



Kadiki,
Plot 75011,
Nakatindi Road
PO Box 60822,
Livingstone, 23455
Zambia

AIM

To improve the nutrition and health of poor, rural Zambians in particular through the substitution and diversification of, the crops they currently grow and eat.

OBJECTIVES

To support the introduction and widespread growth of vitamin A-rich orange crops of maize, sweet potato and cassava, as replacements for their white equivalents.

To teach small-scale farmers the farming practices of diversifying their crops and mulching, thereby sustainably improving both the soil quality and the quality of their and their family's diet.

WHY GROW AND EAT DIFFERENTLY?

"The destiny of nations depends on the manner in which they feed themselves."

Jean-Anthelme Brillat-Savarin (French politician and gastronome), *The Physiology of Taste*, 1825

Vitamin A deficiency and stunting are alarmingly high throughout Zambia, reported to be 40-50% in under-5s.

Vitamin A deficiency results in blindness and other sight-related problems, as well as reducing immunity.

Stunting is a visible consequences of malnutrition. Other consequences include delayed development and long-term health and learning problems.

This level of malnutrition not only undermines personal and community development but also the economic wellbeing of Zambia as a whole.

Addressing it is therefore critical when working to fulfil the Sustainable Development Goals (SDGs), as Zambia has pledged to do (<https://www.tandfonline.com/doi/full/10.1080/03031853.2018.1479974?needAccess=true>).

Actions taken to date to prevent vitamin A deficiency in Zambia have been:

1. Six-monthly vitamin A supplementation to children under 5 years;
2. Compulsory vitamin A supplementation of all sugar; and,
3. The development and introduction of bio-fortified maize seed — orange maize — which is high in vitamin A. When orange maize replaces the staple white maize vitamin A deficiency is minimised.

However, despite these interventions the incidence of vitamin A deficiency remains very high, suggesting that the current actions are not addressing the most vulnerable, ie the rural poor.

The main problems with these three actions are as follows:

1. The course of supplementation is not always completed, particularly in rural areas where medical facilities are limited which sometimes results in young children not starting on the programme at all;
2. Many poor Zambians cannot afford sugar, the price of which increased about 50% when compulsory supplementation was introduced a decade or so ago;
3. Furthermore, as a general health strategy supplementing sugar and encouraging its consumption is not advisable when the number of obese people nationwide is rising; and,
4. Even though bio-fortified crops are a simple and cost-effective way to improve nutrition, in Zambia orange maize seed is not readily available throughout the country; for example, in Livingstone, a town of 200,000 people with many small farmers living in the district, orange maize seed could not be purchased locally through the 2017/18 rainy season.

ADDRESSING NUTRITION DEFICIENCIES IN THE FIELD

Good nutrition and good health require a nutritious and diverse diet.

70% of Zambians live in rural areas and a large percentage are poor. The rural poor are overwhelmingly subsistence farmers, growing a large proportion of the food they and their family eats. Their diet is very limited and very dependant on white maize as a staple.

Changes in the crops they grow and improved agriculture practices are an effective and low-cost way dramatically to improve their nutrition and therefore their general health. Consider.

Growing Orange Maize to minimise Vitamin A deficiency

Animal products are rich in vitamin A. However, the diet of many poor rural Zambians contains little animal protein and the staple white maize contains no vitamin A. If orange maize were to replace white maize vitamin A deficiency would be minimised, if not eradicated.

Developing Sustainable Farming Practices to increase productivity and diversify the diet

Across many areas in Zambia the soil quality is deteriorating, as observed by many small-scale farmers. The consequences are a reduction in crop yields, an increasing sensitivity of the soil to the variable rainfall and the increasing prevalence of pests. This is very often the result of continuous single-cropping of maize and the burning of all plant material from the previous harvest. The only support the soil receives is the addition of commercial fertilisers — when they are available and can be afforded. On the other hand, sustainable farming, the rotation of crops and the mulching of soil, replaces lost nourishment, increases productivity and enhances water retention of the soil. Furthermore, when growing a greater variety of crops subsistence farmers improve their and their family's diet and nutrition.

BUILDING ON A SUCCESSFUL PILOT INITIATIVE

After moving to Livingstone, I become aware of the high incidence of blindness and other sight-related problems, subsequently learning of the vitamin A deficiency and malnutrition which hamstringing the country. I therefore became interested in the use of bio-fortified maize to minimise vitamin A deficiency. The Zambian love of nshima makes this a pragmatic nutrition intervention. However, in Livingstone, the majority of people appear to be unaware of orange maize and its benefits; nor (and almost certainly related) was the seed available from the local vendors.

I decided to explore whether this crop was acceptable in taste and texture to Zambians I know personally. From Lusaka I obtained seed and grew a small plot of orange maize. The fresh cobs I distributed to Zambians in local lodges, schools and farms. It was a success. The product was well received — they liked the flavour and many were interested in the health benefits, asking where they could purchase the seed for themselves.

