Title:

Nutritional benefits of grain legume cultivation within the N2Africa project in Northern Ghana

Authors & affiliations:

I. de Jager[1], E. Ronner[2], A. C. Franke[2], I. D. Brouwer[1] and K. E. Giller[2]
[1]Division of Human Nutrition, Wageningen University, The Netherlands; [2]Plant Production Systems group, Wageningen University, The Netherlands
The N2Africa project is funded by the Bill & Melinda Gates Foundation.

N2Africa is a large-scale research project (www.n2africa.org), aiming to expand the area cropped with grain legumes and intensify production, to improve soil fertility and enhance nutrition security of smallholder farmers. The project works with common bean, cowpea, groundnut and soybean and focuses on improved crop management mainly through use of improved varieties, phosphate-based fertilizer and rhizobium inoculants. Even though the link between increased agricultural productivity and improved nutrition is often implicitly assumed, it is rarely measured. The aim of this study is therefore to: 1) assess the increase in yields of soybean, cowpea and groundnut that can be achieved with improved management practices; 2) explore the potential pathways through which improved legume productivity may affect nutrition status of children under 5 years of age; 3) investigate the effect of improved agricultural productivity on the diversity of the diet and the nutritional status of children under 5 years of age.

The study was conducted in Northern Ghana (Karaga and Bawku West Districts). Major grain legumes in this area are groundnut, cowpea and soybean. Seed of 'best-bet' varieties of these legumes, P-fertilizer (TSP) and (in the case of soybean) inoculants were disseminated among farmers. Farmers tested this package in a simple, non-replicated trial on their own field. Trials were monitored and data on cropping history, management factors, crop yields, etc., were gathered among 300 farmers in the 2011 cropping season. A nutritional study was carried out in 2013, consisting of a quasi-experimental, cross-sectional study in villages that did (11 villages) and did not (18 villages) receive N2Africa inputs between 2010 and 2012. 126 farmers from the N_2Africa villages and 203 farmers from the non-N_2Africa villages were randomly selected. Individual dietary diversity scores (IDDS) were measured by 24-hour dietary recalls and the nutritional status by anthropometric measurements. Among N_2Africa farmers, eight focus group discussions were held (four with male and four with female farmers).

Results of the on-farm trials show a large spread in responses of soybean to TSP and inoculants (Figure 1). On average, soybean yields increased from the 884 kg ha^{-1} on the control plot to 952 kg ha^{-1} with inoculants, 1023 kg ha^{-1} with TSP and 1135 kg ha^{-1} with the combination of TSP and inoculants. Although 15% of the farmers doubled their soybean yield with TSP and inoculants, a quarter of the farmers did not improve their yield at all with these inputs. Groundnut yields increased from 646 in the control to 775 kg ha^{-1} with TSP, and for cowpea from 866 kg ha^{-1} to 1095 kg ha^{-1}. Again, the response to TSP shows a wide variability. Factors explaining this variability are delays in planting time (due to late delivery of inputs), and in the case of soybean a long time between inoculant application and planting. This highlights the importance of good agronomic management as a crucial first step to actually reach improved agricultural productivity on farmers' fields.

