Genetic resource & plant breeding possibilities & limitations for fruit & vegetable crops

Colin Khoury

“Innovating global fruit and vegetable food systems to help bring sustainable nutrition security” workshop
Keystone, Colorado
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YOU'RE FAT, BUT YOU'RE GOOD FAT.

AVOCADO AFFIRMATION
Biodiversidad desarrollo y bienestar
¡Conservémosla!
Crop commodities measured in FAO food supply data

http://ciat.cgiar.org/the-changing-global-diet/
Lettuce Expressly for the Summer Slot

Sweet & crisp or soft & buttery, these are heat-tolerant & resistant to tipburn.

SHOP
Healthier lives and more resilient livelihoods through greater diversity in what we grow and eat

The World Vegetable Center conducts research, builds networks, and carries out training and promotion activities to raise awareness of the role of vegetables for improved health and global poverty alleviation.

Vegetables can alleviate poverty by creating new jobs and new sources of income for farmers and landless laborers, improve health by providing essential micronutrients lacking in diets, enhance learning and working capacities of adults and children through improved diets and health, and improve the sustainability of food production practices by diversifying cropping systems. The Center's research and development work focuses on breeding improved vegetable lines, developing and promoting safe production practices, reducing postharvest losses, and improving the nutritional value of vegetables.
United States joins pioneering plant genetic resources treaty

Number of countries participating in Treaty on Plant Genetic Resources for Food and Agriculture grows to 143.
Geographic origins of the average U.S. diet (food supply from plants)

The Changing Composition of the Global Diet: Implications for CGIAR Research

Colin K. Khoury and Andy Jarvis

In the few decades during which CGIAR has worked to reduce poverty and hunger through agricultural research, very substantial changes have occurred in human diets worldwide and in the production systems that sustain them. National diets around the world have become increasingly animal, getting in calories, protein, and fat, as animal-derived foods and high-calorie plant foods (cereals and sugars) have risen in importance. The proportion of diets consisting of legumes and oil crops has increased, while significantly and locally important cereals, root crops, and oil crops have generally become less important. Developing countries show the most significant shifts in diets over this period.

These changes have been driven by globalization, urbanization, and economic development, including agricultural research. While this “nutrition transition” has enhanced food security by making macronutrients more readily available worldwide, it has had mixed effects on micronutrient sufficiency, and the over-consumption of macronutrients has contributed to a global surge in diet-related non-communicable diseases. Dietary change is also linked with greater homogenization in human diets and the associated commercial food systems, thus heightening concerns about genetic vulnerability to biotic and abiotic stresses as well as food system vulnerability to climate and political instability. This policy brief provides an overview of the key results from a recent study published by the International Center for Tropical Agriculture (CIAT) and CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) (Khoury et al., 2014), which has important implications for CGIAR research priorities.

Key messages

- The results of a recent CCAFS/CGIAR study reveal three major trends in the diets of various crop species grown in global diets: (1) a steady increase in the importance of major cereals, (2) the growing importance of oil crops, and (3) a decline in regional cash crops.
- CCAFS research on three global staples—rice, wheat, and maize—continues to be critical because of their increasing importance in the global food system.
- The rising global significance of oil crops creates new opportunities to benefit farmers in parts of the developing world but also poses major environmental challenges, including deforestation and land degradation, as well as reduced nutritional quality and higher prices for oilseeds and plant-based oilseeds, which are becoming relatively marginalized (e.g., sorghum, yams, cassava, and potatoes) in many parts of the world.
- Agricultural research should pursue a systems approach aimed at improving the nutrition of an increasingly urban population, while conserving natural resources.

Since the creation of CGIAR, global diets have undergone significant changes, which are reflected in three main crop trends.

1. The major cereals—wheat, rice, and maize—are primary sources of starch and protein sources for the developing countries of Africa, Asia, and Latin America and the Caribbean. These crops have gained importance in diets outside their regions of origin, and their overall relative contribution to diets in developing countries has gradually expanded.

2. A number of oil crops have emerged from relatively minor positions to assume very significant roles as sources of calories and fat worldwide. Soybeans and palm oils in particular have gained importance in plant oil commodity development, providing the world with cheap cooking oil, which otherwise may come from animal food products.

3. Regionally important cereals, root crops, and oil crops have either remained static or declined in relative importance as sources of calories, protein, and/or fat in national diets. Crops such as amaranth, millets, and sweet potatoes, cassava, yams, bananas and plantains, beans, cowpea, pulses, coconut, and groundnut, while important in importing into new regions, have as a whole played reduced roles in global diets during recent decades, as major cereal and oil crops have increased in significance.

What are the implications of these changes in global diets for CGIAR research? Are the current nutrient crops still relevant for alleviating poverty? Is CGIAR maximizing non-cereal crops that are important for improving diets and incomes, particularly as developing countries urbanize? Which crops should receive primary emphasis in research, as policy-makers seek to promote healthier and more sustainable food systems?

Khoury & Jarvis (2014) CIAT Policy Brief #18 (Cali: CIAT)
Declining nutritional quality of fruits and vegetables in the USA and UK

Apparent changes in nutrient concentrations in 20 vegetables and 20 fruits with 95% confidence intervals.

Breeding for nutritional quality is possible

http://www.harvestplus.org/
When life gives you lemons

Pomelo (*Citrus maxima*) - SE Asia

Mandarin (*Citrus reticulata*) - SE Asia

Bitter orange (*Citrus aurantium*) - China

Citron (*Citrus medica*) - India

Lemon (*Citrus limon*) - China? India?
Thank you!

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