I approached a Zambian shop-owner in Simonga, my closest village, who agreed to open a second shop and sell orange maize seed along with other non-food items. (Simonga is, of course, just 15km from Livingstone and would not, therefore, be considered 'remote', perhaps not even 'rural'. But there is still a clear need there for education and assistance of the sort envisioned in this programme.) Obtaining the necessary seed-selling licence has been a little problematic but he hopes to be operational for the growing season of 2018/19.

This pilot is garnering growing support and interest from the local community. Several people have verbally committed to buying orange maize seed and two schools plan to grow the crop and include it in their school meals. I am confident that, with the retail outlet, knowledge, interest and sales will increase. Furthermore, it will also provide a platform for ongoing education about nutrition, food and sustainable farming practices.

WHO TO WORK WITH?

I propose working with a variety of individuals and organisations to pursue this programme and to have it included in rural programmes which are already up and running. These may include:

- NGOs and charities with programmes in rural communities;
- Zambian Government health and agriculture programmes;
- Foreign Government-funded rural agriculture and nutrition programmes;
- Conservation programmes in and around National Parks and Game Management Areas; and,
- Individuals and organisations pursuing nutrition within their programme(s).

ADDRESSING THE HEALTH OF THE LAND AND THE INDIVIDUAL FOR THE LONG-TERM BENEFIT OF BOTH

Caring for people and their land is essential for the sustainability of any programme working to improve the diet of subsistence farmers.

Set out immediately below is an eight-step programme to introduce orange maize to rural communities over the course of two successive rainy seasons, as follows:

1. **Building support from community leaders** (chief, headman or woman, school teachers, health workers etc) for the trial of orange maize and the use of a piece of land on which to have a demo plot;
2. **Teaching the village community** about the advantages of orange maize: the taste, health benefits, and that it is grown in the same way as white maize while being more drought- and disease-resistant and having only a three-month growing period;
3. **Cultivating a demo plot** of orange maize in the village;
4. **Distributing samples** of this orange maize crop to village members;
5. **Recording reactions and responses** to orange maize (the growing process and the taste);

6. **Working with the community** to build interest in growing orange maize;
7. **Liaising with seed retailers** to ensure the availability of orange maize seed and encouraging them to introduce a time-bound discounts for early-adopter farmers; and,
8. **Establishing a simple community loan system** (if necessary) to facilitate the purchase of orange maize seed by small scale farmers, along the lines of models already successfully deployed in Zambia.

Steps 9 to 14 below are an extension aimed at consolidating of the adoption of orange maize throughout the community as a whole, as well as introducing of a variety of other crops and encouraging the adoption of sustainable farming practices. The precise steps adopted and the order in which they are taken will be dependant on community interest and acceptance of further change, current practices and community choice.

9. **Introducing sustainable farming practices**, ie crop rotation and companion planting, and composting (in place of burning);
10. **Developing kitchen gardens for 'relish' crops**, growing fruits and vegetables for home consumption and/or local barter for different relish crops;
11. **Promoting school gardens** to teach children to grow and cook new foods and provide exposure to new flavours as a step towards a more diverse and nutritional diet;
12. **Boosting the nutrition intake of babies** during the weaning and potentially critical 6-24 months period by teaching the production of a porridge mix utilising the variety of crops being grown;
13. **Demonstrating the preparation of new nutritious meals** utilising, to a large extent, crops grown by the family; and,
14. **Training local trainers** to extend this work to other villages and areas based on the 13 steps previously noted.

Throughout the programme there will be regular presentations and tasting of new foods and cooking ideas further to encourage an increased diversity in growing, cooking and eating. A particular focus is the reduction in the quantity of salt added to cooking (high blood pressure being a big health problem in Zambia).

CONCLUSIONS: WHY THIS WILL WORK

This programme will work because it is straightforward, highly affordable and totally consistent with long-established Zambian food preferences.

In the first instance it involves simply switching the staple white maize for orange. Zambians want better health for themselves and their children; and, critically, they like the taste of orange maize. The interest and enthusiasm for the demo project in Simonga confirms what can be achieved with minimal cost in helping people improve their lives.

CLARE SULLIVAN

I am a nutritionist working in and around Livingstone, Zambia. I originally trained as a dietitian and has worked in clinical dietetics and nutrition in Australia and London.

My husband and I moved to Zambia in 2015 and established Alavan Business Advisory Limited dedicating to assisting Africa's business development (www.alavan.biz). Here, my role has primarily been to support

the development of Zambian tourism by providing a 'unique edge' to the industry, ie training in nutrition to cater for the increasing dietary demands of clients.

When I first became aware of the high levels of vitamin A deficiency and malnutrition throughout the country I recognised this as a significant barrier to business development thanks to their negative impact on the quality of the labour force. I therefore ran a simple small-scale pilot testing the scope for reducing vitamin A deficiency among members in my immediate community. With its success, I aim to roll out this programme more widely in our immediate area and onwards to more remote rural areas where there is currently neither information nor access to orange maize seed.

In conjunction with my local programme, I am consulting with African Parks (AP), which manages Liuwa National Park, about improving nutrition through agriculture. A trial with vitamin A-rich crops is planned as part of the development programmes AP is implementing in and around the park.

Clare Sullivan
Director
Alavan Business Advisory Limited
+260 961350882
clare75011@gmail.com

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