provide protein-rich food, cash income and are important sources of feed for livestock. Grain legumes are particularly attractive to low input systems of agriculture because they take inert nitrogen from the air and (through root nodule bacteria known as rhizobia) transform it into proteins in a process that leaves no carbon footprint. IITA has renewed focus to the science of biological nitrogen fixation to make it work for smallholder farmers.

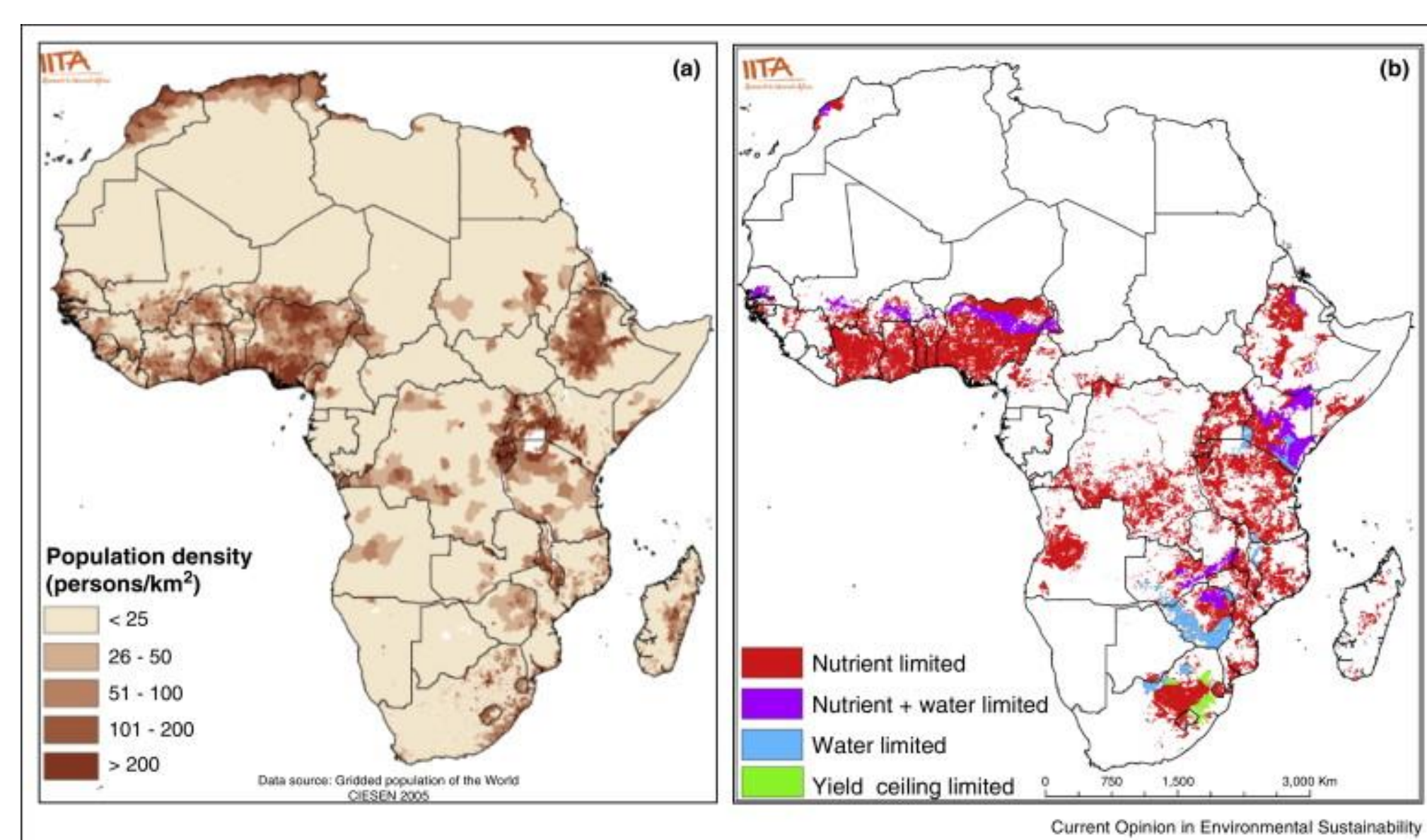


Fig 1: Maps of population density (a) and biotic factors (b) limiting crop production in sub-Saharan Africa. Livelihoods are mainly based on exploitation of natural resources, principally small scale farming.

Activities implemented to address the problem

IITA with its partners, have embarked on strategic research and development in rhizobia inoculant technology including on-farm evaluation of commercial inoculants, assessing the need to inoculate, testing and registration of most effective rhizobia products and collection of new rhizobia strains that are adapted to local conditions.



