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Bioversity International

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POLICY BRIEF No. 55

Beans: A Crop to Invest In

August 2021

Key message

From both an economic and nutritional perspective, the common bean is under-represented in the diets of low-income populations. This shortfall is reflected in high bean prices and chronic deficiencies in protein and key nutrients, seen across the developing world. Future demand for beans, meanwhile, is projected to increase, as incomes rise and rural-urban migration increases. Investment in the development of common bean varieties and value chains has the potential to offer substantial food security and economic benefits to these populations.

- Staple food markets in the developing world are currently undersupplied with legumes, resulting in high prices that place these important sources of protein and nutrients out of the reach of the low-income populations that most need them (Figure 1).
- Beans, in particular, are well suited to address the legume shortfall. Decades of research at the Bioversity-CIAT Alliance and elsewhere have produced higher yielding, iron enriched bean varieties adapted to local conditions in Latin America and Africa. Work is ongoing to further align these successful varieties with local preferences, as well as to further improve their nutritional value and to build plant resilience in the face of climate change.
- The return on investments in bean research and value chains is made more attractive still when considering the high costs of inaction on this front. The current legume supply-demand imbalance has resulted in widespread protein and mineral deficiency, which, in turn, has resulted in childhood stunting and other costly, ongoing public health crises.
- At current levels of production, these costs will only multiply going forward, as demand for legumes is projected to grow faster than demand for starchy staples.

Figure 1. Production value per metric ton of main staple crops.
Source: FAO Food Balance Sheets, 2018.

Rationale and support

From a nutritional standpoint, the legume supply shortfall is reflected in over-starchy, protein deficient diets. Optimal protein formation within the human organism requires a balance of 2.3 grams of cereals to every gram of legumes (Bressani and Elias 1974). In many parts of Africa, particularly outside of the bean production corridors, the ratio of cereals to legumes currently ranges from 3 to 5, and even higher in some areas (Figure 2). Legume deficits are especially pronounced in Malawi and the rest of southern Africa.

