

Opportunities for Horticulture to Feed the World[©]

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By the middle of the 21st century, the world population will increase 30% to more than 9 billion. Food production will need to increase 70% to meet increased demands. The numbers do not add-up how the world can realistically meet the increased demand for food. For the first time in human history, food production will be limited on a global scale by the availability of land, water, and energy. Food issues could become as politically destabilizing after 2050 as energy issues are today. More efficient technologies and crops will need to be developed to address this challenge — and equally important, better ways of applying these technologies locally for farmers. Simply put: technologies are not reaching enough smallholder farmers. A greater emphasis is needed in high-value, horticultural crops which create jobs and economic opportunities for rural communities, enables more profitable, intensive farming of small tracts of land in urban areas. Better information delivery (extension), reducing high crop losses and improving the value-chain from farm to fork are critical.

INTRODUCTION

High-value horticultural crops play a key-role in helping to feed the world with nutritionally healthy food (Harvesting the Sun: A Profile of the World of Horticulture, 2012). Horticulture, as part of specialty crops, represents 50% of the farm-gate value of all crops produced in the USA, and unlike cotton, corn, rice, soybean and other staple crops, they receive little government subsidization. While staple cereal crops are needed for their starch and calories, they do not supply the vitamins and minerals found in fruits and vegetables. There are opportunities for increased vegetable and fruit production and consumption to ensure a diet rich in vitamins and micronutrients (Bowman, 2013). Then there is the economics of scale: a smallholder farmer can be commercially successful growing high-value horticulture crops under small-acreage in rural, peri-urban or urban environments, while hectares are required to commercially farm cereals.

In California, the fastest growing segment of new farmers is female, non-Anglo, intensively growing horticulture crops on small acreage. In Ghana, the tomato industry is dominated by the “Tomato Queens of Accra” from production to marketing. A greater emphasis is needed in high-value, vegetable, fruit and ornamental plants which create jobs and economic opportunities for rural communities; enable more profitable, intensive farming of small tracts of land in urban areas; and employ smallholder entrepreneurs, especially women (Davies, 2012; Konuma, 2013).

INCREASED FOOD DEMANDS AND URBANIZATION

By the middle of the 21st century, the world population will increase 30% to more than 9 billion. By 2030, 60% of the population will live in urban areas, and will reach 70% by 2050 (Wilson, 2014). Food production will need to increase 70% to meet higher demands. The numbers do not add-up how the world can realistically meet the increased demand for food, with environmentally and economically sustainable systems. For the first time in human history, food production will be limited on a global scale by the availability of

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land, water, and energy. Poverty is the principle cause of hunger. Some 75% of the world's chronically poor are found in mid-income countries, i.e., China, India, Brazil (World Hunger Education Service, 2013). Food issues could become as politically destabilizing after 2050 as energy issues are today (Friedman, 2008).

Indonesia is an example of a developing country facing significant nutritional and food security issues. The country imports 50% of its food while more than half of Indonesian children are malnourished. More than 60% of the 40% of Indonesians working in agriculture live at the poverty level, and there are large losses of product from farm to fork (i.e., 35% losses in tomatoes and rice) because of an inefficient supply chain that lacks SOPs — standard operational procedures and GAPs — good agricultural practices (Anonymous, 2014). These are daunting food security, human health, economic and political stability issues. Moreover, there are many other developing countries with fewer resources face that more severe challenges than Indonesia.

To reduce land pressures, more programs are needed in sustainable agriculture and resource management, as well as reducing food loss from farm to fork in developing countries. This includes increased infrastructure of roads, adequate storage facilities, good agricultural practices (GAP), post-harvest practices and developing cooperatives/agricultural clusters (Friedlander, 2014).

MEGATRENDS AFFECTING HORTICULTURE

Some 70% of the world's seven billion people own or have access to mobile phones. A billion people actively use Facebook. Indonesia, a developing country, is the fourth highest user of Facebook. Kenya is the largest user of mobile money. Some 30% of Kenya's GDP is spent through mobile phones (Mims, 2013). The largest region in the world to use mobile money is sub-Saharan Africa — one of the poorest regions in the world.

There are many innovative information and communication technologies (ICT). Most developing countries lack an organized, integrated USA-type land-grant system of research, teaching, and extension delivery for producers and consumers. In the developing world there is increasing emphasis on public-private hybrids of extension/information delivery to smallholder farmers. National governments, international agencies and NGOs are starting to utilize ICT technology for information delivery for smallholder farmers. The modernizing extension and advisory education program (MEAS) at USAID utilizes ICT technology as well as farmer schools, farmer-to-farmer and other programs: <<http://agrilinks.org/activity/modernizing-extension-and-advisory-services>>.

