

Stories of change

© IDRC/Petterik Wiggers



From field to fingers: enriching soils and seeds to improve nutrition

By Carol Henry, Sheleme Beyene, Atul Nayyar, Tewodros Tefera and Zenebe Woruk

Key messages

- Through enhanced soil health and improved crop varieties, farmers in southern Ethiopia have achieved a two-fold increase in productivity of chickpea.
- Improved food processing and preparation methods, coupled with education programs, have contributed to improved nutrition, with mothers learning to incorporate chickpeas into complementary foods.
- Hawassa University has become a center of excellence on nutrition in Ethiopia - the University of Saskatchewan has contributed to this achievement as a key partner in nutrition.

Context

Ethiopia has one of the worst rates of protein-calorie malnutrition and micronutrient deficiency in the world. The problem is especially acute in southern Ethiopia, where three-quarters of pregnant women suffer from zinc deficiency and nearly half of all child deaths are associated with

deficiencies in protein and micronutrients (i.e. vitamin A, iodine, zinc and iron). Food insecurity is primarily caused by low productivity and poor access to farming resources and technology, as well as poor access to and consumption of key nutrients. Combating food insecurity in Ethiopia therefore requires changes in agricultural practice and human nutrition interventions.

In Ethiopia, the concept of improved feeding of infants and young children is not well understood by most families. When mothers introduce solid foods to their infants, they traditionally give gruel made from a variety of cereals, such as wheat, maize, barley, oat, teff, millet or sorghum. Complementary food strategies based on pulses and cereals are a potential source of protein and micronutrients, and increasing the nutrient density of complementary foods (to supplement breast milk) is a strategy commonly recommended to improve child nutrition. In addition, household food processing methods such as soaking, fermentation and germination may influence the bio-availability of nutrients and improve palatability, thereby enhancing nutritional value of the foods for infants and young children.

To combat malnutrition and micronutrient deficiencies, while contributing to the



sustainability of local agro-ecosystems, the *Improving Nutrition in Ethiopia through Plant Breeding and Soil Management* project is researching biofortification of pulse crops. Biofortification strategies include enriching the nutrient contribution of staple crops (chickpea) through plant breeding, coupled with soil micronutrient management (zinc fertilizer) and household processing strategies. Biofortification provides a cost-effective and sustainable approach for increasing micronutrients in crops using agronomic strategies. The project also focuses on women's empowerment, through processing and preparation techniques that respond to nutritional needs along the pulses value chain.

Emerging outcomes

Increased soil fertility and crop productivity

Improved soil management through crop diversification and improved cropping systems (intercropping, crop rotation and double cropping) have led to increased soil fertility and pulse productivity. Four out of the 15 introduced varieties of chickpea have shown promising productivity, compared to local varieties; three improved cultivars have exceeded the local cultivar by 62-89% at various sites.

More micronutrients

Biofortification of improved pulse varieties has increased their zinc and iron content. One improved variety (*Habru*) is also significantly better in seed weight, swelling and hydration capacity than the local varieties, indicating

better cooking quality. These improvements have led to the production of high quality, nutrient-rich grains, thereby enhancing nutrition for rural households.

“ After consuming pulses, my kids are strong and healthy. ”
Female farmer, Halaba district

Enhancing nutrition

Nutrition studies show increasing acceptance of pulses, including enhanced chickpea varieties, for household consumption. In addition, nutrient studies on bio-availability indicate cooking methods are key to reducing some deficiencies, such as iron and zinc.

Nutrition education has helped mothers with infant children to improve their feeding practices and those of their households by maximizing the resources around them, evidenced by improved weight gain in young children. A study of 200 mothers was carried out in southern Ethiopia; half received education. Approaches included group counseling and participatory learning methods, such as demonstrations of how to cook complementary foods using pulses. The control group continued to use a cereal-based food. Figure 1 shows that after a six month intervention, prevalence of wasting (WHZ) and underweight (WAZ) had significantly improved with nutrition education. This demonstrates that nutrition education can empower mothers to utilize their own resources to bring about changes in the health of their children and themselves.



© IDRC/Petterik Wiggers

Female farmers discussing the importance of chickpea at Halaba

Center of excellence in human nutrition

Hawassa University is one of two universities in Africa accredited as a center of excellence in nutrition. During a recent visit from Canadian Ambassador David Usher, Hawassa University president, Yosef Manor, credited much of the success to the dedication of nutrition researchers from the University of Saskatchewan, who were instrumental in establishing the micronutrient lab. Funds for the major equipment in the lab come from the project. The lab currently supports the research of faculty/staff and graduate students from Hawassa University, and University of Saskatchewan training for undergraduate students (field work).

Proper preparation of pulses prior to cooking, by soaking, fermentation and germination, reduces anti-nutrient levels and enhances digestibility. Mineral content of chickpea and bean-based dishes were well retained in most of the dishes in the germination treatment groups. Processed products also showed reduction in phytate content, which if present bind essential minerals in the digestive tract, making them less available in the body. The use of improved varieties, together with modified food processing and preparation methods, have also reduced the cooking time, thereby reducing demand for fuel wood and the time spent - predominantly by women - in collecting it.

