HIGH IRON AND ZINC BEANS

Kicking hidden hunger out of Malawi

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Better Beans for Africa

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Two thirds (63%) of Malawian children suffer from anaemia; a condition of low haemoglobin levels in the body, and iron is a key component of haemoglobin [1]. Iron deficiency is estimated to be responsible for half of all global anaemia cases, and iron-deficiency anaemia is a leading cause of global sickness [2]. Children suffering from iron-deficiency anaemia have poorer cognition, school achievement, and more behavioral issues into middle childhood [3].

Six in every ten (60%) Malawian children also suffer from zinc deficiency [4]. Zinc deficiency is closely associated with growth retardation, increased risk of child sickness and mortality in developing countries [5]. In 2012, combined effects of malnutrition ripped a tenth of Malawi's Gross Domestic Product (GDP); an equivalent of US$ 597 million in health, education and labour productivity losses [6]. There are a number of opportunities available that the Malawi government can explore to combat malnutrition in all its forms, especially among school going children and their households. Due to the multi-faceted nature of malnutrition, there is need to employ a multi-sectorial approach as a winning formula [7]. The Sustainable Development Goals (SDGs) on Zero hunger, good health and well-being, quality education among healthy children will be realised when stakeholders in agriculture, education and health jointly work to kick malnutrition out of Malawi.

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2. Kassebaum, N.J., The Global Burden of Anemia. Hematology/Oncology Clinics of North America, 2016. 30(2): p. 247-308.
3. Grantham-McGregor, S. and C. Ani, A Review of Studies on the Effect of Iron Deficiency on Cognitive Development in Children. The Journal of Nutrition, 20001. 133(2): p. 649S–668S.
4. National Statistical Office (NSO), et al., Malawi Micronutrient Survey 2015-16. 2017: Atlanta, GA, USA.
5. King, J.C., et al., Biomarkers of Nutrition for Development (BOND) - Zinc Review. The Journal of Nutrition, 2015. 146(4): p. 858S-885S.
6. African Union Commission (AU), et al., The Cost of Hunger in Malawi: Social and Economic Impact of Child Undernutrition in Malawi, Implications on National Development and Vision 2020. 2015.

School feeding programmes, as an opportunity to address malnutrition

The Malawi government together with various partners adopted the School Feeding Programme (SFP) as a strategy to improve children's nutrition, increase school attendance, and encourage academic performance.

Several studies have linked good nutrition, especially adequate intake of iron, zinc, vitamin A and iodine, through school feeding, to improved children's health, school attendance, academic performance and hunger alleviation [3, 8, 9]. In Malawi, the World Food Programme reported a 15% increment in enrolment among schools providing meals, with over 30,000 farmers linked to existing market opportunities and mobilized into farmer groups [10]. Another World Food Programme (WFP) evaluation study suggested that SFPs increased school participation, reduced hunger, increased meal frequency and dietary diversity for both learners and their households [11].

Other researchers have also reported that children in schools under SFPs had better learning skills and body measurements as opposed to those without [12]. Overall, evidence suggests that for every dollar invested in school meals in Malawi, at least six dollars are returned in better health and productivity when children reach adulthood [10].

Despite the successes, nutrition and school feeding programmes are disjointed and more needs to be done. There are still some drawbacks in terms of broader understanding of the consequences of malnutrition and appreciation of multi-sectoral nature of nutrition, school feeding, education, funding and human capacities. According to the World Food Programme (WFP), the current coverage on SFP in Malawi is estimated at only 30% [10]. Majority of school meal programmes in Malawi offer daily porridge (mostly

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9. Pollitt, E., Malnutrition and infection in the classroom: Summary and conclusions. 1994, Paris, France: UNESCO.
10. World Food Programme (WFP), School Meals Programme (SMP) Report. 2018, World Food Programme: Lilongwe, Malawi.

made from white maize and soya beans) for all learners and take-home portions for vulnerable students. More sustainable strategies could involve assisting schools to produce their own nutritious food in the school gardens or introduce programs that empower schools to purchase nutritious food from surrounding communities or farmers.

In addition, the white maize and soya bean blend formulation has disproportionately dominated the SFPs limiting the diversification to other cereal and legume food groups. Worldwide, especially in developing countries, there has been growing concerns on poor quality and nutritive value of some foods supplied under SFPs [13]. Evidence point to the far reaching advantages of accessing multiple micronutrients through supplementary feeding [14].

Good results in agricultural research and food based approaches have been registered through Biofortification; a process of increasing minerals and vitamins density through plant breeding and agronomic practices. Foods biofortified with vitamin A, iron, zinc and iodine, have proven to be acceptable and cost-effective solution for reducing deficiencies in these micronutrients, and in improving health outcomes [15].

Researchers from the Pan-African Bean Research Alliance (PABRA) under the Alliance of Bioversity and CIAT (ABC) and the Department of Agricultural Research Services (DARS) in Malawi released various biofortified beans [Chitedze BN 8 (NUA45), Chitedze BN 9 (NUA59) and Chitedze BN 12 (NUA 35)], rich in iron and zinc. These biofortified beans are available and incorporating them in the SFPs will be an entry point to addressing health and education challenges.

There is dire need to strengthen and 'connect the missing puzzle pieces' for agriculture, nutrition, health and education sectors to work in tandem to combat micronutrient deficiency malnutrition.

