Plentiful, Nutrient-Dense Food for the World: A Guide for Registered Dietitian Nutritionists

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A FEBRUARY 2014 SURVEY OF A representative sample of Academy of Nutrition and Dietetics (Academy) members showed high interest in learning more about domestic and global farming and food production practices, strategies for increasing global food security, care of animals raised for human consumption, and environmental considerations along the food supply chain. In response, the Academy produced a series of four educational webinars exploring the increasingly more complex relationship between agriculture and food and nutrition.

As a follow-up to the webinar series, the Academy Foundation hosted a symposium before the 2014 Food & Nutrition Conference & Expo in Atlanta, GA, titled "The RDN's Guide to Plentiful, Nutrient-Dense Food for the World." The symposium was designed to:

- build awareness of major issues in global food security;
- explore agriculture practices and innovations that address these issues;
- examine key messages registered dietitian nutritionist (RDN) farmers use to respond to common consumer food and agriculture concerns; and
- motivate action to promote healthy food systems locally, nationally, and globally.

The first half of the symposium featured two highly regarded food and nutrition security experts, Robert Thompson, PhD, visiting scholar and professorial lecturer at Johns Hopkins University's Paul H. Nitze School of Advanced International Studies, and William Weldon, PhD, vice president for Global Research and Development at Elanco Animal Health. They presented the current state of global food and nutrition security and explained the importance of innovative advances in agricultural productivity and environmental sustainability. The second half of the symposium featured four RDN farmers, each addressing a consumer question about farming that they are commonly asked, presenting the science supporting their answer to that question, and providing application suggestions for RDNs and other food and nutrition practitioners.

This article features symposium highlights from the both the food and nutrition security experts and the RDN farmers.

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MAJOR ISSUES AFFECTING GLOBAL FOOD SECURITY

The major issues affecting global food security were presented in five categories: food security, poverty, and malnutrition; food demand growth; land and water constraints; food systems productivity; and agriculture innovations.

Food Security, Poverty, and Malnutrition

According to the World Health Organization, food security is built upon three pillars: food availability (sufficient quantities of food available on a consistent basis, also known as food access); resources to obtain nutrient-dense foods; and food use (appropriate use based on a knowledge of basic nutrition and care).[1] Other stakeholders, such as The World Food Programme, include a fourth pillar: The innovation required to overcome threats to food security such as inadequate water and sanitation, poor soil quality and growing conditions, crop failure, food waste reduction, natural disasters, war, illness, lack of education, and unemployment.[2]

Of the 7.2 billion people alive in the world today, 1.2 billion are living on less than an adjusted $1.25/day.[2] One out of eight people cannot afford to purchase enough food to provide 1,800 kcal/day, which is less than what is required to support even a medium level of physical activity.[3] This calorie deficit also leads to devastating malnutrition. For example, from the time of conception to age 24 months, malnutrition can cause permanent stunting of a child's mental and physical development, resulting in reduced learning capacity and labor productivity.[4]

Calories alone are not enough to ensure good health. Whereas approximately 842 million people around the world experience calorie deficiencies, >2 billion people experience micronutrient deficiencies, especially in vitamin A, iodine, iron, and zinc.[5] In fact, mortality from micronutrient deficiencies is higher than deaths from human immunodeficiency virus/acquired immune deficiency syndrome, malaria, and tuberculosis combined.[6] The bottom line is clear: Both calories and micronutrients are critical to sustained good health.

Food Demand Growth

During the next 35 years, world food demand is projected to increase by about two-thirds. One-third of this increase will be due to the growing world population, which is mostly concentrated in developing countries; the other one-third will result from an increase in urbanization and economic growth in emerging countries.[7] The global middle class is expected to

increase from 1.8 billion (in 2009) to 4.9 billion in 2030.[8] As incomes rise, so does demand for animal-source protein, such as meat, dairy, and eggs, and for edible oils, fruits, and vegetables. As the world population grows, and more people achieve middle-class status, we will need to produce more nutrient-dense food without increasing our use of natural resources.