Increased skills and knowledge

Farmer field days and a nutrition extension program have resulted in increased dissemination of new seeds, crop management and cooking methods. Women from farming communities and those engaged in microenterprises have been trained on modified food processing methods, to promote inclusion of pulses in their daily diets. Women farmers acknowledge that training and education received from the project



© IDRC/Petterick Wiggers

Chickpea production within a double cropping system has increased household income

have helped to boost their production and consumption. During training, they have also been provided with much needed help, in the form of seeds.

The project contributed to capacity building of MSc (60 nutrition and 50+ agriculture) and PhD students (two nutrition and four agriculture) from Hawassa University. A student exchange program was established, allowing all six PhD students from Hawassa to benefit from high quality technology and modern facilities at the University of Saskatchewan. The training has created a critical mass of young scientists (51% female), who are contributing to the development of Ethiopian agriculture and nutrition initiatives. It has also fostered greater collaboration between Canadian and Ethiopian researchers, and thereby enhanced knowledge and expertise in both Hawassa University and the University of Saskatchewan.

Improved income

The introduction of chickpea within a double cropping system (growing two crops in a

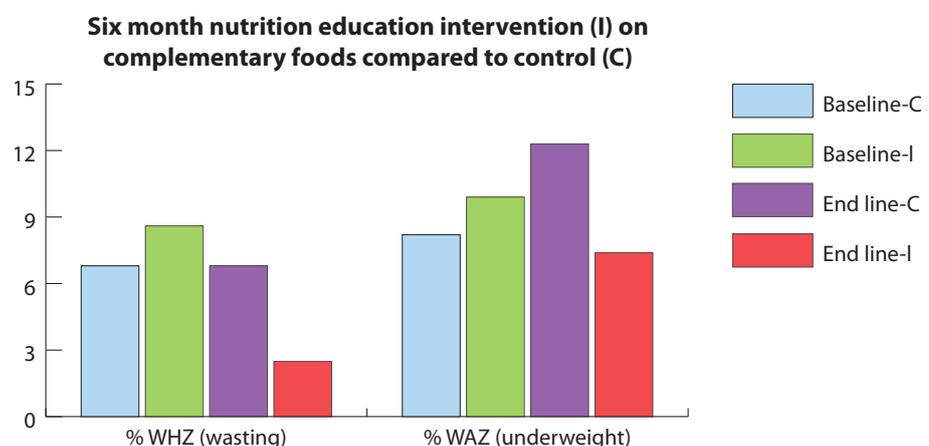


Figure 1: Nutrition education improves mothers feeding practices, reducing the prevalence of wasting and underweight in young children

cropping season) has increased household income compared to the traditional practice of growing one crop per season. At Halaba, household income from chickpea increased by 520 Birr (US\$28), due to the practice of double cropping as compared to income from only one cropping cycle. In Damot Gale, Sodo and Meskan areas, income from chickpea accounted for 21%, 22% and 17% of total farm income respectively, where increments were obtained through introduction of high yielding varieties. Introduction of chickpea - a nitrogen-fixing legume crop - has also increased the productivity of succeeding crops grown on the same land. Consequently, the income of households has increased and the intervention areas have been transformed from net buyers of chickpea seeds to seed self-sufficiency. This indicates that further increasing crop area under chickpea is able to improve household income and purchasing power.

Boosting earnings from trade

The chickpea trade in Ethiopia involves many different actors, including producers, rural and urban wholesalers, retailers and consumers. According to a value chain study, the total amount of chickpea that was transacted through market channels in Ethiopia in 2012/13 was 918 tons, of which the project farmers contributed 77%. The project helped farmers to gain access to markets to sell their excess produce and increase their household income.

Conclusion

Investing in biofortification practices provides a cost-effective and sustainable approach for the delivery of more micronutrients in the diet and improved nutritional status. Increased soil fertility and pulse productivity through improved soil management (crop diversification and cropping systems), plant breeding and household processing strategies have made significant gains in meeting the nutrition and



Farmers observing the influence of micro-nutrient fertilization of haricot beans intercropped with maize

income generation needs of farmers and their households. More and more farmers are adopting new varieties of chickpeas and new management practices. In addition, households are increasingly adopting new approaches to processing, preparation and consumption of pulses, thereby decreasing women's workload and having high potential payoffs for the nutritional status of mothers and young children. Partnerships and collaboration between institutions can lead to success in capacity building.

References

- IDRC. *Improving Nutrition in Ethiopia Through Plant Breeding and Soil Management*. <http://bit.ly/MtDHR2>.
- University of Saskatchewan. *Improving Nutrition in Ethiopia Through Plant Breeding and Soil Management*. <http://bit.ly/18ltsSV>.

Contact

Dr Carol Henry: carol.henry@usask.ca

Dr Sheleme Beyene Jiru: shelemebe@yahoo.com



Foreign Affairs, Trade and
Development Canada

Affaires étrangères, Commerce
et Développement Canada



IDRC | CRDI

International Development Research Centre
Centre de recherches pour le développement international

Canada

This outcome story is one in a series that reports on research supported by the Canadian International Food Security Research Fund (CIFSRF), a program of Canada's International Development Research Centre (IDRC), undertaken with financial support from the Government of Canada, provided through Foreign Affairs, Trade and Development Canada (DFATD). Produced by WRENmedia in March 2014.