11. World Food Programme (WFP), Evaluation of the School Meals Programme in Malawi with financial support from United States Department of Agriculture (USDA) 2016 to 2018, M. Grace, et al., Editors. 2019, World Food Proramme: Lilongwe, Malawi.
12. Nkhoma, O.W.W., et al., Early-Stage Primary School Children Attending a School in the Malawian School Feeding Program (SFP) Have Better Reversal Learning and Lean Muscle Mass Growth Than Those Attending a Non-SFP School. The Journal of Nutrition, 2013. 143(8): p. 1324–1330.
13. Tomlinson, M., School feeding in east and southern Africa: Improving food sovereignty or photo opportunity? 2007, Regional Network for Equity in Health in Southern Africa (EQUINET) Causeway, Harare, Zimbabwe

Our strategy for nutrition in school feeding programme through biofortified beans

Researchers from the Department of Agricultural Research Services (DARS) and the Alliance of Bioversity and International Centre for Tropical Agriculture (Alliance) have recognised the challenges that malnutrition poses, especially amongst children and are now breeding biofortified beans to specially address malnutrition among vulnerable communities in Malawi. Biofortification as a food based strategy has gained mileage due to its multi-prong pathways in addressing some health disorders such as malnutrition. Three high iron and zinc bean (HIZB) varieties; Chitedze BN 8 (NUA45) and Chitedze BN 9 (NUA59) were released in 2009 and Chitedze BN 12 (NUA 35) in 2017, are red mottled and large seeded bean varieties. These biofortified bean varieties have been adopted by the farmers, because:

- They can address public health concerns among children and women of reproductive age. They are high in iron and zinc with a density of between 40 – 90 ppm (parts per million), which are readily absorbed in the human body [16]. Besides, beans are naturally good source of proteins and carbohydrates. They are also an excellent source of dietary fibre, which is important in helping the function of the digestive system and satiation [17].
- The beans can be processed into flour and blended with other biofortified flour, such as provitamin A maize flour to formulate a multiple micronutrient blended flour good for making nutrient dense porridge for children and women who are pregnant or lactating. The biofortified bean flour can also be mixed with other grain flours and baking flour as composite flour for baking various nutrient dense confectionary products, such as biscuits, cakes and doughnuts. Blended and composite flours from biofortified crops could be a relatively easier and sustainable way of providing an alternative to white maize and soya bean

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17. Garden-Robinson, J. and K. McNeal, All about beans: Nutriion, health benefits, preparation and use in menus. 2019, Fargo, North Dakota: Deb Tanner, NDSU Agriculture Communication.

blended formulations and improve dietary diversification. The composite bean and maize flour, can be processed locally or on commercial scale, opening up business opportunity and contributing to Malawi's economic growth.

- Smallholder farmers can grow and supply HIZB to schools strengthening the Home-Grown School Feeding Programme in Malawi. The HIZB varieties are early maturing and high yielding - matures within 70 days and have potential to yield up to 40 - 50 bags of 50kg per hectare. They are bred to be resistant to diseases, such as Common Bacteria Blight and Angular Leaf Spot.

Making agriculture work for nutrition

Promotion and adoption of high iron and zinc beans have not been without any hurdles. The fact that these are newly bred beans, most farmers are not aware of the benefits of these micronutrient beans. Intensive awareness creation and promotion is one way of ensuring that farmers, processors and consumers are aware of the benefits of these beans. More investments in research and development of biofortified crops is necessary as this will derive across board the various nutritious crops available to the population. Policymakers' involvement is also a critical entry point in ensuring adoption of the micronutrient beans. This is important in driving the nutrition agenda forward, especially among agriculture, health and education sectors. Unlike other priority areas, food and nutrition security and other crosscutting issues do not have specific framework implementation plans (FIPs). This minimizes the capacity for resource mobilization and monitoring and evaluation.

High Iron and Zinc Beans (HIZBs), are a cost-effective opportunity to improve the school feeding programmes (SFP) in Malawi. HIZB could be adopted and grown by smallholder farmers increasing availability, access and utilisation by the SFPs for all. Private sector, especially agro-processing industries have a business

opportunity to produce nutrient-dense flours to be used in the school feeding programmes in Malawi.

Making agriculture work for nutrition is a great step to hasten the achievement of the Sustainable Development Goals. We help governments make nutrition a national priority to include nutrition goals as part of the policies. We drive this agenda by:

- Supporting inclusion of biofortified crops, such as HIZBs in national policies, programmes, strategies and guidelines that directly affect SFPs, for instance the National Education Sector Plan, National School Health and Nutrition Policy and the National Social Support Programme.
- Strengthening multi-sectoral and multi-stakeholder nutrition coordination structures among health, agriculture and education line ministries. The Ministries of Education and Agriculture are involved in ensuring the broadening of school feeding principles and objectives, however there need to have a coordination unit for school feeding throughout the country.
- Supporting local communities with subsidised inputs to produce biofortified foods for Home-Grown SFPs. This will increase school enrolment, while promoting local food production and the incorporation of agriculture into school programmes.
- Lobbying for inclusion of HIZBs into the Affordable Inputs Programme (AIP) to increase availability, access and utilisation.
- Inclusion of food basket approach in school curriculum for long term benefits. A better foundation for children means productive, skilful and entrepreneurial farmers of generations to come.
- Make directives to encourage development partners to diversify the current white maize and soya flour formulation used in SFPs with biofortified beans.
- Supporting further improvements through research and development initiatives for biofortified crops.
- Providing incentives for farmers growing biofortified foods by making available market information that include competitive prices and agricultural insurances.
- Supporting small and medium enterprises to produce blended flours from biofortified foods, i.e. the Blended High Iron and Zinc Bean – provitamin A maize flour that are nutrient dense
- Incentives for agro-processors involved in processing and marketing blended flours from biofortified crops. This could include tax exemptions and duty free on goods and machinery.

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