8th Hugh Bunting Memorial Lecture

Horticulture - the key ingredient in the developing world for nourishing families, empowering women, and commercialising smallholders

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Introduction

I was privileged to work with Hugh Bunting at the close of his career in the late 1990s whilst I was at Reading as Professor of Agricultural Systems and Management. I am honoured now to hold the same title he used as an Emeritus Professor of Tropical Agriculture. I was also pleased to have held a senior position at the International Institute of Tropical Agriculture (IITA) in Nigeria – the establishment of which was Professor Bunting's most lasting career achievement. To then have the esteem of presenting the annual lecture in his name gives me the opportunity to repay a small portion of the mentoring debt that I owed him when I joined Reading in 1993 as a young and inexperienced professor.

In my view, the policy makers of agriculture are currently being led astray by out-of-date green revolution thinking fixated on garnering further productivity from staple cereals worldwide. It will be a significant world policy failure if, in 2050, we can actually feed the world's population, but at the same time fail to adequately nourish it. Last year's Bunting lecturer - Andrew MacMillan - was also of the opinion that 'the world food system is in a mess…'; however, my 'solutions' diverge from his, as I operate from the substantially narrower perspective of horticulture.

Farmers will inevitably struggle to grow themselves out of poverty when they are restricted to small land holdings and grow only staple crops. A different approach incorporating much greater on-farm diversity is called for if we are to seriously address the Millennium Development Goals of eliminating poverty, reducing child mortality, stunting and issues associated with malnutrition, and delivering better female health and empowerment (Dias, 2011).

These admittedly strident views have been promulgated globally by me and a few others representing the Diversity for Development Alliance (Global Horticultural Initiative, the International Society for Horticultural Science (ISHS), AVRDC, Bioversity International, Crops for the Future, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), International Center for Agricultural Research in the Dry Areas (ICARDA), International Livestock Research Institute (ILRI), World Fish Center, etc). I believe that the message is perhaps now finally being absorbed at least at the donor agency level and at the UK Department for International Development (DFID) in particular. I will attempt to justify my views in the remainder of this paper.

Failure to make sufficient vegetables available to the general population (current consumption is <200 g/day) so that they can be incorporated in a sensible, balanced diet may result in substantial child mortality or stunting (Keatinge *et al,* 2011). This supply failure can be due to the lack of local production, ignorance of the importance of fruit and vegetables for health, or most common, prices in excess of what the poor can afford.

To complicate matters, it is clear that not all vegetables are equal when it comes to human nutritional value. For women in the first trimester of pregnancy, where potential malnutrition is a major threat to human health and effective reproductive development, eating white cabbage and red tomatoes, for example, may in fact provide only small amounts of the key micronutrients required for the health of mother and foetus (Keatinge *et al,* 2011); these vegetables are neither vitamin-rich (they are low in vitamins A and E) nor are they nutrient-dense with respect to iron, zinc, calcium or folate. Likewise, staple cereals and root crops contain only trace amounts of these particular micronutrients vital for human health. Healthy balanced diets for pregnant women should include

substantial quantities of nutrient-dense fruit, vegetables and pulses. Many indigenous vegetables are often substantially nutrient-dense with vitamins and minerals, particularly in pro-vitamin A, such as amaranth *(Amaranthus spp)*, cowpea leaves and pods *(Vigna unguiculata)*, African nightshade *(Solanum scabrum)*, and roselle *(Hibiscus sabdariffa)* - a rich source of easily preserved vitamin C (Fasoyiro *et al*, 2005). Moringa *(Moringa oleifera)* is also particularly rich in a range of vitamins and minerals (Afari-Sefa *et al,* 2012) and is used when dried to fortify baby food or ready-to-use therapeutic foods, such as *Plumpynut*, recommended by the World Health Organization.

Nourishing families

If a dietary-based solution to malnutrition that includes vegetables and fruits is to be devised and promulgated widely, then it will be of fundamental importance that those foods be suitably nutrient-dense and provide a range of vitamins and minerals, whether they are indigenous or globally important species. Globally important vegetables such as tomatoes can be nutrient-dense, but to supply pro-vitamin A precursors they need to be orange/yellow in colour rather than red (Stommel, 1992). It is an unfortunate fact, as indicated by Davis & Riordan (2004), that since 1950 most breeding efforts for vegetables in the developed world have marginalised nutritional content in pursuit of appearance, extended shelf-life, yield, etc. As a result, the comparative nutrient density of today's vegetables has substantively decreased.

Evidence from AVRDC surveys in Asia and Africa indicates that indigenous vegetables account for about 50 percent of *per capita* vegetable consumption in developing countries. In Tanzania, for example, the poorest third of the human population gets almost half of its vitamin A requirements from indigenous vegetables alone (Afari-Sefa *et al,* 2012). Given the challenge of attaining the Millennium Development Goals, it seems most unwise not to devote considerable research attention to these species. Regrettably, this is not the case; generous long-term funding for indigenous vegetable research remains extremely limited. In addition, as bio-availability of minerals and vitamins may also be a severe constraint when humans consume fruit and vegetables (De Pee & Bloem, 2007), it is also surprising that more investment is not made in disciplines such as home economics and nutrition. These, through teaching and advocating food combinations and cooking methods, strive to maximise dietary benefits to maintain and enhance human health and longevity.