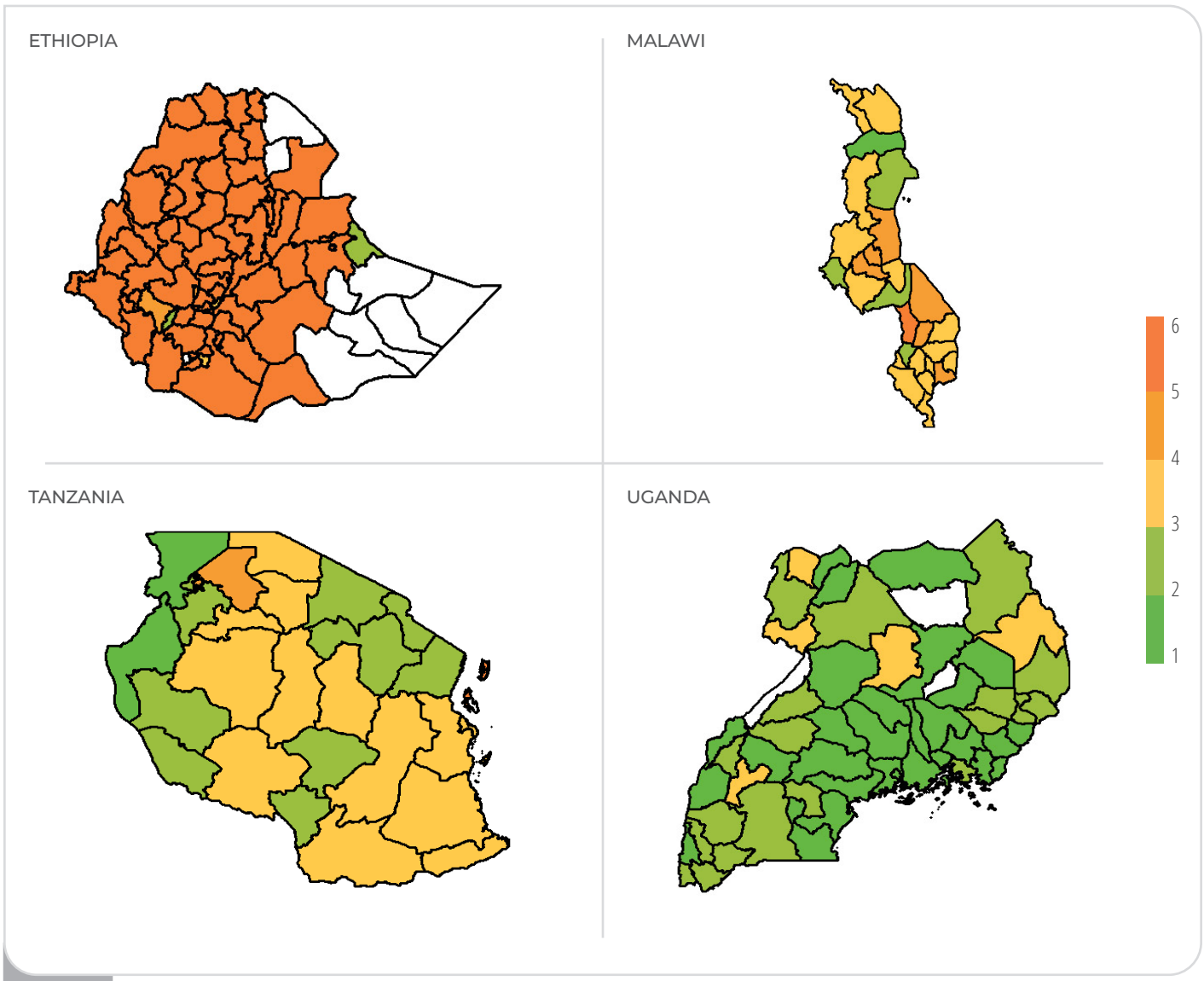


Figure 2. Cereal to legume consumption ratios in (clockwise) Ethiopia, Malawi, Uganda, and Tanzania.
Source: LSMS-ISA.

The adverse health effects of diets deficient in protein, iron, and vitamin A are well documented (Schönfeldt and Hall 2012). However, recent research indicates that these deficiencies are even more pronounced in low-income countries than previously anticipated. Protein sufficiency has generally been overestimated due to a failure to adjust for protein quality and for the heightened requirements of children living in conditions of chronic energy deficit and infection (Uauy et al. 2016). In Malawi, an area with some of the most pronounced cereal-legume imbalances in Africa, protein deficiency has been definitively linked with stunting in children (Semba et al. 2016).

The legume supply-demand imbalance will only increase going forward, as incomes rise and starchy carbohydrate demand is increasingly supplanted by demand for more nutrient-dense foods[1] (see Figure 3). Budding downstream bean processing markets and intra-Africa trade opportunities are signs that this nutrition transition is already underway. Emerging markets for pre-cooked beans, for example, have begun transforming diets and livelihoods in Uganda and Kenya (Ugen et al. 2017).

The Bioversity-CIAT Alliance Bean Program has demonstrated that, given funding, it can deliver

1 In accordance with Bennett's Law, a well documented empirical relation whereby demand for starchy staples is supplanted by demand for other foods as incomes rise.