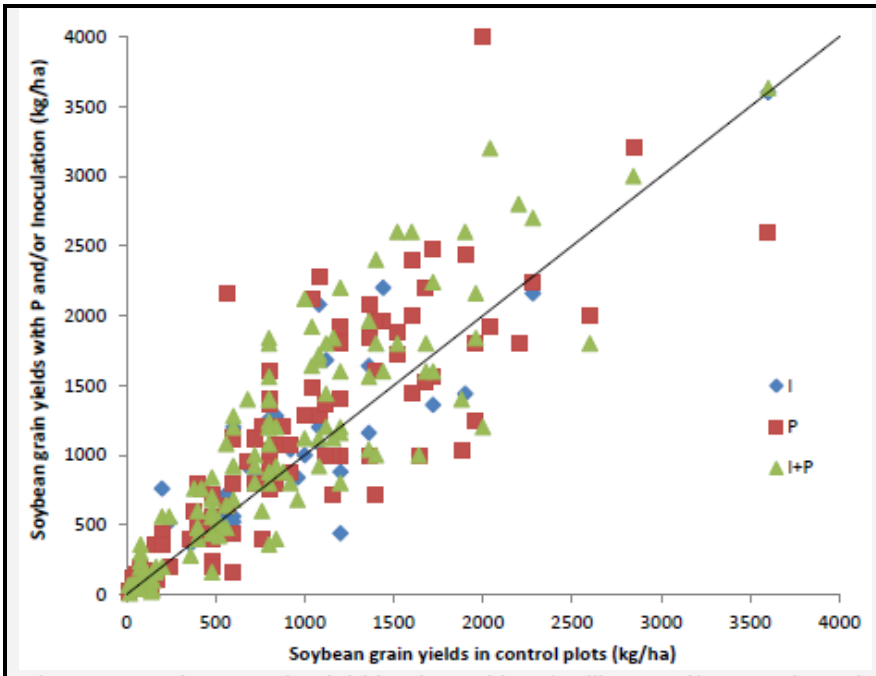

Figure 1: Soybean grain yield in plots with P fertilizer and/or BNF inoculants relative to the yield in the associated control plot without any additions.

Preliminary results from the nutrition study show that improved agricultural productivity may affect nutrition status via different pathways (Figure 2): 1) via an increase in food availability for own consumption (and the possible introduction of new food into the diet) in case of female farmers; 2) via an increase in income in case of male farmers. Whether an increase in income translates into an increase in food expenditures or non-food expenditures is unclear. Results of the effect of improved agricultural productivity (due to inputs of the N2Africa project) on dietary diversity and nutritional status are expected.

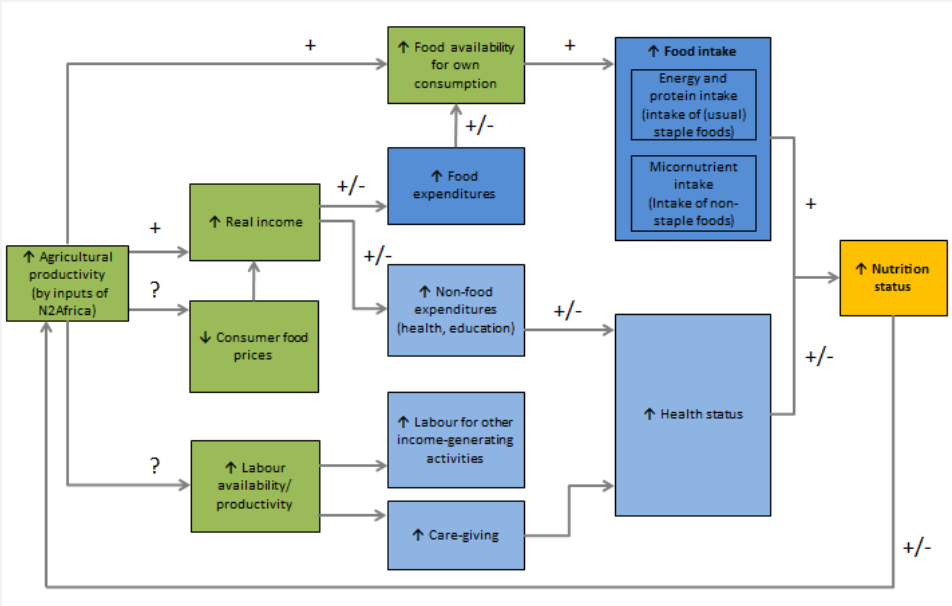

Figure 2: Pathways through which improved agricultural productivity (by inputs of N2Africa) may affect nutrition status in Northern Ghana

Recent review studies indicate a lack of data showing the translation of improved agricultural productivity to improved nutrition and health of household members. Unravelling the potential pathways through which enhanced agricultural productivity may improve nutritional status provides necessary

information on how to strengthen this link. From this study, it appears that agricultural interventions should target female farmers to directly increase food availability (and diversity of the diet by introducing a new food) and should target male farmers to increase income and potentially, via different indirect ways, contribute to improved nutritional status of household members. Furthermore, education on preparation methods and general nutrition education seems to enhance the potential effect of improved agricultural production. Thus, although the link between agriculture and nutrition seems obvious, it takes many steps to go from an agricultural intervention to increased productivity to improved nutrition security. The intermediate steps need to be investigated to achieve nutrition specific goals by agricultural projects.