Land and Water Constraints

How we use natural resources such as land and water to meet this demand is critical to environmental sustainability. According to the World Wildlife Fund,[9] we are currently using 1.5 "earth's worth" of ecological resources to support our population. There is at most only 12% additional arable farmland available worldwide—land that is neither forested nor subject to erosion or desertification.[10] Most available cropland is in remote areas of South America and Sub-Saharan Africa where infrastructure is minimal and soils are inferior in quality.[10]

Demand for fresh water also constrains food production. As global populations continue to urbanize, cities may outbid agriculture for available fresh water, thus requiring farmers to increase the productivity of water they already have available. And as climate change reduces the amount of potable water in many areas of the world, the need for agricultural systems that require less water will continue to rise. Investment in innovation is critical to finding the most environmentally sustainable solutions to looming land and water constraints.

Food System Productivity

Escalating demand for food must be met with improved productivity along the supply chain. Food loss occurs during all stages of the production cycle—in the fields, during harvest, and from spoilage during shipment and storage.[11] An estimated one-third of world food production—1.3 billion tons of food—ends up in landfills each year as food waste.[12] Converting unusable soil into productive farmland, increasing the genetic potential for crops or farming systems, and reducing postharvest losses are ways to increase food system productivity while preserving natural resources, including land, water, energy, and fertilizer.

Agriculture-Based Innovation

There is no one silver bullet to solve all of the issues that affect global food security. Advances in agricultural innovation, however, have yielded benefits across the food supply chain and will continue to be a driving force in achieving food security.

For example, food fortification can play a lifesaving role in reducing population-wide nutrient deficiencies. Examples of long-standing fortification in the United States and other developed countries include adding vitamins A and D to milk; adding iodine to salt; and adding thiamine, riboflavin, niacin, and folate to wheat flour. An example of using biotechnology to help enhance a crop with valuable nutrients is golden rice. The Golden Rice Project is a technology that enriches rice with provitamin A to help combat vitamin A deficiency in developing countries. In 2012 the World Health Organization reported that about 250 million preschool children experience vitamin A deficiency and that providing those children with vitamin A could prevent about one-third of all deaths of children younger than age 5 years, which amounts to approximately 2.7 million children that could be saved from dying unnecessarily.[13]

In certain areas of the world—such as the United States, Canada, and Mexico—soil quality, precipitation, temperature, disease, weed control, and supplementation with fertilizer produce higher crop yields. Innovations in plant breeding and transgenic technology (ie, genetic modification) have increased productivity through development of drought-tolerant and disease-resistant crops.[14] Improved plant propagation techniques have led to reduced need for pesticides and herbicides and have slowed down product spoilage. Other advances include no-till farming, nitrogen use efficiency, precision agriculture, and soil fertility management. In addition, innovations in animal nutrition and the prevention and treatment of disease have brought dramatic change to animal management.[15]

Many factors addressed in the first half of the symposium are supported by the Academy's position that "all people should have consistent access to an appropriately nutritious diet of food and water, coupled with a sanitary environment, adequate health services, and care that ensure a healthy and active life for all household members. The Academy supports policies, systems, programs, and practices that work with developing nations to achieve nutrition security and self-sufficiency while being environmentally and economically sustainable."[16]

RDN FARMERS ANSWER COMMON CONSUMER FOOD AND AGRICULTURE QUESTIONS

During the second portion of the symposium, four RDN farmers—Amy Myrdal Miller, MS, RDN, founder and president of Farmer's Daughter Consulting, LLC; Dayna Green-Burgeson, RD, senior dietitian, Food and Nutrition Services at University of California, Davis, Medical Center; Abigail Andrew Copenhaver, RDN, Farmstead Nutrition and Consulting, LLC; and Jennie Schmidt, MS, RD, Schmidt Farms Inc—identified and presented talking points on topics that consumers commonly ask them.

Is Grass-Fed Beef Better than Grain-Fed Beef? (Amy Myrdal Miller, MS, RDN)

Although many factors affect beef quality, there is little difference in nutrient value between grain-fed and grass-fed beef. Grass-fed beef is slightly lower in calories and total fat, and slightly higher in protein. It is important to remember that all cattle start their lives eating grass. In cases where cattle are not receiving enough nutrition from grazing in a pasture, the rancher may supplement their diets with other grains, including corn or sorghum or with soybeans.

Although there is little difference in nutrient value, there is a difference in environmental impact between grass-fed and grain-fed cattle. Grass-fed cattle take longer to reach slaughter weight, and therefore produce more methane gas during their lives compared with grain-fed cattle. Grass-fed cattle also produce more methane than their grain-fed counterparts due to the quality of the diet. Cattle are ruminants; methane is produced by bacteria in the stomach or rumen of cattle. The less digestible the feed, the