Digital Green video programs <<http://www.digitalgreen.org/>> is a low-cost platform to help with information transfer to smallholder farmers and consumers in India and Africa. Local, progressive smallholder farmers are recorded in their local language and dialect and used to transfer best practices to other local farmers. The ‘Shamba Shape-Up’ farm makeover reality TV show <<http://www.shambashapeup.com/>> reaches over ten million viewers in Kenya, many of them small-holder farmers. The International Potato Center (CIP) in Nairobi, has helped develop a series on “Shamba Shape-Up TV shows to educate the public and small holder farmers about highly nutritious, orange-fleshed sweet potatoes (OFSP). The series includes OFSP nutritional importance (high beta carotene for combating vitamin A deficiency), field preparation, propagation, planting, production, harvesting, post-harvest handling, storage, — and ideas on better ways to prepare and cook OFSP (Bouis and Islam, 2012).

PACKAGE APPROACH OF HIGH VALUE HORTICULTURE CROPS LINKED TO MARKETS

Lack of access to credit, insurance, low quality seed, lack of technical assistance and direct links to markets limits the ability of smallholder farmers to become more commercially successful. Amiran <<http://www.amirankenya.com>>, which is a commercial greenhouse supplier in Kenya, has developed Amiran “farmer kits” to improve the livelihoods of smallholders. It is a micro-niche approach for producing high-

value horticulture crops from smallholders linked to markets. There is also support from the Kenyan government and commercial banks supplying low-interest loans and reinsurance that is used for micro-insurance of production inputs (i.e., high value horticulture seed, greenhouse materials, drip-irrigation, chemicals, etc.). The \$4,000 micro-loan package is to be paid off over a period of several seasons, based on the high-value vegetable crop cash flow. The program targets young producers, 35-years and younger, who are required to contribute 10% collateral. The vegetable production system utilizes low-cost, insect-screened greenhouse structures and outdoor drip irrigation. There is access to trainers, pest-certification — and assistance to forge direct links to markets.

CONSILIENCE AND HORTICULTURE

Successful programs in horticulture use consilience. This evolution of collaboration with horticulture and other disciplines has been going on for some time. We see it in thriving programs addressing societal issues, such as health, obesity and nutrition. Some 2/3 of all deaths are diet related: obesity, hypertension, heart disease, diabetes, etc. In the developing world, treating HIV patients in Kenya is compounded when they have diet-related diseases, plus malnourishment which limits effective treatment. A nutritious diet of vegetables enhances efficacy of HIV treatments (Weller, 2014).

A horticultural program built around consilience is the Cancer Prevention Laboratory (CPL) that Henry Thompson runs in the Department of Horticulture and Landscape Architecture at Colorado State University <<http://www.cropsforhealth.colostate.edu/>>]. The CPL conducts both pre-clinical and clinical research, the goal of which is to identify practical solutions that will empower an individual to adopt lifestyles that achieve and maintain a lower risk for cancer. They use consilience in tackling chronic disease prevention. This includes developing crops for health, integrating plant breeders, producers, retailers, biologists, chemists, health care professionals — and ultimately consumers. Because our food supply is a primary source of many chemicals that contribute to the interplay of forces that promote as well as prevent the development of cancer, the CPL is part of the College of Agricultural Sciences. This permits cancer researchers to regularly interact with investigators responsible for decisions that impact the health characteristics of the foods ultimately made available to the consumer. The CPL judges that enhancement of the health benefits of the foods made available to consumers could have global impact on human health and wellbeing.

SUMMARY

Production of horticulture specialty crops is an opportunity to: reduce malnourishment, hunger, poverty, and to generate employment, create niche market opportunities for smallholder farmers on small acreage, and generate income for women. Unlike field crops (e.g., corn, wheat, rice, sorghum) which require larger land availability for economies of scale, horticulture can be profitable under reduced acreage. Building roads enables smallholders to have closer access to peri-urban and urban markets; this favours high-value, nutritious, intensively-grown vegetables, fruits, and flowers — as compared to field crops (Reardon, 2013).

Through sustainable intensification in urban and peri-urban environments, we can efficiently grow high value horticultural crops vertically, in synthetic media under protected culture (CEA — controlled environmental systems) from hoop-houses to modified greenhouses and buildings. To support the developing and developed world population increases, niches are needed of commercial small-holder to large-holder farmers producing in peri-urban and urban environments. It is all part of the nexus of Food, Energy, Water, Sanitation, and Health-Nutrition.

There are many opportunities for young and more experienced horticulturists to participate in addressing world food challenges. This includes the U.S. Peace Corps <<http://www.peacecorps.gov/>>, USAID Farmer to Farmer program <<http://www.usaid.gov/what-we-do/agriculture-and-food-security/supporting-agricultural-capacity->

development/john-ogonowski> and various NGOs — non-government organizations <<http://theglobaljournal.net/top100NGOs/>>.

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