SUB-SAHARAN AFRICAN BEAN EXPORTS HAVE INCREASED BY **500%** OVER THE PAST **10 YEARS,** ACCORDING TO **FAO.**

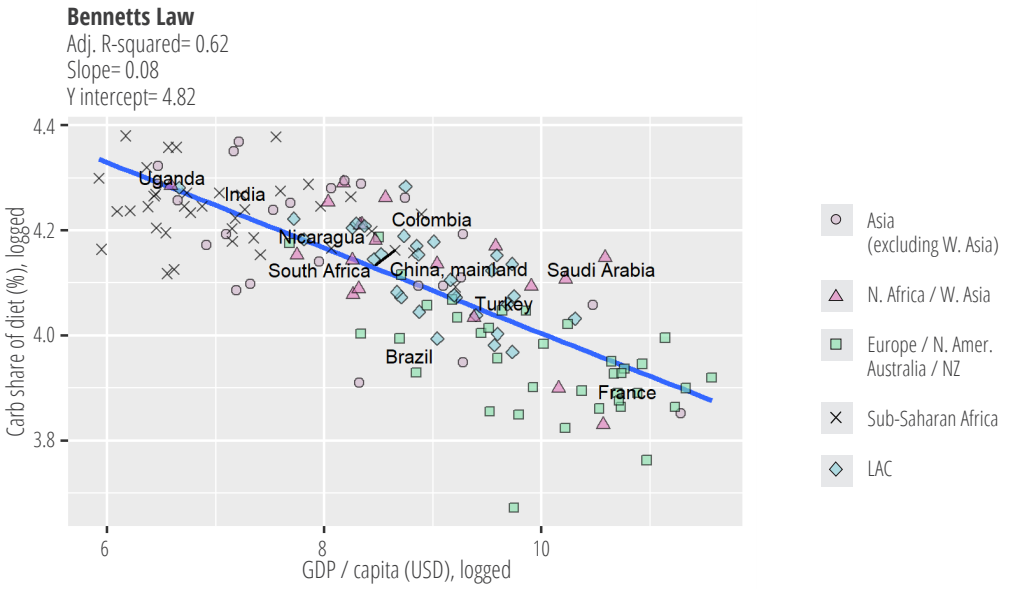


Figure 3. Bennett's Law
Source: FAO Food Balance Sheets, 2017.

genetic gain trajectories of 2%-3.3% per year in research stations, while new methods of on-farm research will quantify this in the hands of farmers. This is comfortably above modern breeding standards for development-related crop breeding such as those set by the CGIAR Excellence in Breeding platform, in order to meet rising demand well into the future.

Implications

Investment in beans is a high return, low risk investment opportunity. Beans consistently demonstrate value in the marketplace and bean research is routinely successful. An economic analysis of bean research conducted on the occasion of CIAT's 50th anniversary indicated an additional benefit of $17 billion resulting from improved varieties (CIAT 2017). In East Africa the aggregate value of beans is 86% of that of maize.

Bean investments target multiple SDG challenges, including climate resilience, increased jobs, improved incomes, and improved nutrition outcomes among others.

Value-added bean markets and trade opportunities have come online only in the last 10 years or so, and constitute a small fraction of total bean demand. However, any uncertainty regarding these developments revolves around not whether these new markets will grow, but rather by how much, and how fast.

Bean export opportunities are not limited to the widely discussed intra-Africa bean trade. Just under half of Africa's bean exports currently go to South Asia (Figure 4), where legume prices are among the highest in the world. This could become an important source of revenue in the future, but can also compete with local demand if research does not continue to improve productivity.

