Nutritious Food Systems for Subsistence Farmers

Robin D. Graham[1] and Ross M. Welch[2]

[1] Discipline of Plant and Food Science, School of Agriculture, Food and Wine, The University of Adelaide, Waite Campus, Glen Osmond, South Australia 5064, AUSTRALIA (robin.graham@adelaide.edu.au)
[2] Plant, Soil and Nutrition Laboratory, USDA-ARS, USA

INTRODUCTION

Over half of the human population on earth is deficient in one or more of the micronutrients Fe, Zn, Se, I, vitamin A and vitamin B12; a further 15% have inadequate energy supply. Most of these people are in resource-poor countries, the food systems of which can be said to be dysfunctional since they fail to deliver all the nutrients needed for healthy lives.

THE CONCEPT

The conceptual framework for this approach is the synergy that arises when all potentially limiting nutrients are supplied together, resulting in improvements in growth and health of crops, and humans and animals dependent on them that are much greater and more complete than predicted from benefits derived from interventions with any of these nutrients supplied alone.

THE SIGNIFICANCE OF ZINC

We argue that the emphasis in the green revolution on cereals to the detriment of production of other secondary staples, and the increase in use of macronutrient fertilisers are likely to be the primary causes of the present extent of Zn deficiencies in human populations (Hotz and Brown, 2004). Zinc therefore has a primary role in our food systems strategy.

STRATEGY

The strategic framework that makes a complex multi-nutrient intervention feasible is to balance *first* the nutrient requirements of the crops that require about 16 essential mineral, a simpler task than for humans that require over 50 essential mineral and organic nutrients.

AGRONOMY

Agronomists have considerable experience in achieving complete nutritional balance in crops and thereby achieving optimal yields for rainfall and other physical constraints of the environment, as well as generally lowering the susceptibility to pests and disease. Balanced nutrition of crops generally enhances the nutritional value of these crops for the minerals supplied to the crop and for the organic nutrients synthesized by the crops and needed for humans dependent on them. The few additional nutrients that are needed by healthy humans above and beyond those delivered by healthy crops finally can be dealt with in a more manageable way. In particular, three minerals, cobalt, iodine and selenium, not necessarily needed by the crops but carried in them can be supplied to the food system with the fertilizer applied to the crops. Vitamin A may still be limiting at this point if the food system does not already include foods containing the yellow provitamin A carotenoids, and a new crop must be introduced to the food system for this purpose, one of the many available that proves to be acceptable to the people and adapted to the environment.

ANIMAL INPUTS

Even then, vitamin B12 that is effectively only available via animal products is likely to be deficient unless small amounts of animal products such as milk, eggs, fish or meat are introduced in a sustainable way. Small animals where acceptable can complement the food system considerably while detracting little from the available land for essential staple production.

CONCLUSIONS

We argue that this approach, while requiring significant but currently well developed technologies and fertilizers (currently not available in many parts of Africa, for example), has, nevertheless, much greater potential to deliver full health and wellbeing to target populations and thereby to be more sustainable in the long run than many of the single-factor interventions of current international aid programs.

Nutritional deficiencies in human diets can be analysed at a food system level, and solutions developed for the food system in the context of local soils and other constraints to production and distribution. By analysing on this basis we can ensure that the changes we would want to make are agronomically, socially and economically sound, and sustainable.

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