Keatinge *et al* (2012) comprehensively surveyed literature on home, community, hospital, prison and other vegetable gardens in which produce is grown specifically for home consumption, and concluded that these gardens bolster human nutrition, build social capital, and provide considerable economic returns. Introducing policies of not relying on imports and helping families to 'grow their own' are actions many regions in the developing world might thus profitably adopt further. However, one major constraint does exist. It is no simple thing to obtain seed, particularly of indigenous vegetables and non-hybrids, for home gardens in many of the poorer parts of the world. AVRDC is attempting to address this issue through breeding and seed bulking in many developing countries. Many multiple-species home garden seed packs have been devised by the Center with clear instructions on how to grow and suitably rotate vegetable crops; the goal is to help growers and consumers get the maximum return on nutrition for their gardening effort. AVRDC holds the largest public-sector genebank of tropical vegetables in the world with around 430+ species available for distribution on request (Afari-Sefa *et al,* 2012). Details of specific seed availability can be obtained through the AVRDC website: www.avrdc.org.

Empowering women

Home gardening and horticultural crops are principally the responsibility of women in most of the developing world, and are thus a means of overcoming cultural and social restrictions to undertaking activities outside the home. Gardens are also important places where mothers educate their children about food production and the need to respect the necessary environmental aspects for sustainable agriculture. Gardens act as an empowering vehicle for women by providing opportunities for them to receive information on effective ways to overcome malnutrition and to provide cash in their pockets for additional household expenses. For example, 85 percent of women in Bangladesh who participated in the large Helen Keller International Homestead Gardens Program (Bushamuka *et al,* 2005) stated that they had considerably increased their contribution to the household's resources, and hence had increased their status and decision-making power.

Horticulture is a potential engine of additional paid employment in both rural and peri-urban areas; it creates jobs from the homestead field all the way to the market and beyond. For the landless poor and people dependent on wage labour, horticulture can create jobs in field work, harvesting, sorting, grading, drying, cleaning, processing, transporting, storage and marketing. Most of these jobs in the developing world appear to be largely the domain of women, and can be a source of empowerment. For example, Weinberger & Lumpkin (2007) reported that women accounted for 65 percent of the labour employed in packing houses in Kenya and Zambia. Even higher proportions of wage-earners (80-100%) were reported to be female in vegetable processing and packaging activities in Mexico, Guatemala and Zimbabwe.

Although the benefits to be derived from vegetable gardens are many, it is important to note that establishing and tending a productive vegetable garden requires time and physical effort. Women fully burdened with family and domestic responsibilities may not have the hours or the energy to spare on gardening activities. For example, Keatinge *et al* (2012) report that the total energy expended by a single female worker in a 6 x 6 m garden over a three-month period (sowing to harvesting) was approximately 54,000 kcal, or about 300 kcal/hr over a two-hour working period/day - equivalent to the energy expended on an elliptical exercise trainer operating at around 11 km/hr for the same period/day.

Commercialising smallholders

AVRDC scientists believe that vegetable production can be a significant pathway out of poverty for many smallholder

farmers. This route to relative affluence needs to be exploited much more quickly and effectively than in the past if national development targets are to be achieved. In the case of India, for example, more than one-third of all farmers owning less than one hectare of land (often considerably less) grow vegetables - and they often have a comparative advantage in vegetable production due to the limited economies of scale (Birthal & Joshi, 2007). Weinberger & Lumpkin (2007) record data showing substantive differences in net farm income per household member between vegetable and non-vegetable producing farms.

Higher incomes are a prerequisite if horticultural enterprises are to be sustained long enough to mature into semi-commercial and fully commercial enterprises. Such horticultural activities may require additional labour to commercialise adequately; this creates new jobs on the farm and all the way along the vegetable value chain from field to market (packing, storing, transport, value-addition processing, etc). Vegetables sales generate higher and immediate cash income when compared with staple cereals (Dias, 2011). For example in the Mekong River region of Southeast Asia, more than 95 percent of all horticultural produce is sold in markets compared with less than 25 percent of rice traded by these means (Weinberger & Lumpkin, 2007).

Most farmers that keep small home gardens not only consume their own produce, but also market a portion of the harvest for cash, or distribute excess produce to relatives and neighbours, and thus provide a substantial social benefit (Keatinge *et al,* 2012). Tchientche *et al* (2012) reported that in Yaoundé, Cameroon, more than 75 percent of peri-urban vegetable farmers noted combined consumption and sales as the major reasons for producing vegetable crops. Vegetable farming was the main source of livelihood for around 70 percent of the households surveyed, with staple crops providing significant income in only around 40 percent of the survey respondents' farms.

Final thoughts

I believe horticulture is a necessary tool for the alleviation of poverty and the elimination of micronutrient malnutrition globally. It can serve as a mechanism to enhance social equity, not only between genders but also for many other potentially disadvantaged groups, such as HIV positive people and refugees. Horticulture can help people who have experienced disasters such as wars, earthquakes, floods or fires to begin the process of rebuilding their livelihoods. Investment in a few packets of seed and simple tools to tend a vegetable plot can provide food, nutrition and the means to generate cash comparatively quickly from small land holdings. I believe that if Hugh Bunting were starting his career today, he would be distressed, as I am, by the persistence of unnecessary hunger, malnutrition and poverty around the world. I am certain he would be a strong advocate for horticulture in the developing world, and that he would agree with much of what I have argued in this paper.

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