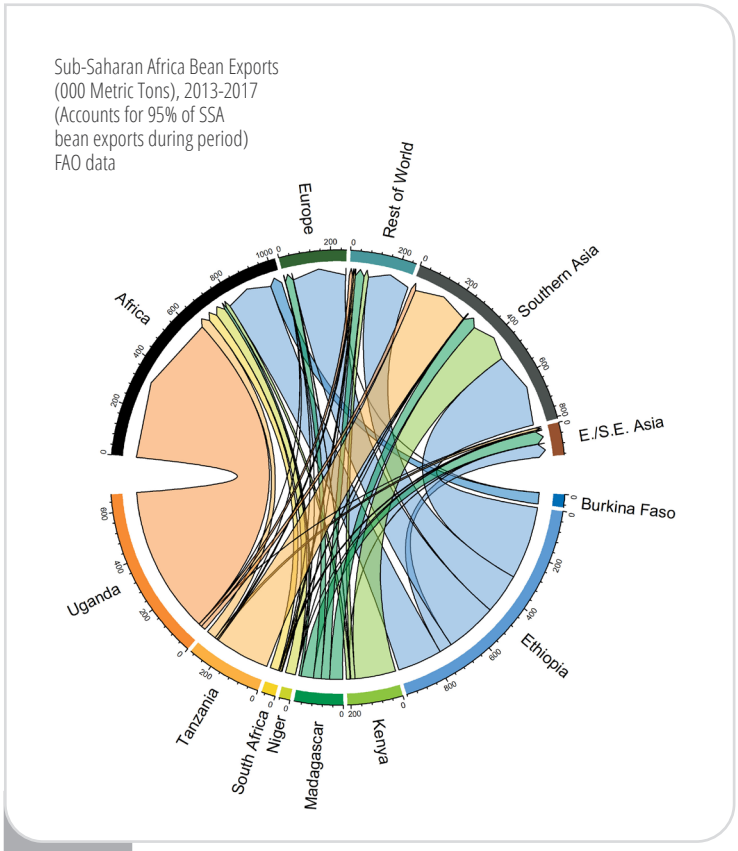
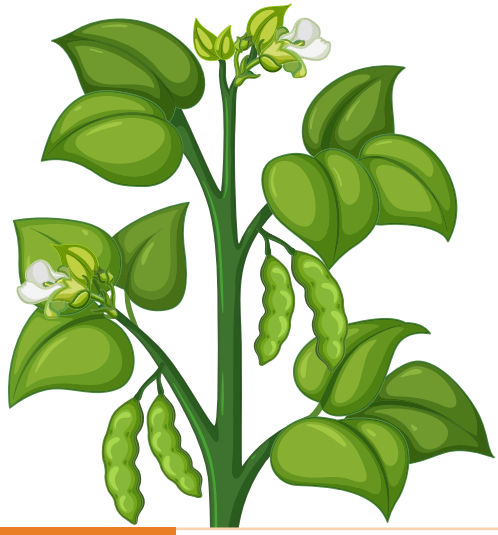


Figure 4. The Africa bean trade.



WAY FORWARD

- Approaches that emphasize demand-led breeding for beans will continue to have large potential payoff, especially when put in the context of a variety of solutions and investment is targeted to the best portfolio thereof. There is little downside.
- At the very least, the evidence indicates that inaction on the bean front would be a very costly, high-risk proposition. Diets are already protein and nutrient deficient in many low-income countries. Failure to close this gap may result in more costly public health crises.
- Beans are not just for the developing world. Many developed nations are in the midst of a different kind of public health crisis due to fat-heavy, nutrient-deficient diets. Investment in beans can play an important role in promoting healthier, more plant-based diets in such populations.
- Continued investment in improved management practices can enhance research impacts. Downstream support of emerging value chain opportunities may also act as a catalyst to facilitate new business incentives and trade.
- As the downstream business environment develops, economic foresight can help assess opportunities and bottlenecks, thereby guiding economic policy, institutional, and infrastructural adjustments in an optimal manner, greatly enhancing research impacts at minimal cost.

References

Bressani, R. & Elias, L.G. 1974. Legume foods. In A.M. Altschul, ed. New protein foods, Vol. I A, p. 231 297. New York, Academic Press Inc.

CIAT (International Center for Tropical Agriculture). (2017). The Impacts of CIAT's Collaborative Research. https://bit.ly/37ObZK5.

Schönfeldt, H. C., & Hall, N. G. (2012). Dietary protein quality and malnutrition in Africa. British Journal of Nutrition, 108(S2), S69-S76.

Semba, R. D., Shardell, M., Ashour, F. A. S., Moaddel, R., Trehan, I., Maleta, K. M., ... & Manary, M. J. (2016). Child stunting is associated with low circulating essential amino acids. EBioMedicine, 6, 246-252.

Uauy, R., Suri, D. J., Ghosh, S., Kurpad, A., & Rosenberg, I. H. (2016). Low circulating amino acids and protein quality: an interesting piece in the puzzle of early childhood stunting. EBioMedicine, 8, 28-29.

Ugen, M., Karanja, D., Birachi, E., Katabalwa, C., Ouma, J., & Mutuku, R. (2017). Pre-cooked beans for improving food and nutrition security and income generation in Kenya and Uganda-final technical report.

Wiebe, K., Sulser, T.B., Dunston, S., Rosegrant, M.W., Fuglie, K., Willenbockel, D., andNelson, G.C. 2020. Modeling impacts of faster productivity growth to inform the CGIAR initiative on Crops to End Hunger.

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