Fig 2: BNF technology disseminated through field demonstration plots and training of extension and lead farmers: **A**, Participatory evaluation of the performance of soybean following inoculation at Maposeni village in Songea district, Tanzania; **B**, hands on training of lead farmers and field technicians on nodulation assessment at Ilonga research station, Morogoro.

Results to date

Benefits from use of inoculants

Field evidence indicate that inoculation results in yield improvement of 30-40% in soybean grain relative to the un-inoculated treatment and of 68-97% when inoculation is used in conjunction with fertilizer P. This is above what is obtained upon N fertilizers use at 20 N kg ha⁻¹. This yield benefit worth US\$ 50-75 for an investment of only US\$3-5. Positive results are also more when improved soybean varieties are used. Moreover, a yield increase of 5-15% has been recorded on maize grown following soybean.

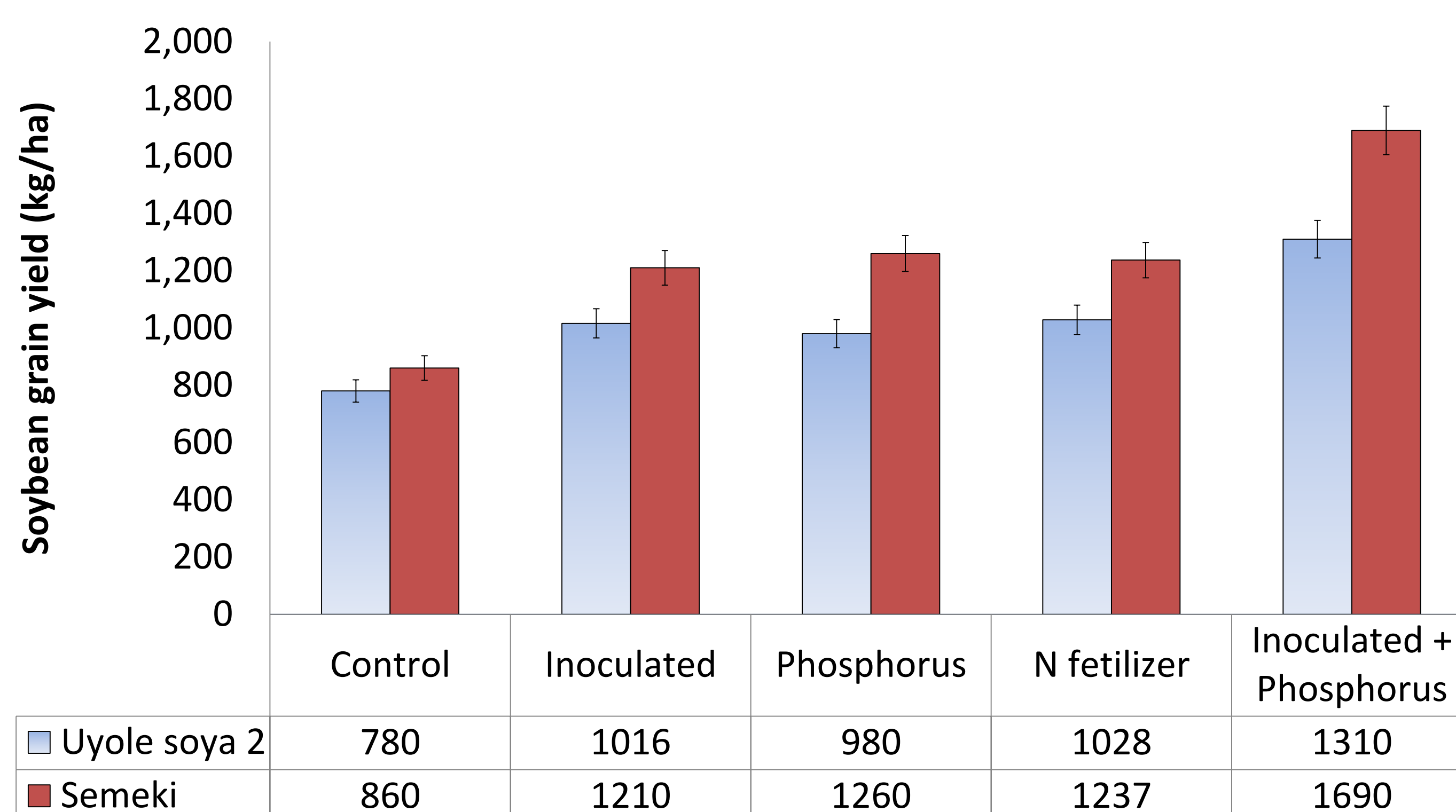
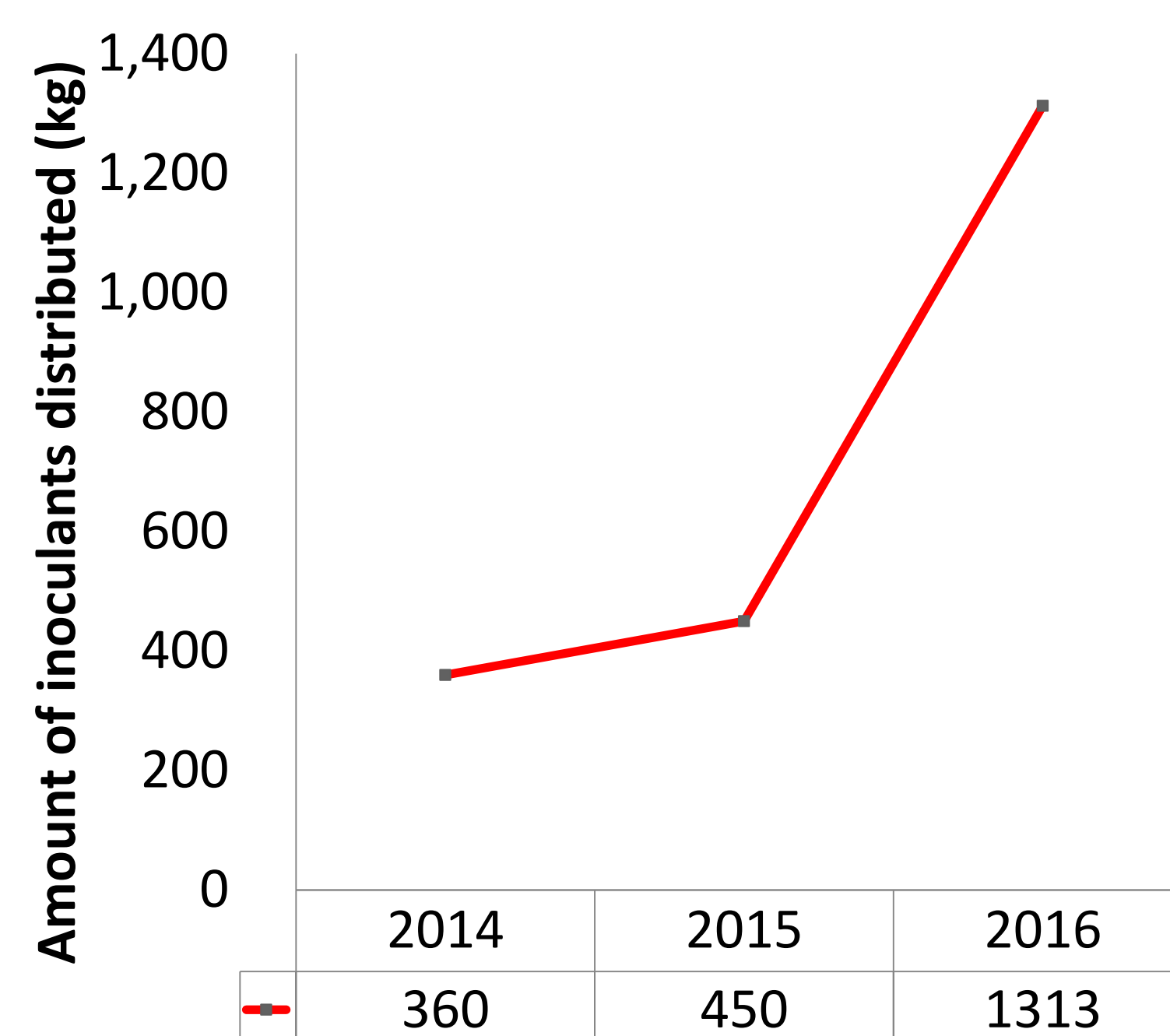


Table 1: Mean yield response of two soybean varieties to rhizobia inoculation in Southern Highlands of Tanzania (Ruvuma, Njombe and Iringa regions). Data are from 46 demo sites collected over 3 growing seasons (2014-2016).

Making rhizobia inoculants available

More than 80,000 farmers have been reached in Tanzania contributing to rapid growth of inoculants industry in Tanzanian's. Two products; Legumefix and Biofix are registered with TFRA and commercially available. One product NODUMAX (IITA manufactured) is in process to be registered in Tanzania. Establishment of inoculant sale points is on-going.



Scalability

Low cost technology with remarkable short-term impact on grain legume yield. The demand of technology is very high, its availability close to farmers will lead to increased legume production, more cash income to farmers and soil fertility improvement.

Acknowledgements

This work is funded by Bill & Melinda Gates Foundation through N2Africa project, USDA through CRS Soya-ni-Pesa project, and USAID through Africa RISING-NAFAKA scaling project.